©Zoologische Staatssammlung München/Verlag Friedrich Pfeil; download www.pfeil-verlag.de

SPIXIANA	33	2	281–288	München, November 2010	ISSN 0341–8391

Scolopendra antananarivoensis spec. nov. – a new species of *Scolopendra* Linnaeus, 1758 related to *Scolopendra morsitans* Linnaeus, 1758 from Madagascar

(Myriapoda, Chilopoda, Scolopendridae)

Christian Kronmüller

Kronmüller, C. 2010. *Scolopendra antananarivoensis* spec. nov. – a new species of *Scolopendra* Linnaeus, 1758 related to *Scolopendra morsitans* Linnaeus, 1758 from Madagascar (Myriapoda, Chilopoda, Scolopendridae). Spixiana 33(2): 281-288.

Scolopendra antananarivoensis spec. nov., a new species closely related to *Scolopendra morsitans* Linnaeus, 1758, is described from central Madagascar for the first time.

Christian Kronmüller, Lüssweg 35, 89233 Neu-Ulm, Germany;
e-mail: info@myriapoden.de

Introduction

According to earlier studies, the genus *Scolopendra* Linnaeus, 1758 comprises more than 90 valid species including the following species described from Madagascar:

Scolopendra morsitans Linnaeus, 1758
Scolopendra madagascariensis Attems, 1910
Scolopendra cingulata Latreille, 1829

Among these species, only *S. morsitans* remains proved to occur in Madagascar, while the other species are partly unclear. The occurrence of *S. cingulata* in Madagascar is doubtful (see http://chilobase.bio.unipd.it, Bonato et al. 2006). *S. madagascariensis* was described by Attems based only upon a single specimen (Attems 1910) and therefore Lewis doubts the existence of this species generally (Lewis 2010). In addition to the listed species, *Scolopendra valida* Lucas, 1840 once was sold as "great Madagascar centipede" in the pet trade some years ago, but has never been reported scientifically for Madagascar (see http://chilobase.bio.unipd.it).

Last year, together with other arthropods, three species of scolopendrid centipedes were imported by the b.t.b.e Insektenzucht GmbH incidentally:

Cormocephalus ferox Saussure & Zehntner, 1902
Scolopendra afer (Meinert, 1886)
Scolopendra antananarivoensis spec. nov.

While *C. ferox* is a common centipede in the area around Antananarivo, the capital of Madagascar, the species *S. afer* wasn't reported for Madagascar to date (see http://chilobase.bio.unipd.it). As the imported specimens are clearly identified as *S. afer*, the occurrence of this species in Madagascar is proven through my personal observations.

The third species, imported from Madagascar last year, first seemed to be *S. morsitans* but after thorough examinations it appeared to be a new species closely related to *S. morsitans* described here as *S. antananarivoensis* spec. nov.

The new species *S. antananarivoensis* was found by local collectors in the woodland 15 km in the south of Antananarivo, near the village Ambohijanaka and the river Ikopa. There it lives in the same habitat as *S. afer* and *C. ferox* between rotten leaves as well as under stones, stumps and burrowed in the root system of the plants.

©Zoologische Staatssammlung München/Verlag Friedrich Pfeil; download www.pfeil-verlag.de

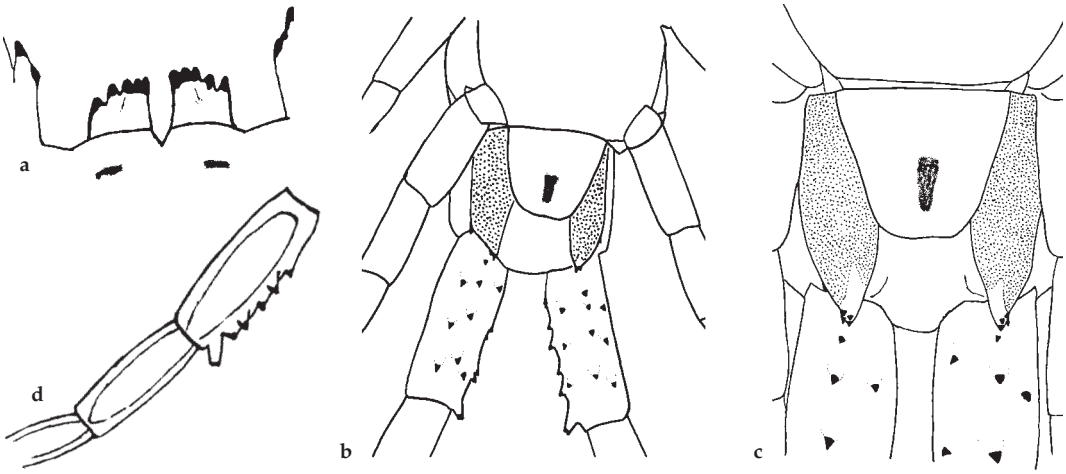

Fig. 1. **a.** Coxosternal and trochanterofemoral teeth. **b.** Endsternit with longitudinal depression and prefemur of ultimate legs. **c.** Coxopleural process and endsternit, ultimate legs with spines on broad swollen bases. **d.** Left ultimate leg of a male, dorsal view.

Methods

The examinations of the type material were made with the binoculars Bresser Advance ICD 10×–160× and Zeiss Stemi 4. The photos were shot with a Canon EOS 350d together with a Sigma 105 mm macro lens and a Canon EOS 5d together with a Canon 100 mm macro lens. The drawings were made with a 0.4 mm fineliner.

All types and the other living individuals of the new species, on which the description is based on, were sexed alive with the following method:

The centipedes got narcotized with CO_2 up to complete paralysis and turned into dorsal position. Thereafter the 20th sternit was slightly pressed with a toothpick or ball-pen until the genitals were pulled out. In this situation a macro photo was shot to do further examinations.

Taxonomy

Scolopendra antananarivoensis spec. nov.

Material examined. Holotype: adult female, Madagascar, Ambohijanaka (south of Antananarivo), November 2009, leg. Henry Djamal. – Paratype 1: adult female; paratype 2: adult male; paratype 3: adult female. Same collecting data as holotype for all paratypes.

The description of the new species is based on the holotype and 3 paratypes as well as some other living individuals from subadult to adult stages. The holotype and paratype 1 are deposited at the Zoologische Staatssammlung München (ZSM, Munich). The paratypes 2, 3 and the still living specimens remain in the author's collection. The type material is preserved in 70 % ethanol.

Diagnosis. Using the actual old world *Scolopendra* keys provided by Lewis (2010), the new species fits to *S. morsitans*, but differs in a longer, more slender coxopleural process as well as ventral prefemoral spines of the ultimate legs with broad swollen, cylindrical bases (Fig. 1c). The examined specimens mostly (7 of 11; one specimen obviously had two regenerated ultimate legs with irregular spine patterns on both sides) had at least one ultimate leg with three rows of spines ventrally with 3-4-3 spines (Fig. 1b) and 5 spines in two rows dorsally. The endsternit shows a longitudinal median depression (not a suture, see Figs 1b and 1c), which is absent in the comparatively observed *S. morsitans* from different locations.

Etymology. The name *S. antananarivoensis* spec. nov. is given because of the distribution near Antananarivo, the capital of Madagascar, where this species has been collected for the first time.

Description

Overview. *S. antananarivoensis* spec. nov. is a plump and compact looking species. The tergits are coloured from light brown-green with dark green bandings at the caudal side of the tergits and completely dark green (almost black) with considerably more bright green to yellow coloured locomotory legs. The antennae and the terminal legs are more greenish than the locomotory legs. The length from head capsule to last

©Zoologische Staatssammlung München/Verlag Friedrich Pfeil; download www.pfeil-verlag.de

Fig. 2. Habitat of *Scolopendra antananarivoensis* spec. nov. near Antananarivo, Madagascar (photo Hans-Werner Auer).

Fig. 3. *Scolopendra antananarivoensis* spec. nov., complete view.

©Zoologische Staatssammlung München/Verlag Friedrich Pfeil; download www.pfeil-verlag.de

Fig. 4. *Scolopendra antananarivoensis* spec. nov., male reproductive organs with clearly visible gonopods.

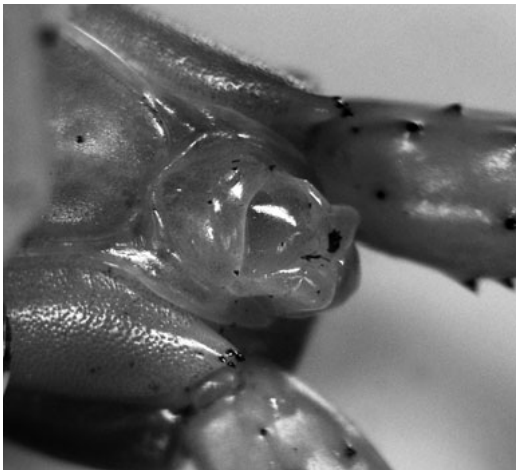

Fig. 5. *Scolopendra antananarivoensis* spec. nov., female repoductive organs.

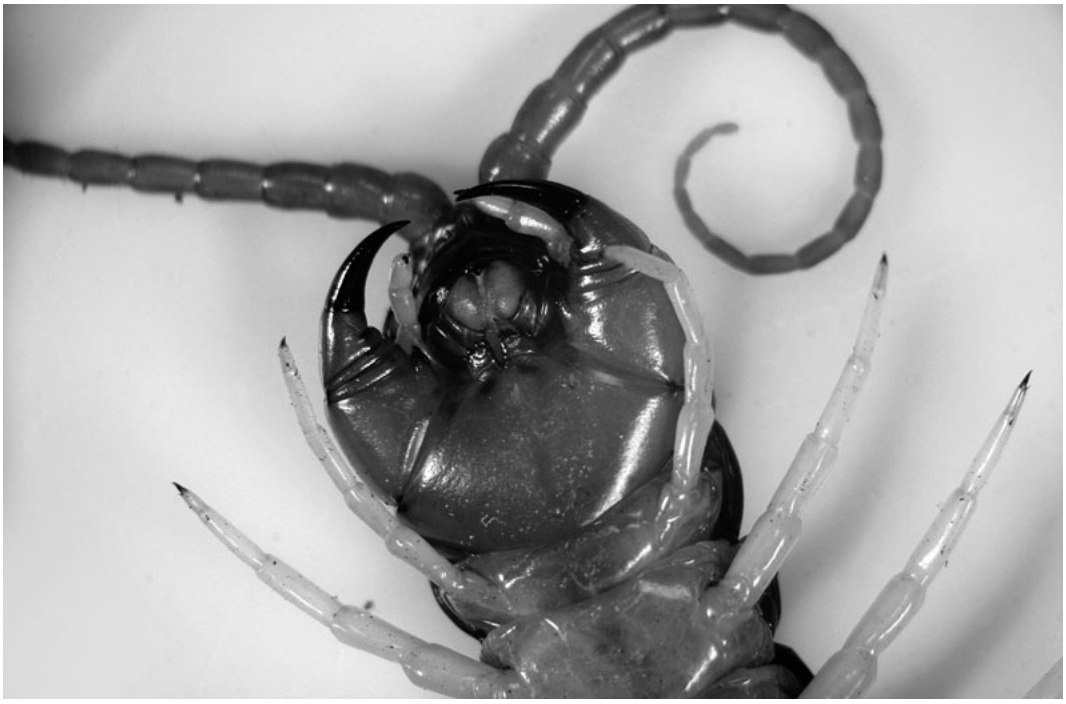

Fig. 6. *Scolopendra antananarivoensis* spec. nov., ventral view of the head and the first pairs of locomotory legs.

tergit is between 81-107 mm with a maximum tergit width of 9 mm (tergit 12 in the holotype).

Head. The head capsule is coloured green-brown, and is overlapping the first tergit. There are no visible sutures or ridges, but fine punctures at the cranial side of the head capsule which decrease caudally. In front of the head capsule the antennomeres emerge laterally ankled. The antennomeres have 18-22 articles, 5 to 6¼ of them are glabrous. On the ventral side the coxosternal toothplate has 5 teeth on each side. The lateral two teeth are well-defined, the 3

©Zoologische Staatssammlung München/Verlag Friedrich Pfeil; download www.pfeil-verlag.de

medial ones are grown together (Fig. 1a). Under the teeth on the coxosternal toothplate is a very small hairlike spine (in case the spine is missing, there is still a visible spot on the toothplate where the spine is normally inserted). The trochanteroprefemoral process has two clearly contrasted black-tipped teeth. The medial one is shorter and seems to be completely connected to the trochanteroprefemoral process, while the lateral one looks towered cranially.

Tergits. The tergits are brownish-green to dark green (nearly black). Margination is not a steady taxonomic parameter as it begins between 3rd and 14th tergit (in males from 3rd to 5th, in females from 7th to 14th), but then continues to the 21st tergit. In some specimens, the margination doesn't reach the proximal and distal borders of the tergits. The paramedian sutures begin at the 3rd tergit. The last tergit has a clearly visible median suture (in some specimens only the proximal part of the tergit), but no median depressure.

Sternites. The sternits are washy yellow. The sternits have two parallel paramedian sulci, which are sometimes hard to see and do not reach the distal and proximal border of the sternits and sometimes are missing in the last 2-3 sternits.

Endsternit and coxopleural process. The endsternit (sternit 21) reduces to the end and has a longitudinal medial depression (broader than a furrow or suture!). The coxopleural process is long and conically narrowed. The relation of the length of the endsternit to the coxopleural process is between 1 : 1.6 to 1 : 1.8. The coxopleural process ends in 5 black-tipped spines. In all specimens on each side one small side spine is found. The poreal zone nearly reaches the distal end of the process, as well as the proximal border just missing a small area near the caudal spine.

Legs. In contrast to the body the locomotory legs are yellow. All legs have two claw spurs, from 1st to 19th pair of legs, there is one tarsal spur. The 20th pair of legs normally has no tarsal spur, just in a few specimens on one side, a tarsal spur can be seen (4 of

Table 1. Taxonomical details of the type material. * antennomere with distinguishable injury and loss of segments.

	holotype female	paratype 1 female	paratype 2 male	paratype 3 female
teeth on coxosternal tooth plate	5/5	5/5	5/5	5/5
trochanteroprefemoral teeth (left/right)	2/2	2/2	2/2	2/2
segments of antennomere (left/right)	19/21	12*/22	19/22	18/18
glabrous antenna segments (left/right)	5⅓ / 5⅓	5¼ / 5	5¼ / 5	6¼ / 6¼
2 claw spurs on legs	1-21	1-21	1-21	1-21
tarsal spur on legs	1-19	1-19 tarsal spur on left 20th leg	1-19 tarsal spur on right 20th leg	1-19
spines on coxopleural process (left/right)	5/4	5/5	5/5	5/5
margination of tergits	12-21	3-21	7-21	10-21
length [mm] (cephalic plate to last tergit)	107	85	85	89
max. width [mm]	9	9	8	9
max width at tergit nr.	12	16	16	14
ultimate legs: prefemoral spines				
dorsal (left/right)	5/5	5/5	4/5	5/5
ventral (from ventral-lateral to ventral-medial)	left: 3-3-3 right: 3-4-3	left: 3-4-3 right: 3-4-2	left: 3-3-3 right: 3-4-3	left: 3-3-3 right: 3-4-3
spines at prefemor. corner spur (left/right)	4/4	4/4	4/4	4/4
characteristics				
endsternit	all observed specimens have a longitudinal depression on the endsternit			
ultimate legs, ventral spines	the bigger ventral spines of the ultimate legs grow out of broad swollen bases			
relation of the length of coxopleural process to the endsternit	1.68	1.80	1.55	1.59
tergit 21 – length to wide relation	1.33	1.37	1.08	1.20

©Zoologische Staatssammlung München/Verlag Friedrich Pfeil; download www.pfeil-verlag.de

the 11 observed specimens have one tarsal spur, no specimen has a tarsal spur of the 20th pair of legs on both sides).

Ultimate legs. The ultimate legs are washy yellow. The prefemurs have dorsally 5 spines (arranged in two rows and partly looking like growing out of one small ridge or bulge), ventrally from medial to lateral three rows with mostly 3-4-3 spines (11 specimens had been examined: 7 of them had at least 1 ultimate leg with the 3-4-3 pattern, 1 specimen had two regenerated ultimate legs with irregular patterns). As this taxonomical detail is relatively unsteady, the main point is that there are three rows of spines with altogether between 9 and 12 spines. The spines mostly have a cylindric broad base. The prefemoral corner spur ends in 4 spines (3 and/or 5 are seen rarely).

Discussion

The following details characterize the new species *S. antananarivoensis* as a member of the genus *Scolopendra* (order Scolopendromorpha, family Scolopendridae), as described by Attems (1930): It has 21 tergits with 21 pairs of legs. It has 4 ocelli on each side and the tarsi of the legs are two jointed. The spiracles in the pleural zone are at tergit 3, 5, 8, 10, 12, 14, 16, 18, 20 and have three-sectioned valves. The head capsule is overlapping the first tergit and the antennomeres emerge the head capsule in a lateral angle. The coxopleural process is completely covered with coxopleural pores except a small zone near the caudal spines and the teethplate on the coxosternite is shortbased.

The separation from the very similar species *S. morsitans* is made because of the endemic occurrence and some steady taxonomical features that appear in the new species.

Regarding the description of *S. morsitans* made by Attems (1930), which is the most complete one up to date and further descriptions made by Würmli (1974) and Lewis (2001), the new species *S. antananarivoensis* differs in having 5 to 6¼ glabrous antenna segments (*S. morsitans* 6-9), constantly 5 caudal spines on the coxopleural process and 1 side spine (*S. morsitans* 3-5, mostly 4 and 1 side spine), constantly 5 dorsal spines at the prefemur of the terminal legs (*S. morsitans* 4-6

Table 2. Taxonomic details of *S. antananarivoensis* spec. nov. in comparison with other members of the genus *Scolopendra* (Attems C., 1930).

	S. antananarivoensis spec. nov.	*S. morsitans*	*S. afer*	*S. madagascariensis*
teeth on coxosternal tooth plate (each side)	5	4-5	4	no data
trochantero-prefemoral teeth (each side)	2	1-2	no data	no data
segments of antennomere	(18) 19-22	18-21	17	19
glabrous antenna segments	5-6¼	6-7 (9)	5 (6-8)	5½
2 claw spurs on legs	1.-21.	1.-21.	1.-21.	no data
1 tarsal spur on legs	1.-19.	1.-19. (20.)	1.-19.	1.-19.
spines on coxopleural process	4 (and 1 side spine)	3-5 (partly 1 side spine)	2-3	3-4
margination of tergits	3. (13.)-21.	3.-21.	21.	20./21.
paramedian suture	2. (3.)-21.	2. (3.)-21.	no data	3.-20.
length [mm]	110	120	55	42
Terminal legs: prefemoral spines				
dorsal	5	4-6	2-3 (5)	5
ventral (v.-lateral to v.-medial)	mostly 3/4/3 (3 rows within more than 9 spines), spines have broad swollen looking bases	3/3/3 or others, often inordinated	7-10 in 3-4 rows	10-12
spines at prefemoral corner spur (each side)	long, slender conical, (3) 4	conical, (3) 4 (-8)	short, 1-2	2
	longitudinal depression on the endsternit			
distribution	Madagascar	Africa, Asia, introduced to many countries	Africa	Madagascar

©Zoologische Staatssammlung München/Verlag Friedrich Pfeil; download www.pfeil-verlag.de

in two rows), more than 9 spines (3-4-3 is the most common) ventrally located in 3 rows (*S. morsitans* 3-3-3 or more but in this case almost inordinate) and is sized only up to 110 mm (*S. morsitans* 120 mm). The most obvious difference is the atypical longer coxopleural process. Compared to *S. morsitans*, which has a relation of the endsternit to the coxopleural process from 1 : 1.2 to 1 : 1.5 in all examined *S. morsitans* specimens from different distributions, the new species has a relation between 1 : 1.6 to 1 : 1.8. Other distinctive characters are the dorsal situated bulge at the prefemur of the ultimate legs where the dorsal spines are situated as well as the swollen looking bases of the ventral spines (Lewis observed similar spines in some *S. morsitans* specimens from Zimbabwe and considered this as atypical for *S. morsitans*). Also not seen in any *S. morsitans* is the longitudinal depression of the endsternit, which occurs in every examined specimens of *S. antananarivoensis*.

Just as known in *S. morsitans* the new species has a sexual dimorphism in the structure of the terminal legs: in the male's terminal legs, prefemur, femur and tibia are dorsally flattened and have a very well noticeable ridge while the terminal legs of the females are of roundish shape or sometimes dorsally flattened but without any ridges (Fig. 1d). During the examinations, all individuals of the new species were sexed. Thereby the gender was determined by the existence of gonopods and a second genital sternit in the males and the absence of these characters in the females (see Figs 4 and 5, examinations made according to Radl 1993 and Iorio 2003). Comparing the visible sexual dimorphism seen in the shape of the ultimate legs with the sexual organs in all examined specimens of *S. antananarivoensis*, there is a 100 % correlation. This sure sexual dimorphism is another character that makes the new species seem to be closely related to *S. morsitans*.

As the description of *S. morsitans* is very inexactly and allows a wide range of variations within this currently existing species, the occurrence of *S. morsitans* in Madagascar must be proved by further examinations. Saussure and Zehntner (1901, 1902) described three new species that occur in Madagascar: *Scolopendra lineata* Saussure & Zehntner, 1902, *Scolopendra spinosella* Saussure & Zehntner, 1902, and *Scolopendra grandidieri* Saussure & Zehntner, 1902. Furthermore they reported another species in Madagascar: *Scolopendra angulipes* Newport et al., 1844. All four species were synonymized by Kraepelin (1903) *(S. lineata, S. spinosella, S. grandidieri)* and Kohlrausch (1881) *(S. angulipes)* to *S. morsitans*. As this fact shows the dubious state of *S. morsitans* especially in Madagascar, it should be taken into consideration, that the so far named *S. morsitans*, that occurs in Madagascar, in fact belongs to the new species *S. antananarivoensis*. To bring this into light, the centipede occurrence in Madagascar needs further examinations in future.

Acknowledgements

My special thanks go to my friends from b.t.b.e. Insektenzucht GmbH, especially Dipl.-Biol. Martin Thierer-Lutz, who provided the specimens, supported me with information, gave me important advice to write this manuscript and did the first proof-reading and editing. Many thanks to Dr. Eberhard Meyer for the first honest and constructive review of the text and the drawings. Special thanks also to Hans-Werner Auer who gave me important informations about the habitat and the area where the specimens were collected. Thanks to Dr. John G. E. Lewis, Dr. Rowland Shelley and Greg Edgecombe for the great phone and email correspondence. Thanks also to Prof. Dr. Roland Melzer, Stefan Friedrich and Dr. Jörg Spelda of the Zoologische Staatssammlung in Munich (ZSM), who admitted me friendly and supported me with great patience and endurance.

References

Attems, C. 1910. Myriopoden von Madagaskar den Comoren und den Inseln Ostafrikas. Pp. 73-115 in: Voeltzkow, A. (ed.). Reise in Ostafrika. Stuttgart (Schweizerbart'sche E. Nägele and Dr. Sproessner).

– – 1930. Myriapoda 2. Scolopendromorpha. Das Tierreich 54. 308 pp., Berlin and Leipzig (Walter de Gruyter & Co.).

Bonato, L., Chagas Junior, A., Dioguardi, R., Edgecombe, G., Lewis, J., Minelli, A., Pereira, L., Shelley, R., Stoev, P., Uliana, M., Zapparoli, M. 2006. Chilobase – a world catalogue of Centipedes (Chilopoda). World Wide Web electronic publication. http://chilobase.bio.unipd.it [accessed 12-Oct-2010].

Iorio, E. 2003. Morphologie externe des appareils génitaux mâle et femelle de la famille Scolopendridae (Chilopoda: Scolopendromorpha). Le Bulletin de Phyllie 16: 10-16.

Kohlrausch, E. 1881. Gattungen und Arten der Scolopendriden. Archiv für Naturgeschichte 47: 50-132.

Kraepelin, K. 1903. Revision der Scolopendriden. Jahrbuch der Hamburgischen Wissenschaftlichen Anstalten 20: 1-276.

Lewis, J. 2001. The scolopendrid centipedes in the collection of the National Museum of Natural History in Sofia (Chilopoda: Scolopendromorpha: Scolopendridae). Historia Naturalis Bulgarica 13: 5-51.

– – 2010. A key and annotated list of the *Scolopendra* species of the Old World with a reappraisal of *Arthrorhabdus* (Chilopoda: Scolopendromorpha: Scolopendridae). International Journal of Myriapodology 3: 83-122.

©Zoologische Staatssammlung München/Verlag Friedrich Pfeil; download www.pfeil-verlag.de

Radl, R. 1993. Über Lebenszyklus, Fortpflanzung und Brutpflege des Hundertfüsslers *Scolopendra cingulata* (Chilopoda, Scolopendromorpha). 120 pp., PhD thesis Universität Würzburg.

Saussure, H. de & Zehntner, L. 1901. Myriopoden aus Madagaskar und Zanzibar. Sonderabdruck aus den Abhandlungen der Senckenbergischen Naturforschenden Gesellschaft 26: 432.

– – & – – 1902. Histoire naturelle des myriapodes. Pp. 1-356 in: Grandidier, A. (ed.). Histoire physique naturelle et politique de Madagascar. Paris (L'Imprimerie Nationale)

Würmli, M. 1974. Systematische Kriterien in der Gruppe von *Scolopendra morsitans* Linné, 1758 (Chilopoda, Scolopendridae). Deutsche Entomologische Zeitschrift 22: 201-206.

ZOBODAT - www.zobodat.at

Zoologisch-Botanische Datenbank/Zoological-Botanical Database

Digitale Literatur/Digital Literature

Zeitschrift/Journal: Spixiana, Zeitschrift für Zoologie

Jahr/Year: 2010

Band/Volume: 033

Autor(en)/Author(s): Kronmüller Christian

Artikel/Article: Scolopendra antananarivoensis spec. nov. - a new species of Scolopendra LINNAEUS, 1758 related to Scolopendra morsitans LINNAEUS, 1758 from Madagascar (Myriapoda, Chilopoda, Scolopendridae) 281-288