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A new species of *Tityus* C. L. Koch, 1836 from Ecuador: the first element of the '*Tityus* *androcottoides*' subgroup for this country

WILSON R. LOURENÇO

(with 13 figures)

Abstract

A new species of *Tityus* C. L. Koch, 1837 (the subgenus *Atreus* Gervais, 1843), is described from the Province of Morona-Santiago in Ecuador. It is the first genuine element of the '*Tityus androcottoides*' subgroup to be found in that country and is the 14th species of *Tityus* to be recorded from Ecuador. Seven of these species are endemic. The scorpion fauna of Ecuador is one of the most diverse in the world.

Key words: Scorpiones, '*Tityus androcottoides*' subgroup, *Tityus ythieri* sp. n., Morona-Santiago, Ecuador.

Introduction

The known Ecuadorian scorpion fauna has increased greatly in number of species during recent years (Lourenço 1981, 1988). One contribution (Lourenço 1995) represented the first attempt to produce a synthesis. It was admitted there that the results probably represented only a part of the fauna actually present in Ecuador. In fact, the scorpion fauna of Ecuador is one of the most diverse in the world (Lourenço 1994), especially if one takes into consideration the small size of the country.

The genus *Tityus* C. L. Koch, 1837 is the most speciose of all scorpion genera, with almost 170 known species (Lourenço 2006). There is a constant increase in the number of known species being described every year. In order to facilitate the identification of such a large number of species in the same genus, many attempts have been made to divide *Tityus* into groups of species. The number of these suggested groups has shown considerable variation during the last century, comprising from 3 to sometimes 12 groups according to their authors (e.g. Kraepelin 1899; Mello-Leitão 1939, 1945). More recent studies (e.g. Lourenço 1992, 1997a,b, 2000, 2002) retained only three groups of species, namely the '*Tityus clathratus*' group, the '*Tityus bahiensis*' group and the '*Tityus asthenes*' group. Then, Lourenço and Pézier (2002) proposed a fourth group, '*Tityus adisi*' to accommodate small species endemic to the Amazonian forest canopy. Recently Lourenço (2006) proposed a division of the genus *Tityus* into several subgenera mainly in order to maintain the stability of the used names.

A new species of *Tityus*, belonging to the subgenus *Atreus* Gervais, 1843 is described here from the Province of Morona-Santiago in Ecuador. It represents the first true member of the '*Tityus androcottoides*' subgroup to be recorded from that country. A check-list to the species of *Tityus* known to be present in Ecuador is also provided.

Remarks about the type locality of *Tityus magnimanus* Pocock, 1897

As already pointed out in previous papers (Lourenço 1987; Lourenço & Ramos 2004), *T. magnimanus* was first described by Pocock (1897a) based on two specimens, an adult male and a juvenile female. According to Pocock (1897a) these had originally been presented by E. E. Austen. Indeed, in a previous paper published during the same year, Pocock (1897b) described several new species which had actually been collected by E. E. Austen and F. Pickard-Cambridge during their trip on the steamship 'Faraday' in the Lower Amazon. All the species described or reported in the Pocock's (1897b) paper (*Tityus cambridgei*, *Tityus metuendus*, *Tityus silvestris*, *Broteochactas parvulus* and *Brotheas gervaisii*) were collected from precisely described localities in Brazil, and have subsequently been found again in Brazilian Amazonia. In contrast, *T. magnimanus* was described with the single word 'Brazil' given as its type locality. It has never again been found in Brazilian Amazonia. In his monograph, Mello-Leitão (1945) indicated the island of Marajó in the delta of the Amazon, State of Pará in Brazil, as being the type locality of *T. magnimanus*, but without giving any justification.

Lourenço (1987) suggested incorrectly that the types of *T. magnimanus* had probably been collected in the upper Amazon basin. This argument was supported mainly by the fact that the only specimens corresponding to *T. magnimanus* examined by him had been collected in Venezuela. However, the trip of the 'Faraday' in the Lower Amazonia was precisely reported by E. E. Austen, and all the collecting localities have been documented (see Lourenço & Ramos 2004).

Moreover, the types of *T. magnimanus* deposited in the Natural History Museum, London, are labelled as follows: BMNH-1891.8.31.1 and BMNH-1891.8.31.2. Dr. Paul D. Hillyard, Curator of Arachnida in the Department of Entomology, the Natural History Museum (London), has the following explanation of this code: "1891 means the year of registration and this may or may not be the year of collection. 8 and 31 means August 31st". There are two specimens as indicated by the numbers 1 and 2 after the codes. This explanation proves that the type material of *T. magnimanus* was collected before or at least no later than 1891. It excludes any possibility that the specimens had been collected by E. E. Austen during his trip to the Lower Amazon in Brazil, because this took place between the autumn of 1895 and March 1896. In conclusion, it can be claimed that some error, almost certainly of mislabelling, must have place with the type material of *T. magnimanus*. This species does not occur in Brazil, and its range of distribution is apparently limited to the North of Venezuela (Lourenço 1987, Lourenço & Ramos 2004).

Description of a new species

Tityus ythieri sp. n.

(Figs 1-13)

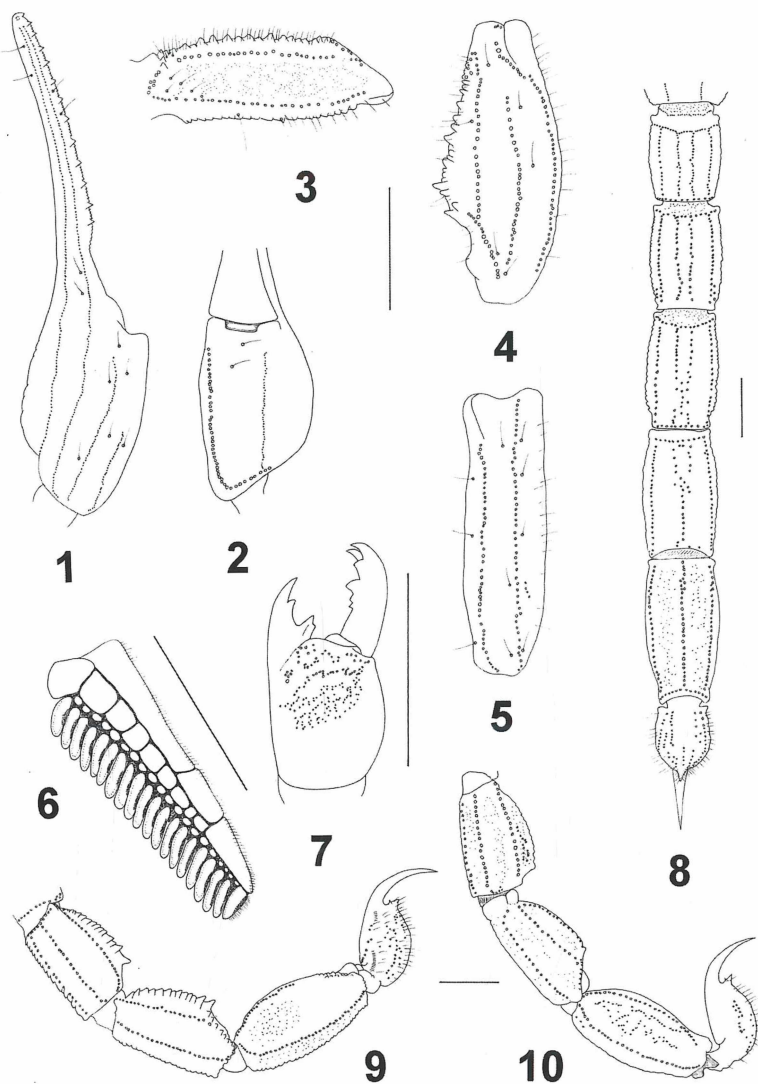
TYPE MATERIAL: Holotype (♀) and five paratypes (2♂, 3♀) Ecuador, Morona-Santiago Province, South of Yaupi: holotype (♀) and paratype (♂) collected by local Indians (coll. J. Castro, October, 1993); four paratypes (♂, 3♀) collected by (E. Ythier, March 2005). Holotype (ZMH Acc. No. A22/07) and 3 paratypes (ZMH Acc. No. A23/07) deposited in the Zoologisches Museum, Hamburg. Two paratypes deposited in the Muséum national d'Histoire naturelle, Paris.

ETYMOLOGY: Patronym in honour of my colleague Eric Ythier, La Chapelle de Guinchay, France.

DIAGNOSIS: A moderate to large species when compared with the average size of the other species in the genus: males up to 50 mm and females up to 60 mm in total length (see Table 1). General pattern of pigmentation reddish-yellow to dark reddish overall. Basal middle lamella of female pectines strongly dilated. Subaculear tooth short and strongly spinoid. Pectinal tooth count 20-21 in males and 18-21 in females. Fixed and movable fingers of the pedipalp with 14/16 oblique rows of granules. Ventral carinae of metasomal segments II to IV partly or largely fused, forming a Y-shape configuration. This is the first species of *Tityus* presenting this kind of Y-shape configuration to have been described from Ecuador, but the second to be confirmed in Amazonia. It is possibly an endemic element to the Amazonian rainforest of Ecuador.

DESCRIPTION based on female holotype and male paratype. Measurements in Table 1.

Coloration. Basically reddish-yellow to dark reddish overall. Prosoma: carapace reddish-yellow with some dark pigment on the



Figs 1-10. *Tityus ythieri* sp. n. (holotype ♀): 1-5, trichobothrial pattern; 1-2, chela, dorso-external and ventral aspects; 3, femur, dorsal aspect. 4-5, patella, dorsal and external aspects; 6, pecten; 7, chelicera, dorsal aspect; 8, metasomal segments I to V and telson ventral aspect, with carination; 9, metasomal segments III-V and telson, lateral aspect; 10, idem for *T. magnimanus* Pocock (scale bars = 3 mm).

carinae. Mesosoma: tergites reddish-yellow with one darker transverse stripe on the posterior edge of tergites I-VI. Metasoma: segments I to III reddish-yellow; IV dark reddish with some blackish regions; V very dark, almost blackish. Vesicle: dark, almost blackish; aculeus reddish-yellow. Venter reddish yellow; sternite VII with dark zones on lateral and posterior edges; pectines pale yellow. Chelicerae yellowish with a dark thread; fingers yellowish with dark teeth. Pedipalps: reddish-yellow; fingers dark, almost blackish with the extremities yellowish. Legs yellowish with some diffuse fuscous spots.

MORPHOLOGY. *P r o s o m a*: Carapace moderately to strongly granular; anterior margin with a moderate concavity. Anterior median superciliary and posterior median carinae moderate. All furrows moderately deep. Median ocular tubercle distinctly anterior to centre of carapace. Eyes separated by a little more than one ocular diameter. Three pairs of lateral eyes. Sternum subtriangular. *M e s o s o m a*: tergites moderately to strongly granular. Median carina moderate in all tergites. Tergite VII pentacarinat. Venter: genital operculum divided longitudinally; each half with a semi-triangular shape. Pectines: pectinal tooth count 20-20 in female holotype and 21-21 in male paratype; basal middle lamellae of the pectines strongly dilated in the female. Sternites weakly granular with elongate spiracles; VII with four carinae. *M e t a s o m a*: segment I with 10 carinae, crenulate; segment II with 10

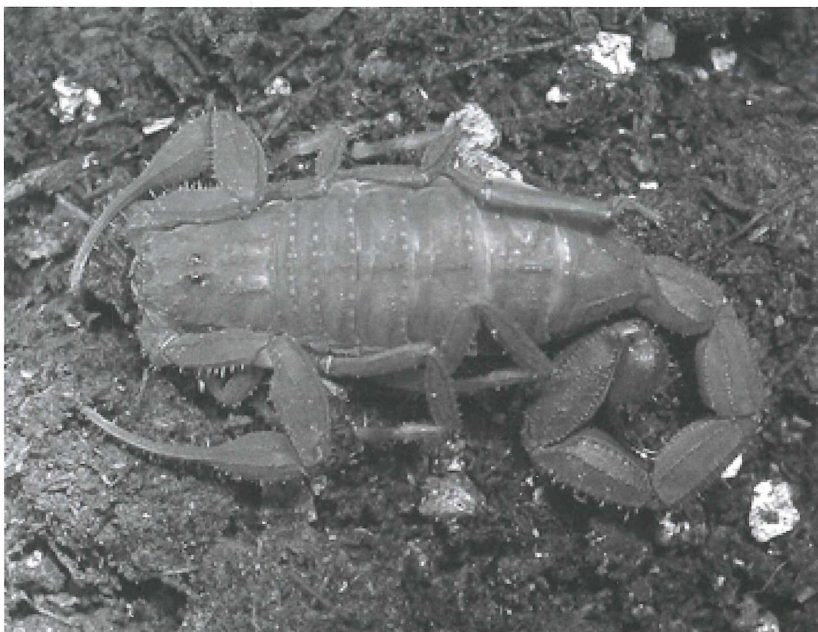


Fig. 11. *Tityus ythieri* sp. n., paratype ♀ (alive).

carinae, crenulate; the ventral partially fused on the distal third; segment III with 8 carinae, crenulate; the ventral fused on distal half, forming a Y shape configuration; segment IV with 7/8 carinae, crenulate; the ventral fused over 2/3 of the total length; segment V with 5 carinae, crenulate. Dorsal carinae on segments II to IV with one to three strong spinoid granules. Lateral inframedian carinae on segment I complete, strongly crenulate; on II represented by only 5 distal granules; absent from III and IV. Ventrolateral carinae strong, crenulate. Ventral submedian carinae strongly crenulate. Intercarinal spaces weakly to moderately granular. Segment V with dorsolateral, ventrolateral and ventromedian carinae strong, crenulate. Lateral intercarinal spaces moderately granular; carinae and granulations less marked in males. Telson, strongly granular, with a moderately long but strongly curved aculeus. Dorsal surface smooth; ventral surface strongly granular in females, but less marked in males; subaculear tooth short and strongly spinoid. C h e l i c e r a l dentition characteristic of the family Buthidae (Vachon 1963); movable finger with two well formed basal teeth; ventral aspect of both fingers and manus with long dense setae. P e d i p a l p s: femur pentacarinat; patella with 7 carinae; chela with 9 carinae; all faces moderately granular. Fixed and movable fingers with 14/16 oblique rows of granules. T r i c h o b o t h r i o t a x y: orthobothriotaxy *A-á (alpha)* (Vachon 1974, 1975). L e g s: tarsus with numerous short fine setae ventrally.



Fig. 12. *Tityus ythieri* sp. n., female with brood.

REMARKS: From its general morphology, the new species belongs to the '*Tityus androcottoides*' subgroup. Because of its morphological features and also because of the closest area of distribution, it can be associated with *T. magnimanus* and with *Tityus elizabethae* Lourenço & Ramos, 2004. The three species can, however, be distinguished from each other by the following characters:

(i) The new species has a paler reddish-yellow coloration almost overall, (ii) the basal middle lamella of the pectines is more strongly dilated in the new species than it is in *T. magnimanus* and *T. elizabethae*, (iii) the subaculear tooth is strongly spinoid and short in the new species whereas, in *T. elizabethae*, it is strongly rhomboidal, (iv) pectinal tooth count shows 18-21 teeth in the new species against 15-16 in *T. elizabethae*, (v) dorsal carinae of metasomal segments II to IV have one to three strong spinoid granules in the new species whereas, in the other two species, these granules are weakly developed.

Finally, the habitat in which each species lives is quite different: altitudinal forest for *T. magnimanus*, savannah of the Guianas for *T. elizabethae*, and Amazonian rainforest for the new species.

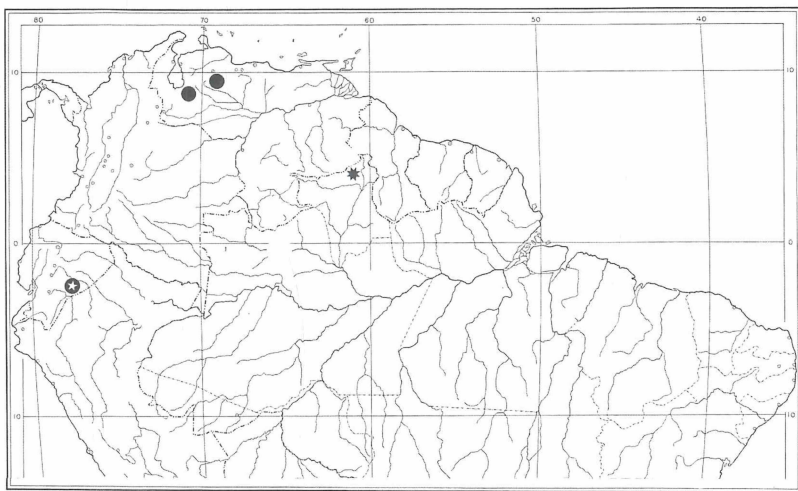


Fig. 13. Northern South America with the site in Venezuela where *Tityus magnimanus* Pocock can be found (black circle), the type locality of *Tityus elizabethae* Lourenço & Ramos (black star) and the type locality of *Tityus ythieri* sp. n. (black circle with white star).

A check-list of the Ecuadorian species of *Tityus*

Genus *Tityus* C.L. Koch, 1836

1. Species belonging to the subgenus *Archaeotityus* Lourenço, 2006

Tityus bastosi Lourenço, 1984

Tityus silvestris Pocock, 1897

Tityus julianae Lourenço, 2005 (*)

2. Species belonging to the subgenus *Tityus* C.L. Koch, 1836

Tityus demangei Lourenço, 1981 (*)

Tityus ecuadorensis Kraepelin, 1896

Tityus gasci Lourenço, 1981

Tityus intermedius Borelli, 1899 (*)

Tityus jussarae Lourenço, 1988 (*)

Tityus pugillator Pocock, 1898 (*)

Tityus roigi Maury & Lourenço, 1987 (*)

Tityus simonsi Pocock, 1900

3. Species belonging to the subgenus *Atreus* Gervais, 1843

Tityus asthenes Pocock, 1893

Tityus forcipula (Gervais, 1844)

Tityus ythieri sp. n. (*)

Total 14 species. Seven (*) are endemic to Ecuador.

Biological notes

The average clutch size observed for *Tityus ythieri* sp. n. was 17 juveniles. However, smaller broods were also observed. One brood, composed of only 4 juveniles (two males and two females) was born on 5 May 2002. Males were identified by numbers 1 and 2, and females by numbers 3 and 4. Males reached adulthood after 4 molts (instar V), on the 1 November 2003, with a duration of 18 months for postembryonic development. Females reached adulthood after 5 molts (instar VI), on the 9 February 2004, with a duration of 21 months.

Male 1 mated with female 3 on the 10 March 2004. A brood of 19 juveniles was born on the 18 August 2004, with a duration for the embryonic development of 5 months. Male 2 mated with female 4 on the 10 March 2004. A brood of 13 juveniles was born on the 15 September 2004 (Fig. 12), with duration of 6 months. This same female gave birth to another brood of 20 juveniles, without a new fecundation, on the 9 May 2005. Duration of the embryonic development was of 8 months in this case.

Table 1. Measurements (in mm) of the female holotype and male paratype of *Tityus ythieri* sp. n. and of female holotype of *T. elizabethae* and male and female of *T. magnimanus*.

	<i>Tityus ythieri</i> sp. n.		<i>T. elizabethae</i>	<i>T. magnimanus</i>	
	♂	♀	♀	♂	♀
Total length:	49.7	59.6	70.2	67.5	69.7
Carapace:					
length	5.4	6.7	7.2	6.8	6.9
anterior width	3.8	4.8	5.2	5.2	5.2
posterior width	5.8	7.6	7.9	7.6	7.8
Metasoma, segment I.:					
length	4.1	4.5	5.4	5.0	4.6
width	2.9	3.8	4.2	3.9	4.3
Metasoma, segment V.:					
length	7.2	7.6	8.9	8.5	8.1
width	3.2	3.7	3.8	4.2	4.3
depth	3.2	3.6	3.6	4.1	4.0
Vesicle:					
width	2.4	2.8	2.9	3.1	3.0
depth	2.2	2.7	2.9	3.0	3.0
Pedipalp:					
Femur:					
length	5.6	6.4	7.8	7.5	7.3
width	1.7	2.2	2.3	2.3	2.3
Patella:					
length	6.2	7.3	8.5	8.2	8.1
width	2.2	2.9	2.9	3.2	3.3
Chela:					
length	10.7	12.8	14.4	15.6	14.9
width	2.7	2.9	2.6	4.1	3.3
depth	2.6	2.7	2.4	3.6	3.0
Movable finger:					
length	6.9	8.6	9.9	9.2	9.7

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Author's address:

Dr. R. W. LOURENÇO, Département de Systématique et Evolution, USM 0602, Section Arthropodes (Arachnologie), CP 053, Muséum National d'Histoire Naturelle, 61 rue Buffon 75005, Paris, France (e-mail: arachne@mnhn.fr).

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