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OXYAGRION TENNESSENI SPEC. NOV. FROM ECUADOR (ZYGOPTERA: COENAGRIONIDAE)

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The new sp. is described and illustrated from the Ecuadorian Andes (holotype ♂, allotype ♀: Napo prov., Baeza, 26-VII-1996; deposited at FSCA, Gainesville). It is similar to *O. terminale* Sel. and *O. bruchi* Navas, from which it is differentiated by the shape of the cerci and the coloration on abdominal segments 8-10.

INTRODUCTION

A large series of the new *Oxyagrion* was collected within a 100 km radius of the village of Baeza, Napo Province, Ecuador. The first series of specimens was collected in 1980 and 1981 by Dr Sid Dunkle and Dr Ken Knopf. An additional 115 specimens were collected at several different localities during four trips to the area between 1995 and 1997. At first it was thought that these specimens represented *O. bruchi* Navas, a little known species, but closer examination showed it is distinctly different from the description and drawings provided by NAVAS (1924), and COSTA (1978). The new species has the posterior margin of abdominal segment 10 projecting upward similar to that of many species within the *Acanthagrion-Oxyagrion* group, but it distinctly falls within *Oxyagrion* because of its predominantly red color, lack of post ocular spots, lack of black on the head or thorax, and the bilobed distal penis segment of the male. These features distinguishing *Oxyagrion* from *Acanthagrion* were discussed by DE MARMELS (1984).

OXYAGRION TENNESSENI SP. NOV.

Figures 1-6

M a t e r i a l. – **Holotype** ♂: ECUADOR, Napo prov., Baeza, 10.6 km S on Hwy 45 (Tena Hwy), seepages, 24-VII-1996, W.F. Mauffray leg.; deposited in Florida State Collection of Arthropods (FSCA),

Gainesville, Florida, USA (type specimen No. 1015). **Allotype** ♀: same data as holotype, deposited with holotype (type specimen No. 1022). **Paratypes** (100 ♂, 35 ♀): ECUADOR, Napo prov., 6 km E of Baeza, Baeza-Lago Agrio Rd, small stream and pond, 0°24'S 77°50'W, 21-VII-1980, 6 ♂, 6 ♀, K.W. Knopf leg.; – same locality, 21-VIII-1980, 5 ♂, S.W. Dunkle (?) leg.; – 17 km E of Coyuja, 2 ♂, 2 ♀, S.W. Dunkle leg.; – Baeza, 31-X-1981, 1 ♂, S.W. Dunkle leg.; – 2 mi W of Baeza, seepage pond, 7-VI-1995, 2 ♂, 2 ♀, W.F. Mauffray leg.; – same locality, 1 ♂, S.W. Dunkle leg.; – 28.3 km N of Chaco, 7-VI-1995, 2 ♂, 1 ♀, K.J. Tennessen leg.; – 10.6 km S of Baeza, Tena Rd, seepages 16-VI-1995, 9 ♂, W.F. Mauffray leg.; – same locality, 11 ♂, S.W. Dunkle leg.; – same locality, 5 ♂, K.J. Tennessen leg.; – 12.8 km N of Narupa, seepages adjacent to small tributary, 14-VII-1996, 1 ♂, W.F. Mauffray leg.; – 12 km N of Narupa, roadside seepage, 14-VII-1996, 1 ♂, K.J. Tennessen leg.; – 5 km N of Cosanga, Baeza Hwy, roadside seepage, 24-VII-1996, 1 ♀, W.F. Mauffray leg.; – same locality, 3 ♂, 1 ♀, J.J. Daigle leg.; – 10.6 km S of Baeza, Tena Rd, seepages 24-VII-1996, 4 ♂, 5 ♀, W.F. Mauffray leg.; – same locality, 2 ♀, S.W. Dunkle leg.; – same locality, 2 ♂, 1 ♀, J.J. Daigle leg.; – same locality, 4 ♂, 4 ♀, K.J. Tennessen leg.; – 5 km S of Baeza, seepages along small tributary, 25-VII-1996, 6 ♂, W.F. Mauffray leg.; – same locality, 2 ♂, S.W. Dunkle leg.; – same locality, 2 ♂, 1 ♀, J.J. Daigle leg.; – 18.5 km N of Baeza, horsetail marsh and pond, 25-VII-1996, 2 ♂, 2 ♀, W.F. Mauffray leg.; – same locality, 6 ♂, S.W. Dunkle leg.; – same locality, 8 ♂, J.J. Daigle leg.; – same locality, 4 ♂, 3 ♀, K.J. Tennessen leg.; – roadside seepage 43.5 km E of Narupa Jct. on Loreto Rd, 14-XI-1997, 1 ♂, W.F. Mauffray leg.; – 10.6 km S of Baeza, on Tena Rd, seepages, 19-XI-1997, 1 ♂, 1 ♀, W.F. Mauffray leg.; – same locality, 1 ♂, 1 ♀, T.W. Donnelly leg.; – 4.8-5.0 km S of Baeza, Tena Rd, seepages along 3 tributaries, 2 ♂, 2 ♀, W.F. Mauffray leg.; – horsetail marsh and pond 18.5 km N of Baeza, 20-XI-1997, 3 ♂, T.W. Donnelly leg.

Paratypes were distributed to Florida State Collection of Arthropods, Gainesville FL, USA (FSCA), International Odonata Research Institute, Gainesville, FL, USA (IORI), Catholic University Natural History Museum, Quito, Ecuador (QCAZ), Ciencias Naturales y Museo, La Plata, Argentina, U.S. National Museum, Washington, DC, USA (USNM), University of Michigan Museum of Zoology (UMMZ), Louisiana State University Collection of Arthropods, Baton Rouge, LA, USA (LSU); and the personal collections of Drs Rosser Garrison, Thomas Donnelly, Sid Dunkle, Ken Tennessen, Jerrel Daigle, and Ken Knopf.

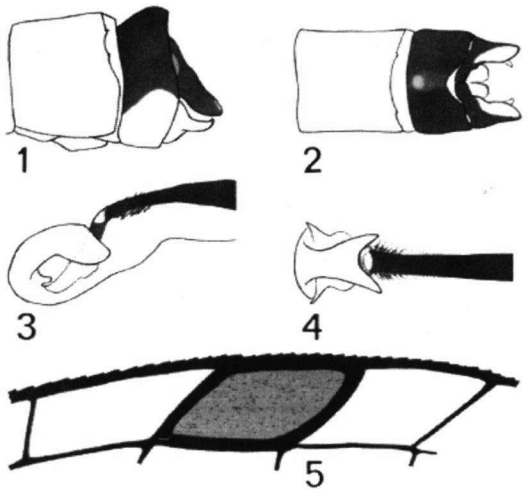
Etymology. – The species is named for Dr Ken Tennessen for his contributions to odonatology. Dr Tennessen has accompanied me on all the 1995-1997 Ecuadorian collecting trips.

MALE **(Holotype)**. – Head. – Face: brown; clypeus slightly darker brown than rest of face, labrum with dark midbasal spot, antennae all black; postocular area reddish brown with a distinct dark irregular line running laterally from compound eye towards ocelli, but not quite reaching ocelli; postoccipital areas with dark brown specks, a light brown seta arising from each speck.

Thorax. – Pronotum reddish brown; distinct row of brown hairs projecting from posterior lobe of pronotum. Pterothorax mostly reddish brown; mesepisternum (antehumeral area) a little lighter in coloration and with scattered dark brown specks typical of genus, each speck bearing a brown seta; a small area on either side of the middorsal carina devoid of specks; anterior half of the mesepimeron with a few specks; antealar crest brown; meso- and meta-pleural fossae marked with dark brown, as is the area just dorsal and posterior to the fossae along the antealar carina; lower portion of mesepimeron and most of metepimeron pale yellowish. Femora pale beneath with dark brown spines, becoming reddish brown on the extensor surfaces; tibiae and tarsi darker.

Wings hyaline, no hint of coloration, veins brownish black, pterostigma reddish brown, longer than wide (Fig. 5). Antenodal crossveins in front wing 12 in hind wing 10.

A b d o m e n. – Segments 1-6 crimson red to scarlet (in life), fading to reddish brown in dried specimens (darker in non-acetoned specimens), with the following exceptions: segment 2 with apical annulus with a hint of brownish coloration; on segment 3 the apical annulus and the adjacent ventrolateral area brown; segment 4 similar to 3 but with brownish area expanded dorsally to form a diffuse band on the apical 8th; segment 5 with a definite dark brown ring occupying the apical 8th of the segment; segment 6 with the apical band narrowing slightly laterally, darker than preceding segment, almost black; segment 7 mostly black dorsally, except pale basal annulus and apical annulus posterior to the transverse carina blue; ventral lateral areas red, becoming paler ventrally. Segment 8 blue with an irregular shaped lateral black mark extending anteriorly about 80% the length of the segment. This black mark extends apically onto the apical annulus and hooks dorsally ending in a shiny jet black mark matching that of and lining up with similar shiny black areas of segments 7 and 9; segment 8 with an additional black pair of small dorsal spots located at about 3/10 the segment length from the apex; also with black spines on transverse carina. Segment 9 blue except for shiny black spot of the apical annulus and black spines on carina. Segment 10 black dorsally except for a small dorsal spot and a pair of small dorsal lateral pale (blue?) spots or blemishes. (Markings on 8-10 in paratypes are quite variable; see discussion below). Apex of segment 10 projecting upward, well above the level of segment 9 in lateral view; this projection is scalloped out in posterior view and is slightly pruinose on its inner (posterior) surface. In lateral view, cerci strongly slanted downward, dark brown to black on lateral surface and light brown on inner surface; paraprocts not reaching rips of cerci, yellowish with a prominent upturned dark colored tooth (Figs 1-2). In profile, the appendages resemble *Acanthagrion peruvianum* Leonard. Terminal segment of penes is, in ventral view, deeply divided with the outer surfaces almost parallel and the inner



Figs 1-5. *Oxyagrion tennesseni* sp. n., male: (1) abdominal segments 9-10 and caudal appendages, lateral view; – (2) same, dorsal view; – (3) terminal segment of penes, lateral view; – (4) same, ventral view; – (5) pterostigma.

Fig. 6. *Oxyagrion tennesseni* sp. n., female: thorax, dorsal view, showing mesostigmal plates and branches of mid-dorsal carina.

surface forming a deep long "U" shaped cleft (Figs 3-4).

Measurements (in mm). – Total length 36.0, abdomen 26.0, hind wing 19.5.

FEMALE **(Allotype)**. – General coloration more olive brown than male. Head similar to male except postoccipital region a little lighter than the frons, but not reddish as in the male. There is a curved "T" shaped spot anterior to the ocelli.

Pronotum and pterothorax also similar to male, but olive brown; meso-stigmal plates flat (Fig. 6); branches of middorsal carina form a heart-shaped area longer than wide (Fig. 6); just posterior to the branches of middorsal carina lie a pair of black spots surrounding the pits, which are not elevated when viewed laterally.

Wings are similar to male; 12 postnodals in front wing, 11 in hind wing.

Abdominal segments mostly red on the dorsum as in male, the lateral and ventral surfaces pale cream yellow; segment 1 mostly yellowish, segments 2-5 with pair of dorsal lateral yellowish-brown marks near apex extending laterally and posteriorly; dark banding similar to that of male on segments 3-6, that of 5 covering up the lower portion of the dorsal lateral lighter markings; dark dorsal apical band on segment 6 decreasing in size laterally; segment 7 similar to that of male, with the area posterior to the transverse carina pale; segment 8 blackish brown its entire length, with a small pale apical dorsal spot and with area posterior to transverse carina pale; segment 9 blackish brown on dorsum, split by a pale spot extending most of length, tapering slightly posteriorly; small apical pale spot on each side; segment 10 black dorsally. Appendages yellowish brown; tip of vulvar spine, basal plate and styli of ovipositor dark brown.

Measurements (in mm). – Total length 33.5, abdomen 21.5, hind wing 19.0.

VARIATION WITHIN PARATYPES. – Total length varied from 30 to 37.5 mm, the majority being between 32 and 35.5 mm. Abdomen length varied from 25 to 29 mm, hind wing length from 17.5 to 21.5 mm. Number of postnodals ranged from 12-14 in the front wings and 10-12 in the hind wings; some specimens varied as to the number of crossveins in the wings. Extra postnodals were most commonly found just proximal to the pterostigma. Coloration varied mostly in the posterior abdominal segments. The black lateral marking of segment 8 was variable in shape, its length ranging from 75% to 97% of the length of the segment (most often 80--85%). The shape of the spot also varied considerably. The presence of blue or pale markings on segment 10 varied from no blue or pale to distinct dorsal and lateral

spots, but none approached the amount of blue found in *O. terminale*. The pruinosity on the posterior surface of segment 10 was variable also, although the majority lacked any pruinosity.

HABITAT. – The species was found near small streamlets and seepage areas in a variety of situations on the east slope of the Andes at 1700-2100 m. They were collected in full sunlight, flying down from vegetation overhanging small seepage streamlets to 1-3 m above water and landing on leaves. When disturbed, they flew back up high in the vegetation, similar to the flight of some *Argia* species. At these sites we also found *Argia medullaris* Hagen, *Erythrodiplax ines* Ris, *Cannaphila vibex* (Hagen), and *Aeshna marchali* Rambur. At one locality with overcast skies and light drizzle, numerous tenerals were found in a grassy field on the side of a moderately sloping hillside. Along with them we collected *Argia infrequentula* Fraser.

DISCUSSION

Oxyagrion tennesseni sp. n. is most similar to *O. terminale* Selys in general appearance of the apical appendages (lateral view), and in the general shape of the penis. *O. tennesseni* differs as follows: abdominal segment 6 has a large apical band, and there are no dorsolateral spots or specks on segment 9; segment 10 has a greater extension of the dorsoposterior surface, and the cerci have a greater downward slant; the shape of the cerci differ by having a slight bulge at about 1/2 their length and the tips are bluntly pointed. *O. terminale* has little or no bulge and the tips of the cerci are bluntly rounded. In addition, *O. terminale* has no blue markings on abdominal segments 7 or 8. Although the blue or pale coloration of abdominal segment 10 is variable in *O. tennesseni*, the lateral spots never connect dorsally as they often do in *O. terminale*. The female of *O. tennesseni* differs from *O. terminale* in having the mesepisternal fossae (pits) not or hardly raised above the surface of the thorax in lateral view, by having a greater cleft of the heart-shaped interlaminal sinus (more like that of *O. miniopsis* Selys), and the pale color of abdominal segment 9 is in the form of a parallel to tapering dorsal spot versus a "T" shaped spot. The apical spine on the paraproct extends to the level of the apex of the cerci in dorsal view, whereas it falls short in *O. terminale*. The stigma of *O. terminale* has the costal edge much lighter than the middle of the stigma. There is only a hint of a lighter area in a few of the paratypes of *O. tennesseni*, and the lighter coloration is reduced to a hairline.

Oxyagrion terminale "form b" of Ris from Bolivia has the same basic differences as the normal *O. terminale*. Abdominal segment 10 has most of the dorsum blue. The head and thorax lack the dark brown specks found in *O. tennesseni*, and the pterostigma lacks the yellowish streak on the costal side. COSTA (1978) considered this form to be *O. bruchi* Navas.

No specimens of *O. bruchi* could be located for this study. The literature refer-

ences all refer to the type, which according to COSTA (1978) could not be located in the Barcelona Museum where it is supposed to be deposited. According to NAVAS (1924), this species has the dorsum of abdominal segments 8 and 9 and part of 10 blue. His drawing of the paraproct shows that it has a distinct 135° angle in its downward slant, whereas *O. tennesseni* has no such angle to the paraproct (Fig. 1). Segment 10 in lateral view shows hardly any upward projection in *O. bruchi*. This species seems to be known only from the original Argentina record of NAVAS (1924).

Oxyagrion miniopsis Selys, reported from Peru and Colombia, has no blue markings on the abdomen. The male has red extending laterally on segment 8, and the dorsum of 8-10 is black. The upward projection of segment 10 is similar in both species, but the paraprocts are distinctly longer than the cerci in *O. miniopsis*. The terminal segment of the penis in *O. miniopsis* has two lateral projections, and the area between the terminal projections is nearly flat, whereas in *O. tennesseni* this area is more "U" shaped. The female of *O. miniopsis* has segments 8-10 all dark with no hint of light coloration. In *O. miniopsis*, the sides of the pterostigma are almost equal, whereas in *O. tennesseni* the pterostigma are distinctly longer than wide.

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