

A new species of *Opisthacanthus* Peters, 1861 (Scorpiones: Hormuridae) from the Parc National d'Andohahela, Madagascar

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(with 20 figures)

Abstract

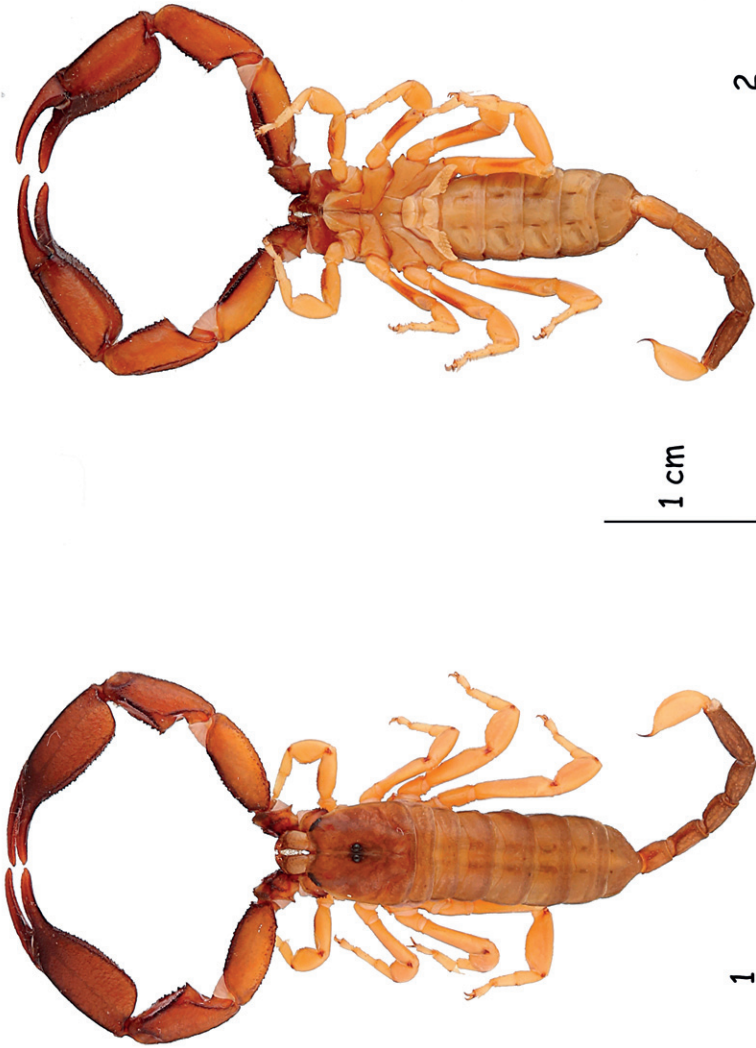
A new species, *Opisthacanthus andohahela* sp. n., is described from the Parc National d'Andohahela, Madagascar. The new species is a sibling species to *Opisthacanthus luciennae* Lourenço & Goodman, also known from the Parc National d'Andohahela. However, *O. luciennae* is exclusively found in spiny forest thickets whereas the new species was found in humid forests. The close relationship presented by the two species can suggest past ecological connexions between distinct parcels of Parc National d'Andohahela. The total number of *Opisthacanthus* species in Madagascar is now raised to eight.

K e y w o r d s: Scorpiones, new species, *Opisthacanthus*, sibling taxa, Madagascar.

Introduction

Scorpions of the genus *Opisthacanthus* Peters, 1861 have been the subject of several studies and revisions during the last three decades (Lourenço 1987, Lourenço & Fé 2003, Lourenço & Goodman 2006). Nevertheless, new discoveries are always possible, as in the case of the descriptions of new species for the subgenus *Monodopisthacanthus* Lourenço, 2001 from Madagascar (Lourenço 2001, Lourenço & Goodman 2006, 2008). For a precise historical account readers can refer to Lourenço and Goodman (2006, 2008).

The present study of new samples of hormurid scorpions of the genus *Opisthacanthus*, subgenus *Monodopisthacanthus* from Madagascar, has resulted in the discovery of one new species. These were collected from the extreme South-East of the Island, in the Parc National d'Andohahela, and are all related to *Opisthacanthus luciennae* Lourenço & Goodman, 2006, also known for the Parc National d'Andohahela. However, *O. luciennae* is exclusively found in spiny forest thickets (of the "Parcel 2": see Fig. 20) whereas the new species was found in humid forests (of the "Parcel 1"). Some comments on the known geographic distribution and the ecology of the Malagasy species of *Opisthacanthus* are included in the paper.



Figs 1-2. *Opisthacanthus luciennae* Lourenço & Goodman, male paratype, dorsal and ventral aspects.

The composition of the genus *Opisthacanthus* Peters, 1861

The classification given below takes into account the most recent taxonomic modifications proposed for the genus.

Subgenus *Opisthacanthus* Peters, 1861, with 3 species groups:

- I. *cayaporum* group, distributed in Tropical South America.
- II. *lepturus* group, distributed in Tropical South and Central Americas and on the Great Antilles.
- III. *lecomtei* group, distributed in Western Africa.

Subgenus *Nepabellus* Francke, 1974, with 5 species groups:

- I. *africanus* group, distributed in Southern, Western and Eastern Africa.
- II. *asper* group, distributed in Southern and Eastern Africa.
- III. *laevipes* group, distributed in Southern Africa
- IV. *rugulosus* group, distributed in Southern Africa.
- V. *validus* group, distributed in Southern Africa.

Subgenus *Monodopisthacanthus* Lourenço, 2001, with one species group:

- I. *madagascariensis* group, distributed in Madagascar, with eight species:

Opisthacanthus madagascariensis Kraepelin, 1894
Opisthacanthus lucienneae Lourenço & Goodman, 2006
Opisthacanthus maculatus Lourenço & Goodman, 2006
Opisthacanthus darainensis Lourenço & Goodman, 2006
Opisthacanthus piceus Lourenço & Goodman, 2006
Opisthacanthus milloti Lourenço & Goodman, 2008
Opisthacanthus pauliani Lourenço & Goodman, 2008
Opisthacanthus andohahela sp. n.

Methods

Illustrations and measurements were made with the aid of a Wild M5 stereomicroscope equipped with a drawing tube (camera lucida) and an ocular micrometer. Measurements follow Stahnke (1970) and are given in mm. Trichobothrial notations follow Vachon (1974) and morphological terminology mostly follows Hjelle (1990).

Taxonomic treatment

Opisthacanthus andohahela sp. n.
(Figs 5-19)

TYPE MATERIAL: Holotype (♂) and paratypes (5 ♀, 3 ♂). Madagascar, Toliara Province, Parc National d'Andohahela (Parcel 1), Forêt humide (rainforest), S Vohibaka, 560 m alt., X/1971 (J. M. Betsch – RCP 225). Holotype (♂) in MNHN. Paratypes: 2 ♀, 1 juv. ♂ in MNHN; ♀, 3 ♂, 1 juv. ♀ in ZMH.

MNHN = Muséum national d'Histoire naturelle, Paris.

ZMH = Zoologisches Museum Hamburg.



Figs 3-4. *Opisthacanthus lucienneae* Lourenço & Goodman, female paratype, dorsal and ventral aspects.

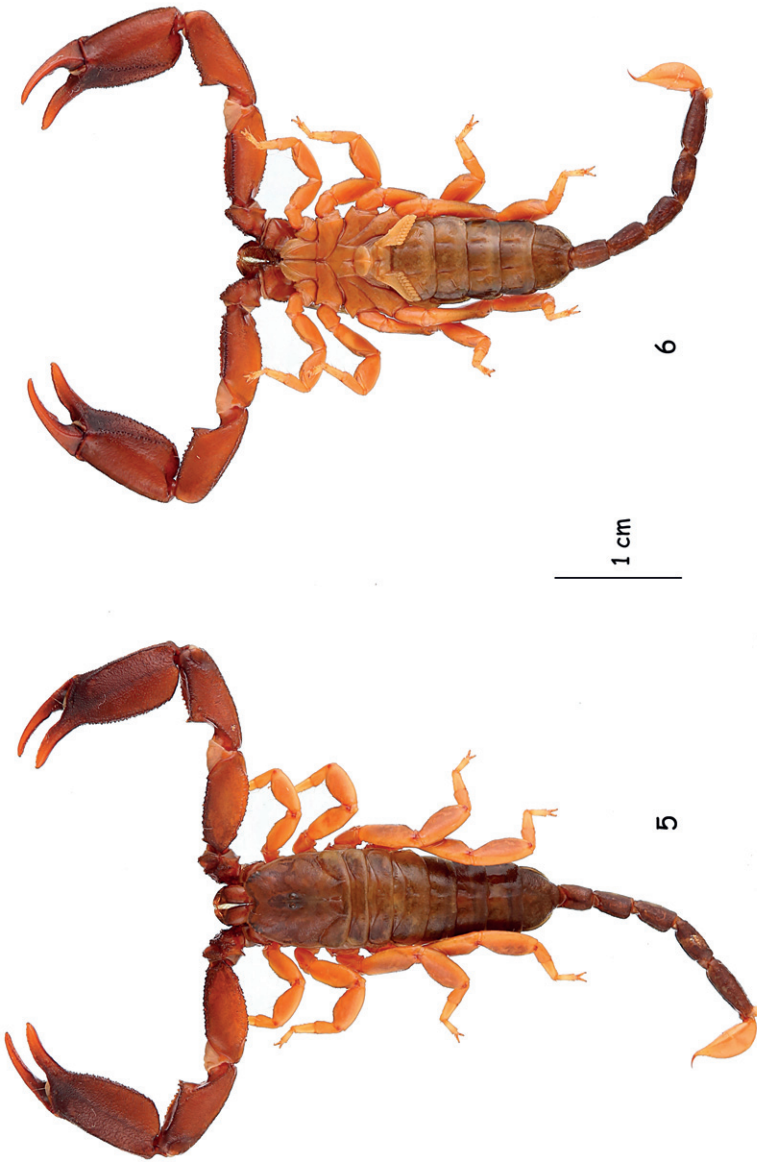
ETYMOLOGY: The specific name is a noun in apposition to the generic name and refers to the region where the new species was found.

DIAGNOSIS: Medium size scorpions, males 47 mm and females 56 mm in total length. Coloration reddish-yellow to reddish-brown, with some dark variegated zones on metasomal segments and chelicerae. Pectines with 8-9 teeth in males and 7-8 teeth in females, mode 8 in males and females. Hemispermatophore remains unknown; absent in both dissected adult males. Female genital operculum large and slightly heart-like shaped, with a minute incision in the base. Trichobothrial pattern of type C, orthobothriotaxy.

DESCRIPTION based on male holotype and paratypes.

C o l o r a t i o n. Basically reddish-yellow to reddish-brown with some dark variegated zones on the metasomal segments and chelicerae. **P r o s o m a:** Carapace reddish-brown with some dark variegated spots on male; median and lateral eyes surrounded with black pigment. Tergites yellow to reddish-yellow with vestigial dark variegated spots on male. Metasomal segments reddish-brown with dark variegated spots; vesicle yellow with a reddish lateral strip; aculeus dark reddish. Chelicerae reddish-yellow; base of fingers dark; the whole surface with diffuse variegated spots; fingers reddish-brown with reddish teeth. Pedipalps dark reddish to reddish-brown; most carinae blackish. Venter and sternites yellow to reddish-yellow; pectines and genital operculum paler than sternites, sternum and coxapophysis; legs yellow to reddish-yellow.

MORPHOLOGY. **C a r a p a c e** with some rare granulations and with punctation; almost smooth; furrows shallow. Anterior margin with a strong concavity reaching as far as the level of the 2rd lateral eye. Median ocular tubercle flattened and almost in the centre of the carapace; median eyes moderate, separated by a little less than one ocular diameter; three pairs of large lateral eyes. Sternum pentagonal, wider than long. Genital operculum formed by two semi-oval plates in males, and one single slightly heart-like shaped plate in females; with a minute incision in the base. Tergites with only a vestigial median carina, smooth and with punctuations. Pectinal tooth count 8-8 in male holotype (see diagnosis for variation in paratypes). Sternites smooth and shiny; VII acarinate with a few punctuations. **M e t a s o m a l** segments I to V longer than wide, with some thin but intense granulations. All carinae moderately marked in segments I-IV; segment V rounded with some weak spinoid granules on the ventral surface. All segments with moderate to weak chetotaxy. Telson with a pear-like shape; smooth and covered with strong chetotaxy. **P e d i p a l p s:** femur with dorsal internal, dorsal external, ventral internal and ventral external carinae strong, tuberculate; dorsal face with thin granulation; ventral face with minute granulation; internal face moderately granulose. Patella with internal and external faces weakly granulated; dorsal and ventral faces smooth and lustrous; dorsal internal, ventral internal, ventral external and external carinae moderate to strong; other carinae less well marked. Chela strongly granular excepted on ventral face; dorsal marginal, external secondary, ventrointernal and ventral median carina strong; other



Figs 5-6. *Opisthacanthus andohahela* sp. n, male holotype, dorsal and ventral aspects.

carinae less well marked. C h e l i c e r a e typical of Scorpioidea (Vachon 1963); teeth moderately sharp. Trichobothriotaxy type C; orthobothriotaxic (Vachon 1974). L e g s: tarsi with two lateral rows of spines, surrounded by a few long setae. Spurs moderate. Hemispermatophore unknown.

REMARKS: The new species can be distinguished from its sibling species, *O. lucienseae* (Figs 1-4) by the following characters: (i) bigger global size and distinct morphometric values (ii) a globally darker coloration, (iii) female genital operculum with a minute incision in the base. Moreover, both populations inhabit quite distinct habitats (see section on geographic distribution).

Table 1. Measurements (in mm) of holotype (♂) and paratype (♀) of *Opisthacanthus andohahela* sp. n., and holotype (♂) and paratype (♀) of *O. lucienseae* Lourenço & Goodman.

	<i>O. andohahela</i>		<i>O. lucienseae</i>	
	♂	♀	♂	♀
Total length*	47.0	55.8	40.7	48.2
Carapace:				
- length	7.8	8.7	6.8	7.5
- anterior width	4.6	5.5	4.4	4.8
- posterior width	7.7	8.6	6.6	7.2
Metasoma, segment I:				
- length	2.6	2.8	2.1	2.3
- width	1.9	2.2	1.7	1.9
Metasoma, segment V:				
- length	5.1	5.9	4.6	4.7
- width	1.4	1.8	1.3	1.4
- depth	1.7	1.7	1.4	1.5
Telson length	5.9	6.3	5.2	5.3
Vesicle:				
- width	2.1	1.8	1.7	1.7
- depth	2.2	2.2	2.0	2.0
Femur:				
- length	7.8	7.5	7.0	6.6
- width	3.4	3.4	2.8	2.9
Patella:				
- length	8.3	8.1	7.3	6.8
- width	3.5	3.8	2.6	2.7
Chela:				
- length	13.6	14.8	12.2	13.2
- width	5.0	6.3	3.9	5.1
- depth	2.6	3.9	2.5	3.2
Movable finger:				
- length	6.3	7.4	5.9	6.9

*including telson

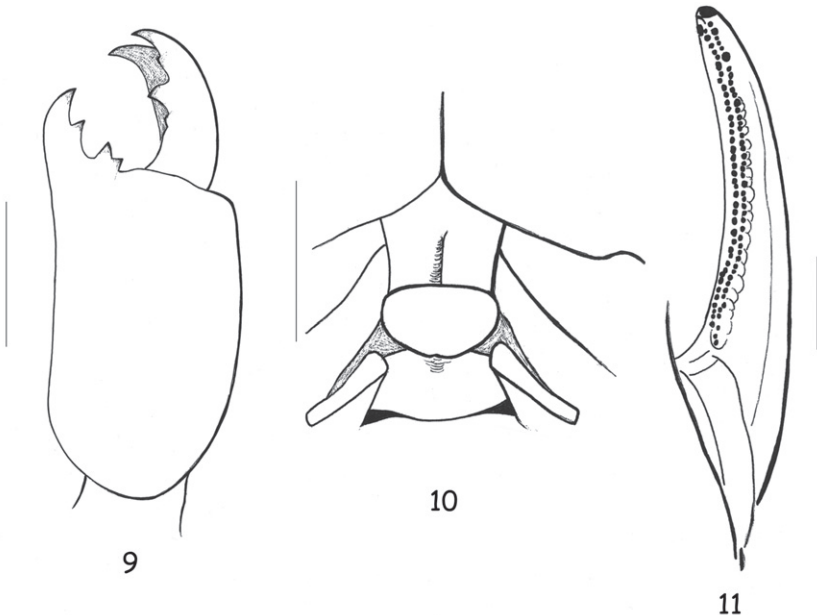


Figs 7-8. *Opisthacanthus andohahela* sp. n., female paratype, dorsal and ventral aspects.

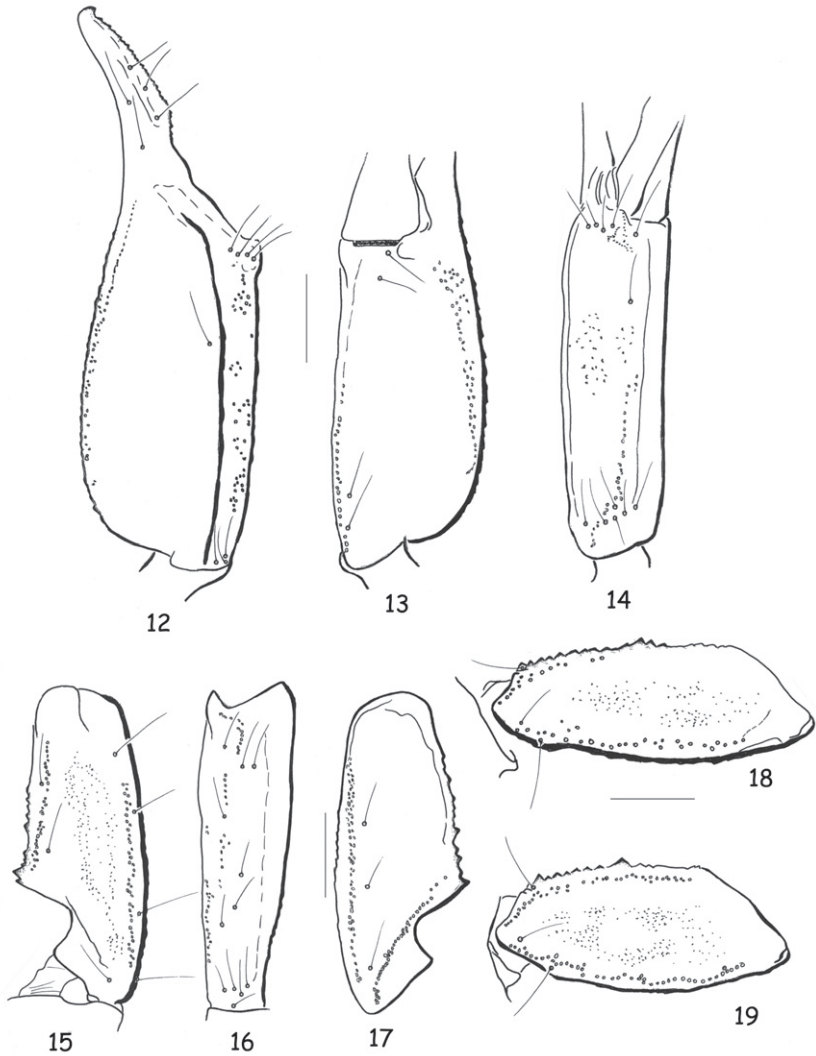
Ecological characteristics of the Parc National d'Andohahela

All major ecological aspects of the Parc National d'Andohahela are very precisely detailed by Goodman (1999a). A synthesis of the major aspects is presented here. Readers interested by all the detailed aspects of this National Park are encouraged to refer to Goodman (1999a,b).

As stated by Goodman (1999a), the Parc National d'Andohahela is located in a zone of dramatic ecotones between the humid eastern and the dry southern portions of the island. Much of the habitat diversity is represented in the Park, ranging from rain forests to subdesert spiny bush forest. This ecological situation is largely the result of the effect of the Anosyenne Mountains, which act as a rain barrier (Battistini 1964, Goodman *et al.* 1997). The abrupt shift in habitats is due to this north-south-aligned mountain chain. The eastern slopes of these ancient mountains are in a relatively short distance from the Indian Ocean coast, with their summital zone and higher ridges blocking the movement of rain-bearing clouds coming in from the east (Paulian *et al.* 1973, Goodman 1999a). The biological communities occurring on either side of this divide have little in common with one another.



Figs 9-11. *Opisthacanthus andohahela* sp. n. holotype ♂ (9,11) and paratype ♀ (10). **9.** Chelicera. **10.** Ventral aspect, showing sternum and the shape of the genital operculum plate. **11.** Cutting edge of movable finger, showing the two series of granulations (scale bars = 1 mm).



Figs 12-19. *Opisthacanthus andohahela* sp. n., trichobothrial pattern. Holotype ♂ (12-18), paratype ♀ (19). 12-14. Chela, dorso-external, ventral and external aspects. 15-17. Patella, dorsal, external and ventral aspects. 18-19. Femur, dorsal aspect (scale bars = 2 mm).

The Park, with a surface of 76,020 ha, is divided into three noncontiguous regions (= parcels) (Nicoll & Langrand 1989). "Parcel 1" is composed of humid forests on the eastern flank of the Anosyenne Mountains, "Parcel 2" of dry spiny forest and some degraded gallery forest along river margins to the west of the Anosyenne Mountains and, "Parcel 3" composed of transitional humid and dry forest located just to the west of the Anosyenne Mountains (Fig. 20). The abrupt ecotone between wet and dry across this zone gives rise to an extraordinary level of species turnover in the biotic communities over a distance of a few kilometres (Goodman 1999a).

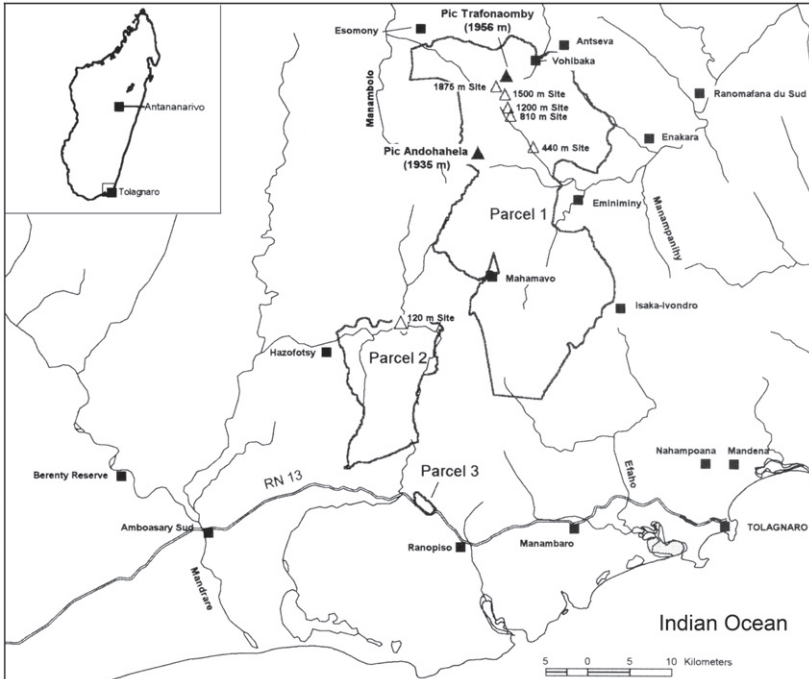


Fig. 20. Map of the Parc National d'Andohahela in southern-east Madagascar showing parcels 1 to 3 (modified from Goodman, 1999a).

The geographic distribution of Malagasy *Opisthacanthus*

The taxonomy of *Opisthacanthus madagascariensis*, remained unclear for a long time and, until the publication by Lourenço and Goodman (2006), the presence of one or two species (*cf. O. punctulatus*) was not precisely defined in Madagascar (Lourenço & Goodman 1999). A similar situation also prevailed for a long period of time for two *Opisthacanthus* species distributed

in the Neotropical region, namely *O. lepturus* (P. de Beauvois, 1805) and *O. elatus* (Gervais, 1844). Their status was finally clarified by Lourenço (1995).

O. madagascariensis is found in dry to semi-dry formations on the west coast of Madagascar, ranging from the Manongarivo to the South, with a possible natural limit nearby the region of the Onilahy River.

O. luciennae appears to have a parapatric distribution in relation to *O. madagascariensis*. Its distribution ranges from P.N. d'Andohahela over the extreme south and in part the south-west.

O. maculatus shows a sympatric distribution in relation to *O. madagascariensis*, but its range is limited to the west coast only, and much less extensive than that of *O. madagascariensis*.

O. darainensis looks to be another endemic species to the Daraina region and its nearby areas (Lourenço & Goodman, 2002).

O. piceus is only known from its type locality, and represents one of the two elements of the genus *Opisthacanthus* from Madagascar collected in a wet forest formation.

O. andohahela sp. n. is equally only known from its type locality, and represents the second element (together with *O. piceus*) of the genus *Opisthacanthus* from Madagascar collected in a wet forest formation.

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