



## ARTÍCULO:

**A new species of *Tityobuthus* (Pocock) from Namoroka in the Province of Mahajanga, Madagascar (Scorpiones, Buthidae)**

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**A NEW SPECIES OF *TITYOBUTHUS* (POCOCK) FROM NAMOROKA IN THE PROVINCE OF MAHAJANGA, MADAGASCAR (SCORPIONES, BUTHIDAE)**

Wilson R. Lourenço & Steven M. Goodman

**Abstract:**

A new species, *Tityobuthus antsingy* sp. n., is described from the Réserve Naturelle Intégrale de Namoroka in Mahajanga province, Madagascar. The new species is characterized by moderate to large size, with respect to the genus, and a general yellowish coloration with diffuse spots. This species raises the total number in the endemic genus *Tityobuthus* to 16; a revised key is given for these species.

**Key words:** Scorpiones, Buthidae, *Tityobuthus*, new species, taxonomy, Madagascar.

**Taxonomy:** *Tityobuthus antsingy* sp. n.

**Una nueva especie de *Tityobuthus* (Pocock) de Namoroka, provincia de Mahajanga, Madagascar (Scorpiones, Buthidae)**

**Resumen:**

Se describe *Tityobuthus antsingy* sp. n. de la Reserva Natural Integral de Namoroka en la provincia de Mahajanga, Madagascar. La nueva especie se caracteriza por su mediano tamaño con respecto al género, así como por su coloración amarillenta con puntaduras. La nueva especie eleva el número total de elementos del género endémico *Tityobuthus* a 16; se presenta una clave de sus especies.

**Palabras clave:** Scorpiones, Buthidae, *Tityobuthus*, nueva especie, taxonomía, Madagascar.

**Taxonomía:** *Tityobuthus antsingy* sp. n.

**Introduction**

The genus *Tityobuthus* was established by Pocock (1893) for *T. baroni* (Pocock, 1890) previously included in the genus *Rhoptrurus* Karsch, 1886. In the last few years, and in particular since the scorpion fauna of Madagascar was summarised by Lourenço (1996), a considerable number of new species in the genus *Tityobuthus* have been described. This indicates that this genus of micro-scorpions, is species rich and a revision of the genus was subsequently undertaken (Lourenço, 2000). More detailed aspects about the systematics of the genus *Tityobuthus* and related taxa can be found in Lourenço (2000) and Lourenço & Goodman (2003).

In this paper, a new species, *Tityobuthus antsingy* sp. n., is described from the Réserve Naturelle Intégrale (RNI) de Namoroka in the Province de Mahajanga, Madagascar, which brings the total number of species in the genus *Tityobuthus* to 16. A revised key to the known species in this genus is also provided.

**Description of a new species*****Tityobuthus antsingy* sp. n.**

Fig. 1-5; Table I.

**TYPE MATERIAL:** One female holotype. Madagascar, Province de Mahajanga, Réserve Naturelle Intégrale (RNI) de Namoroka, site Andriabe, 3.3 km SE Namoroka (village), 16° 24.666'S, 45° 18.911' E, 140 m, 23/IX/2003 (S. M. Goodman - 13803). Type deposited in the Field Museum of Natural History, Chicago.

**ETYMOLOGY:** The specific name makes reference to region where the new species was found, a zone of limestone outcrops with 'antsingy' formations.

**DIAGNOSIS:** Moderate in size (with respect to the genus) reaching almost 29 mm in length. General coloration pale yellow throughout, both the body and the appendages have some discrete spots on the carapace, tergites, legs, and pedipalps. Carapace with a moderately pronounced concavity, forming a weak angle. Cheliceral dentition with basal teeth of movable fingers reduced and almost fused. Pectines with 20-20 teeth; fulcra present. Sternites smooth; sternite V without any bright zone on posterior edge. Dorsal furrow of metasomal segments strongly granulated, forming

two extra carinae on segment IV. Telson less elongated than in the other species of the genus, with the exception of *Tityobuthus pallidus* Lourenço; aculeus moderately curved; subaculear tooth moderate and slightly spinoid with two basal granules. Tibial spurs reduced. Pedipalp fixed and movable fingers with 8/9 almost linear rows of granules. Trichobothrial pattern type A- $\alpha$  - orthobothriotaxic.

**RELATIONSHIPS:** From its general morphology, and especially by the diffused pigmentation, *Tityobuthus antsingy* sp. n. appears to be more closely related to *T. guillaumeti* Lourenço, *T. judsoni* Lourenço, and *T. pallidus*. The new species can be readily distinguished from these three other members of this genus by the following characters: (i) a unique pattern of pigmentation with yellowish pedipalp femur and patella with only the internal and external faces dark; (ii) the presence of fulcra on the pectines; (iii) dorsal furrow of metasomal segments strongly granulated; (iv) furrow granulation of metasomal segment IV forming two 'extra dorsal carinae', and (v) reduced tibial spurs.

#### DESCRIPTION BASED ON FEMALE HOLOTYPE.

**Coloration.** Ground color pale yellow throughout the body and appendages. Carapace yellowish with an inverted triangular diffused dark spot, between median and lateral eyes, and with some dark zones on the lateral margins; eyes surrounded by black pigment. Mesosoma yellow with three diffuse longitudinal dark strips; the median divided by a yellowish strip. Metasomal segments I to IV yellowish; segment V and telson reddish. Legs yellowish with diffused spots. Pedipalps yellowish with diffused spots on the internal and external faces; Chelicerae yellowish with dense variegated pigmentation over the entire surface.

**Morphology.** Carapace moderately granular; anterior margin with a moderately pronounced median concavity, forming a weak angle. All carinae weak; furrows moderate to weak. Median ocular tubercle distinctly anterior to the center of the carapace; median eyes separated by a little less than one ocular diameter. Three pairs of lateral eyes. Sternum subtriangular to subpentagonal. Mesosoma: tergites weakly granular. Median carina weak on all tergites; other carinae absent. Tergite VII pentacarinat. Venter: genital operculum divided longitudinally, each half being semi-triangular in shape. Pectines: pectinal tooth count 20-20; basal middle lamellae not dilated; fulcra present. Sternites smooth with small, elongate stigmata; VII without carinae. Sternite V without any smooth or bright zone on posterior edge. Metasoma: segments I-III with 10 carinae, crenulate. Segment IV with 8 carinae, crenulated; granulation on dorsal furrow forming two extra carinae. Intercarinal spaces weakly granular. Segment V with five carinae, rounded and weakly granular. Telson smooth, with a globular shape and an intense setation; aculeus moderately curved; subaculear tooth moderate and slightly spinoid in shape with two basal granules. Cheliceral dentition characteristic of the family Buthi-

dae (see Vachon, 1963); basal teeth of movable fingers reduced and almost fused; ventral surfaces of finger and manus with setae. Pedipalps: femur pentacarinat; patella and chela with some carinae, weakly crenulate; internal face of patella with 8 spinoid granules; all faces weakly granular; fixed and movable fingers with 8/9 almost linear rows of granules.

**Trichobothriotaxy;** orthobothriotaxy A- $\alpha$  (cf. Vachon, 1974, 1975). Legs: tarsus with numerous fine median setae ventrally. Pedal spurs moderate and tibial spurs reduced.

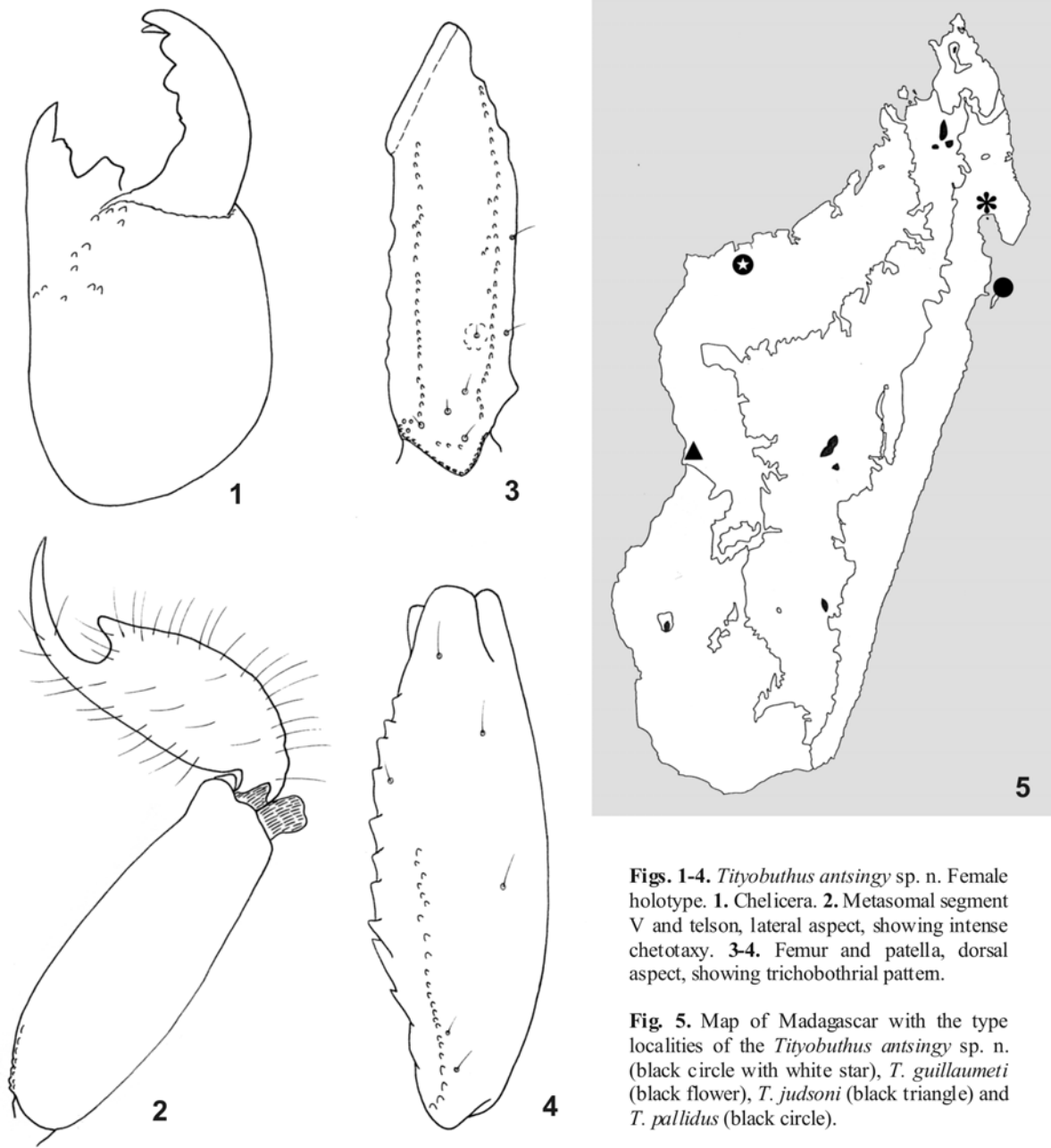
#### ECOLOGY:

The holotype was collected at the opening of a cave locally known as the Grotte d'Andriabe, in the southeastern portion of the reserve. The animal was found during the late afternoon hours in leaf litter near the opening of the cave. Other species of scorpions known from the reserve include *Grosphus garciai* Lourenço and *Opisthacanthus madagascariensis* Kraepelin.

The RNI de Namoroka rests on Mesozoic limestone dating to the Jurassic and early Cretaceous (about 195-100 million years ago) and is a complex karst region with an extensive network of caves and underground water sources (Besaire & Collignon, 1972). Portions of the limestone have been eroded into sharp pinnacles, and these formations are known as *tsingy* in Malagasy. Two other areas of western Madagascar have similar *tsingy* habitat and are composed of limestone of the same geological age – Ankarana and Bemaraha. These two sites have been surveyed for scorpions and contain other species of locally occurring *Tityobuthus*, namely *T. pococki* Lourenço, *T. judsoni* Lourenço and *T. rakotondravonyi* Lourenço & Goodman. In all cases these three zones are separated by non-limestone deposits and it would appear that the locally endemic species at each have evolved in isolation.

Table I. Morphometric values in mm of the female holotype of *Tityobuthus antsingy* sp. n.

<b>Total length</b>		28.9
<b>Carapace:</b>	- length	3.4
	- anterior width	2.5
	- posterior width	3.6
<b>Metasomal segment I:</b>	- length	2.1
	- width	2.0
<b>Metasomal segment V:</b>	- length	4.4
	- width	1.5
	- depth	1.5
<b>Vesicle:</b>	- width	1.1
	- depth	1.2
<b>Pedipalp:</b>	- Femur length	3.4
	- Femur width	0.9
	- Patella length	4.2
	- Patella width	1.5
	- Chela length	6.1
	- Chela width	1.2
<b>Movable finger:</b>	- Chela depth	1.0
	- length	4.5



**Figs. 1-4.** *Tityobuthus antsingy* sp. n. Female holotype. **1.** Chelicera. **2.** Metasomal segment V and telson, lateral aspect, showing intense chetotaxy. **3-4.** Femur and patella, dorsal aspect, showing trichobothrial pattern.

**Fig. 5.** Map of Madagascar with the type localities of the *Tityobuthus antsingy* sp. n. (black circle with white star), *T. guillaumeti* (black flower), *T. judsoni* (black triangle) and *T. pallidus* (black circle).

**Key to the species of *Tityobuthus***

- 1. Pectines with fulcra vestigial or absent ..... 2
- Pectines with well developed fulcra ..... 3
- 2. Fulcra vestigial ..... *T. monodi*
- Fulcra absent ..... *T. guillaumeti*
- 3. Tibial spurs absent or very reduced ..... 4
- Tibial spurs present ..... 5
- 4. Pectines with 19-20 teeth ..... *T. baroni*
- Pectines with 14-16 teeth ..... *T. rakotondravonyi*
- 5. Chelicerae without spots or pigmentation ..... 6
- Chelicerae with dark spots and pigmentation ..... 7

6. Pedipalp chela globular; fingers short ..... *T. judsoni*  
 – Pedipalp chela slender; fingers elongated ..... *T. pallidus*
7. Pectines with 21 or more teeth ..... **8**  
 – Pectines with 20 or less teeth ..... **10**
8. A conspicuous smooth, white and bright central zone on sternite V ..... *T. manonae*  
 – No such zone on sternite V ..... **9**
9. Body, pedipalps and legs heavily spotted; pedipalpal chela short and robust; internal face of patella with four spinoid granules ..... *T. lucileae*  
 – Body, pedipalps and legs with only vestigial spots; pedipalpal chela long and slender; internal face of patella with 5 or 6 spinoid granules ..... *T. pococki*
10. Pectines with 11 teeth ..... *T. ivohibe*  
 – Pectines with 12 to 20 teeth ..... **11**
11. Pectines with 12 to 14 teeth ..... **12**  
 – Pectines with 15 to 20 teeth ..... **13**
12. A smooth and white central zone on sternite V and two small rounded smooth white zones laterally ..... *T. griswoldi*  
 – Sternite V without any smooth white zone ..... *T. parrilloi*
13. Sternite V with a reduced or conspicuous smooth white zone; total length averaging 20 mm ..... **15**  
 – Sternite V without any smooth white zone; total length averaging 25-35 mm ..... **14**
14. Total length averaging 35 mm; tergites and pedipalps with several dark spots ..... *T. darainensis*  
 – Total length averaging 29 mm; tergites with diffuse spots; pedipalps with diffuse spots on internal and external margins only ..... *T. antsingy* sp. n.
15. Sternite V centrally with a single conspicuous smooth white zone ..... *T. dastychi*  
 – Sternite V with a reduced smooth white central zone associated with two small rounded smooth white zones laterally ..... *T. petrae*

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