

Taxonomic and ecological observations on the scorpions collected in the Forest of Ankazomivady-Ambositra and on the «RS d'Ivohibe», Madagascar

* Wilson R. Lourenço & ** Steven M. Goodman

* Laboratoire de Zoologie (Arthropodes), M.N.H.N., 61 rue de Buffon 75005, Paris, France: e-mail. arachne@mnhn.fr

** Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, Illinois 60605, U.S.A., and WWF, BP 738, Antananarivo (101) Madagascar.

Abstract.- During the three months of field work between October and December 1997 by the junior author in the in the Réserve Spéciale d'Ivohibe and in the Forêt d'Ankazomivady-Ambositra, Province of Fianarantsoa, a collection of scorpions was made, mainly with the use of pitfall buckets. The species collected were *Grosphus limbatus* (Pocock), *Grosphus madagascariensis* (Gervais), and new species of *Tityobuthus* Pocock (Scorpiones, Buthidae), which is described from Ivohibe based on two female specimens. *Tityobuthus ivohibe* n. sp., is the eleventh species described in the genus from Madagascar. Some comments concerning the taxonomic position of the new species are also presented.

Key words: Scorpiones, Buthidae, *Tityobuthus*, *Grosphus*, Ivohibe, Madagascar, New species.

INTRODUCTION

During three months of field work done between October and December 1997 by the junior author in the Réserve Spéciale (RS) d'Ivohibe and in the Forêt d'Ankazomivady-Ambositra, both in the Province de Fianarantsoa, a reasonable number of scorpions were collected, mainly with the use of pitfall trap lines. Part of this material was studied by the senior author while on a short visit to the Field Museum and the rest was brought to the Paris Museum for further analysis.

These collections contain three species of scorpions, all belonging to the family Buthidae. Two represent already known species in the genus *Grosphus* Simon 1880, and the third one has been identified as a new species in the genus *Tityobuthus* Pocock 1893. With the description of this new species, the

total number in the genus *Tityobuthus* is raised to eleven. The increasing number of new species within *Tityobuthus* suggests that this genus, which can be included among the micro-scorpion genera, may be very rich in species. A similar phenomenon has already been observed in other micro-scorpion genera such as *Ananteris* Thorell 1891 of the neotropics, in which the number of described species increased from 3 to 19 in the space of twelve years (Lourenço 1993, 1994). In fact, since the publication of the Scorpion Fauna of Madagascar (Lourenço 1996), other new species of *Tityobuthus*, *Microcharmus* Lourenço 1995 and *Pseudouroplectes* Lourenço 1995 have been discovered and described (Lourenço 1997, 1998; Lourenço & Goodman 1999). This situation suggests that the scorpion fauna of Madagascar is still far from being well known and that many new taxa remain to be discovered.

METHODS

One technique that has proven effective to capture scorpions on Madagascar consists of pit-fall traps with drift fences. These devices are largely put in place to capture small mammals, reptiles and amphibians. In all of the elevational sites surveyed, separate pit-fall lines were installed in three different topographic settings (valley bottom, slope, and ridge crest). Each line was 100 m long and consisted of 11 buckets (275 mm deep, 290 mm top internal diameter, 220 mm bottom internal diameter), 10 m apart, generally in operation for a minimum of seven nights. Small holes (2 mm diameter) were drilled in the bottom to allow water drainage. Buckets were sunk to a depth where the rim was even with ground-level. A barrier (drift fence) made from plastic sheeting (0,5 m high and 100 m long) was stapled in a vertical position to thin wooden stakes. The drift fence bisected all of the buckets in the line (Voss & Emmons 1996, fig. 7). A flange of about 50 mm at the bottom of the standing plastic fence was covered with soil and leaf litter to block animals from moving under the barrier.

1. Forest of Ankazomivady-Ambositra

- *Grosphus limbatus* (Pocock 1889)

Madagascar, Province de Fianarantsoa, 28 km SSW Ambositra, 4.7 km SW Ambalamanakana, Forêt d'Ankazomivady, 20 46.5 S ; 47 10,1 E (1700 m), 6-15/II/1998 (S.M. Goodman). 3 adult females ; one of the females with a brood composed of 8 males and 6 females.

The majority of specimens were collected on hills exposed rock and were found below rock. These hillrocks were out of the forested zone and were generally surrounded by open grasslands composed of introduced species of Gramineae. This site of collection probably corresponds to the highest one known for scorpions in Madagascar.

2. Réserve Spéciale d'Ivohibe

- *Grosphus madagasariensis* (Gervais 1844)

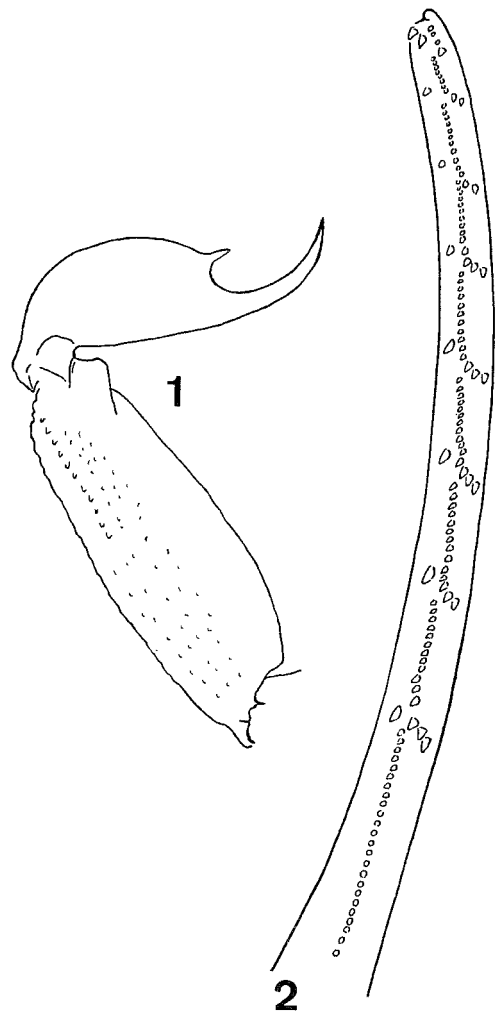
Madagascar, Province de Fianarantsoa, exterior northern limit of Réserve Spéciale

d'Ivohibe, along the Hefitany River, 7,5 km ENE Ivohibe, 22 28,2' S - 46 57,6' E (900 m), camp 1, 6-13/X/1997 (S. M. Goodman, coll.). 6 adult males and 1 juvenile female.

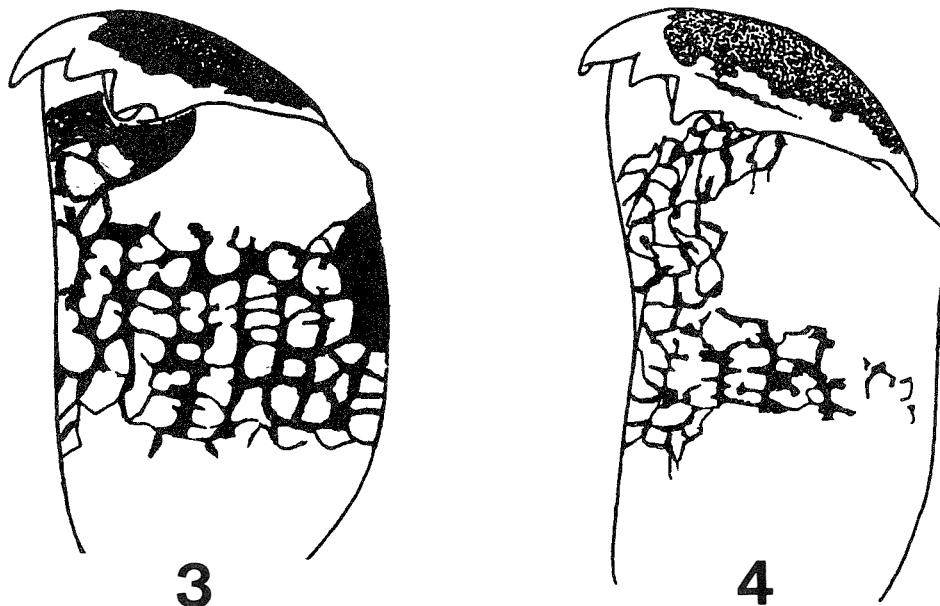
As for *Grosphus limbatus*, specimens were found under rocks.

- *Tityobuthus ivohibe* new species (Figs. 1 to 3 and 5 to 9)

Holotype female : Madagascar, Province de Fianarantsoa, exterior northern limit of Réserve Spéciale d'Ivohibe, along Hefitany



Figs 1 and 2. *Tityobuthus ivohibe* (holotype), 1. Fifth metasomal segment and telson, lateral view. 2. Movable finger of pedipalp chela.



Figs 3 and 4. Chelicera with typical patterns of pigmentation. 3. *Tityobuthus ivohibe* (holotype). 4. *Tityobuthus parrilloi* (holotype).

river, 7,5 km ENE Ivohibe, 22 28,2' S - 46 57,6' E (900 m), camp 1, 6-13/X/1997 (S. Goodman, coll.).

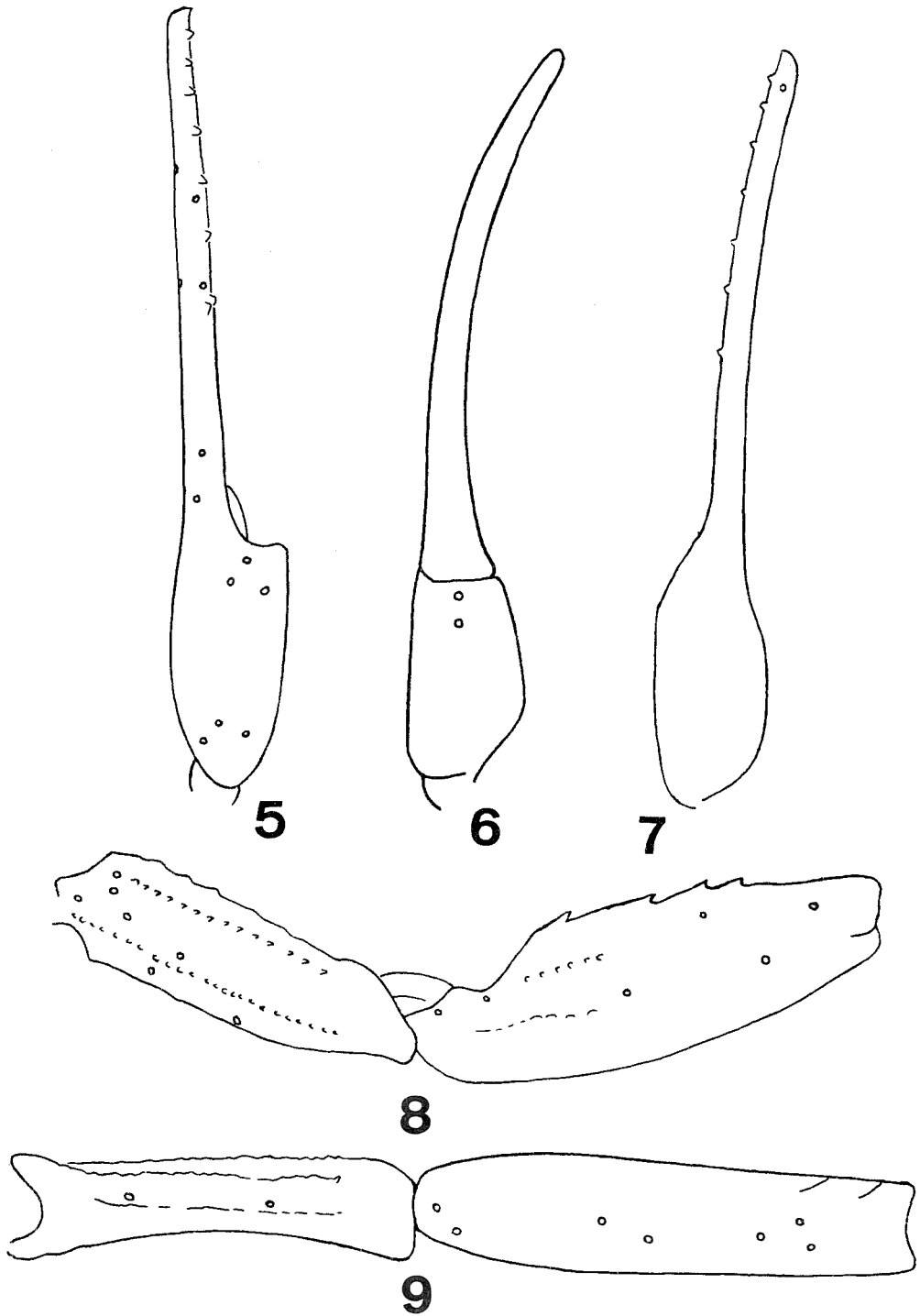
Deposited in the Field Museum of Natural History, Chicago, USA.

Etymology: The specific name is a name placed in apposition to the generic name and makes reference to the type-locality.

Description based on female holotype. Measurements presented in Table I.

Coloration. Basically yellowish, symmetrically marbled with dark brown, producing an overall spotted appearance. Prosoma: carapace yellowish, heavily spotted; eyes surrounded by black pigment. Mesosoma: yellowish with four longitudinal brown stripes. Metasoma: segments I to V yellowish; vesicle yellowish but lighter than segment V. Venter yellow with several spots on all sternites. Sternite III with a very small bright white zone in the posterior region. Chelicerae reddish-yellow with dark spots on the median zone; fingers reddish. Pedipalps yellowish with several spots on femur and tibia; chelae less densely spotted; fingers darker, reddish. Legs yellowish with diffuse fuscous spots.

Morphology. Carapace moderately to feebly granular; anterior margin with a median concavity. Anterior median superciliary and posterior median keels moderate to feeble. All furrows moderate to feeble. Median ocular tubercle distinctly anterior to the center; median eyes separated by one ocular diameter. Three pairs of lateral eyes. Sternum subtriangular to pentagonal. Mesosoma: tergites feebly granular. Median keel moderate to feeble in all tergites. Tergite VII pentacarinat. Venter: genital operculum divided longitudinally. Pectines: pectinal tooth count 11-11; basal middle lamellae of the pectines not dilated; fulcra present. Sternites smooth with moderately elongate stigmata; VII without keels. Metasoma: segments I to III with 10 keels, crenulate. Lateral inframedian keels on segments I and II complete, crenulate; incomplete on III. Intercarinal spaces moderate to feebly granular. Segment V feebly granular, almost smooth and rounded. Telson smooth with a moderately long and moderately curved aculeus; subaculear tooth strong and spinoid. Cheliceral dentition characteristic of the genus



Figs 5 to 9. Trichobotriataxy of *Tityobuthus ivohibe* (holotype). 5 to 7. Chela in external, ventral and internal views. 8 and 9. Femur and tibia in dorsal and external views.

Tityobuthus (Vachon 1963); ventral aspect of both finger and manus with dense, long setae. Pedipalps: femur pentacarinata; tibia and chelae with some keels but moderately crenulate; internal face of tibia with four spinoid granules; all faces moderate to feebly granular. Movable fingers with 9 oblique rows of granules; internal and external accessory granules present. Trichobothriotaxy; orthobothriotaxy A- (Vachon 1973, 1975). Legs: tarsus with very numerous median fine setae ventrally. Tibial spurs present.

Paratype female: Similar to the holotype female with respect to both coloration and morphology. Pectinal tooth count 11-11. Data for female paratype, same as for the holotype. Deposited in the Muséum National d'Histoire Naturelle, Paris.

Taxonomic position of the new species

According to the key presented by Lourenço (1996) for the various species in the genus *Tityobuthus*, the new species *T. ivohibe* appears to be most closely related to *T. parrilloi* Lourenço 1996. This latter species is only known from the lowland humid forests of the RNI d'Andohahela in the extreme Southeastern portion of the country. The two species can, however, be readily distinguished by the following features: (i) a different pattern of pigmentation of the chelicera (see Figs 3 and 4); (ii) a different pectinal tooth count: 13/14 in *T. parrilloi*, and 11 in *T. ivohibe*; (iii) metasomal segments III of *T. parrilloi* with 8 keels, whereas in the new species segment III has 10 keels; and (iv) pronounced differences in morphometric values (see Table I).

Notes on the habitat of *Tityobuthus ivohibe* n. sp.

The vegetation of the zone where *T. ivohibe* was captured at 900 m consists of largely undisturbed lowland humid forest. The site is a few hundred meters from the northwestern edge of the Réserve Spéciale (RS) d'Ivohibe and falls within a continuous forested corridor between this reserve and the Réserve Naturelle Intégrale (RNI) d'Andringitra to the north. In the lowland forest of the RNI d'Andringitra, at

TABLE I

Comparative morphometric measurements (in mm) of the female holotype of *Tityobuthus ivohibe* new species and the female allotype of *T. parrilloi*

	<i>T. ivohibe</i>	<i>T. parrilloi</i>
Carapace:		
- length	3,0	2,2
- anterior width	2,4	1,9
- posterior width	3,3	2,6
Metasomal segment I:		
- length	1,6	1,0
- width	1,7	1,5
Metasomal segment V:		
- length	3,9	2,9
- width	1,4	1,2
- depth	1,3	1,1
Vesicle:		
- width	1,1	0,8
- depth	1,2	0,9
Pedipalp:		
- Femur length	2,8	2,0
- Femur width	0,9	0,6
- Tibia length	3,6	2,4
- Tibia width	1,2	0,9
- Chelae length	5,4	4,0
- Chelae width	1,0	0,8
- Chelae depth	1,0	0,7
Movable finger:		
- length	3,6	2,9

approximately the same altitude as the site at Ivohibe, the dominant large or emergent trees consist of *Sloanea rhodantha* var. *rhodantha* (Elaeocarpaceae) and *Canarium madagascariense* (Burseraceae) and the canopy and understory trees of members of the Lauraceae, Myrtaceae, Violaceae (*Rinorea*), Monimiaceae (*Tambourissa*, *Ephippiandra*, and *Decarydendron*) (Lewis *et al.* 1996).

In the vicinity of the 900 m site at the edge of the RS d'Ivohibe, down large trees, in various stages of decay, were relatively common and soil litter or the organic layer was not extensive. During the inventory of this site, little rain fell and the upper soil layer was distinctly dry.

The intent of the 1997 inventory of the forested Ivohibe region was to assess the elevational distribution of plants and animals along a transect of the slopes of Pic Ivohibe and the importance of the forested corridor

between the RS d'Ivohibe and the RNI d'Andringitra. Sites were surveyed at 900 m (just outside the reserve), at 1200 and 1575 m within the reserve, and at 900 and 1200 m in the corridor. Both 1200 m sites surveyed on Pic Ivohibe contained numerous montane elements, and was distinctly different from the 900 m sites.

Tityobuthus ivohibe was only found at the 900 m just outside the reserve and not at any other of the sites surveyed. Further, this species was not recorded during an intensive four month inventory of the RNI d'Andringitra in 1993, although similar pitfall techniques were used. We presume that this species is relatively uncommon, or at least difficult to capture using pitfall techniques, rather than having a very limited distribution.

There is a continuous band of extant forest that runs from Pic d'Ivohibe north to the RNI d'Andringitra, and then in a northeasterly direction through the Ikongo Forest to the area surrounding the Parc National de Ranomafana. Although *Tityobuthus ivohibe* is currently only known from 900 m at the edge of the RS d'Ivohibe, we strongly suspect that it occurs in the lowland forest across this zone. This habitat type is severely threatened in the region, largely for slash and burn agricultural practices. If indeed this species is limited to lowland forest, a considerable portion of its habitat has already been destroyed.

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