

**TWO NEW SPECIES OF *OXYAGRION* SELYS, 1876,  
WITH A DESCRIPTION OF FIVE NEW LARVAE  
(ZYGOPTERA: COENAGRIONIDAE)**

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*O. pseudocardinale* sp. n. (holotype ♂: Brazil, Minas Gerais, Fazenda da Cachoeira F.F. de Souza, 13-II-1990) and *O. sulmatogrossense* sp. n. (holotype ♂: Brazil, Mato Grosso do Sul, Campo Grande, Campus UFMS, 24-XII-1997) are described and illustrated. The larvae of *O. basale* Selys, 1876; *O. haematinum* Selys, 1876; *O. pavidum* Selys, 1876; *O. santosi* Martins, 1967 and *O. sulinum* Costa, 1978 are described and illustrated for the first time. Keys are provided for the known *Oxyagrion* spp. and for the known larvae.

## INTRODUCTION

Nineteen species of *Oxyagrion* are known from the Neotropical region (COSTA, 1978, 1988; SANTOS, 1961) and 5 species are known from Mato Grosso and Mato Grosso do Sul States: *O. chapadense* Costa, 1978; *O. evanescens* Calvert, 1909; *O. impunctatum* Calvert, 1909; *O. microstigma* Selys, 1876 and *O. pavidum* Selys, 1876. Of the 19 species, 15 occur in Brazil and of these only *O. sulinum* Costa, 1978 had not been recorded from Mato Grosso State.

The two new species we describe here belong to *Oxyagrion* because they have red color patterns; lack postocular spots; black area on the head and on mesoepisternum is absent; penis with double fold; females with mesoepisternal fossae (except *O. hempeli* and *O. microstigma*) and with genital spine on 8<sup>th</sup> segment (except *O. evanescens*). All material, including types are lodged in the Museu Nacional, Rio de Janeiro.

*OXYAGRION PSEUDOCARDINALE* SP. NOV.

Figures 1-6

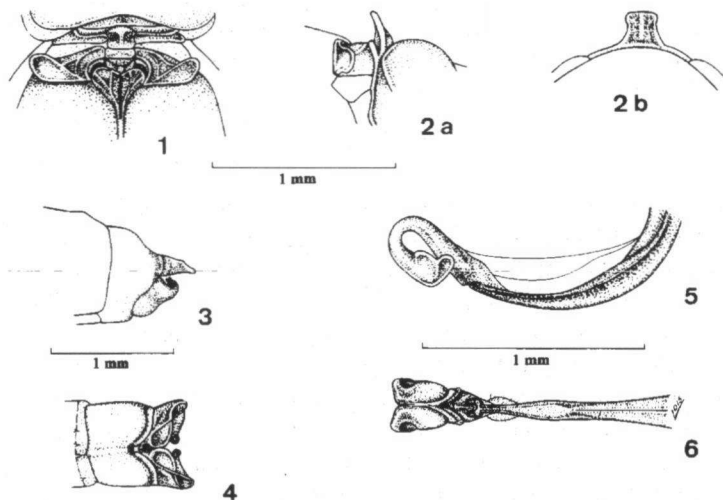
**Material.** — **Holotype** ♂ (No. 803): Brazil, Minas Gerais, Fazenda da Cachoeira Francisco F. de Souza (Cachoeira Mariana), 13-II-1990, J.M. Costa & S. Marshall leg.

**Etymology.** — An allusion to the projecting posterior lobe of prothorax as in *Oxyagrion cardinale*.

**MALE (Holotype).** — **Head** reddish; postocular spots dark brown; a narrow ring surrounding lateral ocellus; 1<sup>st</sup> and 2<sup>nd</sup> antennal segments reddish [distal segments lacking]. Labium yellow; labial cleft with sparse white pruinosity; postocular area lacking black dots.

**Thorax.** — Prothorax light brown, medial part of posterior lobe projecting posteriorly, quadrangular shaped, not undulate (Figs 1, 2a, 2b). Synthorax reddish, red. Legs cream with dark spots; tibial spines strong, asymmetric and black; internal spines longer than the space between them; decreasing in size toward tarsus; external spines longer and as long as the space between them. Tarsi light, dark rings about articulation areas; claws black, simple.

**Wings.** — Hyaline, petiolated to Ac; arculus at second antenodal crossvein; Cac between two antenodals; 10 postnodals in forewings, 8 in hindwings; R<sub>3</sub> in the forewings arising near the 5<sup>th</sup> postnodal at 4<sup>th</sup> postnodal in hindwings; IR<sub>2</sub> in forewings at 8<sup>th</sup> postnodal; at 7<sup>th</sup> postnodal in hindwings. Pterostigma yellowish brown, similarly shaped in all wings, slightly oblique, covering less than one



Figs 1-6. *Oxyagrion pseudocardinale* (holotype ♂): (1) prothorax, dorsal view; — (2a) posterior lobe of prothorax, lateral view; — (2b) posterior lobe of prothorax, posterior view; — (3) abdominal segment 10 and anal appendages, lateral view; — (4) abdominal segment 10 and anal appendages, dorsal view; — (5) penis, lateral view; — (6) penis, ventral view.

cell. Forewings distinctly longer than hindwings.

**A b d o m e n.** – Abdominal segments 3-7 black dorsally, increasing distally; dorsum of segment 2 with a black semicircular spot; segments 8-10 red; posterodorsal margin of abdominal segment 10 simple, apical margin with a short incision. Cerci (Figs 3, 4) dark brown, narrowed and diverging distally and shorter than abdominal segment 10; paraproct (Fig. 3) pale, shorter than cerci, base broad. Penis (Figs 5, 6) similar to *O. impunctatum*.

**M e a s u r e m e n t s** (mm). – Total length including appendages 32; – forewings 18; – hindwings 17; – anterior and posterior pterostigma 0.5 on costal side and 1.0 on greater diagonal; – abdomen 27.

**FEMALE** unknown.

**DIAGNOSIS.** – *Oxyagrion pseudocardinale* has the medial portion of the posterior lobe of the prothorax projecting posteriorly as in *O. cardinale* Fraser, 1946, a species of which only one female from Peru has been described. We doubt that this new species represents the male sex of *O. cardinale*. In *O. cardinale* this lobe is undulate while in *O. pseudocardinale* the lobe is not undulate. The characters described by FRASER (1946) and DE MARMELS (1984) for *O. cardinale* leave little doubt that our male represents a new species.

#### *OXYAGRION SULMATOGROSSENSE* SP. NOV.

Figures 7-14

**M a t e r i a l.** – **H o l o t y p e** ♂ (No. 804) and **Paratype** ♂ (No. 805): Brazil, Mato Grosso do Sul, Campo Grande, Campus of UFMS, 24-XII-1997, J.A.S. Silva leg.; – **Allotype** ♀ (No. 806), same locality, 18-II-1998, L.O. Irineu de Souza leg.; – 1 **Paratype** ♀, same locality, 10-II-1998, J.A.S. Silva leg.

**E t y m o l o g y.** – In allusion to the site of collection.

**MALE (Holotype).** – **H e a d** reddish; postocular spots dark brown; 1<sup>st</sup> and 2<sup>nd</sup> antennal segments yellowish brown, remaining segments black. Labium yellow; labial cleft large with intense white pruinosity; dorsum of labrum with a black spot; postocular area with black dots.

**T h o r a x.** – Prothorax reddish but laterally pale, marked with black spots on sutures. Synthorax reddish, with black dots (Fig. 14). Legs cream with dark spots; tibial spines strong and black, as long as the spaces between them. Tarsi dark brown, black rings about articulation areas; claws black, simple.

**Wings.** – Hyaline, petiolated to Ac or slightly before it in hindwings; arculus at second antenodal crossvein or slightly distal to it; Cac near 1<sup>st</sup> antenodal; 11 postnodals in forewings, 9-10 postnodals in hindwings; R<sub>3</sub> in forewings and hindwings arising near 4<sup>th</sup> postnodal crossveins; IR<sub>2</sub> in forewings and hindwings at 7<sup>th</sup> postnodal. Pterostigma yellowish brown, similarly shaped in all wings slightly oblique, surmounting 1 cell.

**A b d o m e n.** – Abdominal segments 1-10 red dorsally with black rings on articulations; dorsum of segment 2 with a black semicircular spot; dorsum of

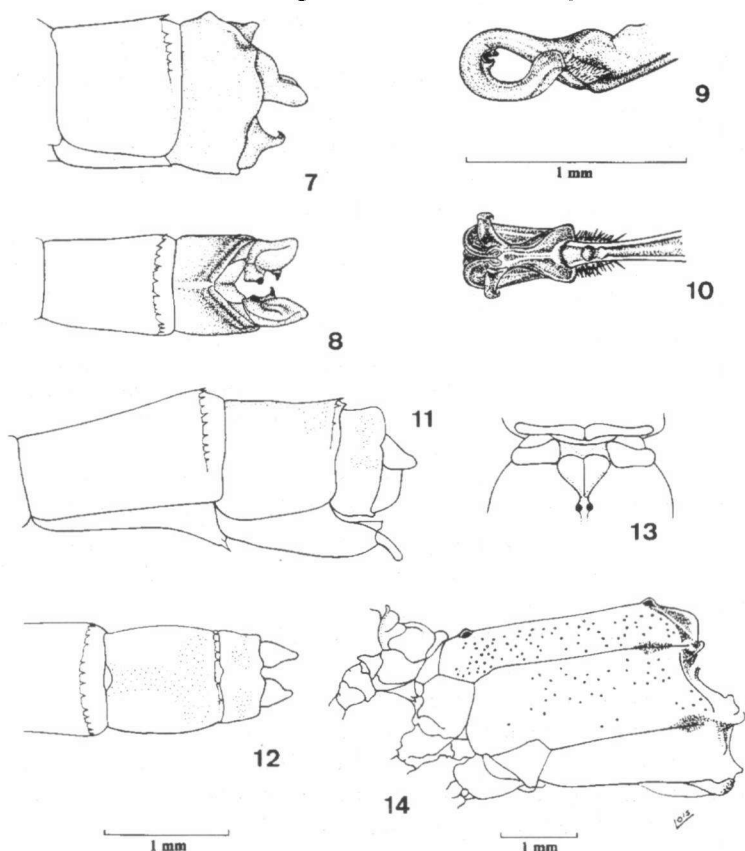
abdominal segment 10 (Figs 7, 8) with a pair of posteriorly directed cornute projections as in *O. chapadense*. Cerci dark brown, rounded at distal end and slightly longer than abdominal segment 10; paraprocts (Figs 7, 8) pale, shorter than cerci, its black tip incurved, base broad. Penis as in Figures 9 and 10.

**Measurements (mm).** – Total length including appendages 35; – forewings 21; – hindwings 20; – anterior and posterior pterostigma 0.5 on external costal side and 1.0 on greater diagonal; abdomen 28.

**FEMALE (Allotype).** – **H e a d.** – As in the male, but labrum bluish laterally.

**T h o r a x.** – Mesoepisternal fossae rounded, impressed on either side of a small elevated tubercle as in *O. chapadense* (Fig. 13).

**A b d o m e n.** – Abdominal segments 3-10 black dorsally and reddish laterally;



Figs 7-14. *Oxyagrion sulmatogrossense*: (7) abdominal segment 10 and anal appendages, lateral view (holotype); – (8) abdominal segment 10 and anal appendages, dorsal view (holotype); – (9) penis, lateral view (holotype); – (10) penis, ventral view (holotype); – (11) terminal abdominal segments, lateral view (paratype female); – (12) terminal abdominal segments, dorsal view (paratype female); – (13) mesoepisternal fossae, dorsal view (allotype); – (14) thorax, lateral view (paratype female).

segment 2 as in male; segment 9 with a blue T-shaped spot (Figs 11, 12).

**M e a s u r e m e n t s** (mm). — Total length including appendages 30; — forewings 18.5; — hindwings 17.5; — anterior and posterior pterostigma 0.5 on the costal side and 1.0 on the greater diagonal; — abdomen 24.

**DIAGNOSIS.** — *Oxyagrion sulmatogrossense* is included in the *basale* group together with *O. basale*, *O. chapadense*, *O. impunctatum* and *O. sulinum* because the posterodorsal margin of abdominal segment 10 has a pair of posteriorly directed cornute projections.

### KEY TO KNOWN NEW SPECIES

- 1 Dorsum of abdominal segment 10 produced to form 2 posteriorly directed horns (*basale* group) ..... 2
- Dorsum of abdominal segment 10 without horns ..... 6
- 2 Dorsum of abdominal segments black; distal segment of penis distinctly wider than width of segment 2; terminal lobe (figs 93-94-95, COSTA, 1978) of penis divided ..... *sulinum*
- Dorsum of abdominal segments with variable color; penis without the above combination ..... 3
- 3 Dorsum of abdominal segments 1-10 red ..... 4
- Dorsum of abdominal segments 1-2 black, 3-10 red ..... 5
- 4 Dorsum face of head blood red, synthorax without black dots ..... *impunctatum*
- Dorsum face of head not blood red; synthorax with black dots ..... *sulmatogrossense*
- 5 Pterostigma quadrangular shaped; cerci as long as abdominal segment 10; penis lobes elongated as in figs 69-70, COSTA, 1978 ..... *chapadense*
- Pterostigma lozenge shaped; cerci longer than abdominal segment 10; penis lobes as in figs 73-74 COSTA, 1978 ..... *basale*
- 6 Posterior lobe of prothorax straight ..... (Species not included in this key)
- Posterior lobe of prothorax subquadrangular or quadrangular shaped ..... 7
- 7 Posterior lobe of prothorax subquadrangular; thorax with antehumeral and humeral parts marked by blue stripes; abdominal segments 1-2 blue laterally; total length 40 mm; 13 postnodals in forewings and 11 in hindwings (Peru) (FRASER, 1946) ..... *cardinale* (♀)
- Posterior lobe of prothorax quadrangular; without blue stripes on thorax; total length 32 mm; 18 postnodals in forewings and 17 in hindwings; Minas Gerais State, Brazil .... *pseudocardinale* (♂)

### LARVA OF *OXYAGRION BASALE* SELYS, 1876

Figures 15-22

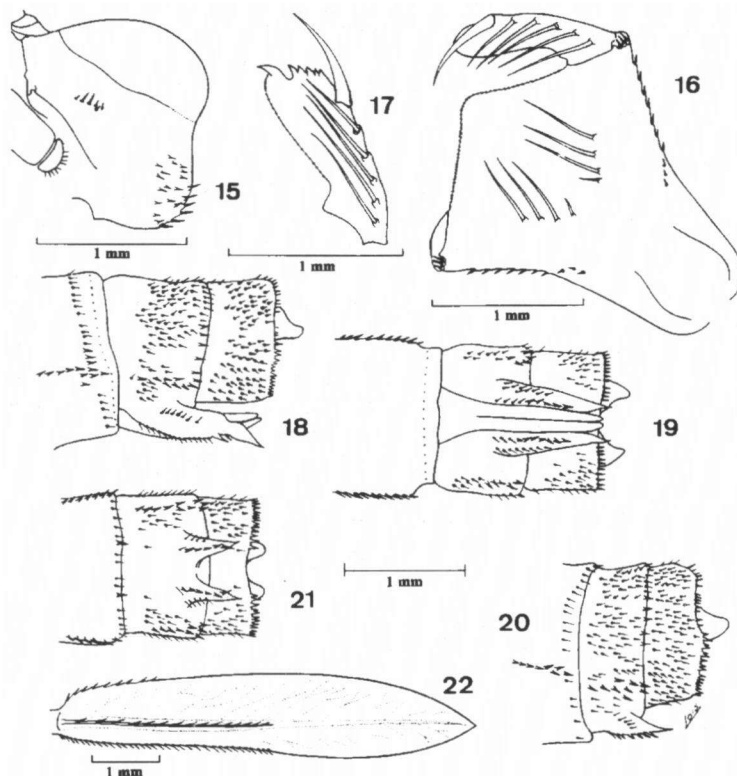
**M a t e r i a l.** — 1 ♀, Brazil, Espirito Santo, Santa Teresa, Rio Timbuí, 17-VII-1985, (emerged on 1-VIII-1985), N.D. Santos, L.F.R. Netto & J. Ulisses leg.; 1 ♂, same place, date and leg. (emerged on 5-VIII-1985); 1 ♂, same place, date and leg. (emerged on 20-VII-1985); 1 ♂, Espirito Santo, Santa Teresa, Penha, 18-VII-1985, same leg. (emerged on 11-VIII-1985); 1 ♂, Santa Teresa, Penha (in creek), 18-VII-1985, same leg. (emerged on 11-VIII-1985).

**H e a d** wider than long, light brown dorsally, dark brown on postocular area, this area with black dots; cephalic lobes with narrow cleft in ventral view; 20 spines on rear of head (Fig. 15); ventral surface of the head pale; 2 large and 4 short spines (Fig. 15) on inferior border of eyes near maxillae; antennae 7-segmented, the 2<sup>nd</sup>

more robust and slightly longer than 3<sup>rd</sup>; labium (Fig. 16) triangular longer than wide with 3 primary mental setae and 1 secondary seta; lateral border of prementum with 7 spiniform setae on distal end, distal margin of prementum feebly crenulated, labial palp (Figs 16, 17) with 5 setae; anterior border of the palps with 3 triangular spines and 2-3 denticles proximal to movable hook; inferior border of palps feebly crenulated; labrum semicircular with setae on distal margin.

**T h o r a x.** — Dark brown; lateral margin of prothorax with 2 tubercles; synthorax pale; legs short and slender with dark brown on articulations; femora and tibiae with spines; claws simple. Anterior and posterior wingpads sheaths extending over the base of abdominal segment 4.

**A b d o m e n.** — Tergites dark brown; sternites yellow. Dorsum of segments 7-10 with setae; distal border of segment 10 with row of spines not interrupted



Figs 15-21. Larva of *Oxyagrion basale*: (15) head, ventral face; — (16) labium, dorsal view; — (17) labial palps, internal face; — (18) terminal abdominal segments and anal appendages, female, lateral view; — (19) terminal abdominal segments and anal appendages, female, ventral view; — (20) terminal abdominal segments and anal appendages, male, lateral view; — (21) terminal abdominal segments and anal appendages, male, ventral view; — (22) lateral caudal lamellae, lateral view.

at basal area of the cerci (Fig. 20). Ventral view of segment 9 as in Figure 21.

Caudal appendages. — Cerci short, in lateral view almost globe-shaped. Caudal lamellae pale, leaf-shaped (Fig. 22), without transverse suture and not pigmented; lateral and dorsal carina of caudal lamellae with short spines on proximal half, this as wide as distal half; principal tracheae almost straight without secondary tracheae.

**M e a s u r e m e n t s** (mm). — Total length (excluding appendages) 12.7; — width of head 3.5; — length of head 1.9; — length of labium 2.6; — width of labium 2.0; — antennae: segment I 0.31; segment II 0.50; segment III 0.64; segment IV 0.44; segment V 0.26; segment VI 0.20; segment VII 0.10; — length of caudal lamella 6.6; — width of lateral caudal lamella 1.25.

**FEMALE.** — Similar to male. Spines of segment 9 long; ovipositor reaching the distal end of segment 10 (Figs 18, 19).

**M e a s u r e m e n t s** (mm). — Total length (excluding appendages) 12.7; — width of head 3.1; — length of head 1.6; — length of labium 2.2; — width of labium 2.1; — antennae: segment I 0.28; segment II 0.48; segment III 0.60; segment IV 0.44; segment V 0.23; segment VI 0.20; segment VII 0.10; — length of caudal lamella 6.0; — width of lateral caudal lamella 1.2.

### LARVA OF *OXYAGRION HAEMATINUM* SELYS, 1876

Figures 23-30

**M a t e r i a l.** — 9 ♂ (5 exuviae) and 7 ♀ (5 exuviae), Brazil, Minas Gerais, Serra do Caraça, Riacho dos Cascudos, XII-1979, N.D. Santos & L.F.R. Netto leg.

**H e a d** wider than long, light brown dorsally; cephalic lobes with narrow cleft in ventral view; more than 20 short spines on rear of head (Fig. 23); ventral surface of the head pale; 2 large spines and 8 short spines (Fig. 23) on inferior border of eyes near maxillae; antennae 7-segmented the 3<sup>rd</sup> is twice as long as 2<sup>nd</sup> segment; labium triangular shaped (Fig. 24) longer than wide with 4 primary mental setae; lateral border of prementum with 8 or 9 spiniform setae on distal end; distal margin of prementum feebly crenulated; labial palp with 6 setae (Figs 24, 25); anterior border of the palps with 3 triangular spines and a row of poorly defined denticles proximal to movable hook; inferior border of palps feebly crenulated (Fig. 25); labrum semicircular with setae on distal margin.

**T h o r a x.** — As in *O. basale* but with prothorax smooth.

**A b d o m e n.** — As in *O. basale* but dorsum of segments 4-10 with short setae; distal border of segment 10 (Fig. 26) as in *O. basale*. Ventral view of segment 9 as in Figure 27.

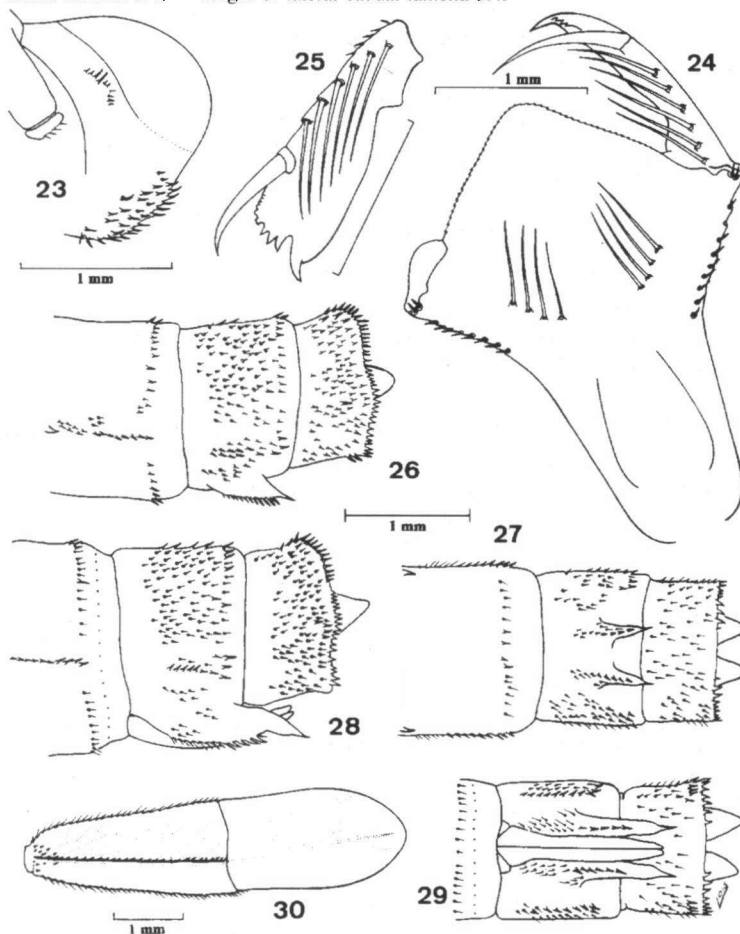
Caudal appendages. — Cerci short, in lateral view conical. Caudal lamellae (Fig. 30) pale, leaf-shaped, with transversal suture and discontinuously pigmented; lateral and dorsal carina of caudal lamellae with short spines on proximal half, this as wide as distal half; principal tracheae almost straight; secondary tracheae thin. In some specimens there is a dark brown shading on middle of caudal lamellae.

**M e a s u r e m e n t s** (mm). — Total length (excluding caudal lamellae) 173; — width of head 3.5; — length of head 1.9; — length of labium 3.2; — width of labium 2.7; — antennae: segment I 0.36;

segment II 0.58; segment III 0.92; segment IV 0.56; segment V 0.32; segment VI 0.22; segment VII 0.12; — length of median caudal lamella 5.4; — width of median caudal lamella 1.6; — width of lateral caudal lamella 1.4; — length of lateral caudal lamella 5.4.

**FEMALE.** — Similar to male. Spines of segment 9 long; ovipositor not reaching the distal end of segment 10 (Figs 28, 29).

**M e a s u r e m e n t s (mm).** — Total length (excluding appendages) 16.5; — width of head 3.3; — length of head 2.2; — length of labium 3.3; — width of labium 2.8; — antennae: segment I 0.34; segment II 0.56; segment III 0.88; segment IV 0.48; segment V 0.30; segment VI 0.18; segment VII 0.12; — length of median caudal lamella 5.4; — width of median caudal lamella 1.6; — width of lateral caudal lamella 1.4; — length of lateral caudal lamella 5.4.



Figs 23-30. Larva of *Oxyagrion haematinum*: (23) head, ventral face; — (24) labium, dorsal view; — (25) labial palps, internal face; — (26) terminal abdominal segments and anal appendages, male, lateral view; — (27) terminal abdominal segments and anal appendages, male, ventral view; — (28) terminal abdominal segments and anal appendages, female, lateral view; — (29) terminal abdominal segments and anal appendages, female, ventral view; — (30) lateral caudal lamellae, lateral view.



LARVA OF *OXYAGRION PAVIDUM* SELYS, 1876

Figures 31-36

**M a t e r i a l.** — 1 ♂, Brazil, Rio de Janeiro, Vassouras, (creek near downtown), 21-I-1971, N.D. Santos & J.M. Costa leg.

**H e a d** slightly wider than long, light brown dorsally; cephalic lobes not evident; more than 20 short spines on rear of head (Fig. 31); ventral surface of the head pale; 3 large spines followed by 6 or 7 short spines (Fig. 31) on inferior border of eyes near maxillae; antennae 7-segmented, the 2<sup>nd</sup> more robust and slightly shorter than 3<sup>rd</sup>; labium (Fig. 32) triangular shaped longer than wide with 2 primary mental setae and 1 secondary seta; lateral border of prementum with 7-8 spiniform setae at distal end; distal margin of prementum feebly crenulated; labial palp (Figs 32, 33) with 4 setae; anterior border of the palps with 2 large triangular spines followed by a row of denticles poorly defined proximal to movable hook; inferior border of palps feebly crenulated; labrum semicircular with setae on distal margin.

**T h o r a x.** — As in *O. haematinum*.

**A b d o m e n.** — Tergites light brown; sternites yellow. Dorsum segments 1-10 with short setae; distal border of segment 10 with row of short spines interrupted at base of cerci (Fig. 35).

**Caudal appendages.** — Cerci short, in lateral view almost globe-shaped. Caudal lamellae (Fig. 36) pale, leaf-shaped, without transversal suture and lacking pigmentation, lateral and dorsal carina of caudal lamellae with short spines on proximal half, narrow at the distal half; principal tracheae almost straight, with a few secondary tracheae. Ventral view of segment 9 as Figure 34.

**M e a s u r e m e n t s** (mm). — Total length (excluding appendages) 12.0; — width of head 2.7; — length of head 1.4; — length of labium 1.9; — width of labium 1.45; antennae: segment I 0.26; segment II 0.32; segment III 0.44; segment IV 0.36; segment V 0.22; segment VI 0.16; segment VII 0.12; — length of median caudal lamella 5.7; — width of median caudal lamella 0.9; — width of lateral caudal lamella 0.8; — length of lateral caudal lamella 5.75.

LARVA OF *OXYAGRION SANTOSI* MARTINS, 1967

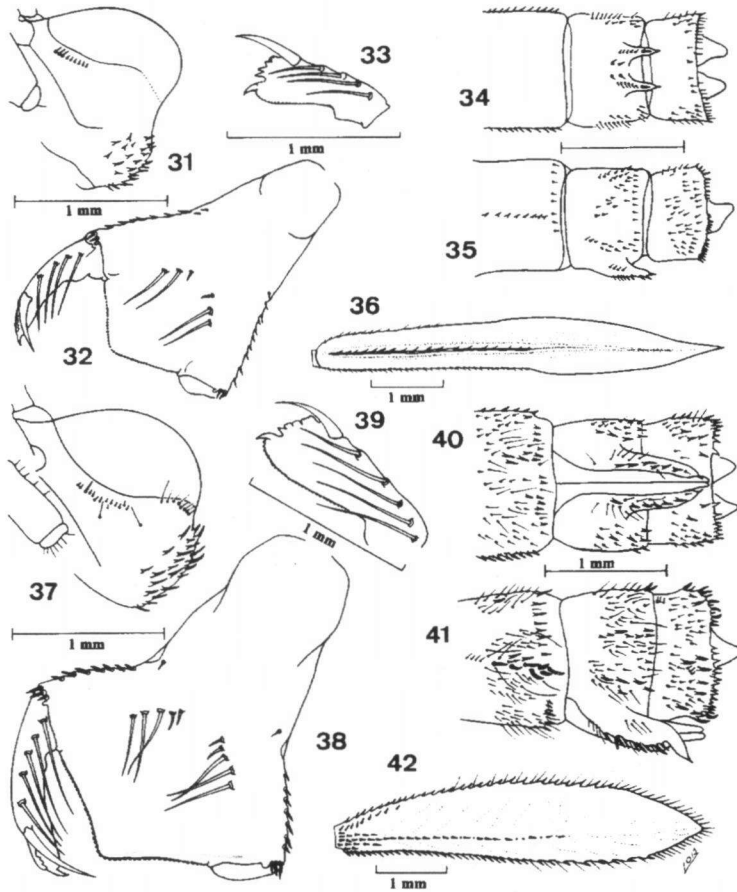
Figures 37-42

**M a t e r i a l.** — 1 ♀ (emerged on 10-I-1980), Brazil, São Paulo, Parque Nacional da Serra da Bocaina, 24-XI-1979, N.D. Santos, J.M. Costa, S.M. Pereira & L.F.R. Netto, leg.

**H e a d** slightly wider than long, grayish brown dorsally; cephalic lobes with a narrow cleft in ventral view; more than 20 spines on rear of head (Fig. 37); ventral surface of head pale; 1 large spine followed by a row of minuscule spines on inferior border of the eyes near maxillae; antennae 7-segmented the 2<sup>nd</sup> more robust and slightly shorter than 3<sup>rd</sup>; labium triangular shaped (Fig. 38) longer than wide with 3 primary mental setae and 2 secondary setae; lateral border of prementum

with 7 spiniform setae on distal end; distal margin of prementum feebly crenulated and prominent; labial palps with 5 setae; anterior border of the palps with 3 triangular spines (Fig. 39) followed by a row of poorly defined denticles proximal to movable hook; inferior border of palps feebly crenulated; labrum semicircular with short setae on distal margin.

**T h o r a x .** — As in *O. basale* but grayish brown; lateral margin of prothorax



Figs 31-36. Larva of *Oxyagrion pavidum*: (31) head, ventral view; — (32) labium, dorsal view; — (33) labial palps, internal face; — (34) terminal abdominal segments and anal appendages, male, ventral view; — (35) terminal abdominal segments and anal appendages, male, lateral view; — (36) lateral caudal lamellae, lateral view.

Figs 37-42. Larva of *Oxyagrion santosi*: (37) head, ventral face; — (38) labium, dorsal view; — (39) labial palps, internal face; — (40) terminal abdominal segments and anal appendages, female, ventral view; — (41) terminal abdominal segments and anal appendages, female, lateral view; — (42) lateral caudal lamellae, lateral view.

with 2 short tubercles; synthorax grayish brown.

**A b d o m e n.** — Tergites and sternites light brown. Dorsum segments 7-10 with short setae; distal border of segment 10 with row of short spines interrupted at basal area of the cerci (Fig. 41). Ovipositor reaching the distal end of segment 10 (Figs 40, 41).

**Caudal appendages.** — Cerci short, in lateral view conical. Caudal lamellae (Fig. 42) pale, leaf-shaped, without transversal suture and not pigmented; lateral and dorsal carina of caudal lamellae with short spines distributed beyond basal half but not reaching the distal end; proximal half as wide as the distal half, principal tracheae almost straight without secondary tracheae.

**M e a s u r e m e n t s** (mm). — Total length (excluding caudal lamellae) 13.5; — width of head 3.0; — length of head 1.7; — length of labium 2.5; — width of labium 1.9; — antennae: segment I 0.30; segment II 0.48; segment III 0.56; segment IV 0.30; segment V 0.22; segment VI 0.24; segment VII 0.03; — length of median caudal lamella 5.1; — width of lateral caudal lamella 1.3; — length of lateral caudal lamella 5.1; — width of lateral caudal lamella 1.0.

#### LARVA OF *OXYAGRION SULINUM* COSTA, 1978

Figures 43-50

**M a t e r i a l.** — 1 ♂ (emerged on 28-XII-1979). Brazil, São Paulo, Parque Nacional da Serra da Bocaina, 24-XI-1979, N.D. Santos, J.M. Costa & L.F.R. Netto leg.; 1 ♀, 29-X-1977 (emerged on 14-XII-1977), N.D. Santos & J.M. Costa; 1 ♀, 29-X-1977 (emerged on 11-XI-1977), N.D. Santos & J.M. Costa leg.; 1 ♂, 2 ♀, 29-X-1977, N.D. Santos & J.M. Costa leg.

**H e a d** wider than long, light brown dorsally; cephalic lobes with narrow cleft in ventral view; 30 short spines on rear of head (Fig. 43); ventral surface of the head pale; 7 large spines followed by a row of minuscule spines (Fig. 43) on inferior border of the eyes near maxillae; antennae 7-segmented the 2<sup>nd</sup> more robust and slightly shorter than the 3<sup>rd</sup>; labium triangular (Fig. 45), longer than wide with 5 primary mental setae and 1 secondary seta; lateral border of prementum with 10 spiniform setae on distal half, distal margin of prementum feebly crenulated and prominent; labial palps with 7 setae (Figs 44, 45); anterior border of the palps with 4 triangular spines followed by a row of denticles proximal to movable hook, inferior border of palps feebly crenulated; labrum semicircular with short setae on distal margin.

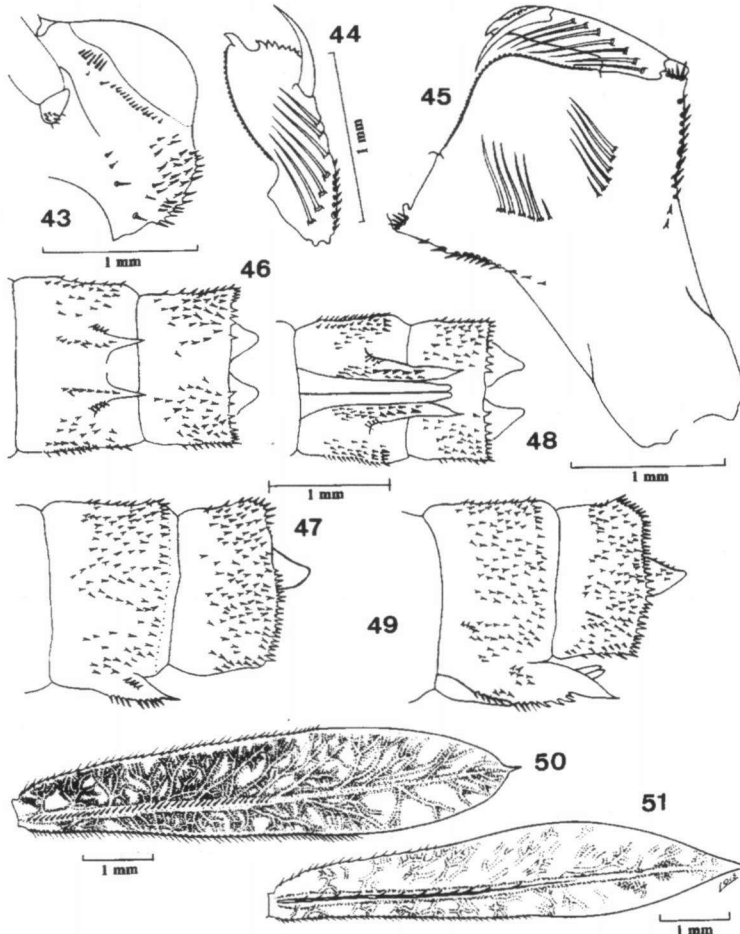
**T h o r a x.** — As in *O. basale* but light brown; lateral margin of prothorax with 2 short tubercles; synthorax brownish.

**A b d o m e n.** — Tergites dark brown; sternites light brown. Dorsum segments 1-10 with short setae more concentrated on segment 10; distal border of segment 10 with a row of spines not interrupted at basal area of the cerci (Fig. 47). Ventral view of segment 9 as Figure 46.

**Caudal appendages.** — Cerci short, in lateral view conical and slightly curved. Caudal lamellae (Fig. 50) pale, leaf-shaped, without transversal suture, irregular pigmentation but lightly concentrated on the middle region; lateral and dorsal ca-

rina of caudal lamellae with short spines on basal half, principal tracheae almost straight; secondary tracheae thin, twisted and slightly ramified.

**Measurements (mm).** — Total length (excluding caudal lamellae) 15.0; — width of head 2.1; — length of head 1.2; — length of labium 3.4; — width of labium 2.7; — antennae: segment I 0.32; segment II 0.58; segment III 0.84; segment IV 0.64; segment V 0.40; segment VI 0.24; segment VII 0.12; — length of median caudal lamella 6.5; — width of lateral caudal lamella 1.6; — length of lateral caudal lamella 7.1; — width of lateral caudal lamella 1.4.



Figs 43-50. Larva of *Oxyagrion sulinum*: (43) head, ventral face; — (44) labial palps, internal face; — (45) labium, dorsal view; — (46) terminal abdominal segments and anal appendages, male, ventral view; — (47) terminal abdominal appendages and anal appendages, male, lateral view; — (48) terminal abdominal appendages and anal appendages, female, ventral view; — (49) terminal abdominal appendages and anal appendages, female, lateral view; — (50) lateral caudal lamellae, lateral view. — Fig. 51. Larva of *Oxyagrion chapadense*: (51) lateral caudal lamellae, lateral view.

FEMALE. — Similar to male. Spines of segment 9 long; ovipositor not reaching the distal end of segment 10 (Figs 48, 49).

M e a s u r e m e n t s (mm). — Total length (excluding appendages) 15.5; — width of head 3.6; — length of head 2.0; — length of labium 3.1; — width of labium 2.4; — antennae: segment I 0.32; segment II 0.54; segment III 0.86; segment IV 0.58; segment V 0.42; segment VI 0.22; segment VII 0.14; — length of median caudal lamella 6.6; — width of median caudal lamella 1.5; — width of lateral caudal lamella 1.5; — length of lateral caudal lamella 7.1.

#### KEY TO KNOWN IMMATURE FORMS OF *OXYAGRION*

- |    |   |                    |
|----|---|--------------------|
| 1  | Caudal lamellae with transverse suture .....  | 2                  |
| —  | Caudal lamellae without transverse suture .....   | 5                  |
| 2  | Caudal lamellae with basal half longer and wider than distal half, becoming narrower after transverse suture; secondary tracheae simple; 2 mental and 4 palpal setae .....  | <i>hempeli</i>     |
| —  | Caudal lamellae with basal half as long as distal half .....  | 3                  |
| 3  | Secondary tracheae abundant and dendritic, more evident at distal end; 3 primary and 1 secondary setae; anterior margin of prementum not prominent; 5-6 palpal setae .....  | <i>rubidum</i>     |
| —  | Secondary tracheae absent .....   | 4                  |
| 4  | Premetum with 3 primary setae and 4 palpal setae; 1 short spine at base of palps ..   | <i>microstigma</i> |
| —  | Premetum with 4 primary setae; 6 palpal setae; 2 short spines at base of palps .....  | <i>haematinum</i>  |
| 5  | Premetum with 5 primary, 1 secondary and 7 palpal setae; inferior border of eyes with 7 large spines continued as a row of minuscule spines; caudal lamellae leaf-shaped; secondary tracheae present .....  | <i>sulinum</i>     |
| —  | Premetum with fewer than 6 setae .....  | 6                  |
| 6  | Premetum with 2 or 3 setae .....  | 7                  |
| —  | Premetum with 4 or 5 setae .....  | 10                 |
| 7  | Premetum with 2 primary setae .....   | 8                  |
| —  | Premetum with 3 primary setae .....   | 9                  |
| 8  | Premetum with 2 primary and 1 secondary setae; inferior border of the eyes near maxillae with 3 large spines followed by 6 or 7 short spines; 4 palpal setae; secondary tracheae vestigial; lateral and dorsal carina of lamellae with short spines on proximal half only ..... | <i>pavidum</i>     |
| —  | Premetum with 2 primary setae and 0 or 1 secondary setae; inferior border of eyes with 3 large spines; 5 palpal setae; secondary tracheae evident; lateral carina of lamellae with short spines along entire length .....   | <i>evanescens</i>  |
| 9  | Inferior border of the eyes near maxillae with 2 large spines and 4 short; caudal lamellae without secondary tracheae, not pigmented; proximal half as wide as the distal half; segment 10 with a row of short spines interrupted at basal area of lateral appendages .....     | <i>basale</i>      |
| —  | Inferior border of the eyes near maxillae with 4 spines; caudal lamellae with secondary tracheae very evident, pigmented; proximal half narrower than distal half; segment 10 with a row of short spines not interrupted at basal area of lateral appendages .....              | <i>chapidense</i>  |
| 10 | Premetum with 3 primary setae .....   | 11                 |
| —  | Premetum with more than 3 primary setae .....   | <i>simile</i>      |
| 11 | Inferior border of the eyes near maxillae with 10 or 12 spines followed by 5 or 6 short spines; caudal lamellae with secondary tracheae present .....   | <i>terminale</i>   |
| —  | Inferior border of the eyes near maxillae with fewer than 10 spines .....   | 12                 |
| 12 | Labial palp with 5 setae; inferior border of the eyes near maxillae with 1 large spine followed by a row of poorly defined minuscule spines; secondary tracheae absent; dorsum of abdomen not pigmented; prementum with 3 primary setae and 2 secondary setae .....             | <i>santosi</i>     |
| —  | Labial palp with 6 setae; inferior border of the eyes near maxillae with 9 short spines; secondary tracheae present; dorsum of abdomen pigmented .....  | <i>impunctatum</i> |

## DISCUSSION

The larvae of known *Oxyagrion* form a heterogeneous group which allow us to determine relationships among some species. The larvae of *O. haematinum*, *O. hempelii*, *O. microstigma* and *O. rubidum* are the only known species having wide caudal lamellae and transversal suture and their adults are unique in having long cerci (longer than in other species) and the penis lobe is the longest among all known species (except in *O. haematinum*).

*Oxyagrion sulmatogrossense* belongs to the *basale* group which includes *O. basale*, *O. chapadense*, *O. impunctatum* and *O. sulinum*. All uniquely possess a pair of posteriorly directed the cornute projections on the posterodorsal margin of abdominal segment 10, the penis limb is short, and the larvae possess leaf-shaped caudal lamellae. Adults of *O. basale* and *O. chapadense* have 1<sup>st</sup> and 2<sup>nd</sup> abdominal segments black and their larvae have 3 mental setae and 5 palpal setae. Larvae of *O. impunctatum* and *O. sulinum* have 6 and 7 palpal setae respectively. The larva of *O. sulmatogrossense* is unknown but we believe that the structure of the caudal lamellae will most likely mirror characters as for other members of the *basale* group.

BULLA (1973) described the larva of *O. chapadense* as *O. basale* (COSTA, 1978; SANTOS, 1988) but he failed to describe the caudal lamellae. These structures are leaf-shaped, without transversal suture, secondary tracheae present; slightly pigmented; proximal half narrower than distal end; lateral end of dorsal carina with short spines.

The female of *O. sulmatogrossense* is similar to that of *O. chapadense* described by BULLA (1973), but differs in the following characteristics: (1) abdominal segment 9 with T-shaped blue spot, (2) dorsum segment abdominal 10 with a short blue spot and (3) pterostigma lozenge shaped. In *O. chapadense* the three last abdominal segments are not blue and the pterostigma is quadrangular shaped.

Although larvae of *O. pavidum* and *O. evanescens* have only two mental setae, adults of these species do not share the structural characteristics and color. The presence of four mental setae is common to larvae of *O. santosi*, *O. simile* and *O. terminale* but adults of these three species do not share any species-specific characters.

Knowledge of the other larvae species most likely allow us to establish further relationships among species. Based on the current material at our disposal, we believe that *O. basale*, *O. chapadense*, *O. impunctatum*, *O. sulinum* and *O. sulmatogrossense* form a compact group whose members are more closely related to one another than each is to any other member of the genus. We believe that *O. haematinum*, *O. hempelii*, *O. microstigma* and *O. rubidum* form a similar compact group.

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