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THE STATUS OF *TITYUS* (*ATREUS*) *RUFOFUSCUS* POCOCK, 1897 (SCORPIONES, BUTHIDAE), AN ENIGMATIC SCORPION DESCRIBED FROM BRAZIL

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Abstract: The status of the enigmatic buthid scorpion, *Tityus rufofuscus* Pocock, 1897 is discussed. Described from Brazil but without any precise locality, the species proves to be valid. An historical analysis of the scientific activities of the supposed collector – Edward Doubleday – suggests that he probably received the specimen from another collector who sent him material from the region of Belém in the State of Pará, Brazil. This collector could be anonymous, or perhaps Henry Walter Bates who carried out an 11 year long field trip up the Amazon. We are not in position to confirm who was the collector of *Tityus rufofuscus*; neverthless, all the known evidence suggests that it was indeed collected in the Amazon region.
Key words: Scorpiones, Buthidae, *Tityus rufofuscus*, status, Brazil.

Estatus de *Tityus* (*Atreus*) *rufofuscus* Pocock, 1897 (Scorpiones, Buthidae), enigmático escorpión descrito de Brasil
Resumen: Se discute el estatus del enigmático escorpión bútido *Tityus rufofuscus* Pocock, 1897. Descrito de Brasil pero sin localidad precisa, la especie resulta ser válida. El análisis histórico de las actividades científicas del supuesto colector, Edward Doubleday, sugiere que probablemente recibió el ejemplar de otro colector que le mandó material de la región de Belém, en el estado de Pará, Brasil. Este otro colector podría ser anónimo, o quizás se trate de Henry Walter Bates, que llevó a cabo una expedición de 11 años remontando el Amazonas. No podemos confirmar quién colectó *Tityus rufofuscus*, pero todos los datos disponibles apuntan a que se colectó en realidad en la región amazónica.
Palabras clave: Scorpiones, Buthidae, *Tityus rufofuscus*, status, Brasil.

Introduction

The buthid scorpion *Tityus rufofuscus* was originally described by Pocock (1897) in a paper devoted to several species of the genus *Tityus*. The description of *T. rufofuscus* was published separately at the end of the paper, after the keys to all the species. This choice of position seems to indicate that Pocock (1897) was not sure about the precise affinities of the new species within the group. The description is rather short and is not accompanied by any illustration. The sex of the type specimen is not indicated either, and the only information provided is: 'Loc. Brazil (E. Doubleday)'. Pocock (1897) compared the new species with those allied to *T. forcipula* (Gervais) and suggested that the new species resembled *T. stigmurus* (Thorell) in many of its characters.

The taxonomic position of *T. rufofuscus* remained unclear subsequently. Kraepelin (1899) placed it, without any justification, in synonymy with *Tityus bahiensis* (Perty) but with an interrogation. Mello-Leitão (1931) rejected Kraepelin's (1899) decision and placed the species in a group consisting of *Tityus forcipula* together with several other large blackish species of *Tityus* found mainly in the Amazon region. In a list of species proposed by this same author (Mello-Leitão, 1932), the Amazon region is also suggested as a possible type locality for the species, but again with an interrogation. In two new reanalyses of the species of *Tityus*, Mello-Leitão (1939, 1945) once again changed his opinion and placed *T. rufofuscus* in the *Tityus bahiensis* group of species. In a study regarding the identity of *Tityus bahiensis* Lourenço (1982) made some comments about *T. rufofuscus* and considered this species to be totally distinct from *T. bahiensis*. Once again, he suggested that it should be placed among the other large blackish species of *Tityus* that are found mainly in the Amazon region.

Since *T. rufofuscus* originates from an unknown locality in Brazil, and the type specimen is the only one known, the species has again been neglected in more recent publications including that on the species of *Tityus* in Pará State, Brazil (Lourenço, 1984), and one of the fauna of Brazilian scorpions (Lourenço, 2002). A new reanalyses of the type specimen of *T. rufofuscus* again led to the conclusion that the species is valid and certainly belongs to the subgenus *Atreus* Gervais (Lourenço, 2006). This consists mainly of large blackish species of *Tityus*. Consequently we decided to redescribe and illustrate the species properly. In the light of more precise information about its supposed collector, Edward Doubleday, further comments about the possible origin of the species are proposed below.

Possible origin and the 'actual' collector of *Tityus rufofuscus*

The original label contained in the vial of *T. rufofuscus*, indicates only 'Brazil (Edw. Doubleday) – 45.67'. In the registration books of the Natural History Museum, London, the numbers '45.67' indicate "17 Hemiptera, 5 Ap-

tera, presented by Edw. Doubleday Esq." Undoubtedly one of the 'Aptera' might actually have been a scorpion.

One major question can, however, be addressed: Did Edward Doubleday ever take part in a field trip to Brazil? According to the information available, he did not.

Edward Doubleday (1810-1849) was an English entomologist mainly interested in Lepidoptera, best known for Doubleday, E. & Westwood, J.O. *The Genera of Diurnal Lepidoptera: comprising their generic characters, a notice of their habits and transformations, and a catalogue of the species of each genus*. Illustrated by William Chapman Hewitson. In the 1830s he joined a colleague named Foster on a trip to the United States. While there, he wrote a series of letters that appeared in *The Entomological Magazine* (London) under the running title 'Communications on the Natural History of North America.' In the U. S., he spent a considerable amount of time at Trenton Falls in West Canada Creek, a tributary of the Mohawk River in New York State. There he and Foster collected numerous insects, including several species new to science (Calhoun, 1989). Doubleday was appointed to the British Museum, and stayed there until he died in December of 1849.

This analysis leads us to another field collector, Henry Walter Bates. According to Papavero (1973), "*Henry Walter Bates was born at Leicester on 8 February 1825. He is best known as the 'father' of the theory of Batesian mimicry. He must have developed early a taste for entomology for, when only seventeen or eighteen years of age he published notes on Coleoptera in the 'Zoologist'. Bates came of a mercantile family, and was himself destined for a career of this nature: but about the year 1845 he made the acquaintance of Alfred Russel Wallace. Two years later Wallace proposed a joint expedition to Pará, in order to collect insects and other natural history objects, attracted to this locality by the account of the country in W. H. Edwards, Voyage up the Amazon".*

Edward Doubleday, then of the British Museum, encouraged them both by showing some specimens of new butterfly species from the environs of Belém, Grão Pará, Brazil, near to the mouth of Amazon (Raffles, 2001).

"Bates sailed from Liverpool, England, in a small trading vessel, on 26 April 1848: after a swift passage from the Irish Channel to the Equator, he arrived on 26 May off Salinas (Salinópolis), on the coast of the Province of Grão Pará, Brazil. On the following day and night he sailed with a light wind, aided by the tide; up the Pará River (Bahia de Marajó), passing by Vigia and, on the morning of the 28th, arrived at Belém. The Capital of the then Province of Grão Pará (which included the Province of São José do Rio Negro, now the State of Amazonas), was called Santa Maria do Grão Belém do Pará, and was commonly abbreviated to Pará".

"Bates was received in Belém by a certain Mr. Miller, consignee of the vessel, in whose house Bates went to live. Afterwards he moved to Mr. Miller's 'rocinha' (small plantation) in the outskirts of the city, and at length rented a house in Nazaré, now a district of the city of Belém. In Nazaré Bates stayed collecting from 15 June to 26 August 1848, making excursions to Maguari, near the Iritiri Greek which communicates with the Rio Pará by the Maguari Greek. From Belém, Bates dispatched the first collections obtained in those localities".

From this account we have two possible indications of a locality for *T. rufofuscus*. **1**. E. Doubleday received zoological material from the region of Belém sometime before the trip of Bates and Wallace (in 1848), as attested by the new species of Butterflies that he showed to both of them. The number 45 on the label of *T. rufofuscus* might possibly indicate the date of 1845 for the collection of these specimens. In this case, the name of the collector remains unknown. **2**. Bates sent his initial collection to the British Museum before the end of 1848. In view of his connections with him, some of the specimens could well have been addressed to Doubleday. Again, the material collected by Bates in 1848, was limited to the region of Belém. Bates made many other collections during his 11 years of field trips in the Amazon. However, the second shipment only took place in 1853 (Papavero, 1973) after the death of Doubleday (in 1849). Consequently, there is a high probability that *T. rufofuscus* was truly collected in the Belém area.

One question, however, remains. Why has this species never been collected subsequently in this highly prospected area of Brazil? First of all, the specimen of *T. rufofuscus* is rather old and most probably collected in the 1840s. At that time Belém was a very small town, with smaller villages such as Nazaré, (today a district of Belém) around it. With the development of Belém in the following decades, many of the natural formations around the town have been modified and/or destroyed. Most scorpions belong to 'equilibrium species' which require stable and predictable environments. When the natural environment is modified or destroyed, these species are selected negatively (Lourenço & Cloudsley-Thompson, 1996). This is a possible scenario of what may have taken place in the case of *T. rufofuscus*. In contrast, some scorpion species are very 'opportunistic' and will colonize most of the modified environments left vacant by 'equilibrium species'. This applies quite well in the case of *Tityus* (*Atreus*) *obscurus* (Gervais), one of the most common species today in the region of Belém (Lourenço 1984, 2002; Lourenço *et al*., 2000).

Taxonomic treatment

***Tityus* (*Atreus*) *rufofuscus* Pocock, 1897**

Fig. 1-10. Table I.

Tityus rufofuscus Pocock, 1897: 520.

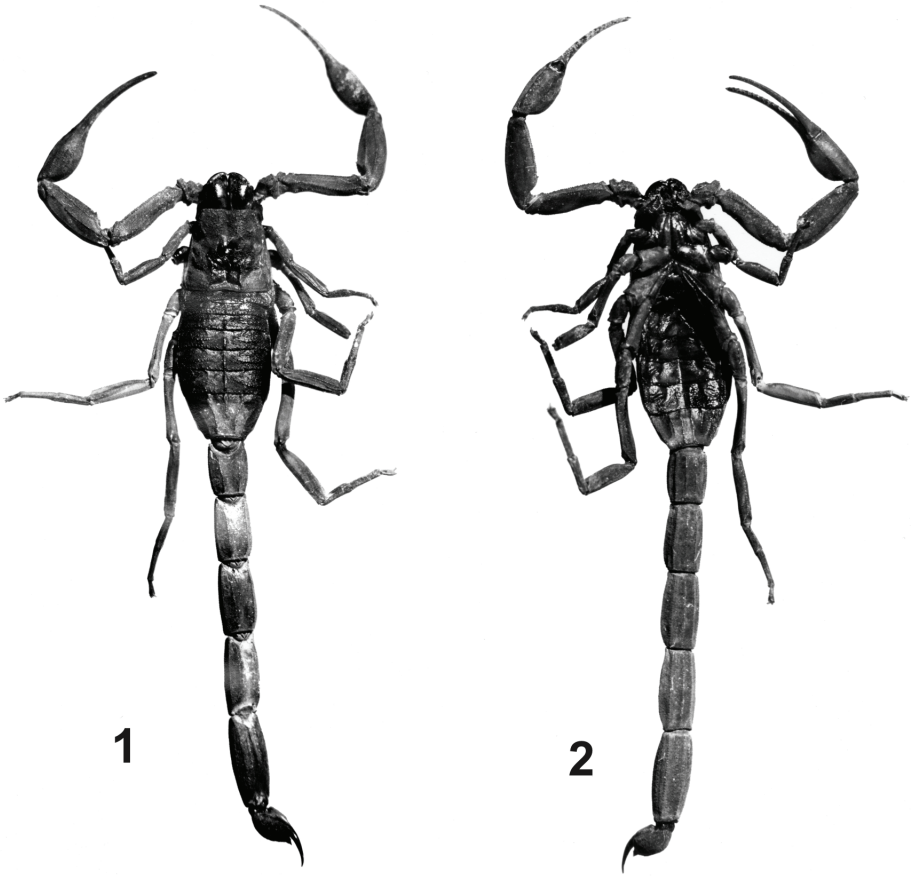
Tityus rufofuscus: Kraepelin, 1899: 83 (under *Tityus bahiensis*).

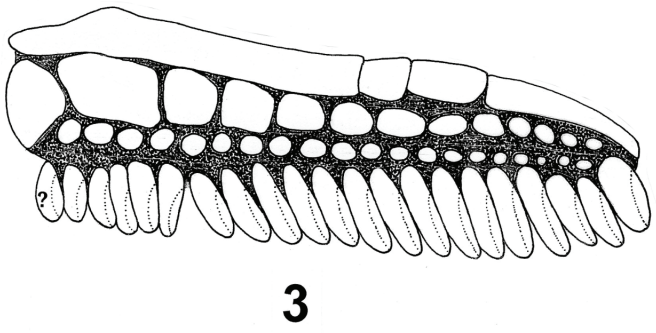
Tityus rufofuscus: Mello-Leitão, 1931: 137, 148; Mello-Leitão, 1932: 30; Mello-Leitão, 1939: 60, 65, 73; Mello-Leitão, 1945: 301, 312, 390; Lourenço, 1982: 95.

REDESCRIPTION OF THE FEMALE HOLOTYPE

Female holotype (type. 45.67), Brazil -without any precise locality- (Edw. Doubleday). Specimen poorly preserved. Most parts are disarticulated. The specimen was originally preserved dry, and subsequently transferred into ethanol.

Coloration. Basically blackish-brown. Ocular tubercle blackish, darker than carapace. Chelicerae reddish-brown. Tergites and metasoma blackish-brown. Vesicle paler than segment V; aculeus reddish-brown. Sternites dark brown. Pedipalps reddish-brown. Legs brownish-yellow.





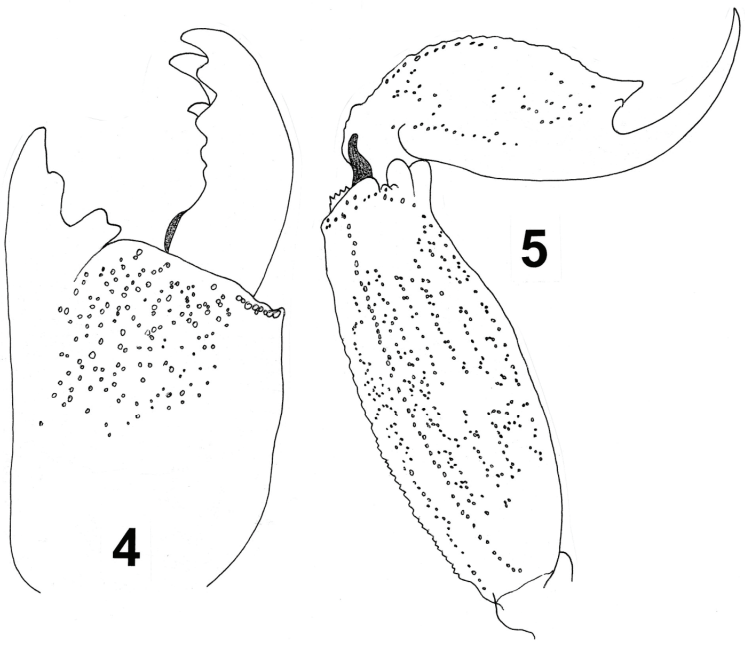


Fig. 1-2. *Tityus* (*Atreus*) *rufofuscus* Female holotype. Habitus, dorsal and ventral aspects. The photos were taken in 1972 (by M. Vachon), when the specimen was much less disarticulated than today. **Fig. 3-5.** *Tityus* (*Atreus*) *rufofuscus* Female holotype. **3**. Pecten showing that the middle basal lamella is not dilated. The most internal tooth (?), was apparently lost prior to the original description. **4**. Chelicera, dorsal aspect. **5**. Metasomal segment V and telson, lateral aspect.

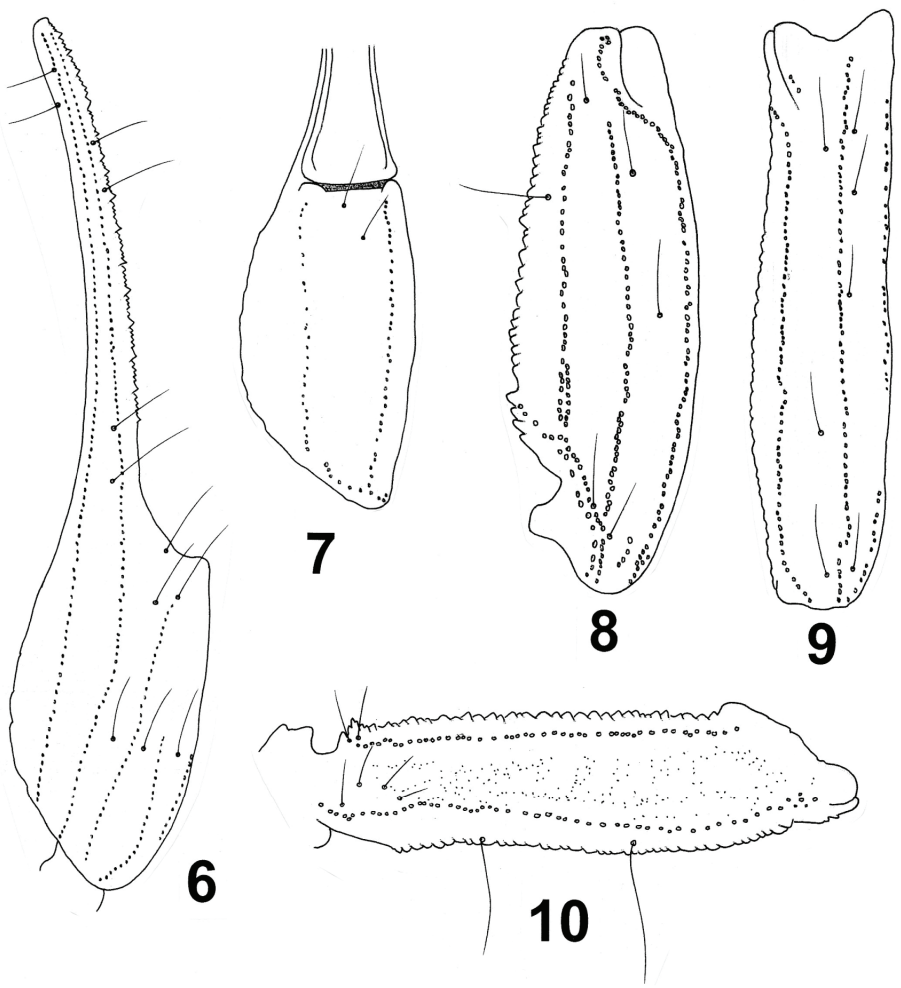


Fig. 6-10. *Tityus* (*Atreus*) *rufofuscus* Female holotype. Trichobothrial pattern. **6-7**. Chela, dorso-external and ventral aspects. **8-9**. Patella, dorsal and external aspects. **10**. Femur, dorsal aspect.

Table I. Morphometric values (in mm) of the female holotype of *Tityus* (*Atreus*) *rufofuscus*.

	Total length	54.8 (62.6*)
Carapace:	- length	7.6
	- anterior width	5.7
	- posterior width	8.5
Metasomal	- length	4.7
segment I:	- width	3.7
Metasomal	- length	6.0
segment II	- width	3.5
Metasomal	- length	6.7
segment III	- width	3.4
Metasomal	- length	7.7
segment IV	- width	3.3
Metasomal	- length	8.4
segment V:	- width	3.1
	- depth	3.1
Vesicle:	- length	7.8
	- width	2.4
	- depth	2.7
Pedipalp:	- Femur length	8.5
	- Femur width	2.2
	- Patella length	8.8
	- Patella width	2.8
	- Chela length	15.2
	- Chela width	2.9
	- Chela depth	2.7
	Movable finger length	9.8

* including telson length.

Morphology. Carapace moderately granular; anterior margin straight. Anterior median and posterior median carinae moderately developed; other carinae weakly marked. Median posterior furrow deep, other furrows moderately marked. Eyes separate by a little more than one ocular diameter; three pairs of lateral eyes. Sternum triangular.

Mesosoma: tergites I-VII strongly granular. Median carina increasing backward. Tergite VII tetracarinate. Venter with genital operculum divided longitudinally, each plate oval in shape. Pectines with 20-20 pectinal teeth; basal middle lamellae of pectines not dilated. Metasoma: segments I to V with 10-10-8-8-5 carinae; lateral inframedian carinae on segment II reduced to a few granules on the posterior edge; ventral carinae parallel. Intercarinal spaces strongly granular in all segments, including dorsal aspect. Segment V with one ventromedian carina; ventrolateral and dorsomedian carinae weakly developed; dorsomedian space moderately to strongly granular. Telson moderately granular with a long and strongly curved aculeus; subaculear tooth strong and spinoid. Cheliceral dentition characteristic of the family Buthidae (Vachon, 1963); basal teeth on movable finger greatly reduced. Pedipalp femur pentacarinate; patella with seven carinae; moderately slender, with eight carinae; fixed and movable fingers with 16-17(18) oblique rows of granules. Trichobothriotaxy: orthobothriotaxy A-α-alpha (Vachon, 1974, 1975). Legs: tarsus ventrally with numerous short and fine setae.

TAXONOMICAL POSITION. Within the subgenus *Atreus*, this species belongs to the '*Tityus asthenes*' group of species. It appears to be associated with *Tityus obscurus*

Gervais, 1843. However, it can be distinguished from this last species by some markedly different morphometric values (see Table I). Moreover, the basal middle lamella of the female pectines in *T. rufofuscus* is not dilated. Any possibility for the type specimen to be a male juvenile of *T. obscurus* can be excluded. This last species shows allometric growing for the male pedipalps, which can be observed from the third and fourth instars (Lourenço *et al*., 2002).

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