

***Acanthagrion aepiolum* sp. nov.**
from South America
(Odonata: Coenagrionidae)

Kenneth J. Tennessen

1949 Hickory Ave., Florence, AL 35630, USA.
<ktennessen@aol.com>

Key words: Odonata, dragonfly, Coenagrionidae, *Acanthagrion*, Bolivia.

ABSTRACT

The new species – holotype ♂, Bolivia, Department of Santa Cruz, Ñuflo de Chavez Prov., stream 11.8 km E of San Javier (16°17'S, 62°37'W), 16 November 1998, leg. K.J. Tennessen; deposited in El Museo de Historia Natural “Noel Kempff Mercado”, Santa Cruz, Bolivia – has been confused with *Acanthagrion ascendens*. Abdominal segment 10 in males is higher than in *A. ascendens* and the second segment of the genital ligula lacks the two setal patches distinctive of *A. ascendens*. *A. luteum* is synonymized with *A. ascendens* [new synonymy].

INTRODUCTION

On an expedition to eastern Bolivia in November of 1998, I collected several males of a relatively large species of *Acanthagrion*. In the field, I suspected they were *A. ascendens* Calvert based on the highly developed apex of S10. I discovered later that the specimens belong to an undescribed species, and that specimens previously identified by some other workers as *A. ascendens* are also this species.

METHODS AND ABBREVIATIONS

For purposes of comparison, I measured height of S10 and the distance that the cerci and paraprocts project beyond the apical margin of S10 as shown in Figure 1. Structure of the Zygoptera genital ligula (penis) follows Pfau (1971), who concluded there are only two segments; the terminal segment is folded back on itself. All measurements are given in mm; total length and abdomen length do not include anal appendages.

Abbreviations for the institutions where the holotype, paratypes and other specimens have been deposited are:

- NKM - El Museo de Historia Natural “Noel Kempff Mercado”, Santa Cruz, Bolivia
 FSCA - Florida State Collection of Arthropods
 USNM - US National Museum of Natural History
 LSU - Louisiana State University Insect Collection
 KJT - collection of K.J. Tennessee
 JJD - collection of J.J. Daigle
 RWG - collection of R.W. Garrison
 RB - collection of R.J. Beckemeyer
 FAAL - collection of F.A.A. Lencioni
 TWD - collection of T. W. Donnelly

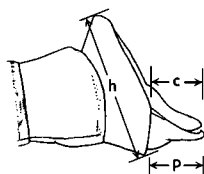


Figure 1: ♂ S10 and appendages showing method of measuring height of S10 and extent cercus and paraproct project beyond apical margin of S10.

Acanthagrion ascendens Calvert, 1909

(Figs 1, 6, 8, 9-10)

- Acanthagrion gracile ascendens* Calvert, 1909: 161, 165-166, figs 81, 81a [type: Cachoeira, Mato Grosso, Brazil, deposited in Carnegie Museum of Natural History].
Acanthagrion ascendens Calvert. — Kennedy (1916: 327-329, figs 12, 13).
Acanthagrion ascendens Calvert. — Williamson (1916: 351-355, fig. 13).
Acanthagrion luteum Rácenis, 1958: 184-187 [type: #1614, Caripito, Monagas, Venezuela, deposited in Museo de Biología, Universidad Central de Venezuela]; new synonymy.

Specimens studied

Holotype male of *A. ascendens*; — 2 paratype ♂ of *A. luteum*, Guárico, Venezuela, coll. Universidad Central de Venezuela; — Bolivia: Santa Cruz Dept., Ichilo Prov., tributary of stream 12 km E of Nuevo Horizonte, 13 xi 1998, 1 ♂ leg. Tennessee (KJT), 1 ♂ leg. Mauffray (FSCA); pond 3 km S of Buena Vista, 6 ii 2001, 1 ♂ leg. Tennessee (KJT); pond 3.5 km S of Buena Vista, 9 ii 2001, 1 ♂ leg. Tennessee (KJT); Nuflo de Chavez Prov., pond 4.2 km E of San Ramon, 15 xi 1998, 3 ♂ leg. Tennessee, 2 ♂ leg. Mauffray (FSCA); tributary of Rio Zapacos, 2 km S of

Concepcion, 13 xi 1999, 1 ♂ leg. Tennessen (KJT); Velasco Prov., Rio San Martin, 70 km N of Santa Rosa de la Roca, 12 xi 1999, 1 ♂ leg. Tennessen (KJT), 1 ♂ leg. Mauffray (FSCA); — Ecuador: Orellana Prov., pond near Rio Savaletto, Parque Nacional Yasuni, 17 vii 1996, 1 ♂ leg. Tennessen (determination tentative, see Discussion) (KJT); — Peru: Loreto Dept., Explorama Inn, 40 km NE of Iquitos, Amazon River, 19 viii 1989, 2 ♂ leg. Dunkle (KJT); — Trinidad: St. Andrew Co., Manzanilla ward, Oropuche River, 19 viii 1986, 2 ♂ leg. Dunkle (KJT); — Venezuela: Bolivar, tributary of Rio Botanamo, 17 vii 1987, 2 ♂ leg. Donnelly (TWD).

Acanthagrion aepiolum sp. nov.

(Figs 2-5, 7)

Acanthagrion ascendens nec Calvert, 1909. — Rácenis (1958: 188-190).

Specimens studied

Holotype ♂: Bolivia, Dept. of Santa Cruz, Ñuflo de Chavez Prov., stream 11.8 km E of San Javier (16°17'S, 62°37'W), 16 ix 1998, leg. Tennessen (NKM). — Paratypes (32 ♂): Bolivia, Dept. of Santa Cruz, Ñuflo de Chavez Prov., stream 18 km E of San Ramon, 15 ix 1998, 1 ♂ leg. Tennessen (KJT); Dept. of Santa Cruz, Ñuflo de Chavez Prov., stream 11.8 km E of San Javier, 16 ix 1998, 4 ♂ leg. Tennessen (KJT); Dept. of Santa Cruz, Ñuflo de Chavez Prov., stream 13.7 km E of San Javier, 16 ix 1998, 1 ♂ leg. Tennessen (KJT), 1 ♂ leg. Mauffray (FSCA); Dept. of Santa Cruz, Ñuflo de Chavez Prov., pond 11 km E of San Ramon, 15 ix 1998, 4 ♂ leg. Mauffray (1 ♂ each LSU, USNM, FSCA, NKM); Dept. of Santa Cruz, Ñuflo de Chavez Prov., small stream 25 km W of Concepcion, 13 ix 1999, 1 ♂ leg. Mauffray (FSCA); Dept. of Santa Cruz, Velasco Prov., Rio Zapacos, 1 km W of Concepcion, 13 ix 1999, 1 ♂ leg. Tennessen (KJT), 2 ♂ leg. Mauffray (FSCA); Dept. of Santa Cruz, Ichilo Prov., Rio Palacito, 3 km S of Buena Vista, 11 ii 2001, 1 ♂ leg. Tennessen (KJT); Dept. of Santa Cruz, Ichilo Prov., Rio Palacito, 3 km S of Buena Vista, 10-11 ii 2001, 3 ♂ leg. Daigle (JJD); Dept. of Cochabamba, Chapare Province, Rio Chipiridi, 9 km N of Villa Tunari, 18 ix 1999, 4 ♂ leg. Tennessen (KJT); Dept. of Cochabamba, Chapare Province, small stream N of Ibuelo, 21 ix 1999, 1 ♂ leg. Gonzales (NKM); Dept. of Cochabamba, Chapare Province, pond E of Rio Zapata, 22 ix 1999, 1 ♂ leg. Mauffray (FSCA). — Brazil, Minas Gerais, Buenopolis, i 1955, 1 ♂ leg. Machado (spec. no. E3421, det. as *ascendens* by Rácenis in 1955; USNM); Minas Gerais, Sao Joao del Ray, 26 x 1955, 1 ♂ leg. Machado (spec. no. JR-06810, det. as *ascendens* by Rácenis in 1958; USNM); Rondonia, pond near Fernandes Trail, Linea C-16, 1 km N of Cacauplandia on B-65, 150 m a.s.l., 16 ix 1991, leg. Westfall, 1 ♂ (FSCA); Sao Paulo, Sitio Primavera, pond near Rio Claro (22°24'33"S, 47°36'44"W), 21 i 2001, leg. Lencioni, 1 ♂ (FAAL); Sao Paulo, Univap, Campus Urbanova, São José dos Campos, 21 i 2001, leg. Lencioni, 1 ♂ (FAAL). — Peru, Madre de Dios Dept., Amazonia Lodge, small lake near jeep trail (12°52'19"S, 71°22'26"W), ca 500 m a.s.l., 12 ix 2000, leg. Beckemeyer, 2 ♂ (RB).

Etymology

The prefix “aep” is Greek for tall or high, referring to the extreme height of S10 of the males.

Description

Holotype male

Head: Labrum pale blue with round black mediobasal spot; labium tan; base of mandible and gena light blue; anteclypeus light blue, postclypeus light blue with small central black spot and larger lateral black spots; antefrons blue; postfrons, antenna and top of head black; large blue postocular spots; rear of head tan.

Thorax: Pronotum with anterior lobe blue, medial lobe black dorsally with lateral pale blue spot; hind lobe black basally, pale blue apically; propleura black above, blue below. Mesostigmal lamina black medially, lateral margins blue. Middorsal carina black, covered by 0.7 mm wide middorsal black stripe; blue antehumeral stripe 0.2 mm wide, black humeral stripe 0.5 mm wide; metepisternum and metepimeron blue, interpleural suture and metapleural fossa black; small, faint brown spot anterior to interpleural suture. Leg spines black; femur black dorsally, remainder tan, tibia tan, tarsus brown. Left Fw with 11 Px, right with 10; Hw each with 9 Px; Pt dark brown, with narrow translucent border inside crossveins.

Abdomen: S1-2 black dorsally, blue laterally; S3-6 black dorsally, black constricted basally by narrow blue spot connected to lateral, elongate tan marking; S7 black on basal 3/4, blue on apical 1/4; S8-9 sky blue; S10 black dorsally and laterally, tan ventrally, dorsum raised above level of abdomen (Fig. 2). Cercus black; paraproct dark brown. Cercus in lateral view slightly undulated (Fig. 2), in dorsoposterior view nearly straight with small medial lobe anterior to midlength and gradually tapering at tip (Fig. 3); maximum length, measured in oblique dorsomedial view, 1.80 mm; paraproct in lateral view tapered to slender upturned, hook-like apex (Fig. 2). Genital ligula with a terminal fold protruding from joint of first and second segments (Fig. 4); lateral lobes of second segment with sharp medial point and sharp tip in lateral view (Fig. 4), in ventral view, narrow and curved posteriorly (Fig. 5); second segment devoid of setae.

Measurements: Total length 33.0; abdomen length 27.5; Hw length 18.2.

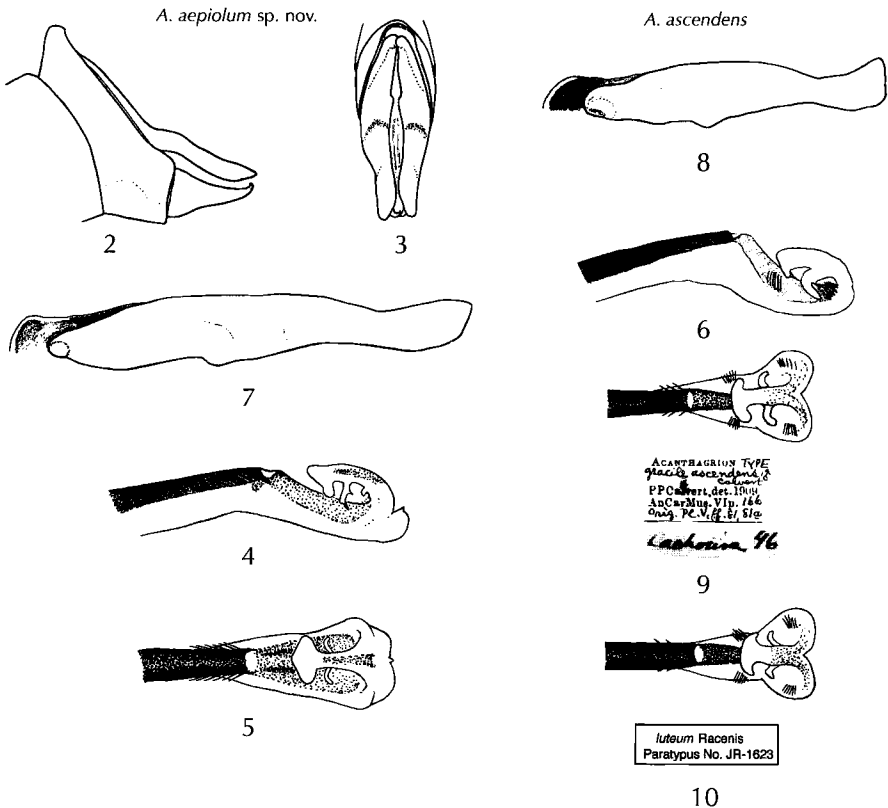
Variation in paratypes

Wings, abdomen: Fw with 10-12 Px, Hw with 8-11 Px. The extent of apical blue on S7 varied 9-25% of the segment length. Height of S10 varied 1.65-1.93 mm, cercus 1.77-2.09 mm. Cercus projects 0.60-0.77 mm beyond the apical margin of S10, paraproct 0.56-0.70 mm beyond S10.

Measurements: Total length 30.2-33.6; abdomen length 25.0-27.8; Hw length 16.1-18.6.

Diagnosis

Based on morphological evidence, the closest relative of the new species is *A. ascendens*. I did not find a color pattern difference between the two species. The extent of the apical blue marking on S7, expressed as a percentage of segment length, ranged 0-38% in *A. ascendens* ($n = 24$) and 9-25% in *A. aepiolum* ($n = 32$). In size, the two species are nearly identical: average abdomen length was 27.2 mm, although the minimum measurement was smaller in *A. ascendens* (23.8 mm vs 25.6 mm). Average Hw length was also nearly identical (17.3 mm vs 17.6 mm), although the minimum was slightly smaller in *A. ascendens* (15.5 mm vs 16.0 mm).



Figures 2-10: Structural details of *Acanthagrion aepiolum* sp. nov. (Figs 2-5, 7) and *A. ascendens* (Figs 6, 8-10). ♂ S10 and appendages of *aepiolum*, lateral view (2); ♂ anal appendages of *aepiolum*, dorsoposterior view (3); ♂ genital ligula of *aepiolum*, lateral (4) and ventral view (5); ♂ genital ligula of *ascendens*, lateral view (6); ♂ cercus of *aepiolum* (7) and *ascendens* (8), both in dorsomedial view; ♂ genital ligula of the type of *ascendens* (9) and of the paratype of *luteum* (= *ascendens*) (10), both in ventral view and showing scan of pin labels.

The main differences between the two species exist in morphology of the genital ligula and in S10, cerci and paraproct measurements. In *A. aepiolum*, the terminal fold of the genital ligula protrudes posteriorly from the external junction of the segments, visible in both lateral (Fig. 4) and ventral views (Fig. 5); this fold is vestigial in *A. ascendens* (Fig. 6). In *A. ascendens*, there are two ventral setal patches on the second segment (Fig. 6) that are absent in *A. aepiolum*.

S10, measured in lateral view as shown in Figure 1, ranged 1.65-1.93 mm high in *A. aepiolum* (\bar{x} = 1.80 mm) compared to 1.31-1.53 mm high (\bar{x} = 1.43 mm) in *A. ascendens*. Maximum length of cercus, measured in dorsomedial view, ranged 1.77-2.09 mm (\bar{x} = 1.89 mm) in *A. aepiolum* (Fig. 7), compared to 1.21-1.41 mm (\bar{x} = 1.33 mm) in *A. ascendens* (Fig. 8). The cerci are nearly identical in shape, although the constriction in the apical fourth is usually more pronounced in *A. ascendens*; the shape of the tip is variable in both species. The distance the cerci extend past the apical margin of S10, measured laterally, was 0.60-0.77 mm in *A. aepiolum* vs 0.44-0.52 mm in *A. ascendens*, and the distance the paraprocts extend past the apical margin of S10 was 0.56-0.70 mm in *A. aepiolum* vs 0.42-0.56 mm in *A. ascendens*.

Biological notes

In Bolivia, *A. aepiolum* was found flying in shady areas around slow pools of small streams and vegetated ponds. Other species of the genus also found at these habitats included *A. apicale* Selys, *A. ascendens*, *A. cuyabae* Calvert, *A. obsoletum* (Förster), *A. peruvianum* Leonard, and *A. vidua* Selys.

DISCUSSION

Rácenis (1958) described *Acanthagrion luteum* based on 52 males and 3 females from Venezuela and Surinam (Guayana Holandesa). He examined specimens from Minas Gerais, Brazil that he determined as *A. ascendens*; he did not examine Calvert's type of *A. ascendens* from Mato Grosso, Brazil. However, I examined two of the Brazilian specimens Rácenis thought were *A. ascendens* – they belong to the species here described as *A. aepiolum*. Therefore when Rácenis saw actual *A. ascendens*, he thought it was a new species and named it *A. luteum*. I compared two of Rácenis' paratypes of *A. luteum* (coll. Universidad Central de Venezuela) with Calvert's holotype of *A. ascendens* and confirmed that they are identical. The genital ligula of Calvert's type of *A. ascendens* and that of one of Rácenis' paratypes are practically identical (Figs 9-10). Rácenis (1958: figs 3c, 3e) illustrated the abdominal apex and genital ligula of *A. luteum*, which appear to be freehand drawings. Although he did not show setal patches on the second segment, the setae are present in the two paratypes I examined. These setae are translucent and very pale, and so are easily overlooked. Rácenis' figure 3d (specimen from Brazil) is a drawing of the genital ligula of *A. aepiolum*. Kennedy (1916) also figured the genital ligula of *A. ascendens* but did not show setal patches. Williamson (1916) described in detail the color pattern of male *A. ascendens* and also, for the

first time, a female of the species; he gave a figure of the position of the mesepisternal fossae in relation to the mesostigmal laminae, and stated that the fossae are near midlength of the mesepisterna and that the carina between the two fossae is elevated into a "small semicircular prominence". Leonard (1977) illustrated the genital ligula, male apical abdominal appendages and female mesepisternal fossae of *A. ascendens*. Because *A. luteum* is a synonym of *A. ascendens*, the notes appended by L.K. Gloyd in Leonard (1977: 148) concerning the status of these two species are in error.

A. ascendens has not been reported previously from Ecuador. The male from Orellana Province that I have tentatively identified as *A. ascendens* has two pairs of setal patches on segment 2 of the genital ligula, although the basal patch is composed of darker setae and is much more extensive. In addition, the labrum and all other pale areas are orange, including the dorsoapical spot on S7 and the terga and sides of S8-9. In size, this male is at the low end of the range of measurements compared to all other specimens of *A. ascendens* I studied: abdomen length 23.7, Hw length 15.5, height of S10 1.31. Leonard (1977) examined specimens from Venezuela with orange ground color. The two Peru males I examined have orange postocular spots and orange antehumeral stripes, but the labrum, genae and pale areas on S7-9 are blue.

The only other *Acanthagrion* species with a somewhat comparably produced, entire S10 that could be confused with *A. ascendens* and *A. aepiolum* are *A. vidua* and *A. yungarum* Ris. S10 is much less produced in *A. vidua* (1.17-1.33 mm high), but in *A. yungarum* it is nearly identical (1.41-1.60 mm high) to the range I measured for *A. ascendens*. In both *A. vidua* and *A. yungarum*, the postclypeus is nearly all black and S7 is usually completely black, although a few individuals of both species had a small, narrow, apical blue spot. Leonard (1977) figured the distinctive genital ligula of both *A. vidua* and *A. yungarum*. *A. risi* Leonard is a synonym of *A. vidua*, as pointed out by Gloyd in a note appended to Leonard (1977: 147). Based on my field experience, *A. ascendens* and *A. aepiolum* occur at low elevations up to 600 m whereas *A. yungarum* occurs at higher elevations from 800 to 1,800 m.

I have not seen females of *A. aepiolum*. The thorax illustrated by Rácenis (1958: fig. 3a) as *A. ascendens* is probably that of *A. aepiolum*, as his figure shows the mesepisternal fossae further back than in true *A. ascendens* (Rácenis' fig. 3b). The larva of *A. aepiolum* is unknown. Geijskes (1941) described the larva of *A. ascendens* based on reared specimens from Surinam; I reared a male in Bolivia (Santa Cruz Dept.) that agrees with Geijskes' description.

ACKNOWLEDGEMENTS

I thank Robert Davidson of the Carnegie Museum of Natural History for loaning me the type of *Acanthagrion ascendens* and Jürg De Marmels for the loan of two paratypes of *A. luteum*. Thanks to Roy Beckemeyer, Jerrell Daigle, Sid Dunkle, Fred Lencioni and Bill Mauffray for allowing me to examine *Acanthagrion* specimens they collected, and to Jerrell Daigle for critiquing the draft manuscript.

REFERENCES

- Calvert, P.P., 1909. Contributions to a knowledge of the Odonata of the neotropical region, exclusive of Mexico and Central America. *Annals of Carnegie Museum* 6: 73-280.
- Geisjkes, D.C., 1941. Notes on Odonata of Surinam. II. Six mostly new zygopterous nymphs from the coastland waters. *Annals of the Entomological Society of America* 34: 719-734.
- Kennedy, C.H., 1916. Notes on the penes of Zygoptera (Odonata). No. 1. Species limits in the genus *Acanthagrion*. *Entomological News* 27: 325-330.
- Leonard, J.W., 1977. A revisionary study of the genus *Acanthagrion* (Odonata: Zygoptera). *Miscellaneous Publications of the Museum of Zoology, University of Michigan* No. 153: 1-173.
- Pfau, H.K., 1971. Struktur und Funktion des sekundären Kopulationsapparates der Odonaten (Insecta, Palaeoptera), ihre Wandlung in der Stammesgeschichte und Bedeutung für die adaptive Entfaltung der Ordnung. *Zeitschrift für Morphologie und Ökologie der Tiere* 70: 281-371.
- Rácenis, J., 1958. Los Odonatos neotropicales en la colección de la Facultad de Agronomía de la Universidad Central de Venezuela. *Acta Biologica Venezuelica* 2: 179-226.
- Williamson, E.B., 1916. On certain *Acanthagrions*, including three new species (Odonata). *Entomological News* 27: 313-325, 349-358.