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NOTES ON *ACANTHAGRION ACUTUM* RIS, *ENALLAGMA OCCULTUM* RIS, AND *E. OVIGERUM* CALVERT (ZYGOPTERA: COENAGRIONIDAE)

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The generic position of the 3 spp. is discussed on the basis of material from the Ris Collection, and figs showing their male characters are presented. Kennedy's genera *Archaeallagma, Cyanallagma, Homeoura, Mesamphiagrion, Oxyallagma* and *Protallagma* are compared and a definition of *Cyanallagma* Kennedy is attempted.

INTRODUCTION

There are numerous South American Coenagrionidae that have been described or figured only inadequately. Often the reasons leading an author to place those species in certain genera remain mysterious, obviously, because many, if not most, of these genera are poorly defined and their phylogenetic relationships, let alone their possible affinity with Old World groups, were not understood. Indeed many genera lack any feature exclusive to them, but show, instead, a more or less peculiar combination of characters, any of which may be present in one or more other genera as well. This fact renders the construction of a key very difficult.

The original descriptions of *Acanthagrion acutum* Ris, *Enallagma occultum* Ris and *E. ovigerum* Calvert are extensive, but the sparsity of accompanying figures makes their generic placement difficult. It is not surprising that the three species have been moved into other genera since. In this paper their generic position is reviewed. Some morphological features are figured for the first time.

ACANTHAGRION ACUTUM RIS, 1918
Figures 1-8

Two paralectotypes (mature males) from "Coroico, Bolivia, 1000-1400 m, 1913 (3), A.H. Fassl" (Senckenberg Register Nos 10193 and 10194) have been examined.

Some characters not mentioned in the original description are: Postnodals in front wing 12, in hind wing 10-11; R_3 originating at the fifth or close to the sixth postnodal in front wing, at the fourth or close to the fifth in hind wing; IR_2 starting from the eighth or ninth postnodal in front wing, from the eighth in hind wing; IR_3 originating at subnodus; R_4 branching at a distance before subnodus equal to one sixth to one third the length of the first postnodal cell in all wings. Petiolation ceasing at CuA cross-vein or somewhat before.

Hind tibiae with 8 spines, these slightly shorter than the spaces between them. Tooth of tarsal claw in apical fourth of claw.

Total length (including anal appendages) 38.0 mm.

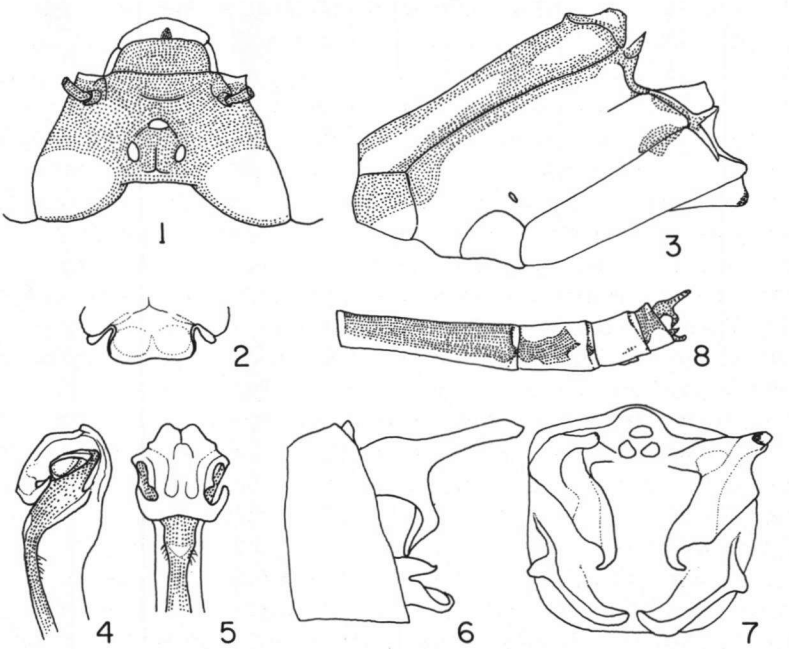
The wing photograph in RIS (1918, fig. 62) of a male *Acanthagrion acutum* from Coroico does not show this species, but rather *Enallagma ovigerum*. It seems possible that figure 62 has been interchanged with figure 59, since the latter corresponds far more with *A. acutum*.

This species has been transferred by KENNEDY (1920), to my opinion correctly, to *Cyanallagma* Kennedy. It is a pity that Kennedy fixed as the generotype of *Cyanallagma* the species *Acanthagrion interruptum* Selys, as the latter is the least typical of the genus when compared with the Andean representatives. — The species definitively included in *Cyanallagma* are, therefore: *acutum, bonariense* Ris, *demarmelsi* Cruz, *interruptum, laterale* Selys, *ovigerum* Calvert, and *tamaense* De Marmels. Not recommended is the inclusion of *cheliferum* Selys (KENNEDY, 1920), which seems to be related to *lindneri* Ris and *nepos* Selys, and perhaps to *Argentagrion ambiguum* (Ris) (DONNELLY & ALAYO, 1966; BULLA, 1971, 1973).

The genus *Cyanallagma* may be characterized as follows: Frons rounded, but not inflated; postocular spots present. Hind lobe of prothorax in both sexes, but especially in the male, with a central projection which is either quadrate or spoon-shaped and may be more or less raised (not well developed in *interruptum* and strongly modified in female *bonariense*). Pterothorax without mesepisternal fossae. Antehumeral stripes interrupted, or constricted in the distal third (not so in *demarmelsi, laterale* and tamaense, nor in some individuals of *ovigerum*).

Body coloration black and blue (or greenish in females), but immature adults with vivid orange to brown markings replacing black on head, thorax and dorsum of abdominal segments 2 and most of 3 (observed so far in *demarmelsi, laterale* and *tamaense*).

Hind legs moderately long, tibial spines as long as intervening spaces, or shorter; tooth of tarsal claw in the apical third or fourth of claw. Wings hyaline to slightly smoky. Pterostigma short, covering less than one cell, or one cell *(acutum,*



Figs 1-8. *Acanthagrion acutum* Ris, paralectotype male, Coroico, Bolivia: (1) head, dorsal view; — (2) hind border of prothorax, dorsal view; — (3) pterothorax, left lateral view; — (4) penis, right lateral view; — (5) same, ventral view; — (6) segment 10 with anal appendages, left lateral view; — (7) same, posterior view; — (8) end of abdomen, left lateral view.

ovigerum), lozenge shaped or rather trapezoid, with costal side shortest *(ovigerum),* or rectangular *(acutum),* with outer and inner margin parallel, or with outer margin curved back towards costa *(ovigerum),* slightly broader than high, or much broader than high *(acutum),* or higher than broad *(tamaense).* Petiolation ceases at CuA cross-vein or shortly before.

Penis with third segment apically expanded and prolonged on each side into a diversely shaped lobe, which may be entire or more or less divided into two lobes; inner side of second segment normally with protuberances; no setae are present on either the second or the third segment, but a few very tiny setae may be visible apically near the shaft of the first segment. Female with vulvar spine on the eighth sternite.

Anal appendages of male often complicated. Superiors horizontal, subparallel with a chitinized hooklet apically (absent in *interruptum* and *bonariense*), and with a medial ventral branch which is more or less blade shaped and may also protrude caudally (in some Andean species). Inferiors dorsoapically with a terminal hook, lower part more or less developed, depending on species.

Each species in the male sex with very characteristic blue and black pattern on segments 7-10, or on some of them. Segment 10 dorsoapically with two short laminar or fingerlike protuberances, which are separated by a narrow incision.

Related to *Cyanallagma* is *Argentagrion ambiguum* (Ris). This species is, however, much smaller, has fewer postnodal cross-veins and lacks the characteristic projection of the prothorax. Another similar species is *Acanthagrion cheliferum* Selys, which has been transferred to *Enallagma* Charpentier by SANTOS (1956). In spite of the objections by DONNELLY & ALAYO (1966), the penis of *cheliferum* shows the same "bladed prominence" on the inside of the second segment as, for example, *Enallagma signatum* (Hagen). This, in addition to the other characters given by Santos, shows that *cheliferum* is not very close to *Cyanallagma,* but rather to the likewise small *Homeoura nepos* (Selys) and its close relative *H. lindneri* (Ris), both of which also possess that "bladed prominence". *Homeoura* Kennedy also differs from *Cyanallagma* in having "large lateral patches of spines on the second segment [of the penis]" (KENNEDY, 1920). DONNELLY & ALAYO (1966) affirm that this "appears to be incorrect [spines on basal (sic!) segment of penis]!", but these spines are present on the second segment in two Bolivian and two Brazilian males examined of *Homeoura nepos.* In some Venezuelan examples, however, those spines are reduced to a few. They differ from southern specimens also in colour pattern of abdominal segments 8 and 9 and may be subspecifically distinct. Whether the presence of such spines is sufficient to erect a genus is another question. It is to be remembered that in some *Acanthagrion* spines are present, in others they are lacking.

ENALLAGMA OCCULTUM RIS, 1918

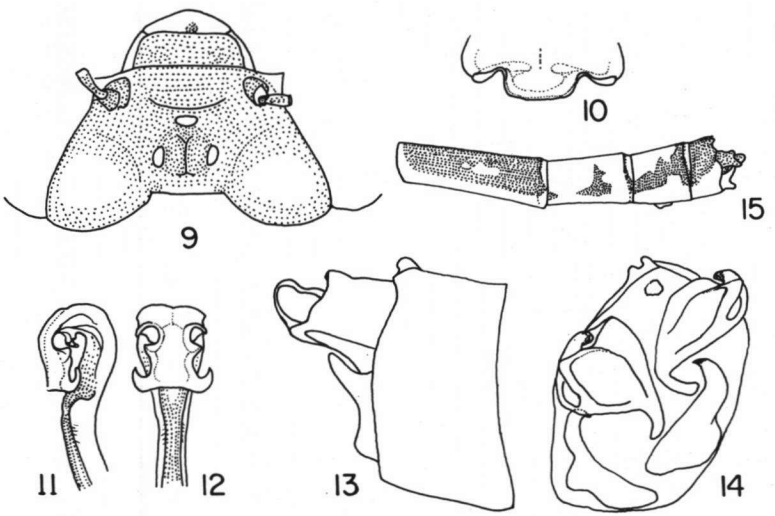
Figures 9-15

The only paralectotype, a mature male from "Bogotá, 2800 m, Columbia I. 1915 Fassl" (Senckenberg Register No. 9726) was studied.

A few characters not stated in the original description are: IR_3 branching from subnodus, R_4 originating at a distance before subnodus which is equal to half the length of the first postnodal cell. Petiolation ceasing as much before CuA cross-vein as the latter is long in the hind wing, more proximally in the fore wing. Seven tibial spines on the hind legs, these spines as long as the spaces separating them or slightly longer. Tooth of tarsal claw located at the apical third of the claw.

Total length (including anal appendages) 33.5 mm.

KENNEDY (1920) created for *E. occultum* a new genus *Mesamphiagrion* Kennedy, but the species is closely related to *Cyanallagma.* This becomes apparent through the shape of penis, anal appendages and hind lobe of prothorax. If I refrain from synonymizing *Mesamphiagrion* with *Cyanallagma* it is due to the following differences (in parentheses figures for seven species of *Cyanallagma*): Abdomen stout, only 3.4 times the length of head and thorax together



Figs 9-15. *Enallagma occultum* Ris, paralectotype male, Bogotá, Colombia: (9) head, dorsal view; — (10) hind border of prothorax, dorsal view; — (11) penis, right lateral view; — (12) same, ventral view; — (13) segment 10 with anal appendages, right lateral view; — (14) same, posterior view; — (15) end of abdomen, left lateral view.

(slender, 3.87 to 4.4 times this length); pterostigma very small relative to wing size, located at conspicuous distance from wing tip (larger in relation to wing size, more apically located. If the colouration of the paralectotype of *E. occultum* corresponds to full maturity, then the ferrugineous colour replacing black on head, thorax and abdominal segments 1-6 separates this species from *Cyanallagma.* These findings do not exclude that future studies of larger series and females might show that *Mesamphiagrion* is a synonym of *Cyanallagma.*

M. occultum reminds one also of *Protallagma titicacae* (Calvert) but the latter has a conspicuously inflated frons, a distinctive metasternal tubercle, robust legs and differs also in penis morphology, and in a peculiarity of wing venation: the poststigmal costal-radial space tends to become broader after the stigma.

Another similar species is *Oxyagrion dissidens* Selys, for which KENNEDY (1920) created the genus *Oxyallagma.* How weak the definitions of all these genera were, was shown by KENNEDY (1939) when redescribing *Oxyallagma dissidens* (Selys) as a new species, *runtuni,* but this time in the genus *Protallagma* Kennedy (see also KENNEDY, 1946). However, *Oxyallagma dissidens* differs clearly from *P. titicacae* in a series of characters: frons much less inflated; postocular spots absent (present in females *titicacae*); distance between compound eyes considerably less; hind legs long and thin; no metasternal tu-

bercle; petiolation of wings much longer; shape of pterostigma dissimilar; post-stigmal costal-radial space narrowing after pterostigma.

Enallagma occultum has more in common with *O. dissidens* than with *P. titicacae,* especially the "cyanallagmine" penis.

ENALLAGMA OVIGERUM CALVERT, 1909

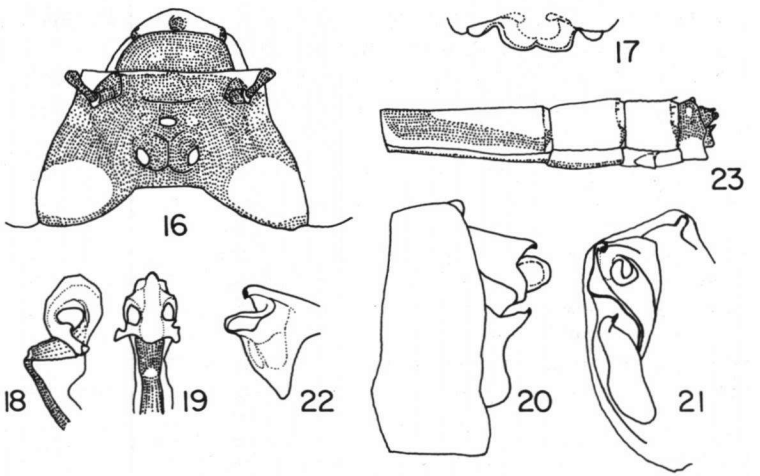
Figures 16-23

Calvert's type from Bogotá was not studied. Instead, two males of the Ris collection, viz. 1 ♂, mature, from "Pacho, 2200 m, O. Cordill. Columbia A.H. Fassl (1915)" (Senckenberg Register No. 9731), and 1 ♂, somewhat immature, from "Anolaima, 2000 m, Columbia XII. 1910 Fassl" (Senckenberg Register No. 9733).

There can be no doubt that this is a true *Cyanallagma.* Nevertheless, KENNEDY (1920) placed it in a separate genus, *Archaeallagma* Kennedy. *Archaeallagma,* however, could stand only if the Andean *laterale* and *acutum* would be removed from *Cyanallagma* (included therein by KENNEDY, 1920) and placed in *Archaeallagma,* leaving in *Cyanallagma* only the two southeastern species *interruptum* and *bonariense.* This, however, would be most unwise. *Archaeallagma* Kennedy is considered by me a synonym of *Cyanallagma* Kennedy (DE MARMELS, 1988).

Without an examination of the type, it cannot be established beyond any doubt whether Ris' specimens are really conspecific with Calvert's. Some incongruities were stated already by RIS (1918), among others the absence of the black band at the posterior end of segment 7. This might be a rather important difference given the species-specific patterns of the four distal segments in *Cyanallagma.* The middorsal bilobed process at the hind margin of segment 10 is, in Ris' specimens, not as much marked off from the rest of the segment as stated for the type. Similarly, the figures in CALVERT (1909, figs 123, 123s) do not show the apical hook of the upper branch of the superior appendage present in Ris' specimens. On the other hand, the latter lack any ventral "strong acute spine" of the kind figured by Calvert. Instead, there is the usual broad ventral branch. Also, in lateral view, the "lower outer branch" of the superior appendage is, in the type, longer than the "upper outer branch", at least in Calvert's figure, while in Ris' specimens this lower outer branch is at most as long as the upper one.

In both of Ris' males examined the pterostigma has its costal edge shortest. There are 15-16 postnodal cross-veins in the front wing and 13 in the hind wing. R_3 originates at the seventh postnodal in the fore wing, at the sixth in the hind wing; IR_2 at the tenth postnodal except for one front wing of one male, where it begins at the eleventh. IR_3 starts from the subnodus, while R_4 branches off at a distance before the subnodus equal to one third to two fifths of the first postnodal cell. The 8 tibial spines of the hind legs are not longer than the spaces between them. The tooth of the tarsal claw is located in the distal fourth. There are 3 postdiscal·antenodal cells in all wings, except for one front wing in one of the



Figs 16-23. *Enallagma ovigerum* Calvert (Figs 16-17: male from Anolaima, Cundinamarca, Colombia, — other Figs: male from Pacho, Cundinamarca, Colombia): (16) head, dorsal view; — (17) hind border of prothorax, dorsal view; — (18) penis, right lateral view; — (19) same, ventral view; — (20) segment 10 with anal appendages, left lateral view; — (21) left half of the same, posterior view; — (22) left superior appendage, right internal view; — (23) end of abdomen, left lateral view.

males, which has 4.

It is not figure 59 in RIS (1918), but figure 62 that shows the wings of *Enallagma ovigerum.*

Total length (including anal appendages) 38.5 mm; hind wing 23.0 mm.

The recent discovery of *demarmelsi* in Bogotá (CRUZ, 1986) and *tamaense* in the Tamá area on the Venezuelan/Colombian border (DE MARMELS, 1988) makes one think, that the genus *Cyanallagma* might yield several more species in the Central and Northern Andes.

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REFERENCES

BULLA, L.A., 1971. Consideraciones sobre el género Argentagrion Fraser, 1947 con la descripción de una nueva especie (Odonata: Coenagrionidae). Revta Soc. ent. argent. 33: 49-55.

BULLA, L.A., 1973. Revisión de dos especies argentinas del género Cyanallagma Kennedy (Odonata: Coenagrionidae). *Revta Soc. ent. argent.* 34: 95-105.

CALVERT, P.P., 1909. Contributions to a knowledge of the Odonata of the neotropical region, exclusive of Mexico and Central America. *Ann. Carnegie Mus.* 6(1): 73-280.

CRUZ, L.F., 1986. Contribucion a los estudios taxonomicos de Odonata-Zygoptera de Colombia: Descripcion de una nueva especie de Cianallagma [sic!] (Odonata: Coenagrionidae). *Caldasia* 14(68/70): 743-747.

DE MARMELS, J., 1988. Odonata del Estado Táchira. *Revta cient. Unet* 2(1): 91-111.

DONNELLY, T.W. & P. ALAYO, 1966. A new genus and species of damselfly from Guatemala and Cuba (Odonata: Coenagrionidae). *Fla Ent.* 49: 107-114.

KENNEDY, C.H., 1920. Forty-two hitherto unrecognized genera and subgenera of Zygoptera. *Ohio J. Sci.* 21(2): 83-88.

KENNEDY, C.H., 1939. Protallagma runtuni n. sp. of dragonfly from Ecuador with notes on the genus (Coenagrionidae: Odonata). *Ann. ent. Soc. Am.* 32(1): 177-187.

KENNEDY, C.H., 1946. Protallagma runtuni Kennedy, 1939, a synonym of Oxyallagma dissidens (Selys), 1876, notes on Oxyagrion and related genera. *Ann. ent. Soc. Am.* 39(3): 381-382.

RIS, F., 1918. Libellen (Odonata) aus der Region der amerikanischen Kordilleren von Costarica bis Catamarca. *Arch. Naturg.* (A) 9: 1-197.

SANTOS, N.D. dos, 1956. Contribuição ao conhecimento da fauna do Distrito Federal. XLVII. Enallagma cheliferum (Selys, 1876) nova combinação (Coenagriidae: Odonata). *Anais Acad. bras. Ciênc.* 28(4): 571-576.