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# A further new species for the Malagasy genus *Pseudouroplectes* Lourenço, 1995 (Scorpiones: Buthidae)

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## Keywords :

Scorpion;  
Buthidae;  
new species;  
*Pseudouroplectes*;  
*jacki*;  
Tsimembo forest;  
Madagascar;  
geographical distribution;  
description.

**Abstract.** – Among Malagasy scorpion genera, *Pseudouroplectes* Lourenço, 1995 (Buthidae) remains one of the less speciose. All species are extremely rare and known only by a few or even for a single individual. A new species is described from the tropical dry forest of Tsimembo in the Melaky Region, confirming the distribution of the genus to a further northern locality. As for several previous cases, the single holotype specimen was obtained by extraction with the use of Berlese method. The description of one more new species, confirms the distributional pattern of *Pseudouroplectes* as a typical element of dry forest formations which range from the south to the middle of the island.

Lourenço W. R., 2021. – A further new species for the Malagasy genus *Pseudouroplectes* Lourenço, 1995 (Scorpiones: Buthidae). *Faunitaxys*, 9(41): 1 – 7.

ZooBank: <http://zoobank.org/C37718D4-1354-4164-86D6-B7402BF828AD>

## Introduction

Since its creation more than 25 year ago (Lourenço, 1995), the genus *Pseudouroplectes* has been the subject of a limited number of publications (see Lourenço et al., 2016 for a synopsis). This genus of micro-scorpions is mainly composed of soil-dwelling species which appear as extremely rare; however this rarity may also be a consequence of the methods used for the collection of scorpions in general. In fact, most micro-scorpions living in organic soil have been collected by extraction methods such as Berlese, Winkler and Kempson and this is also the case for individuals in the genus *Pseudouroplectes*. A second group of micro-scorpions, equally composed of soil species, is represented in Madagascar by the family Microcharmidae Lourenço, 1996 (Lourenço et al., 2006, 2019). Microcharmids are composed by two genera *Microcharmus* Lourenço, 1995 and *Neoprotobuthus* Lourenço, 2000 and seem better represented than *Pseudouroplectes* in the number of species. Unquestionably microcharmids have been the subject of more studies, but contrarily to *Pseudouroplectes* these are largely encountered in humid forest formations what probably contribute to their more significant diversity. Globally higher scorpion diversity is observed in humid forests than in dry forests or savannas. This is generally true in many regions of the world, and also in Madagascar.

The genus *Pseudouroplectes* was created based on the species, *Pseudouroplectes betschi* Lourenço, 1995; description based on two females collected with the use of extraction methods, in the dry southwestern spiny bush formation at Andramanoetse Be, Plateau Mahafaly (Lourenço, 1995). A second species, *Pseudouroplectes pidgeoni* Lourenço & Goodman, 1999 was collected in the extreme southeastern dry forests of the Parc National d'Andohahela (parcel 2). The collection took place from a soil litter sample of the spiny bush parcel of the reserve, only a few kilometres of the ecotone between dry and wet

forest formations (Lourenço & Goodman, 1999). New material of the genus *Pseudouroplectes* was collected a number of years later and a third species, *Pseudouroplectes maculatus* Lourenço & Goodman, 2006 was described (Lourenço & Goodman, 2006). After some more years, based on new material collected in the dry forests of Ifaty, north of Toliara, one more new species, *Pseudouroplectes lalyae* Lourenço & Ythier, 2010 was detected and described (Lourenço & Ythier, 2010). After the death of Professor J.-M. Betsch, collector of the first *Pseudouroplectes* species, some non-identified material collected by him become available and integrated the collections of the Muséum in Paris. The study of this material led to the description of a fifth new species, *Pseudouroplectes tsingy* Lourenço, Wilmé & Waeber, 2016. The material was also collected in dry forests in a Tsingy formation of the Parc National Bemaraha, a location further north, extending the distribution area of the genus into western Madagascar and for the first time overlapping the range of distribution of the genus *Microcharmus* (Lourenço et al., 2016).

Here, one further specimen also collected by J.-M. Betsch but previously neglected, led to the diagnosis of one more new species. As for *P. tsingy* the new species was collected further to the north. The number of species in the genus *Pseudouroplectes* is now raised to six.

## Material and methods

Illustrations and measurements were made with the aid of a Wild M5 stereo-microscope with a drawing tube (camera lucida) and an ocular micrometre. Measurements follow Stahnke (1970) and are given in mm. Trichobothrial notations follow Vachon (1974), cheliceral nomenclature follows Vachon (1963) while morphological terminology mostly follows Hjelle (1990). The holotype of the new species will be deposited in the collections du Muséum national d'Histoire naturelle, Paris, France.

## Taxonomy

Family **Buthidae** C.L. Koch, 1837

Genus *Pseudouroplectes* Lourenço, 1995

*Pseudouroplectes jacki* sp. n.

(Fig. 1-12)

ZooBank: <http://zoobank.org/81F54CF8-61A9-4F61-8299-FEDCF1F19747>

**Holotype**, ♂, Madagascar, Melaky Region, ex-Province Mahajanga, Forêt de Tsimembo, NNW of Soatane, tropical dry forest, X/1972 (J.-M. Betsch), extraction by Berlese, deposited in the Muséum national d'Histoire naturelle, Paris.

**Patronym**. – Name honours Jack Wilson de Wilde (the little Viking) from Stockholm, Sweden.

**Diagnosis**. – Scorpion of small size, when compared with the average known sizes of most species of micro-buthid genera, with a total length of 16.24 mm (see morphometric values after the description). General coloration yellow to pale-yellow without any spots over body and appendages; this almost whitish coloration is the paler one observed for species of the genus. Carinae and granulations moderately to strongly marked. Carapace with a marked concavity on the anterior margin; with a total length superior to the posterior width and marked by a strong granulation. Dorsal and sub-dorsal carinae on metasomal segments I to IV with conspicuous posterior spinoid granules, sometimes forming serrulas. All metasomal segments longer than wide. Chela fingers with 6-7 rows of granules. Pectines are conspicuous with large pectinal plates and 17-17 teeth; fulcra are absent. Trichobothriotaxy A- $\alpha$  (alpha), orthobothriotaxic. The trichobothrial patterns observed for the species of *Pseudouroplectes* are rather uniform. In the new species trichobothria **db** and **est** of chela finger are almost in the same level.

### Description (based on male holotype)

**Coloration**. – Yellow to pale yellow, almost whitish. Carapace yellow to pale yellow; eyes blackish, with median eyes surrounded by a conspicuous blackish spot. Tergites pale yellow without any confluent or longitudinal spots. Pedipalps and legs pale yellow without spots; rows of granules on chela fingers slightly reddish. Metasomal segments yellow; carinae with the same pale colour as the tegument; telson yellow with aculeus slightly reddish. Venter globally pale yellow; pectines with the same tonality of the rest of the ventral zone. Chelicerae pale yellow with finger's teeth slightly reddish (Remark: the specimen was perfectly preserved in a dark tube, consequently no coloration or pigmentation was lost under the effect of light exposure).

**Morphology**. – Carapace with a strongly marked granulation; anterior margin with a strong concavity. Carinae weak; furrows inconspicuous. Median ocular tubercle distinctly on the anterior third of the carapace; median eyes separated by about one ocular diameter. Three pairs of lateral eyes. Sternum sub-pentagonal. Mesosoma: tergites moderately granular, excepted by VII which is markedly granular, in particular on the lateral sides. Median carina moderate to weak in all tergites. Tergite VII pentacarinata with lateral carinae forming serrulas. Venter: genital operculum divided longitudinally, each plate having a more or less sub-oval shape. Pectines large, particularly the pectinal plates; pectinal tooth count 17-17 in male holotype; basal middle lamellae of the pectines not dilated; fulcra absent. Sternites smooth with very short semi-slit-like spiracles; VII with minute granulations and two vestigial carinae. Metasoma: segments I to III with 10 carinae, moderately crenulate; IV with 8 carinae, crenulate; ventral carinae reduced on segments I to IV; dorsal and latero-dorsal carinae on segments I to IV strongly marked with posterior spinoid granules and forming almost serrulas-like structures; intercarinal spaces weakly granular. Segment V rounded with vestigial carinae. Telson with a very elongated 'pear-like' shape, smooth and with a conspicuous setation; aculeus short, weakly curved; subaculear tooth absent. Cheliceral dentition characteristic of the family Buthidae (Vachon, 1963); fixed finger with two moderate basal teeth; movable finger with two very weak and partially fused basal teeth; ventral aspect of both finger and manus with dense, long setae. Pedipalps: femur pentacarinata; patella with weakly

marked carinae; internal face of patella with 5-6 spinoid granules, some of which are conspicuous; chela with vestigial carinae; all faces moderately granular. Fixed and movable fingers with 6-7 almost linear rows of granules; two accessory granules present at the base of each row; extremity of fixed and movable fingers with one long and sharp denticle. Trichobothriotaxy, A- $\alpha$  (alpha) orthobothriotaxic (Vachon, 1974, 1975). Legs: tarsus with very numerous fine median setae ventrally. One conspicuous spinoid seta is observed on patella (segment IV) of legs II to IV. Pedal spurs reduced; tibial spurs absent.

**Relationships**. –The species of the genus *Pseudouroplectes* are generally similar in their morphologies. Their identification is globally possible based on patterns of coloration and pigmentation, associated to some other morphological details which are distinct.

In account of its very pale pattern of coloration the new species seems to be associated to *P. bettschi* and *P. pidgeoni*, however it can be distinguished by a number of features:

- (i) an extremely pale-yellow coloration, almost whitish without any spots on body and appendages,
- (ii) carapace with a marked granulation,
- (iii) all metasomal segments longer than wide,
- (iv) some more conspicuous spinoid granules on internal face of patella,
- (v) lateral carinae on tergite VII strong, forming serrulas,
- (vi) dorsal and latero-dorsal carinae on metasomal segments I to IV strong, forming almost serrulas-like structures.

**Morphometric values** (in mm) of male holotype of the new species and a male topotype of *P. pidgeoni*:

– *Total length* (including telson): 16.24/14.89.

– *Carapace*: length, 1.94/1.87; anterior width, 1.14/1.07; posterior width, 1.80/1.73.

– *Mesosoma*: 4.40/3.80.

– *Metasomal segments*

I: length, 1.14/1.00; width, 1.07/1.07.

II: length, 1.27/1.20; width, 0.94/0.94.

III: length, 1.47/1.34; width, 0.94/0.94.

IV: length, 1.74/1.54; width, 0.87/0.87.

V: length, 2.47/2.20; width, 0.87/0.87; depth, 0.79/0.80.

– *Telson*: length, 1.81/1.94.

– *Vesicle*: width, 0.67/0.60; depth, 0.54/0.54.

– *Pedipalp*

femur length, 1.54/1.40, width, 0.54/0.54;

patella length, 1.87/1.87, width, 0.74/0.67;

chela length, 2.54/2.54, width, 0.54/0.54, depth, 0.54/0.54;

– *Movable finger*: length, 1.81/1.74.

## Distributional pattern presented by the genus *Pseudouroplectes*

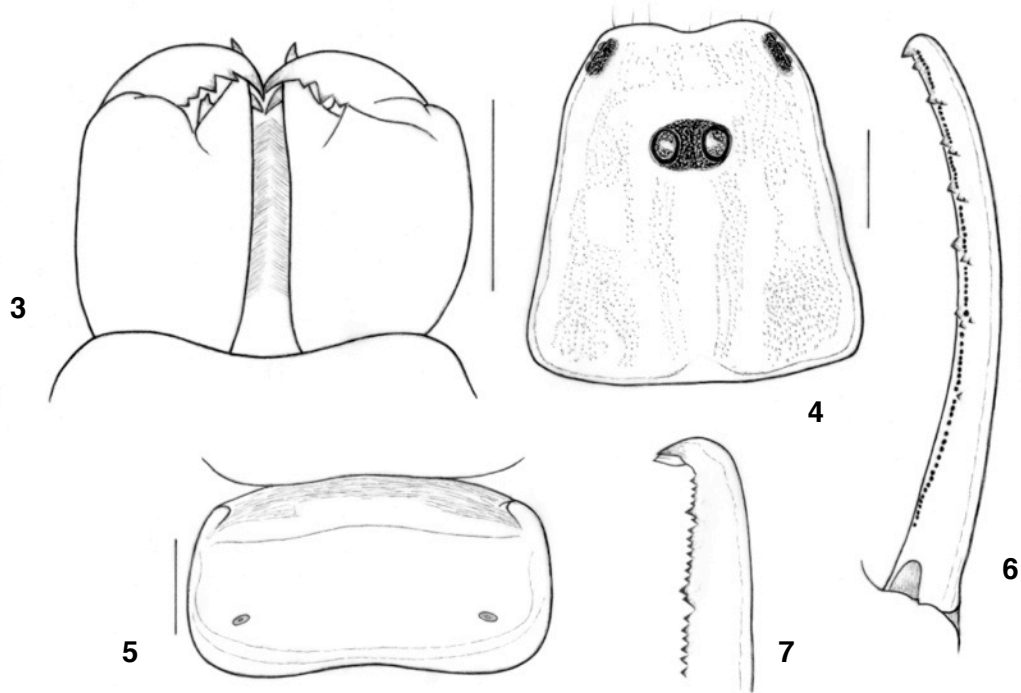
The distributional pattern of the genus *Pseudouroplectes* was already discussed in detail in the previous publications dealing with this group of scorpions (Lourenço & Goodman, 2006; Lourenço & Ythier, 2010; Lourenço et al., 2016). In these publications, precise lists of known localities concerning the species of this genus were proposed. Among the five previously described species of this genus, four are restricted to the extreme southern dry forest formations, while only one was discovered further north, in the western portion of the island. Two species, *Pseudouroplectes bettschi* and *Pseudouroplectes pidgeoni* apparently present a parapatric and even a small sympatric zone of distribution in the southern portion of the island. A similar situation is observed between *Pseudouroplectes maculatus* and *Pseudouroplectes lalyae*, since the two species present, at least, a limited zone of

### Key to the known species of *Pseudouroplectes*

1. Pale scorpions, yellowish to reddish-yellow, with or without spots ..... 2  
 — Dark scorpions with confluent blackish spots over the body and appendages ..... *P. maculatus*
2. Coloration yellowish without any spots; pectinal tooth count 14 to 20 ..... 3  
 — Coloration yellowish with reddish-brown confluent spots or two to four longitudinal reddish-brown stripes over the tergites ..... 4
3. Pectinal tooth count 18 to 20 ..... *P. betschi*  
 — Pectinal tooth count 14(?) to 17 ..... *P. jacki* sp. n.
4. Coloration yellow with reddish-brown confluent spots over the tergites; granulations strongly marked on carapace and tergites ..... *P. tsingy*  
 — Two to four longitudinal reddish-brown stripes over the tergites; granulations moderately to strongly marked on carapace and tergites ..... 5
5. Two longitudinal brownish stripes over the tergites; carapace, pedipalps and metasomal segments without spots ..... *P. pidgeoni*  
 — Four longitudinal brownish stripes over the tergites; carapace, pedipalps and metasomal segments strongly spotted ..... *P. lalyae*

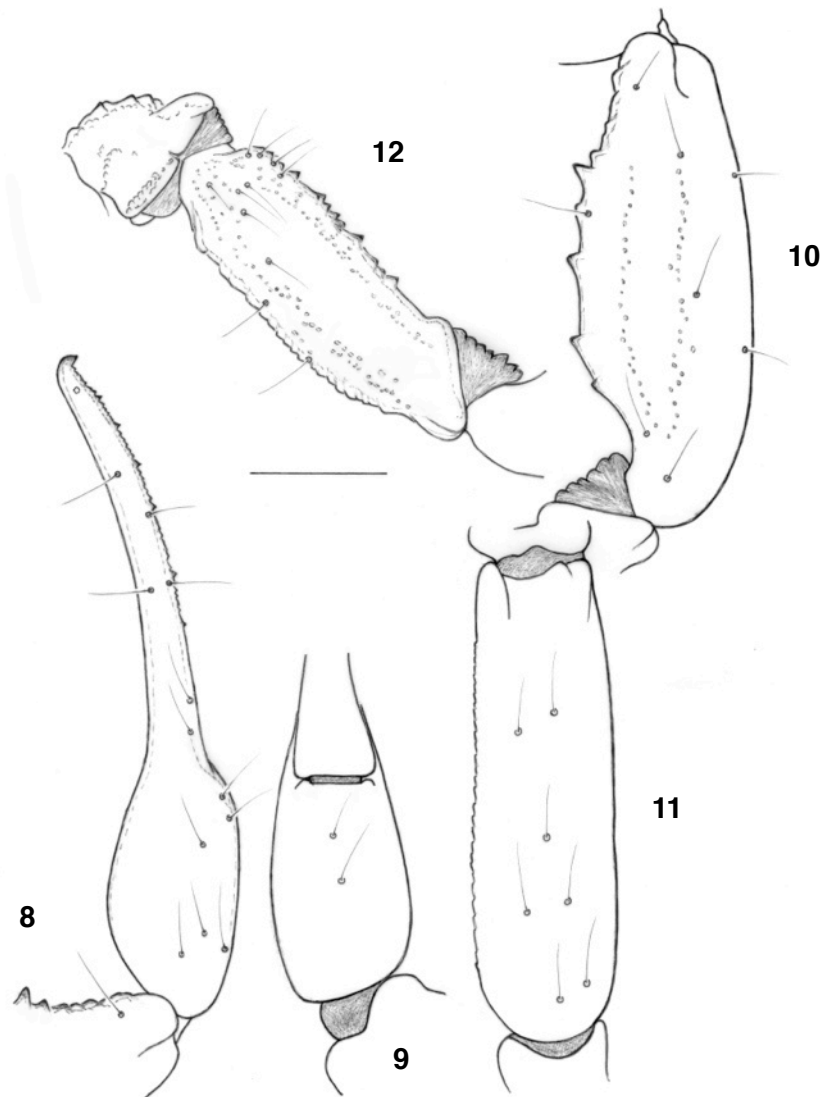


**Fig. 1-2.** *Pseudouroplectes jacki* sp. n., ♂ holotype. Habitus. 1. Dorsal aspect. 2. Ventral aspect.



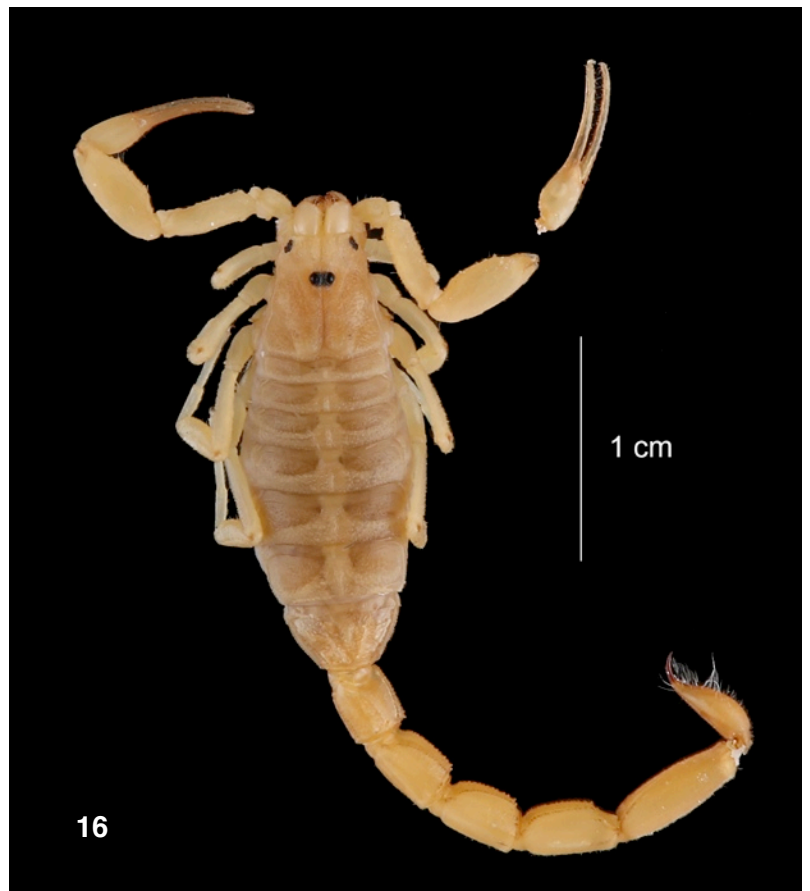
**Fig. 3-7.** *Pseudourolestes jacki* sp. n., ♂ holotype (scales = 0.5 mm).

3. Chelicerae, dorsal aspect. 4. Carapace, dorsal aspect. 5. Sternite V with spiracles. 6. Cutting edge of movable finger showing the characteristic granulation. 7. Extremity of same finger in detail.



**Fig. 8-12.** *Pseudourolestes jacki* sp. n., ♂ holotype. Trichobothrial pattern (scale = 0.5 mm).

8-9. Chela, dorso-external and ventral aspects. 10-11. Patella, dorsal and external aspects. 12. Femur, dorsal aspect.



**Fig. 13-16.** Habitus in dorsal aspect, showing pigmentation patterns.

13. *Pseudouroplectes pigeoni* (♂ topotype). 14. *Pseudouroplectes maculatus* (♀ paratype). 15. *Pseudouroplectes lalyae* (♂ holotype). 16. *Pseudouroplectes tsingy* (♀ holotype).

sympatry. This very restricted distribution could eventually be attributed to incomplete sampling collections, but a large portion of the southwestern region of the island was extensively prospected by several teams during the last 25 years. Consequently, a more plausible explanation can be searched in the recent past of the genus' evolution in respect to its modern distribution, but also taking into consideration the other groups of humicolous micro-scorpions of the islands, such as the species of the endemic family Microcharmidae. The new species described here confirms the distribution of the genus in western zone of Madagascar, and seems to suggest that this middle zone in the island represents a natural border in the area of distribution of this genus. The locality where the specimen of the new species has been collected could be the northern limit of the range for the entire genus, especially because no species of *Pseudouroplectes* has been discovered in parcs further north—Namoroka and Ankarafantsika—despite important and targeted inventories. The western fragmented dry forests where both *Microcharmus* and *Pseudouroplectes* species are encountered could actually hold the secret of the biogeography of these two groups of humicolous micro-scorpions. The total number of known species of *Pseudouroplectes* is now raised to six. A detailed analysis on the biogeography of humicolous micro-scorpions in Madagascar, as well as several aspects of what was then defined as the 'Neogrosphus rule' (Lourenço et al., 2015) are extensively presented in Lourenço et al. (2016). Readers can refer to this publication for precise details.

### Further considerations on the biogeography of humicolous micro-scorpions in Madagascar

As already discussed by Lourenço et al. (2016), the three genera of endemic humicolous micro-scorpions show distinct biogeographical features related to the pace and extent of environmental changes. With their extremely limited dispersal abilities at the time scale of scorpion evolution, the genus *Microcharmus* shows high species richness in the rapidly changing environment in northern Madagascar, while the monotypic *Neoprotobuthus* illustrates a relict population in the family Microcharmidae. The *Pseudouroplectes* have a littoral distribution along the driest region of southern Madagascar, with two relict populations in the western Madagascar: one is *Pseudouroplectes tsingy* and the second is the new species described here as *Pseudouroplectes jacki* sp. n. The extended distribution of the species in the genus *Microcharmus* in the most humid types of vegetation in northern Madagascar, together with the total absence of the genus *Pseudouroplectes* from the humid types of forest in south eastern Madagascar exemplifies the specialized features of the ancestor *Pseudouroplectes* vs. plasticity of the *Microcharmus* ancestor. This may be an explanation for the absence of humicolous micro-scorpions in the eastern humid forests. The Microcharmidae, as well as the genus *Pseudouroplectes* follow the 'Neogrosphus rule' (Lourenço et al., 2015) with a species richness related to dispersal ability and niche breath of the ancestral taxa in a changing environment. The 'Neogrosphus rule' does apply to scorpions but also to mobile species and does allow for biogeographic understanding at taxonomic higher levels.

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I am most grateful to Elise-Anne Leguin (MNHN, Paris) for the preparation of the scorpion photos which illustrate the different species treated (Fig. 1-2, 13-16); to Lily Arison René de Roland for providing the photo of Tsimembo dry forest (Fig. 18) and particularly to Lucienne Wilmé (Missouri Botanical Garden) for the preparation of the map (Fig. 17) and for the revision of previous versions of the text.

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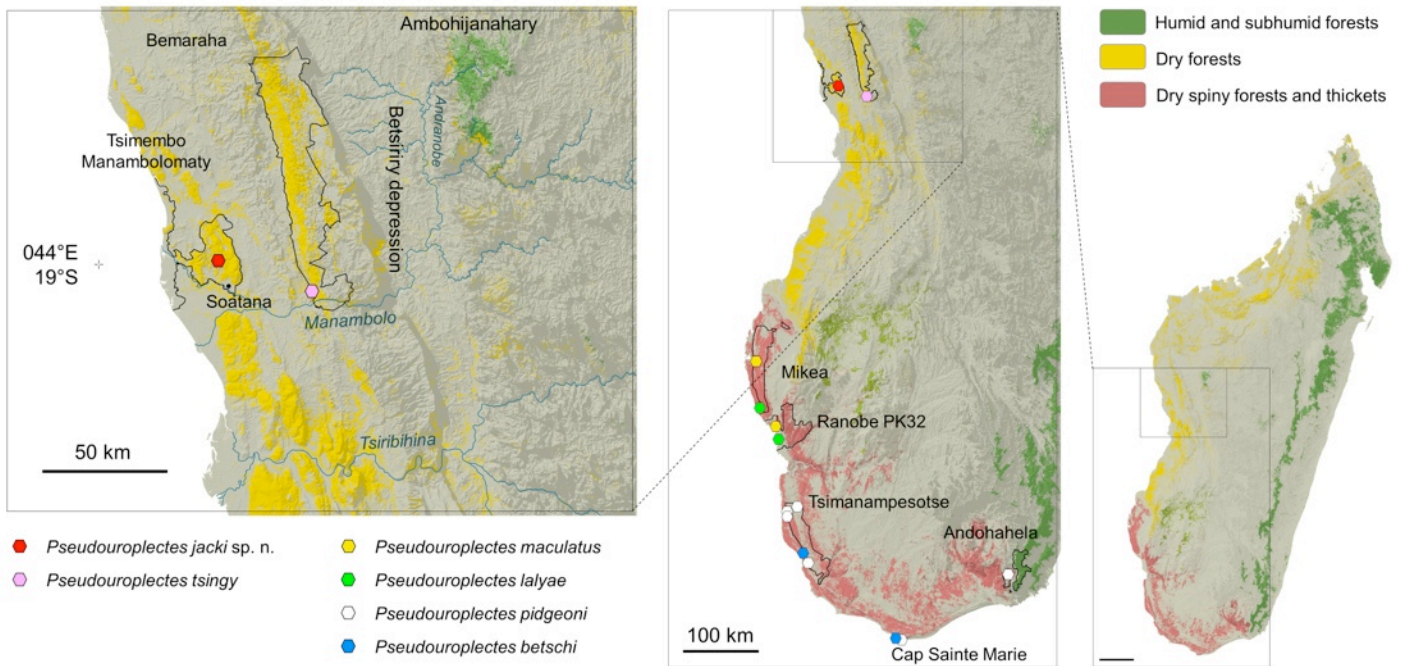


Fig. 17. Collection localities of *Pseudouroplectes* species in Madagascar.



Fig. 18. A general view of the Tsimembo dry forest in western Madagascar.

## Résumé

Lourenço W. R., 2021. – Encore une nouvelle espèce pour le genre malgache *Pseudouroplectes* Lourenço, 1995 (Scorpiones: Buthidae). *Faunitaxys*, 9(41) : 1 – 7.

Parmi les genres de scorpions malgaches, *Pseudouroplectes* Lourenço, 1995 demeure un des plus pauvres par le nombre d'espèces. Toutes les espèces sont extrêmement rares et connues par peu d'individus, voire un seul. Une nouvelle espèce est décrite des forêts sèches de Tsimembo dans la région Melaky confirmant ainsi la distribution du groupe vers le nord. Comme pour divers cas précédents, l'holotype a été collecté par extraction avec l'usage de la méthode Berlese. La description d'une nouvelle espèce confirme le modèle de distribution du genre *Pseudouroplectes* comme celle d'un élément typique des forêts sèches distribuées depuis le sud jusqu'au centre ouest de l'île.

Mots-clés. – Scorpion, Buthidae, nouvelle espèce, *Pseudouroplectes*, *jacki*, forêt de Tsimembo, Madagascar, répartition géographique, description.

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**Illustration de la couverture** : Characteristic morphology of metasomal segment V and telson of *Pseudouroplectes jacki* sp. n.

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