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HETERAGRION TIRADENTENSE SPEC. NOV. FROM THE STATE OF MINAS GERAIS, BRAZIL (ZYGOPTERA: MEGAPODAGRIONIDAE)

A.B.M. MACHADO [1] and L.C. BEDÊ [2]

[1] Departamento de Zoologia, Instituto de Ciências Biológicas, Universidade Federal de Minas Gerais, Caixa Postal 486, BR-31270-901 Belo Horizonte, Minas Gerais, Brazil
angelo@icb.ufmg.br

[2] Conservation International-Brazil, Av. Getúlio Vargas, 1300, 7° andar, BR-3012-021 Belo Horizonte, Minas Gerais, Brazil

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The new sp. (holotype ♂: Brazil, Minas Gerais, Tiradentes, 1-XI-1999) is described and illustrated. It belongs in the group 1 of E. de SELYS-LONGCHAMPS (1862, *Bull. Acad. Belg.* [II] 14: 5-44) and differs from the other spp. of the group by its small size and by the color, shape and size of its mesepisternal spot.

INTRODUCTION

The São José mountain range of southeastern Brazil has recently been proclaimed by the Government of the State of Minas Gerais the "Libélulas da Serra de São José" Wildelife Refuge, the first nature reserve in Brazil and perhaps in South America with the primary focus on the protection of dragonflies. On surveying the rich odonata fauna of this reserve (120 species) we came across a beautiful new species of *Heteragrion* that is described herein under the name of *Heteragrion tiradentense*. With this new finding the genus attains 43 species and 1 subspecies, 16 of which from the Brazilian fauna as reported by SELYS (1862, 1886), CALVERT (1909), SJÖSTEDT (1918), WILLIAMSON (1919), MACHADO (1988), GARRISON (1989) and COSTA & SANTOS (2000). *H. tiradentense* is the 6th species of *Heteragrion* reported for the state of Minas Gerais, two of which, *H.obsoletum* Selys, 1886 and *H. petiense* Machado, 1988, figure among the Brazilian red listed Odonata (MACHADO et al., 2005). Heteragrions are poorly studied in Brazil and the number of species is likely to increase substantially as more studies are made.

HETERAGRION TIRADENTENSE SP. NOV.

Figures 1-5

M a t e r i a l. – **Holotype** ♂ and **allotype** ♀: BRAZIL, Minas Gerais State; Tiradentes. Libélulas da Serra de São José State Wildelife Refuge (Chafariz creek at the Mãe D'-Água forest). 11-XI-1996, L.C. Bedê & W. Piper leg.; 21°06'16"S, 44°10'42"W. – **Paratypes** (2♂), same locality and collector as the holotype, 1-XI-1999. All species deposited in A.B.M. Machado collection in Belo Horizonte, MG, Brazil.

E t y m o l o g y. – The name refers to the municipality of Tiradentes where the specimens were collected.

MALE (**Holotype**): – H e a d (Fig. 2) – Labium yellowish white. Labrum dark brown with the base and the margin orange. Anteclypeus, base of mandible and genae yellowish white, with a transverse dark brown band crossing the genae between the eyes and the postclypeus. Postclypeus black. Anterior portion of frons dark brown. Top of head black except for a light brown stripe between the lateral ocelli and the antennae base and another behind the eyes. Antennae scape and pedicel black. Rear of the head yellowish white.

T h o r a x. – Pronotal lobes black, the median with a brownish yellow stripe at its posterior border (Fig. 2). Propleuron light yellow. Pterothorax (Figs 1-2): mesopleuron black with a large biconvex lens-shaped yellow spot occupying about half the width of the posteroinferior part of the mesepisternum. Lower fouth of the mesepimeron dark brown. Metapleuron light yellow with a light brown stripe on the metepisternum and another poorly defined on the metepimeron (Fig. 1). Legs brown except for the flexor surfaces of femurae that are yellowish. Tooth of tarsal claws small. Wings hyaline, slightly suffused with yellow. Venation brown except for the upper part of the arculus and nodus yellow; pterostigma brown with an yellow line along its radial side.

V e n a t i o n. – Postnodals in forewing 16 (66.6%), 17 (33.3%), in hindwing 15 (66.6%), 16 (33.3%); postquadrangular cells in fore and hindwings 2 (100.0%);

Fig. 1. *Heteragrion tiradentense* sp. n., male photographed alive.

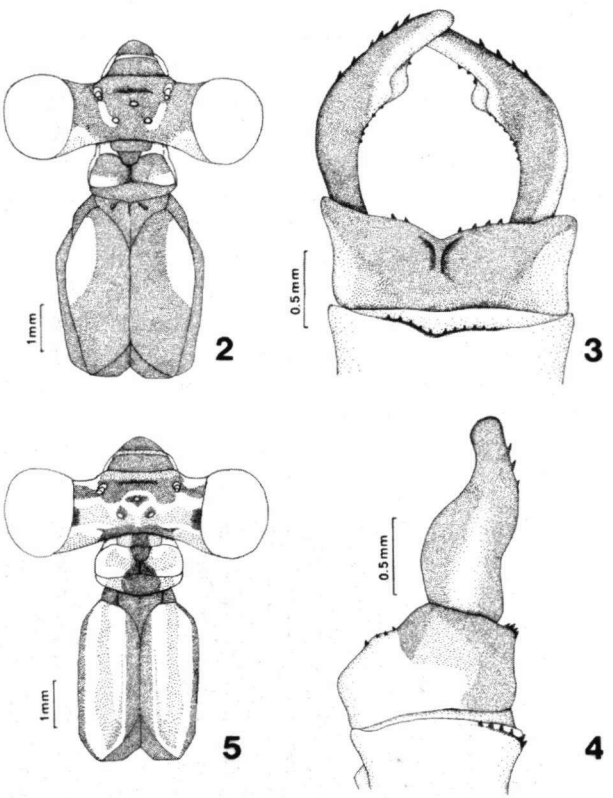
number of cells bellow the pterostigma in forewing 1/4 + 1 + 1/2, 1/2 + 1 + 1/2, 2/3 + 1; in hindwing 2, 1/2 + 1 + 1/2, 2/3 + 3/4. Fore and hindwings petiolated beyond the base of the quadrangle.

A b d o m e n (Fig. 1). – Segments 1-2 pale yellow, dorsally black, segment 2 with a middorsal yellow line. Segments 3-7 black with basal pale yellow rings, ventrolateral yellow subapical stripes and yellow middorsal line. Segment 8 black with a light orange ring at the distal fourth. Segment 9 light orange, 10 dorsally black, laterally light orange (Fig. 3). Superior appendages dark brown, except at the ventrobasal swelling, that is yellow medially and brownish yellow laterally.

S t r u c t u r a l c h a r a c t e r s. – Posterior prothoracic lobe with the hind margin slightly more convex on the middle third (Fig. 2). Superior appendage in dorsal view (Fig. 3) forcipate with a prominent ventral tooth at about 2/3 length, continuous with a ventral denticulated carina to the apex and a smaller dorsal tooth denticulated proximately and continuous distally with a smoothdorsal carina to the apex. In lateral view (Fig. 4), swollen ventrally at base, this part hollow. Inferior appendages absent.

M e a s u r e m e n t s (mm). – Abdomen with appendages 32.0-33.4 (mean 32.5); – forewing 23.8-25.0 (mean 24.6); – hindwing 24.1-25.4 (mean 24.4); – pterostigma in forewing (costal side) 1.1--1.2, (radial side) 1.6; – appendages 1.2.

FEMALE **(allotype)**. – H e a d (Fig. 5). – Labium, labrum, anteclypeus, base of mandibles, genae and postclypeus as in the male. Anterior portion of frons yellowish brown. Top of head olive yellow, reddish yellow at the ocellar region, with black



Figs 2-5. *Heteragrion tiradentense* sp. n., male holotype (Figs 2-4), female allotype (Fig. 5): (2) head and thorax, dorsal view; – (3) appendages, dorsal view; – (4) same, lateral view; – (5) head and thorax, dorsal view.

marks as follows: a large band at the upper portion of frons between the two antennae bases continuing laterally as a large triangular spot that reaches the eye. A large trapezoid stripe laterally black, medially olive brown, connecting the eye to the black occipital bar. Ocelli ringed with black, the lateral ones connected with a transverse black occipital bar.

T h o r a x. – Prothorax yellow shadding into greyish yellow at the median lobe. A middorsal black stripe at the anterior lobe connected with a round black spot occupying the central third of the posterior lobe (Fig. 5). Pterothorax (Fig. 5): mesepisternum with a 0.35 mm wide black stripe adjoining at each side the middorsal carina, that is also black. This stripe is continuous bellow with the acrotergal area and above with the antealar sinus. Laterally to it there is a longitudinal yellow line followed laterally by a greyish yellow and a pale yellow stripe, the latter reaching the mesepimeron that is greyish yellow with a central black stripe. Mesinfrepisternum greyish yellow. Metapleuron pale yellow with two greyish yellow longitudinal stripes on the metepisternum and metepimeron respectivelly. Legs as in the male. Wings hyaline slightly suffused with yellow. Upper part of the arculus and nodus yellow, pterostigma yellowish brown.

V e n a t i o n. – Postnodals in forewing 17, in hindwing 14; postquadrangular cells in fore and hindwings 2; number of cells bellow the pterostigma in forewing 3, in hindwing 2; fore and hindwings petiolated beyond the base of the quadrangle.

A b d o m e n. – Segments 1-6 as in the male, except that the ventrolateral yellow stripes of segments 3-7 extend all the way between the proximal yellow and the distal black rings. Segment 8 dark brown with a yellow ventrolateral stripe, and a yellowish anterolateral round mark. Segment 9 yellow with two dorsolateral, not confluent, dark marks. Segment 10 yellow, dorsally dark. Appendages conical, dark brown with the proximal third yelowish. Ovipositors yellowish.

M e a s u r e m e n t s (mm). – Abdomen 31.0; – forewing 26.5; – hindwing 26.3; – pterostigma in forewing (costal side) 1.1, (radial side) 1.6; – Appendages 0.6.

DISCUSSION

By having the wings petiolated beyond the base of the quadrangle, by the dorsum of head, the prothorax and the mesopleuron largely black and absence of the inferior appendages, *H. tiradentense* belongs in species group I (*H. flavovittatum*) of SELYS (1862). Table I shows the main differences separating the males in species of this group. Based on the size, two subgroups can be distinguished, one containing very large species, *H. muryense* Costa & Santos, 2000 and *H. ovatum* Selys, 1862 and another with much smaller species, *H. petiense* Machado, 1988, *H. flavovittatum* Selys, 1862 and *H. tiradentense* sp.n. . Indeed, with an abdomen of 32-33.4 mm *H. tiradentense* fits among the smallest species of the genus, together with *H. breweri* De Marmels, 1989, *H. icterops* Selys, 1862 and *H.*

Table I
Characters separating the males of group I *Heteragrion* species

Characters *	*H. tiradentense*	*H. petiense*	*H. flavovittatum*	*H. ovatum*	*H. muryense*
Abdomen length	32.0-33.4	32.1-38.0	32.0-35.0	44	45
HW length	24.1-25.4	25.2-27.0	27.0-28.0	31	34
Postnodals in FW	16-17	16-18	20	20	23
Mesepisternal spot: color	Yellow	White	Absent	Yellow	Yellow
Mesepisternal spot: shape	Biconvex lens-shaped	Subretangular	Absent	Oval	Trapezoidal
Mesepisternal spot: size	Small, half width of mesepisternum	Large, full width of mesepisternun	Absent	About half width of mesepimeron	About half width of mesepisternum
Medial teeth of the appendage in dorsal view	Dorsal tooth much shorter than ventral tooth	Dorsal tooth subequal to ventral tooth	Dorsal tooth subequal to ventral tooth	?	Dorsal tooth much shorter than ventral tooth

* data obtained from the literature.

obsoletum Selys, 1886. It can be readily separated from *H. flavovittatum* by the absence of a mesepisternal pale spot on this species. Thus, the closer species to *H. tiradentense* is *H. petiense*. The two species can be readily separated by the characteristics of the pale mesepisternal spot: white, subrectangular and occupying all the width of the mesepisternum in *H. petiense*, while in *H. tiradentense* it is yellow, biconvex lens-shaped and occupying only half width of this sclerite. Table II shows the characters separating the females of group I, confirming that the closer species to *H. tiradentense* is *H. petiense*.

ECOLOGY AND CONSERVATION

H. tiradentense specimens were collected on November 11, 1996 and November 1, 1999 at the Chafariz creek in the "Libélulas da Serra de São José" Wildlife Refuge. Although four more individuals were seen in November 1999, the five attempts to find that species, between December 1996 through March 1997 and in January 1998, were unsuccessful. The Chafariz creek is a shaded slow-flowing, narrow (1-2 m wide) and shallow (10-40 cm deep) first order stream, with a predominantly muddy-sandy substrate. It runs through an old, semideciduous forest area, locally known as the Mãe D'-Água (mother of the water) forest, adjacent to the town of Tiradentes. At this place *H. tiradentense* individuals were more frequently found perched on the marginal vegetation of the creek (Fig. 1). The São José sierra was recently declared a State Wildlife Refuge for the protection

Table II
Characters separating the females of group I *Heteragrion* species

Characters	*H. tiradentense*	*H. petiense*	*H. flavovittatum*	*H. muryense*
Labrum	Dark brown with the base and margin orange	Yellow with a central brown band	Orange	Black (?)
Top of head dominant color	Olive yellow	Dull yellow	Orange	Black
Mesepisternum	Dominantly pale with a black middorsal stripe and a yellow stripe near the humeral suture	Dominantly pale with a black middorsal stripe and a yellow line near the humeral suture	Dominantly black with a pale adjacent to the humeral suture	Dominantly black with central pale curved line
Pterostigma	Brown	Dark brown	Yellow	Brown
Appendages	Dark brown; yellowish at the proximal third with no hair at tip	Brownish orange darkening at tip provided with stiff hairs (?)	Yellow, darkening at tip the is provided with stiff hairs	Brownish yellow with the apex black, tip with stiff hairs
Abdomen (mm)	31.0	31.4	32.0	42.0
Hindwing (mm)	26.3	25.2	28.0-30.0	34.0

of dragonflies (Minas Gerais State Decree No. 43.908/04 of May 11, 2004). It is home to an exceptionally rich Odonata fauna; so far 120 species (76 Anisoptera and 44 Zygoptera) have been recorded, and more discoveries are expected as assessments are undertaken throughout the reserve's 3,717 hectares. The Refuge is the first of its kind in Brazil and one of a few in the world with a primary focus on dragonfly conservation.

Regarding the history of forest habitat change in the region, it is generally known that an almost complete deforestation of the southern slopes of the sierra followed the gold rush in the early 18th century and the succeeding extensive cattle ranching up to recent times (MACHADO & HARGREAVES, 2000). Interestingly, the most preserved forest patch pointed out by these authors, the Mãe D'Água forest, harbors the springs of the Chafariz creek, so far the the only site where *H. tiradentense* was found, out of 42 sampling sites (systematically assessed between November 1996 and February 1998) throughout the Refuge and its surroundings.

The Mãe D'Água area constitutes an emblematic example of freshwater conservation through forest protection. A baroc public water fountain, dated 1749, fed by the Chafariz creek through an aqueduct, has been one of the town's main sources of potable water since colonial times. As in the case of several other *Heteragrion* species, *H. tiradentense* is likely to be a habitat specialist of upstream reaches and has certainly benefitted from the protection of such a valuable water source.

Currently, two Heteragrion species, *H. obsoletum* and *H. petiense* figure among the Brazilian red listed Odonata (MACHADO et al., 2005), apparently with rather small distribution ranges. With regards to *H. tiradentense*, the lack of a more extensive effort to detect it and evaluate its conservation status in forest streams of the region, we recommend that it should be placed under IUCN's Data Defficient threat category and that further research is made with this purpose.

The well-known role of dragonflies as indicators of wetland health (OSBORN, 2005) led them to be called "Guardians of the watershed" (CLAUSNITZER & JÖDICKE, 2004). Indeed, many odonates and specially *Heteragrion* are very sensitive to changes in water quality. A *Heteragrion* species was shown to have disappeared from a creek in a protected area two months after the initiation of mining activities near its upstream course outside the reserve (MACHADO et al., 1988). Thus, dragonflies are ideal flagship candidates for rising public awareness of the link between dragonfly habitat protection and conservation of freshwater resources. This is a promising aspect to be emphasized in the context of the São José sierra, its outstandingly rich Odonata fauna and its status as a protected dragonfly area, taking advantage of the region's tourist attractiveness for the scenic beauty of the sierra and, at its foot, the colonial town of Tiradentes.

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