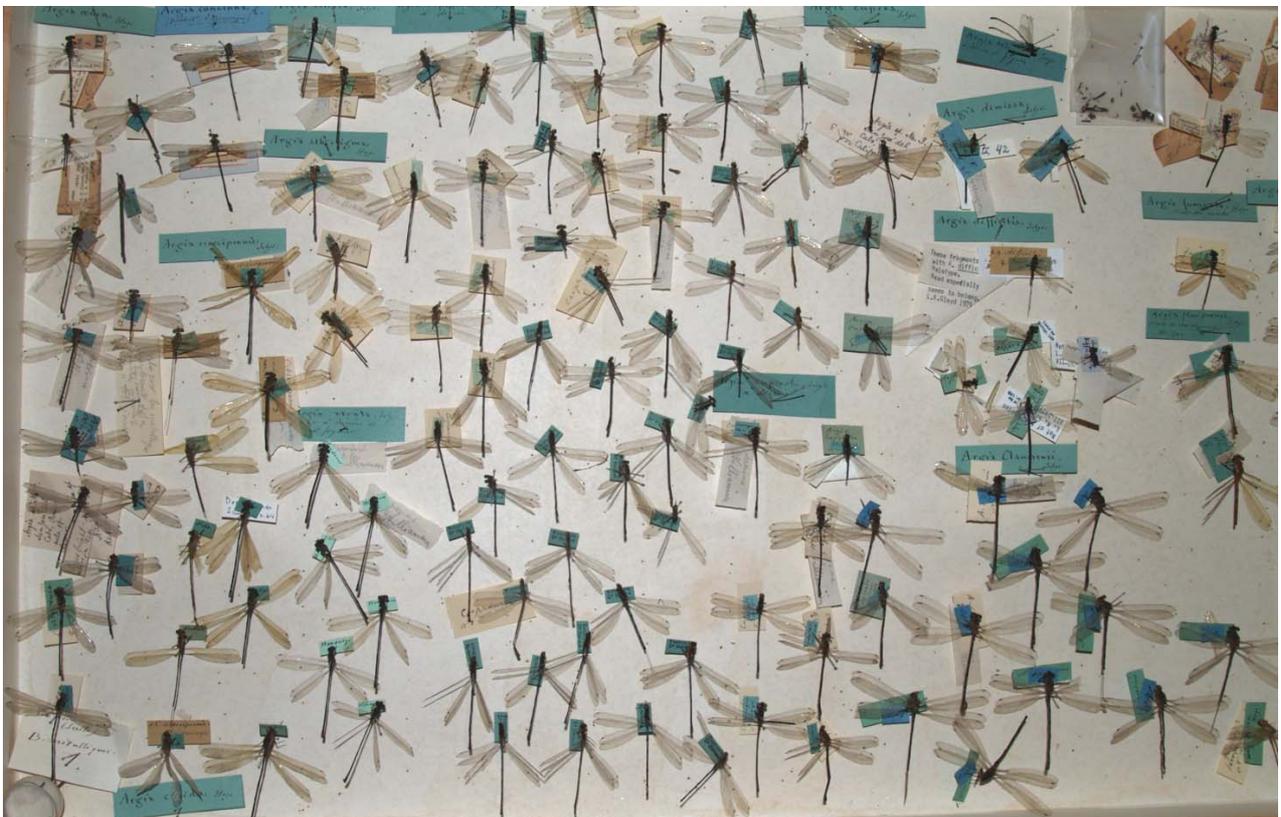


## Untangling some taxonomic riddles on damselfly genera (Zygoptera) from the neotropical region

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Drawer of Selys collection in IRSNB containing some primary types of *Argia* Rambur, 1842

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## Summary

Examination of type material deposited in the IRSNB (Royal Belgian Institute of Natural Sciences, Brussels, Belgium) and in the BMNH (British Museum of Natural History, London, Great Britain) allowed us to solve taxonomic riddles regarding several damselfly (Zygoptera) genera from the neotropical region. We provide notes on the status of several types, and introduce the following new synonymies: *Argia huallaga* Fraser, 1946 = *A. adamsi* Calvert, 1902; *Argia makoka* Fraser, 1946 = *A. kokama* Fraser, 1946; *Argia mollusca* Fraser, 1946 = *A. collata* Selys, 1865; *Argia trifoliata* Fraser, 1946 = *A. variegata* Förster, 1914; *Argia umbriaca* Fraser, 1946 = *A. indicatrix* Calvert, 1902; *Amphiagrion amphion* Selys, 1876 = *Ischnura verticalis* (Say, 1840); a new combination: *Oxyagrion cardinalis* Fraser, 1946 to *Leptobasis cardinalis* (Fraser, 1946); and three lecto-type designations (for *Acanthagrion gracile* race? *lancea* Selys, 1876, *Acanthagrion trimaculatum* Selys, 1876, and *Leptagrion flammeum* Selys, 1876).

## Introduction

Dragonflies and Damselflies (Order Odonata) are one of the more charismatic groups of Insects along with butterflies and certain families of beetles. Their relatively large size, striking coloration, interesting biology, and relative fewness in number of species (about 5,600 species worldwide) compared to other orders of insects are factors contributing to their popularity. They are also optimal indicators of wetland health; their larvae develop in freshwater and are critical as to water quality and aquatic habitat structure. Odonates have already been used as indicators of wetland status in Europe, Japan, USA and Australia (Clausnitzer & Jödicke 2004). In the neotropical region even baseline data – including alpha taxonomy, a prerequisite for any other study – is still badly needed.

The study of neotropical Odonata started with the monumental synopses and monographies published by Rambur (1842), and Selys and Hagen from 1853 through 1989 (i.e. Hagen 1861; Selys 1853; 1854a; 1854b; 1877; 1889). Most of these contained original descriptions of numerous species with only a few free-hand illustrations. Association of these taxa with recently collected material can be verified in most cases only by comparison with type material. The Brazilian entomologist Newton Dias dos Santos, often called the Father of Brazilian Odonatology, published a series of over 100 papers, mostly taxonomic, from



1941 to shortly before his death in 1989. Other papers primarily by J. De Marmels and others (see excellent account in Paulson 2004 for references) have significantly added to the list of species from this region. The neotropical region has the richest odonate diversity in the World; it houses about 1,650 species in 195 genera, or about 30 % of the world's total (Bridges 1994; Tsuda 2000). Despite their appeal and potential usefulness for wetland conservation, no comprehensive accounts comparable to the Nearctic manuals on Odonata Zygoptera (Westfall & May 1996), and Anisoptera (Needham et al. 2000) from the United States and Canada have been published for this region until recently (Förster 2001; Garrison et al. 2006; Heckman 2006). As of today, students of Zygoptera have to rely on scattered publications that treat regional fauna or review particular groups in order to identify their material, and the only South American country for which there are comprehensive keys available is Brazil (Lencioni 2005; 2006).

The generic classification of many neotropical odonates, especially within family Coenagrionidae, is still unsettled. Recently, a few speciose damselfly genera have been revised and illustrated (Garrison 1990; 2006; De Marmels 2001) but similar treatments for most genera are still lacking or are old and out of date. The chance of encountering new species is still high, and it is therefore mandatory that previously described species be documented by examination of type material and, if possible, supplemental illustrations. Although we have already identified a number of synonymies and taxonomic mistakes (i.e. von Ellenrieder 2003; De Marmels & Garrison 2005; Garrison & von Ellenrieder 2007), many remain to be solved. In order to accomplish this, it is necessary we first clarify the identity of several obscure names, the primary types of which are deposited in European collections, particularly the Collection Selys deposited in the IRSNB, which also includes the valuable collection of M. P. Rambur, and the collection of the BNHM.

The objective of this project was thus to elucidate the taxonomic identity of several obscure generic and specific names of damselfly genera from the neotropical region, whose types are lodged in the collections of the Royal Belgian Institute of Natural Sciences and the Natural History Museum of London. This project constitutes a necessary step in the process of diagnosing all neotropical Zygoptera genera, and is part of our work on neotropical damselflies leading to the publication of an annotated and illustrated key to the Zygoptera genera of the New World (as a second volume to follow Garrison et al. 2006).



## Methodology

Primary type material of neotropical Zygoptera in the IRSNB and BMNH collections was critically examined, and diagnostic characters were analyzed and illustrated. Acronyms used for collections are as follows: BMNH: The Natural History Museum, London, Great Britain; IRSNB: Royal Belgian Institute of Natural Sciences, Brussels, Belgium; MCZ: Museum of Comparative Zoology, Cambridge, Massachusetts, U.S.A.; MIZA: Museo del Instituto de Zoología Agrícola, Maracay, Venezuela; NMW: Naturhistorisches Museum, Wien, Austria; NHRS: Naturhistoriska Riksmuseet Stockholm, Sweden; RWG: Rosser W. Garrison personal collection, Sacramento, California, U.S.A.; UMMZ: University of Michigan, Museum of Zoology, Ann Arbor, Michigan, U.S.A. For each taxon examined comments on its taxonomic status, and for new synonyms and new combinations complete synonymic lists are provided. We list material by family and alphabetically by current genera, and use original name combinations when discussing type material. Type nomenclature for material in the BMNH follows Kimmins (1966, 1970). In following text, S = abdominal segment number(s).

## Results

### Amphipterygidae

#### *Amphipteryx* Selys, 1853

#### *Amphipteryx agrioides* Selys, 1853

The single holotype female from “Colombie (Collect. Selys)” was apparently never re-examined, except by B.E. Montgomery who never published his observations. Calvert (1901) in his *Biologia Centrali-Americana* assigned this name to specimens he mentioned and depicted from Guatemala and Mexico, and everyone has followed him since. Examination of the holotype in IRSB indicated that Calvert was incorrect in assigning his species to *A. agrioides*. The species regarded as *A. agrioides* sensu Calvert corresponds to an undescribed species. The type locality of *A. agrioides* (Colombia) has been a mystery since the genus appears exclusive to Middle America and no species of *Amphipteryx* has since been collected in South America; González (1991) described *A. longicaudatus* (should be *A. longicaudata*; Novelo 1995) from Oaxaca, Mexico, and Paulson (1982: 250) listed the same from Mexico, Guatemala, with an unpublished record from Honduras. Selys (1854a: 241, 243) expanded on the distribution of *A. agrioides* noting (page 241) that it had been collected “dans la province de Cumana (Amérique méridionale équatoriale)” and (page 243) “d’après un exemplaire



recueilli par M. Funck, et qui se trouvait avec l' *Hetaerina majuscula* et l' *Agrion* (*Hyponevra*) *Funcki*..." De Marmels (1990) dismissed the record of *A. agrioides* from "Cumaná [Venezuela]." The other two species are Central American; *H. majuscula* Selys, 1853 has so far been collected only in Costa Rica and *Argia funcki* (Selys, 1854) has not been collected south of El Salvador. We strongly suspect that the type locality for *A. agrioides* is in the southern region of Mexico or Guatemala.

*Amphipteryx agrioides* Selys, 1853

(Figs. 1a-b)

*Amphipteryx agrioides* Selys, 1853: 66-67 (description of female); — Selys (1854: 241-243; redescription of female; comments on type locality); — Walker (1853: brief description of male) — Kirby (1890: 111, mention)

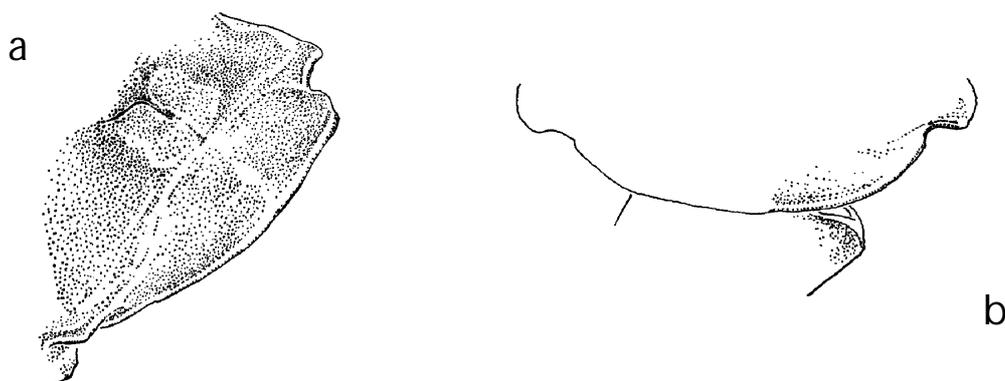


Figure 1. *Amphipteryx* (*Amphipterygidae*) — Posterior lobe of prothorax of holotype female of *A. agrioides* [IRSNB] — (a) medio-dorsal view; (b) dorsal view.

*Megapodagrionidae*

*Heteragrion* Selys, 1862

*Heteragrion aequatoriale* Selys, 1886

Series in IRSNB represented by 2 large males, 1 smaller female, and a very poor teneral incomplete specimen, whose identity is impossible to establish; 1 male, 'Ecuador' [labels photographed]—head missing on this specimen; another mature male: 'Neu/Grenada' [labels photographed; cercus illustrated; Figs 2a-c]; this Colombian male would seem to be *H. mitratum* Williamson, 1919. The smaller female from McLachlan (Rio Bobonaza) is also likely *H. mitratum*. Daigle (in

prep.) has argued that Kimmins' (1970) lectotype designation of a male in the BMNH corresponding to *H. mitratum* be suppressed and that the male in IRSNB from Ecuador be accepted as lectotype of this name. Details of the nomenclatorial history surrounding this name will appear in the paper by Daigle cited above.

*Heteragrion aurantiacum* Selys, 1862

Examination of a complete syntype male in IRSNB allowed us to confirm its identity. Appendages illustrated (Fig. 2d).

*Heteragrion cinnamomeum* Hagen in Selys, 1862

Appendages of a complete syntype male in IRSNB were illustrated by Williamson (1919: figs 123, 124) and we illustrate the appendages in more detail here (Figs 2j-l). We think this is a synonym of *H. macilentum* Hagen in Selys, 1862 (Figs 2m-o; lectotype), and possibly also of *H. ochraceum* Hagen in Selys, 1862.

*Heteragrion cinnamomeum* Selys, 1862

(Figs 2j-o)

*Heteragrion cinnamomeum* Selys, 1862: 26 (24 reprint) (description of male as possible race of *H. aurantiacum* Selys, 1862); Selys (1886: 60, as synonym of *H. aurantiacum*); — Williamson (1919: 25-26; questions authorship of taxon and synonymy with *H. aurantiacum*; suggests possible synonymy with *H. ochraceum* Selys, 1862; illustrations of male cerci, figs. 123, 124) — Lencioni (2005: 139; as synonym of *H. ochraceum*; mention from Brazil)

*Heteragrion macilentum* Hagen in Selys, 1862: 26-27 [24-25 reprint] (description of two males and a female); — Selys (1886: 60-61, misspelled as *H. macilentum*; diagnosis from *H. aurantiacum*); — Williamson (1919: 23; discussion); — St. Quentin (1970: 259; lectotype designation — De Marmels (2004: 442-443; discussion of lectotype, illustration of head, posterior lobe of prothorax, cerci, figs. 14-17) — Lencioni (2005: 135; mention from Brazil; illustration of head, posterior lobe of prothorax, cerci, figs. 84a-e) new synonymy

*Heteragrion flavovittatum* Selys, 1862

Type species of genus. Examination of a complete syntype male in IRSNB allowed us to confirm its identity. Appendages illustrated (Fig. 2e).



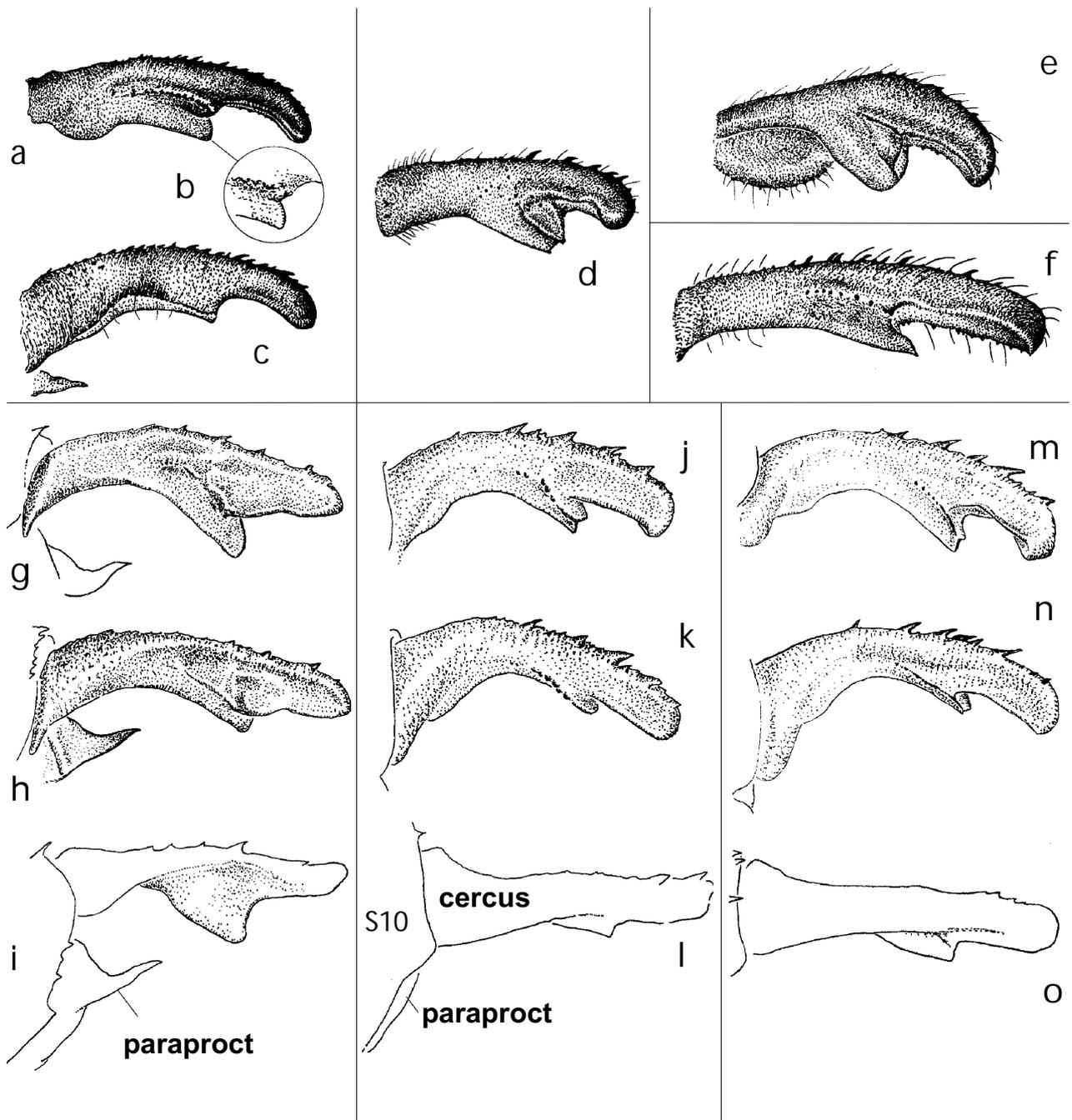


Figure 2. Heteragrion (Megapodagrionidae) — Male cercus — [a-c] Male of *H. aequatoriale* from Colombia [IRSNB]: (a) medio-dorsal view; (b) detail medio-dorsal view; (c) dorsal view — (d) Syntype male of *H. aurantiacum* [IRSNB] (medio-dorsal view); (e) Syntype male of *H. flavovittatum* [IRSNB] (medio-dorsal view); (f) Syntype male of *H. majus* [IRSNB] (medio-dorsal view) — [g-i] Holotype male of *H. romani* (probable junior synonym of *H. icterops*) [NHRS]: (g) mediadorsal view; (h) dorsal view; (i) lateral view — [j-l] Syntype male of *H. cinnamomeum* from Bahia [IRSNB]: (j) mediadorsal view; (k) dorsal view; (l) lateral view — [m-o] Lectotype male of *H. macilentum* [NMW]: (m) mediadorsal view; (n) dorsal view; (o) lateral view.

*Heteragrion icterops* Selys, 1862

Represented by 1 male and 1 female in IRSNB; the male from Santarem by Bates lacks the appendages. There are others labeled by Selys from a later date as *H. icterops* — these include a small series from São João del-Rei which are not *H. icterops*. De Marmels (1987; 1989) discussed the complex problem of associating this name to specimens. Williamson (1919) examined (and figured) a male from “Pebas/Teffe” which is not the same in appendage morphology as *Heteragrion romani* Sjöstedt, 1918 (Figs 2g-i; holotype) a species which De Marmels (1987) believed might be the same as *H. icterops*.

*Heteragrion majus* Selys, 1886

Examination of a complete syntype male in IRSNB allowed us to confirm its identity. Appendages illustrated (Fig. 2f).

*Heteragrion ochraceum* Hagen in Selys, 1862

Type series in IRSNB represented by 2 poorly preserved and incomplete females, whose identities are impossible to establish; 1 female, juvenile ‘Brasil’ lacks head, S7-10 & 1 wing missing; 1 female mature, lacks head, S7-10 missing ‘Cl[aussen]/ 1.’ and ‘*Heteragrion/ aurantiacum* ? Brasil G’, which looks like *H. aurantiacum* Selys, 1862.

Identities of *H. ochraceum* Hagen in Selys, 1862 and *H. obsoletum* Selys, 1886 remain obscure, and the type series of *H. aequatoriale* Selys, 1886 is a mixed series. Thorough revision of this speciose genus necessary to solve their status.

*Mesagrion* Selys, 1885*Mesagrion leucorrhinum* Selys, 1885

Examination of holotype male from Bogotá, Colombia, housed in BMNH allowed us to confirm its identity [holotype photographed].

## Pseudostigmatidae

*Mecistogaster* Rambur, 1842*Mecistogaster buckleyi* McLachlan, 1881

Examination of lectotype male in BMNH allowed confirmation of its identity with specimen in RWG collection [lectotype photographed].

*Mecistogaster jocaste sincerus* McLachlan, 1877

Examination of lectotype female in BMNH allowed confirmation of its identity with specimen in RWG collection [lectotype photographed].



*Microstigma* Rambur, 1842*Microstigma anomalum* Rambur, 1842

Three species are currently recognized in this genus with *M. anomalum* Rambur, 1842 as type species. Types apparently lost or unrecognizable (Schmidt 1958). Males identified as this species in IRSNB compared to specimens in RWG collection determined by Schmidt. Appear to be the same species especially as to hind margin of prothorax.

*Microstigma rotundatum* Selys, 1860

Lectotype female designated by Schmidt (1958) in IRSNB was compared to female in RWG collection. Appear to be the same species especially as to hind margin of prothorax [labels and specimen photographed].

## Protoneuridae

*Idioneura* Selys, 1860*Idioneura ancilla* Selys, 1860

The genus currently contains one described species, but at least two more undescribed species are known (Lencioni pers. comm.; Pessacq 2006). Three specimens identified as *Idioneura ancilla* by Selys – no types – were found in IRSNB: One incomplete female which agrees with species concept by unique morphology of hind margin of prothorax; one female incorrectly labeled (not *I. ancilla* Selys but some other protoneurid); and one male that looks like *I. ancilla* but lacks appendages. Examination of types, supposed to be in the Berlin Museum, needed in order to confirm correct application of name.

*Proneura* Selys, 1889*Proneura prolongata* Selys, 1889

Described from a single male from "Le Peba, Teffé". Possible location of type locality ["Pebas, Teffé (Amazon)"] discussed by Machado (1985: 214). The weird freehand wing illustration provided by Selys (1889) has been about the only evidence anyone has gone by since its original description. The holotype in IRSNB (Figs 3a-e) is a male in poor condition, with frons not angled, rear of head largely pale, and legs mostly gone – no femora, parts of tibiae, spurs appear shorter than intervals between them. HW 14 mm.

By direct comparison of the holotype male with a male of *Junix elumbis* Rácenis, 1968 [MIZA] we determined that they are similar but not the same species. We think it wise to keep them in separate genera for now, though *Junix* could be possibly included in *Proneura*.



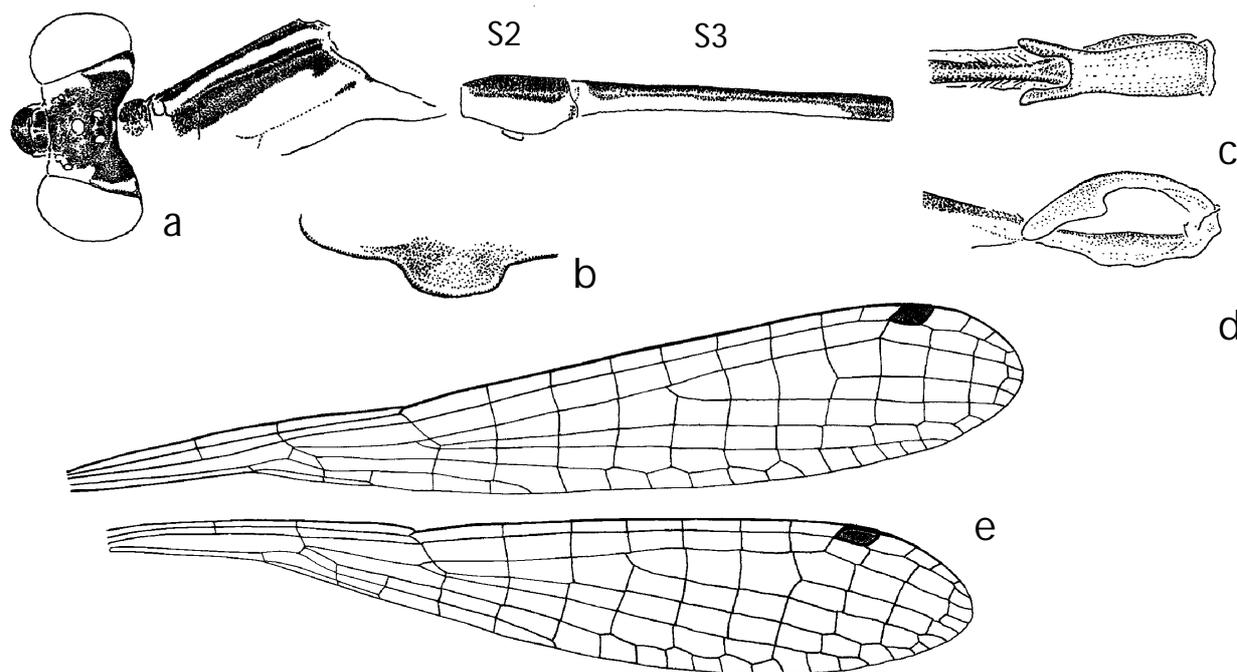


Figure 3. *Proneura* (Protoneuridae) — Male holotype of *P. prolongata* [IRSNB] — (a) head (dorsal view), thorax and S2-3 (lateral view); (b) pronotum (dorsal view); (c) genital ligula (ventral view); (d) genital ligula (lateral view); (e) wings.

### Coenagrionidae

#### *Acanthagrion* Selys, 1876

#### *Acanthagrion apicale* Selys, 1876

Possible syntypes presently in IRSNB: 2 males from 'Para' + Label stating: 1 exemplaire (s) en prêt chez M. Santos depuis le VIII – 1981

#### *Acanthagrion apicale descendens* Fraser, 1946

Examination of male holotype in BMNH from Peru, Mishuyacu, confirms its synonymy with *Acanthagrion apicale*. Genital ligula, which was removed and separately pasted to the card with holotype, is missing but it is illustrated in original description.

#### *Agrion gracile* Rambur, 1842

This is the type species of the large genus *Acanthagrion*, but its identity has not been fully resolved. Given the number of species currently in this genus (42; Garrison 1991), it is imperative to correctly apply this name to specimens. Gloyd in Leonard (1977: 146-147) discussed the type material for this name based on Montgomery's observations in the IRSNB. However, syntypes of *Acanthagrion gracile* were determined not to be presently at IRSNB: Label stating: 2 exemplaire (s) en prêt chez M. Santos depuis le VIII – 1981.

*Acanthagrion gracile floridense* Fraser, 1946

Male holotype in BMNH from Florida, SE Colombia. Morphology of cerci (Figs 4a-b) suggests *Acanthagrion peruvianum* Leonard, 1977 is a junior synonym of *Acanthagrion floridense* Fraser, 1946. Genital ligula missing but illustrated in original description. Taxonomic changes will be published by Lozano (in prep.) as part of his PhD thesis.

*Acanthagrion gracile* variété *cuneatum* Selys, 1876

Syntypes presently in IRSNB comprise a mixed series: 1 male missing S8-10 from 'Mexique' [corresponding to current concept of *A. quadratum*] and 1 male (only incomplete pterothorax) from Rio de Janeiro + Label stating: 2 exemplaire (s) en prêt chez M. Santos depuis le VIII – 1981. Designation of a male from Brazil as lectotype needed in order to avoid *A. quadratum* falling into synonymy with *A. cuneatum*.

*Acanthagrion gracile* variété *quadratum* Selys, 1876

No syntypes presently in IRSNB: Label stating: 1 exemplaire (s) en prêt chez M. Santos depuis le VIII – 1981.

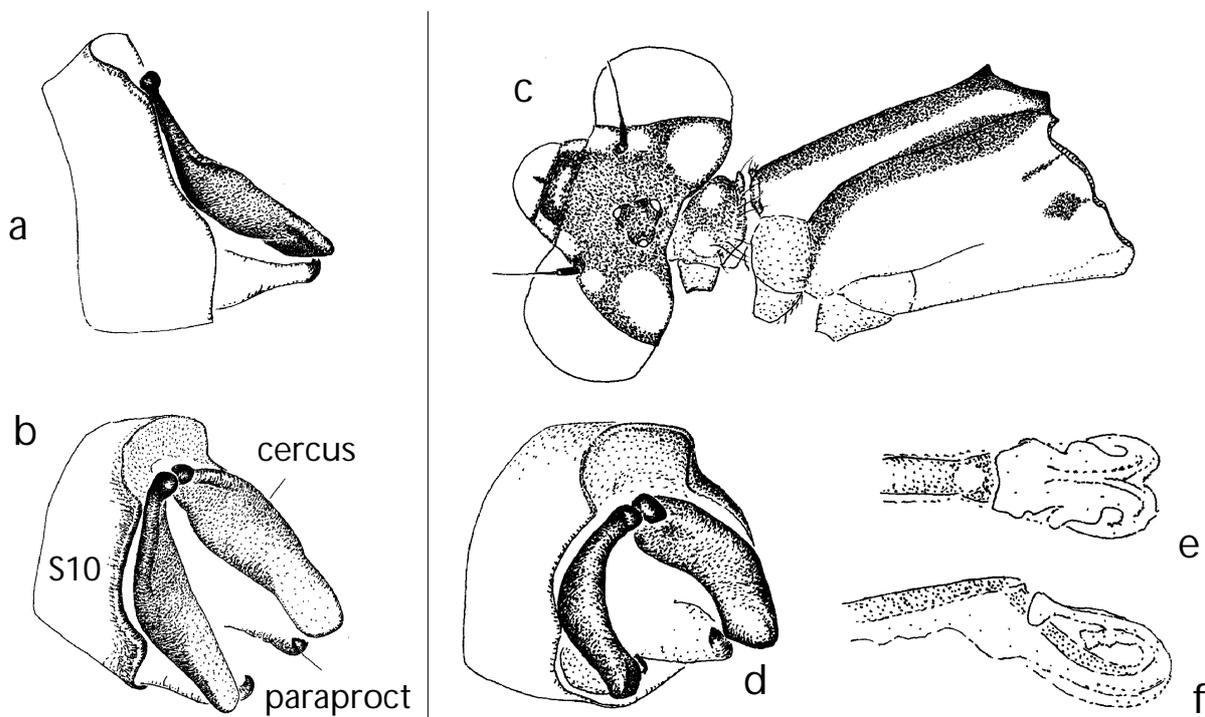


Figure 4. *Acanthagrion* (Coenagrionidae) — [a, b] S10 of male holotype of *A. gracile floridense* [BMNH]: (a) lateral view; (b) medio-dorsal view — [c-f] male lectotype of *A. gracile* race? *lancea* from Buenos Aires, Argentina [IRSNB]: (c) head (dorsal view) and thorax (lateral view); (d) S10 (medio-dorsal view); (e) genital ligula (ventral view); (f) genital ligula (lateral view).

*Acanthagrion gracile* race? *lancea* Selys, 1876

Type series presently in IRSNB includes 5 males from 'Buenos Ayres' + 1 male from 'Santa-Cruz'. Label stating: 2 exemplaire (s) en prêt chez M. Santos depuis le VIII – 1981. A complete male from Buenos Aires was designated as lectotype and illustrated (Figs 4c-f).

*Acanthagrion gracile* race? *minarum* Selys, 1876

Possible types presently in IRSNB include 8 males and 2 females [all with blue label with manuscript MG] + Label stating: 1 exemplaire (s) en prêt chez M. Santos depuis le VIII – 1981. They represent a mixed series: 1 male *A. gracile*, 1 male *A. truncatum*, and remaining specimens of unknown identity.

*Acanthagrion gracile* race? *vidua* Selys, 1876

Syntypes presently in IRSNB: 1 female [with green label with hand written 'Merida'] + Label stating: 1 exemplaire (s) en prêt chez M. Santos depuis le VIII – 1981

*Acanthagrion temporale* Selys, 1876

Possible syntype in IRSNB: 1 female [with light blue label with hand written 'Bres.']+ Label stating: 1 exemplaire (s) en prêt chez M. Santos depuis le VIII – 1981.

*Acanthagrion truncatum* Selys, 1876

Syntypes presently in IRSNB: 5 males and 3 females [all with green label with printed Sã. João-del-Rey] + Label stating: 1 exemplaire (s) en prêt chez M. Santos depuis le VIII – 1981.

We believe a thorough revision of this genus including careful designation of lectotypes is needed in order to solve pending specific questions.

*Aeolagrion* Williamson, 1917*Agrion dorsale* Burmeister, 1839

5 males and 1 female in IRSNB identified by Selys were examined; at least 2 mature males exactly as 2 males of *A. dorsale* from the Williamson collection (British Guiana) except labrum pale, almost ochraceous. Appendages and dissected ligula are the same.



*Leptagrion flammeum* Selys, 1876

This species was included in *Aeolagrion* by Williamson (1917) but its generic placement remains doubtful (Dunkle 1991; De Marmels 2007). Represented by 2 males [# 136 & 56] and 1 female [# 136 – *Agrion cinnamomeum*] [rives Amazonas et Brasil, M. Bates] at IRSNB. Male # 136 illustrated and designated here as lectotype (Figs 5a-d).

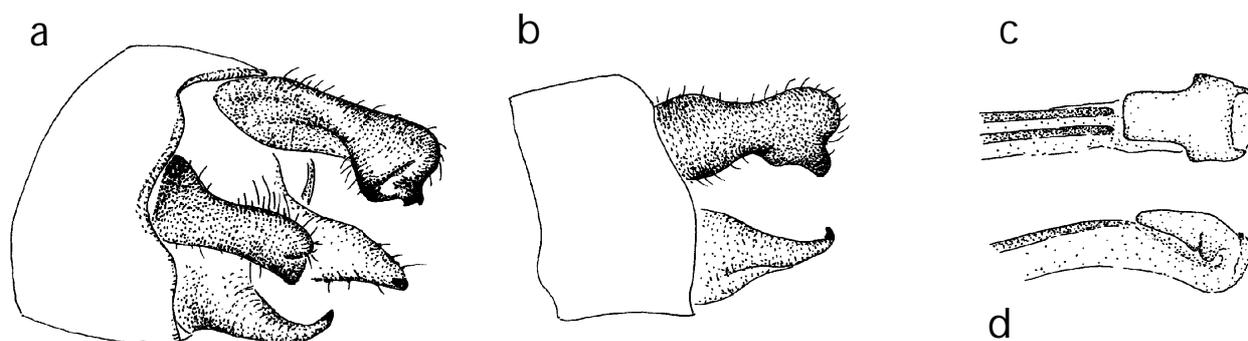


Figure 5. *Aeolagrion* (Coenagrionidae) — Lectotype of *Leptagrion flammeum* from Amazon river [IRSNB] — (a) S10 (medio-dorsal view); (b) S10 (lateral view); (c) genital ligula (ventral view); (d) genital ligula (lateral view).

*Argia Rambur*, 1842

Arguably the most speciose and difficult genus of Odonata in the New World; Garrison (1994) provided a fully illustrated synopsis for all species occurring in the United States and Canada, and is currently working on completion of synopsis for the neotropical components of this genus (Garrison in prep.-b). Most of the type material described by Fraser (1946) in the BMNH has been glued to cards.

*Argia chelata* Calvert, 1902

Identity confirmed by comparison of holotype in BMNH with voucher material in RWG collection.

*Argia clausenii* Selys, 1865

Identity confirmed by comparison of syntypes in IRSNB and Museum of Comparative Zoology, Harvard University with voucher material in RWG collection.

*Argia collata* Selys, 1865

Identity confirmed by comparison of syntype male in IRSNB with voucher material in RWG collection. Previously questioned as a synonym of *Argia thespis*



Hagen in Selys, 1865 (see below under latter name); it was found to be a good species (Figs 6r-t).

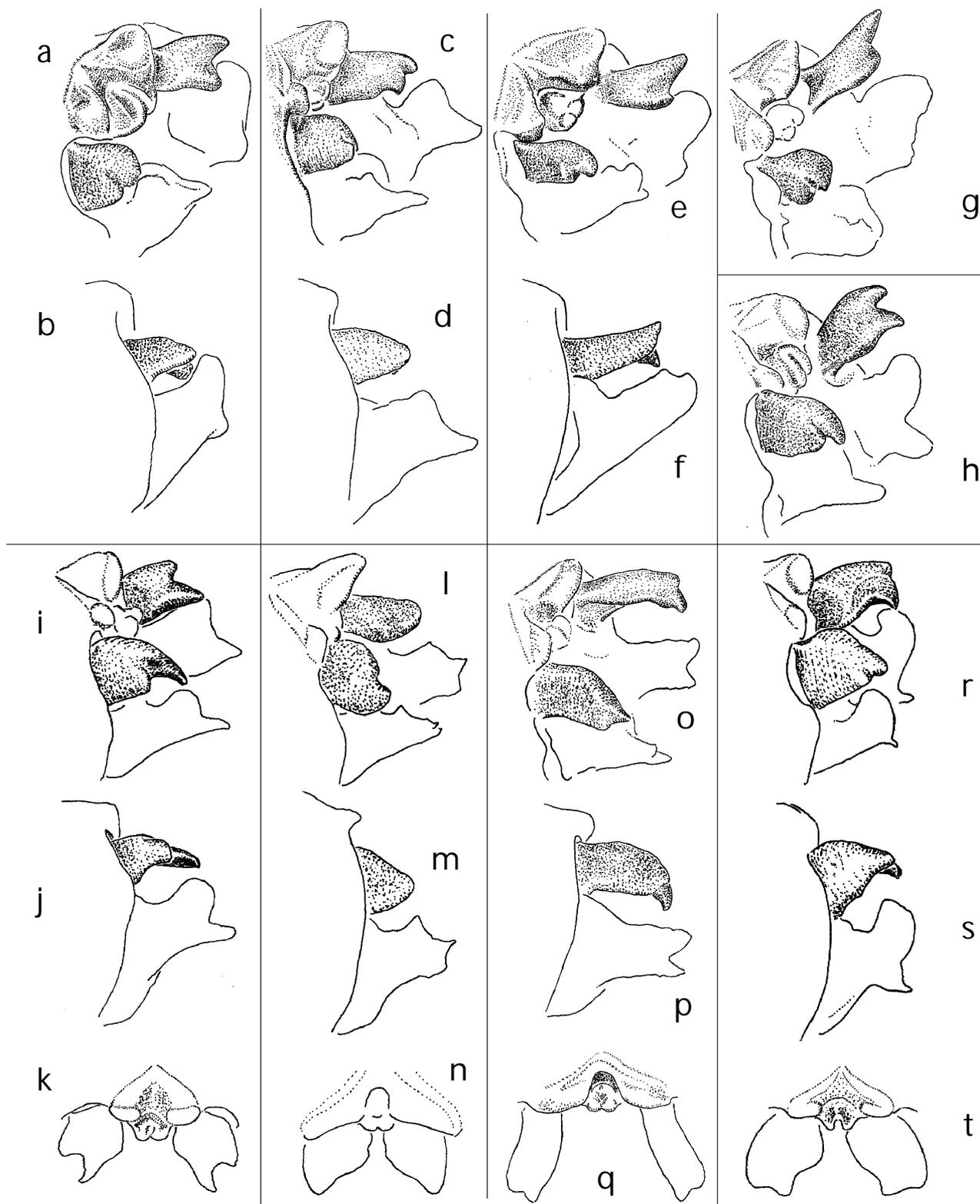


Figure 6. *Argia* (Coenagrionidae) — Male S10 — [a, b] Syntype of *A. dimissa* [IRSNB]: (a) medio-dorsal view; (b) lateral view — [c, d] Holotype of *A. eliptica* [IRSNB]: (c) medio-dorsal view; (d) lateral view — [e, f] Holotype of *A. umbricata* [BMNH]: (e) medio-dorsal view; (f) lateral view — (g) Holotype of *A. indicatrix* [BMNH] (medio-dorsal view); (continued on next page)

(h) Holotype of *A. hamulata* [BMNH] (medio-dorsal view); [i-k] *A. adamsi* from Panama [RWG], illustrations compared with lectotype of *A. huallaga* [BMNH]: (i) medio-dorsal view; (j) lateral view; (k) dorsal view — [l-n] *A. lateralis* (manuscript name for *A. huanacina*) [IRSNB]: (l) medio-dorsal view; (m) lateral view; (n) dorsal view — [o-q] Holotype of *A. popoluca* [BMNH]: (o) medio-dorsal view; (p) lateral view; (q) dorsal view — [r-t] *Argia collata* from Venezuela, Bolivar [RWG] compared to syntype of *A. collata* [IRSNB] and holotype of *A. mollusca* [BMNH]: (r) medio-dorsal view; (s) lateral view; (t) dorsal view.

*Agrion concinnum* Rambur, 1842

Identity confirmed by comparison of syntype male in IRSNB with voucher material in RWG collection.

*Argia croceipennis* Selys, 1865

Identity confirmed by comparison of syntypes in IRSNB with voucher material in RWG collection.

*Argia cupraurea* Calvert, 1902

Identity confirmed by comparison of holotype in BMNH with illustrations of material in RWG collection.

*Argia dimissa* Selys, 1865

Identity confirmed by comparison of male syntype in IRSNB with voucher material in RWG collection labeled as *A. sordida* Hagen in Selys, 1865; junior synonym of *A. sordida* (Lencioni 2006 after Garrison 1991).

*Argia eliptica* Selys, 1865

Lectotype in IRSNB designated by Gloyd in 1979 conforms to RWG concept of this species occurring from Mexico south through Rondônia State, Brazil. Typical bilobed spot on front of epicranium present (Fig. 8a). Appendages of lectotype illustrated (Figs 6c, d).

*Argia euphorbia* Fraser, 1946

Identity confirmed by comparison of holotype in BMNH with voucher material in RWG collection.

*Argia fissa* Selys, 1865

Identity confirmed by comparison of male syntype in IRSNB with voucher material in RWG collection.



*Argia forficula* Fraser, 1946

Identity confirmed by comparison of lectotype in BMNH with voucher material in RWG collection; this species is a junior synonym of *Argia difficilis* Selys, 1865 (Garrison & von Ellenrieder 2007) (also compared in IRSNB).

*Hyponeura funcki* Selys, 1854

Identity confirmed by comparison of syntypes (2 males, 1 female) in IRSNB with voucher material in RWG collection. Label data ("Columbie") determined to be likely in error; more likely eastern Mexico; data labels as for another geographically misplaced species, *Amphipteryx agrioides* (see above).

*Argia hamulata* Fraser, 1946

Identity confirmed by comparison of holotype in BMNH with voucher material in RWG collection. Appendages of holotype illustrated (Fig. 6h).

*Argia herberti* Calvert, 1902

Identity confirmed by comparison of holotype in BMNH with voucher material in RWG collection.

*Argia huallaga* Fraser, 1946

Identity confirmed by comparison of lectotype in BMNH with illustrations of material in RWG collection; a junior synonym of *Argia adamsi* Calvert, 1902.

*Argia adamsi* Calvert, 1902

(Figs 6i-k)

*Argia adamsi* Calvert, 1902: 80-81 (description of male; illustration of male cerci, figs. 35, 35a); — Calvert (1907: 367; description of female, fig. 5); — Rácenis (1959: 474; mention from Huanuco and Moyobamba, Peru)

*Argia huallaga* Fraser, 1946: 450-451 (description of male and female; illustration of male cerci, fig. 2a); — Rácenis (1959: 475; mention from Yumbatos, Peru)  
new synonymy

*Argia impura* Rambur, 1842

Syntype male and female in IRSNB; male compared with material in RWG collection identified as *A. indicatrix* Calvert, 1902; possibly the same species but appendages of syntype missing render positive association of names impossible. Head, thorax, S1-2 and part of S3 illustrated (Figs 8b, c).



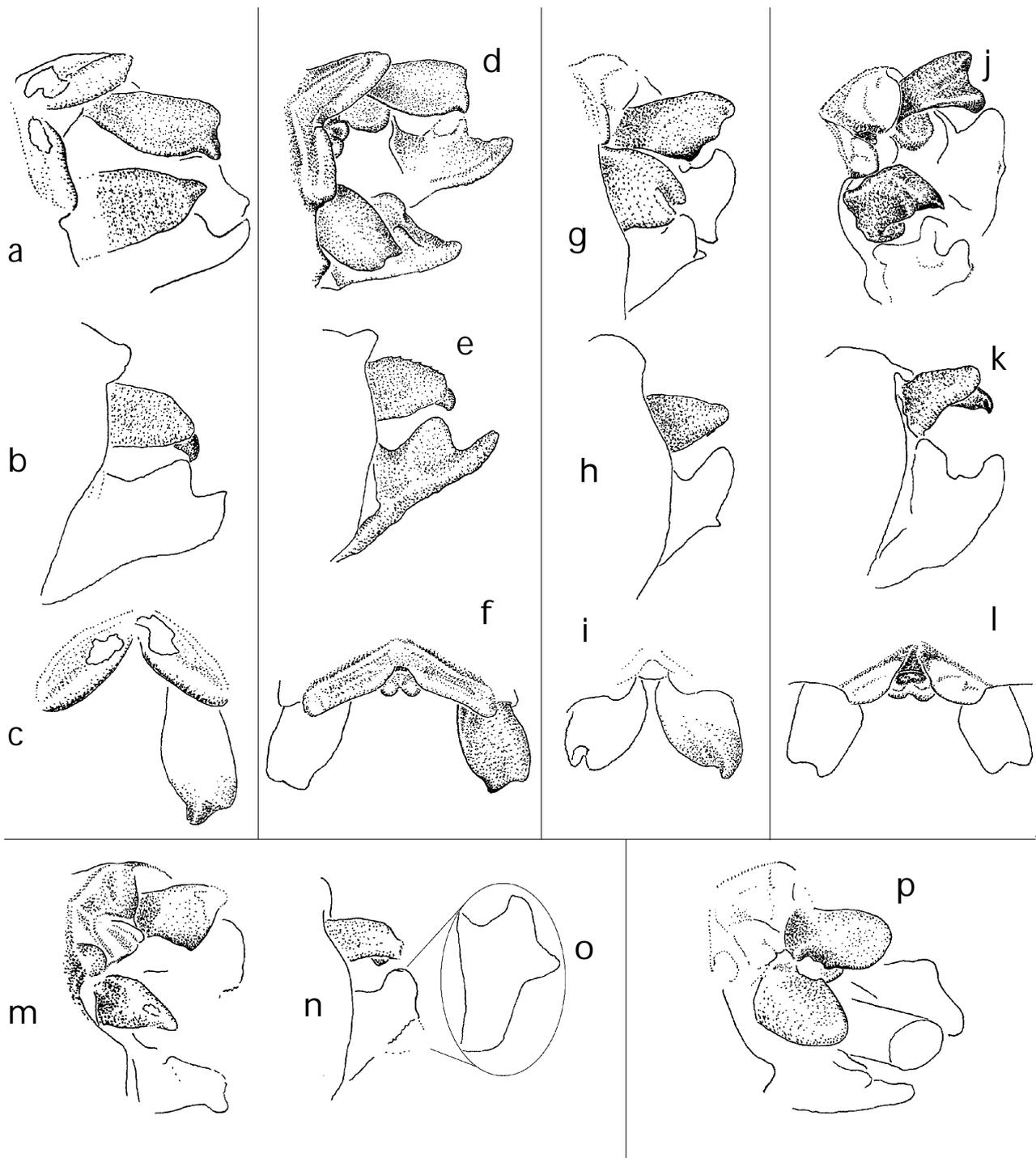


Figure 7. *Argia* (Coenagrionidae) — Male S10 — [a-c] Holotype of *Argia makoka* [BMNH]: (a) medio-dorsal view; (b) lateral view; (c) dorsal view — [d-f] Holotype of *A. kokama* [MCZ]: (d) medio-dorsal view; (e) lateral view; (f) dorsal view — [g-i] Syntype of *A. thespis* [IRSNB]: (g) medio-dorsal view; (h) lateral view; (i) dorsal view — [j-l] specimen of *A. variegata* [RWG] compared to syntype [UMMZ]; illustrations compared to lectotype of *A. trifoliata* [BMNH]: (j) medio-dorsal view; (k) lateral view; (l) dorsal view — [m-o] Syntype of *A. tinctipennis* [IRSNB]: (m) medio-dorsal view; (n) lateral view; (o) detail paraproct (lateral view) — (p) Holotype of *A. reclusa* [IRSNB] (medio-dorsal view).

*Argia indicatrix* Calvert, 1902

Identity confirmed by comparison of holotype in BMNH with voucher material in RWG collection; appendages of holotype illustrated (Fig. 6g). A senior synonym of *A. umbriaca* (see below).

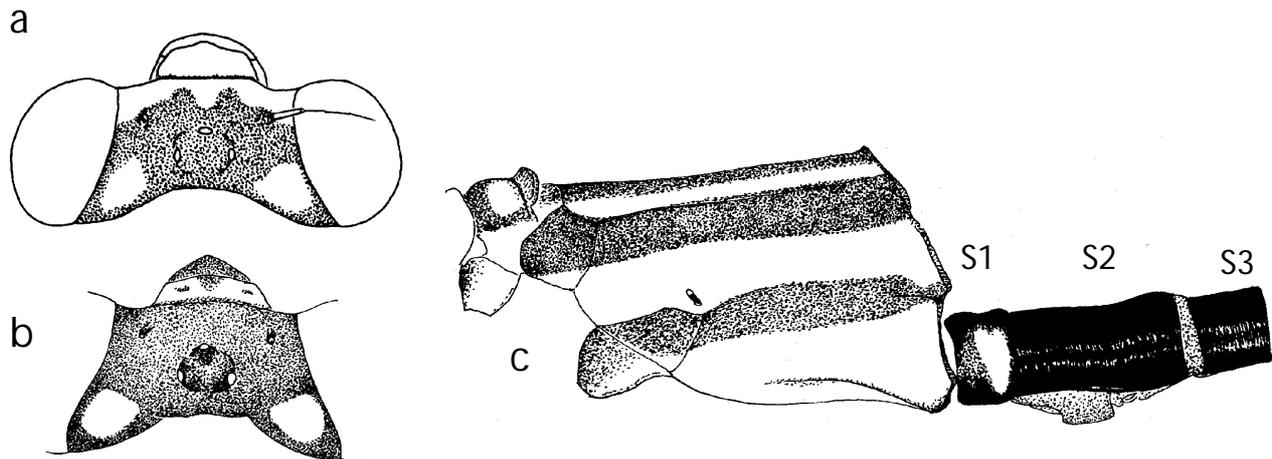


Figure 8. *Argia* (Coenagrionidae) — (a) head (dorsal view) of male holotype of *A. elliptica* [IRSNB] — [b, c] male syntype of *A. impura* [IRSNB]: (b) head (dorsal view); (c) thorax and S1-3 (lateral view).

*Argia infrequentula* Fraser, 1946

Identity confirmed by comparison of lectotype in BMNH with voucher material in RWG collection.

*Argia infumata* Selys, 1865

Identity confirmed by comparison of male syntype in IRSNB with illustrations of material in RWG collection.

*Argia* "lateralis" Selys, MS

This a manuscript name of Selys applied to an undescribed species of the huanacina-group by the late Leonora K. Gloyd. Comparison of complete male in the Selys collection in IRSNB showed that it is, instead, the same as *A. huanacina* Förster, 1914; appendages illustrated (Figs 6l-n).

*Argia lilacina* Selys, 1865

Identity confirmed by comparison of male syntype in IRSNB with voucher material in RWG collection.

*Argia makoka* Fraser, 1946

Identity confirmed by comparison of holotype in BMNH with voucher material in RWG collection; appendages of holotype illustrated (Figs 7a-c); a junior synonym of *Argia kokama* Calvert, 1909 (appendages of holotype illustrated, Figs 7d-e).

*Argia kokama* Calvert, 1909

(Figs 7a-c)

*Argia kokama* Calvert, 1909: 132-133 (description of male; illustration of male cerci, figs 71, 71s); — Rácenis (1959: 476; mention from Iquitos, Peru)

*Argia makoka* Fraser, 1946: 455-456 (description of male; illustration of male cerci, fig. 1a); — Rácenis (1959: 476; mention from Mishuyacu, Peru)  
new synonymy

*Argia medullaris* Hagen in Selys, 1865

Syntype male in Hagen collection (examined previously at the MCZ) lacking abdominal appendages. Identity of this species has now been confirmed with specimen from Bogota, Colombia in RWG collection by comparison with another syntype in IRSNB ("Nouvelle-Grenade/Lindig").

*Argia mishuyaca* Fraser, 1946

Identity confirmed by comparison of lectotype in BMNH with voucher material in RWG collection.

*Argia mollis* Hagen in Selys, 1865

Holotype examined and identity confirmed by comparison of holotype in IRSNB with voucher material in RWG collection.

*Argia mollusca* Fraser, 1946

Examination of lectotype in BMNH proved it is a junior synonym of *Argia collata* Selys, 1865.

*Argia collata* Selys, 1865

(Figs 6r-t)

*Argia collata* Selys, 1865: 395 (23 reprint) (description of male and female)

*Argia mollusca* Fraser, 1946: 454-455 (description of male and female; illustration of male cerci, figs 1j-l); — Rácenis (1959: 476; mention from Florida and Mishuyacu, Peru) new synonymy



*Argia thespis* nec Hagen in Selys, 1865: Lencioni (2006: 108, illustrations male cerci, figs 56a-c)

*Argia percellulata* Calvert, 1902

Identity confirmed by comparison of holotype in BMNH with voucher material in RWG collection. Holotype male teneral with tips of cerci missing.

*Argia popoluca* Calvert, 1902

Identity confirmed by comparison of holotype in BMNH with voucher material in RWG collection; appendages illustrated (Figs 6o-q).

*Argia reclusa* Selys, 1865

Identity confirmed by comparison of holotype in IRSNB with voucher material in RWG collection; appendages illustrated (Fig. 7p).

*Argia rogersi* Calvert, 1902

Identity confirmed by comparison of holotype in BMNH with voucher material in RWG collection.

*Argia sordida* Hagen in Selys, 1865

Identity confirmed by comparison of male syntypes in IRSNB and Museum of Comparative Zoology, Harvard University with voucher material in RWG collection; senior synonym of *A. dimissa* Selys, 1865 (Figs 6a, b).

*Argia talamanca* Calvert, 1907

Identity confirmed by comparison of holotype in BMNH with voucher material in RWG collection.

*Argia terira* Calvert, 1907

Identity confirmed by comparison of specimens identified by Calvert in BMNH with voucher material in RWG collection. Specimens of *A. terira* found also in Selys collection with manuscript name of "*Argia flavipennis*."

*Argia thespis* Hagen in Selys 1865

Examination of probable syntype in IRSNB revealed this is not a synonym of *Argia collata* Selys and *Argia mollusca* Fraser but a distinct species. *Argia thespis* seems to be poorly known, and the male type may be the only representative of that sex representing that name; appendages illustrated (Figs 7g-i).



*Argia tinctipennis* Selys, 1865

Syntypes include 2 males, one lacking tip of abdomen, and 1 female; all in IRSNB. Male whose tips of cerci appear to be lacking (appendages very dirty despite cleaning) illustrated (Figs 7m-o). Conforms to specimen determined by Calvert as this species.

*Argia trifoliata* Fraser, 1946

Identity confirmed by comparison of lectotype in BMNH with voucher material in RWG collection. A junior synonym of *Argia variegata* Förster, 1914 (probable syntypes of latter name have also been examined [UMMZ]; appendages of male compared to syntype illustrated, Figs 7j-l).

*Argia variegata* Förster, 1914

(Figs 7j-l)

*Argia variegata* Förster, 1914: 65-66 (description of male and female)

*Argia trifoliata* Fraser, 1946: 449-450 (description of male and female; illustration of male cerci, figs. 1h, i) new synonymy

*Argia ulmeca* Calvert, 1901

Identity confirmed by comparison of holotype in BMNH with voucher material in RWG collection.

*Argia umbriaca* Fraser, 1946

Identity confirmed by comparison of lectotype in BMNH with voucher material in RWG collection; appendages of holotype illustrated (Figs 6e, f). A junior synonym of *Argia indicatrix* Calvert, 1902.

*Argia indicatrix* Calvert, 1902

(Figs 6e-g)

*Argia indicatrix* Calvert, 1902: 82-83 (description of male and female; Figs. 23, 39, 39s); — Calvert (1907: 368-369; comments on color variability); — Lencioni (2006: 93; mention from Brazil; illustration of male cerci, fig. 41a)

*Argia umbriaca* Fraser, 1946: 451 (description of male and female; illustration of male cerci, figs. 2i, j) new synonymy



*Argia vivida* var. *plana* Calvert, 1902

Identity confirmed by comparison of holotype in BMNH with voucher material in RWG collection.

*Cyanallagma* Kennedy, 1920*Acanthagrion laterale* Selys, 1876

Examination of lectotype male from Nueva Grenada/ McLachlan at BMNH designated by Kimmins, and of paralectotypes in IRSNB: 2 males [green labels with hand written name by Selys 'Acanthagrion laterale' and white label with 'New Grenada McLachlan'] conforms to current concept of *Cyanallagma laterale* (Selys, 1876).

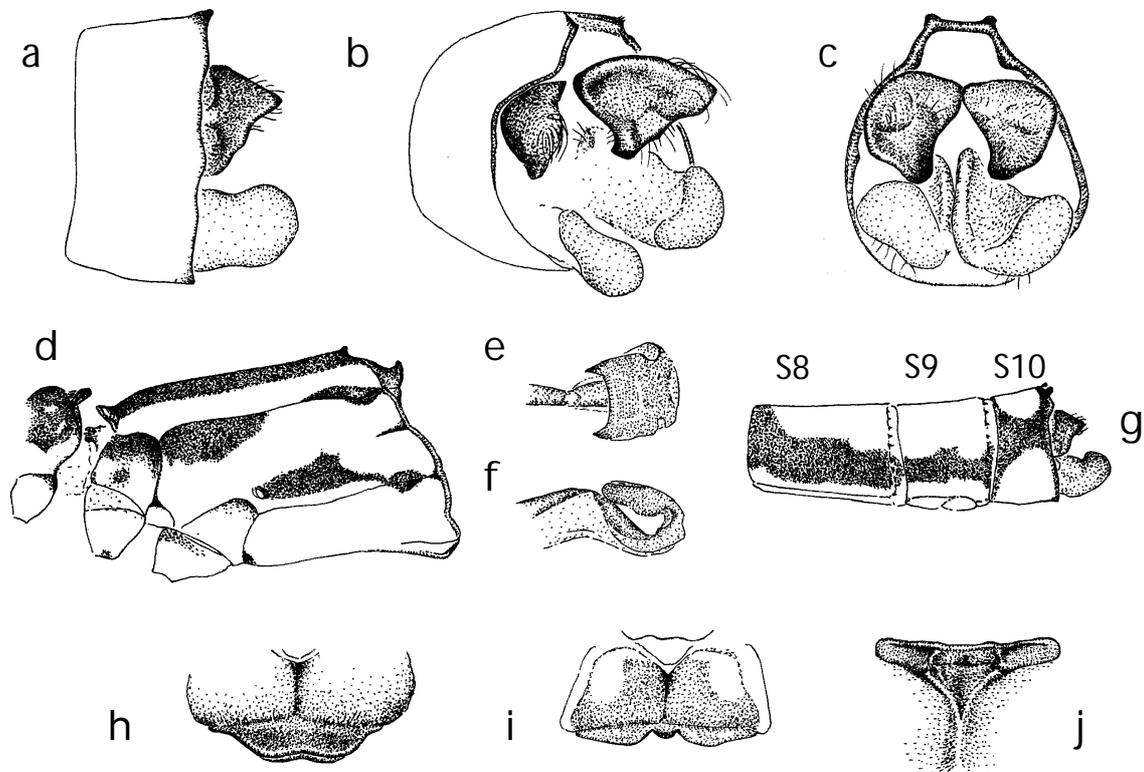


Figure 9. *Cyanallagma* (Coenagrionidae) — *Acanthagrion trimaculatum* (Coenagrionidae) — [a-h] male lectotype [IRSNB]: (a) S10 (lateral view); (b) S10 (medio-dorsal view); (c) S10 (posterior view); (d) thorax (lateral view); (e) genital ligula (ventral view); (f) genital ligula (lateral view); (g) S8-10 (lateral view); (h) prothorax (dorsal view) — [i, j] female paralectotype from Theresopolis [IRSNB]: (i) prothorax (dorsal view); (j) mesostigmal plates (dorsal view).

*Acanthagrion nigrinuchale* Selys, 1876

Examination of syntypes at IRSNB: 1 male and 5 females [all with green label with printed São João-del-Rey] confirms identity of *Cyanallagma nigrinuchale* (Selys, 1876).

*Acanthagrion interruptum* Selys, 1876

Examination of lectotype male in BMNH from Valparaiso, Chile, designated by Kimmins, and of paralectotypes in IRSNB: 1 male and 1 female [with green label with hand written name by Selys '*Acanthagrion interruptum*' and light blue label with 'Chili'] conforms to current concept of *Cyanallagma interruptum* (Selys, 1876).

*Acanthagrion trimaculatum* Selys, 1876

Syntypes presently in IRSNB: 4 males (all but 1 lacking appendages) [green labels with printed Sa.-Cruz (3) and Teresopolis (1)] and 2 females (1 lacking app) [green labels with printed Sa.-Cruz and Teresopolis]. The complete male from Santa Cruz and female from Teresópolis were illustrated (Figs 9a-j), and the male is here designated as lectotype of *Acanthagrion trimaculatum* Selys, 1876, which is currently placed (Leonard 1977) in *Cyanallagma* Kennedy, 1920.

*Homeoura* Kennedy, 1920*Acanthagrion?* *cheliferum* Selys, 1876

Syntypes presently in IRSNB conform to current concept of *Homeoura chelifera* (Selys, 1876): 1 male Entrerios [currently Entre Rios de Minas, Brazil]; 2 males Rio de Janeiro (1 missing abdomen); 1 male Rio Grande (missing S5-10); 1 male Santa Teresa (missing S4-10); 3 males Minas Gerais (1 missing S5-10; 2 missing S7-10).

*Ischnura* Charpentier, 1840*Amphiagrion amphion* Selys, 1876

This species was described from one female from 'Amérique septentrionale'. Examination of the holotype in IRSNB (labels photographed) revealed that its synonymy with *Amphiagrion saucium* (Burmeister, 1839) was incorrect. The holotype's head, thorax and wings correspond instead to a female *Ischnura verticalis* (Say, 1840), to which the name is thus synonymized; the abdomen of an *Enallagma* sp. was erroneously glued to it.

*Ischnura verticalis* (Say, 1840)

*Agrion verticalis* Say, 1840: 37 (description of male and female)

*Ischnura verticalis* Selys (1876: 265-266 [21-23 reprint]; redescription of male and female); — Needham (1903: 261; description of larva); — Needham & Heywood (1929: 355; illustrated) — Walker (1953: 257; illustrated); — Westfall & May (1996: 445, 447, 451, 490-492; keys, redescription, illustrations)



*Amphiagrion amphion* Selys, 1876: 287-288 [43-44 reprint] (description of female) new synonymy

*Agrion canadense* Provancher, 1876: 325 (description)

*Leptagrion* Selys, 1876

*Telagrion prothoracicum* Kimmins, 1945

Holotype in BMNH examined and appendages illustrated (Figs 10a-c). Currently placed in *Leptagrion* but reevaluation is necessary pending examination of other poorly known type material.

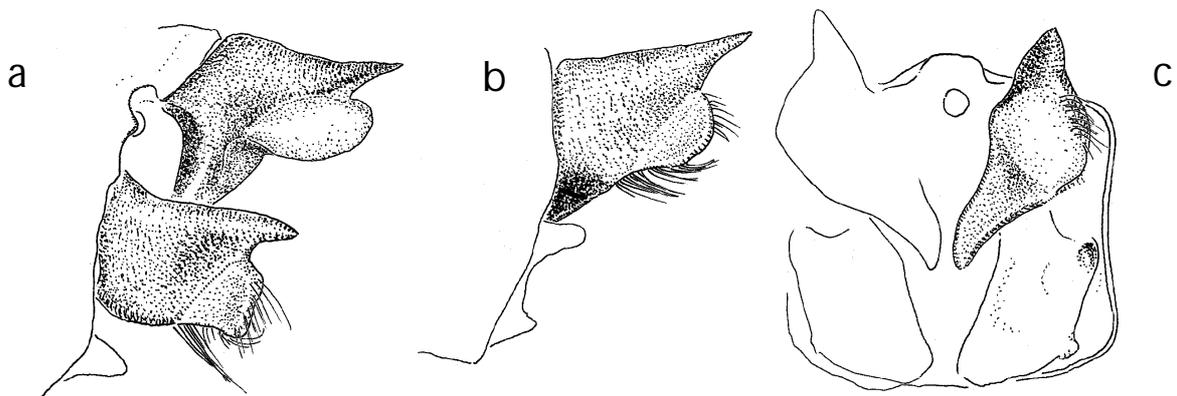


Figure 10. *Leptagrion* (Coenagrionidae) — S10 of male holotype of *Telagrion prothoracicum* [BMNH]: (a) medio-dorsal view; (b) lateral view; (c) posterior view.

*Metaleptobasis* Calvert, 1907

*Leptobasis bicornis* Selys, 1877

Examination of female holotype in IRSNB (missing head), revealed this species belongs in *Metaleptobasis* as it was already stated by Calvert (1909). Pretarsi lacking supplementary claw. Female prothorax and mesepisternum illustrated (Figs 11a, b).

*Metaleptobasis bicornis* (Selys, 1877)

(Figs 11a, b)

*Leptobasis bicornis* Selys, 1877: 103-104 [9-10 reprint] (description of female); — Lencioni (2006: 164; mention from Brazil; illustration female pro and mesothorax, fig. 102a)

*Leptobasis diceras* Selys, 1877

Examination of male and female syntypes in IRSNB revealed this species belongs to the genus *Metaleptobasis* as it was already stated by Cumming (1954). Prothorax, mesepisternum and FW base of female syntype illustrated (Figs 11c-e).

*Metaleptobasis diceras* (Selys, 1877)

(Figs 11c-e)

*Leptobasis diceras* Selys, 1877: 102-103 [8-9 reprint] (description of male and female)

*Leptobasis quadricornis* Selys, 1877

Examination of female holotype at IRSNB confirmed this species belongs in *Metaleptobasis* (Lencioni 2006: 166 after Garrison 1991). Prothorax, mesepisternum and pretarsus illustrated (Figs 11f-h).

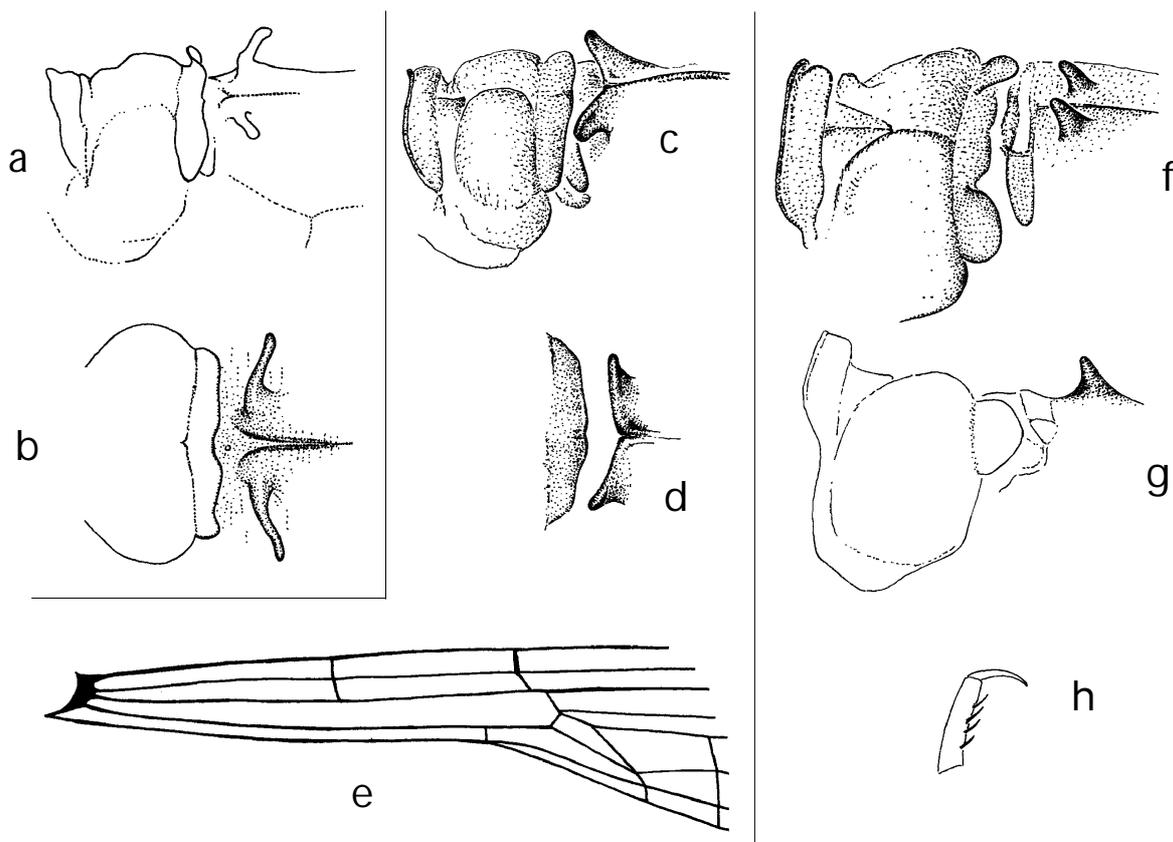


Figure 11. *Metaleptobasis* (Coenagrionidae) — [a, b] prothorax and mesepisternum of female holotype of *Leptobasis bicornis* [IRSNB]: (a) medio-dorsal view; (b) dorsal view — [c-e] female syntype of *Leptobasis diceras* [IRSNB]: (c) prothorax and mesepisternum (medio-dorsal view); (d) prothorax and mesepisternum (dorsal view); (e) base of FW — [f-h] female holotype of *Leptobasis quadricornis* [IRSNB]: (f) prothorax and mesepisternum (medio-dorsal view); (g) prothorax and mesepisternum (lateral view); (h) metatarsus and pretarsus (lateral view).

*Leptobasis* Selys, 1877*Oxyagrion cardinalis* Fraser, 1946

Fraser (1946) mentioned that the reddish thoracic color pattern of this species with contrasting blue-violaceous antehumeral and humeral stripes is reminis-

cent of *Aeolagrion flammeum* and unique among species of *Oxyagrion* Selys, 1876, but based on presence of vulvar spine on sternum S8 and venation he placed it in the latter genus as the most fitting alternative. Costa (1978: 90) suggested the possibility of this species belonging in *Acanthagrion* due to the presence of thoracic stripes. De Marmels (1984) provided a partial redescription of the holotype, including drawings and photographs.

Based on Fraser's description (1946) and examination of the holotype we do not consider this species an *Oxyagrion*, since mesepisternal fossae or carinae (present in most *Oxyagrion* females) are lacking, posterior prothoracic lobe is upright and quadrangular (straight or moderately bi- or trilobate in *Oxyagrion* females), abdomen is considerably long relative to HW (ratio of 0.59; of 0.69-0.83 in all examined *Oxyagrion* females), and thoracic stripes are light blue on a pale orange pterothorax (color combination not present in any *Oxyagrion*). According to all these characters, and the fact that frons is rounded, pretarsal claws are well developed, external metafemoral spurs of medial series are relatively short without surpassing width of femora, and female ovipositor surpasses posterior margin of S10, we believe this species belongs in the genus *Leptobasis* Selys, 1877.

There are, however, some discrepancies between Fraser's (1946) description and the female specimen from Peru, Mishuyacu labeled as holotype in BMNH: namely, his mention of a 'very prominent ventral spine', a 'slightly notched' middle lobe of prothorax and an anterior ridge on thorax projecting 'forwards'. The specimen labeled as holotype lacks a vulvar spine (Fig. 12e), the middle lobe of the prothorax is not notched (Fig. 12b) and the anterior ridge of the thorax projects backwards (Fig. 12a). Mesepisternum (Fig. 12c) possesses a pair of small mound-like tubercles (Fig. 12a) not mentioned in Fraser's (1946) description. However, color pattern, size and venational characters fit within his description, and we believe Fraser's (1946) description included some unintentional mistakes.

*Leptobasis cardinalis* (Fraser, 1946) new combination

(Figs 12a-f)

*Oxyagrion cardinalis* Fraser, 1946: 41-42 (description of female); — Soukup (1954: 12; mention); — Rácenis (1959: 478, mention); — St. Quentin (1960: 59; mention); — Kimmins (1966: 185; mention)

*Oxyagrion cardinale* Rácenis (1959: 478, mention); — Costa (1978: 62, 89-92; key, diagnosis, transcription of original description); — De Marmels (1984: 24-25, figs. 10-15; comparison with *O. fluviatile*, illustrations of S8-10,



prothorax and mesepisternum, and photographs of female holotype);  
 — Costa et al. (2000: 2-3, comparison with *O. pseudocardinalis*)

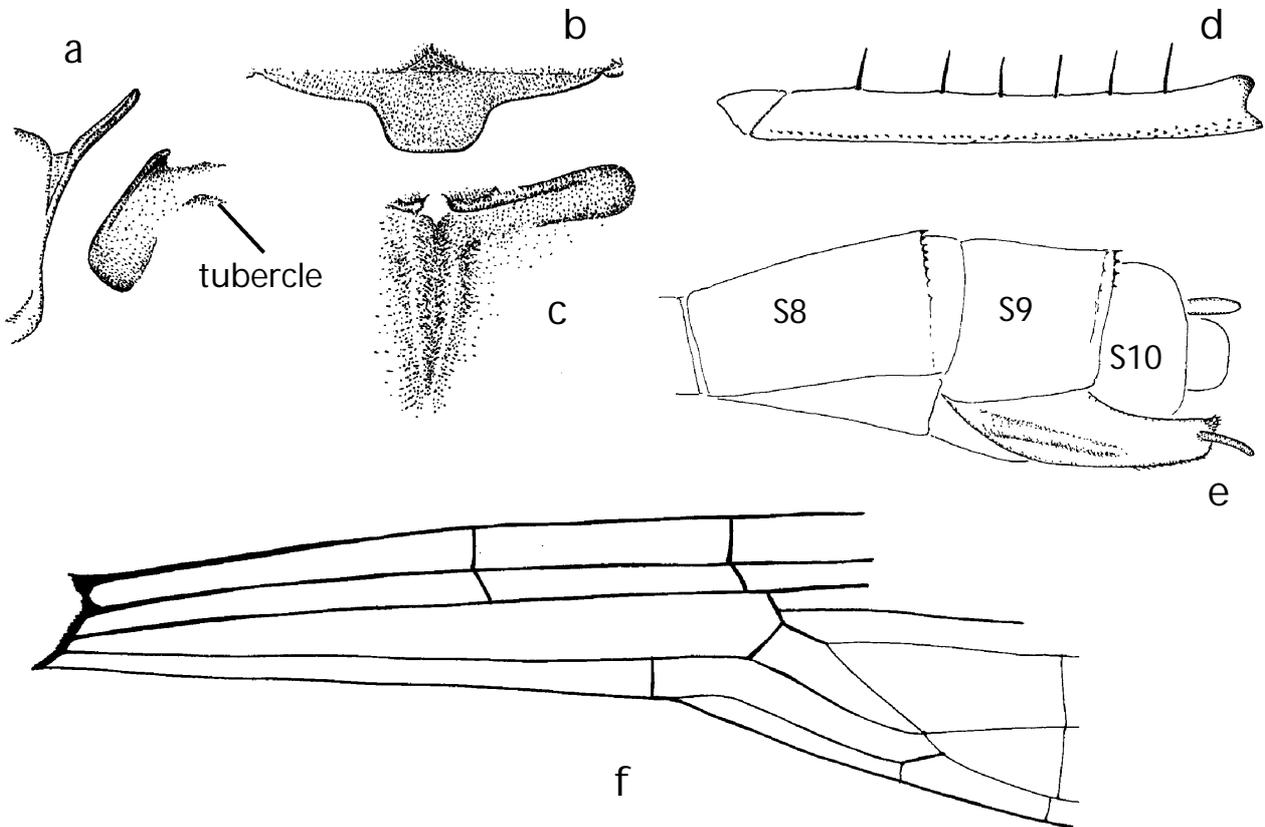


Figure 12. *Leptobasis* (Coenagrionidae) — female holotype of *Oxyagrion cardinalis* [BMNH]  
 — (a) prothorax and mesepisternum (lateral view); (b) prothorax (dorsal view) (c) mesepisternum (dorsal view); (d) metafemur (lateral view); (e) S8-10 (lateral view); (f) base of FW.

*Oxyallagma* Kennedy, 1920

*Oxyallagma dissidens* (Selys, 1876)

Comparison of large syntype series in IRSNB with material in our collection confirmed identity of this species.

*Telagrion* Selys, 1876

*Agrion macilentum* Rambur, 1842

Comparison of male holotype in IRSNB (missing an abdominal segment) with specimen in RWG collection confirmed identity of this species. Appendages illustrated (Figs 13a, b).



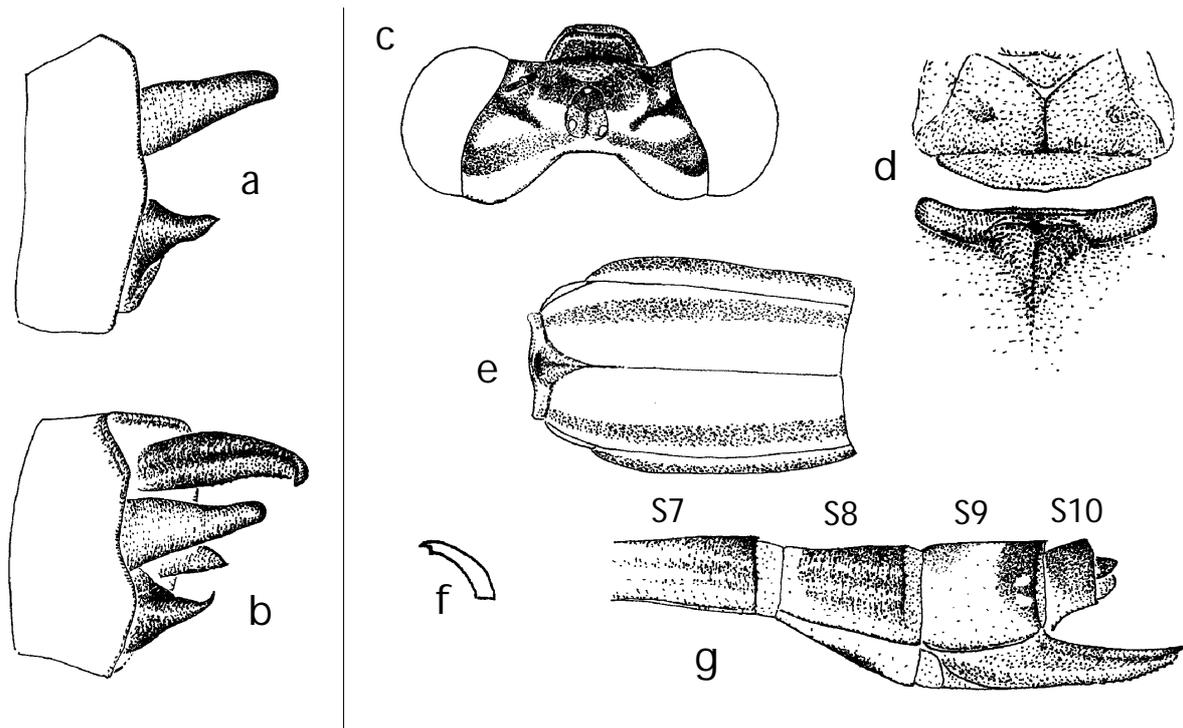


Figure 13. *Telagrion* (Coenagrionidae) — [a, b] S10 of male holotype of *Agrion macilentum* [IRSNB]; (a) lateral view; (b) medio-dorsal view — [c-e] female syntype of *Telagrion fulvellum* [IRSNB]: (c) head (dorsal view); (d) prothorax and mesepisternum (dorsal view); (e) pterothorax (dorsal view); (f) metapretarsus (lateral view); (g) S7-10 (lateral view).

#### *Telagrion fulvellum* Selys, 1876

Examination of female syntype deposited in IRSNB (Figs 13c-g) revealed that this species most likely belongs in the genus *Chrysobasis* Rácenis, 1959. Confirmation of generic placement and designation of lectotype pending examination of male syntype supposedly deposited in the Budapest Museum.

#### *Telebasis* Selys, 1865

##### *Erythragrion erythrinum* Selys, 1876

Described from 4 males and 1 female in IRSNB; female described by Selys is really a female *Telebasis corallina* (Selys, 1876). A lectotype was selected and will be formally designated by Garrison (in prep.-a).

##### *Erythragrion corallinum* Selys, 1876

Type series includes 8 males in IRSNB; all Minas Gerais by Claussen; 3 males and 3 females included in series and description from São João del-Rei correspond to *Telebasis carmesina* Calvert, 1909, as determined and labeled by Minter Westfall. Lectotype designated by Westfall (unpublished); designation will be formally published by Garrison (in prep.-a).

### *Erythragrion dominicanum* Selys, 1876

Type series corresponds to a mixed series of males from Santo Domingo and other localities from main land South America. A lectotype (from Santo Domingo) was selected and will be formally designated by Garrison (in prep.-a).

### *Telebasis boucardi* Selys, 1868

Syntypes in IRSNB include 1 male, 1 female. These are definitely *Telebasis salva* (Hagen, 1861) as Selys later discovered.

### *Telebasis versicolor* Fraser, 1946

Identity confirmed by comparison of holotype male [BMNH] with voucher material in RWG collection.

## Acknowledgments

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