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About the biology of *Steraspis infuscata* Théry and data on additional species of *Steraspis* collected in Benin (Coleoptera, Buprestidae)

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Abstract. – Four species of *Steraspis* Dejean, 1883, have been collected in the centre and the north of Benin in West Africa: *Steraspis fastuosa* Gerstaecker, 1871, *Steraspis infuscata* Théry, 1908, *Steraspis laetitia* Curletti, 2011, and *Steraspis modesta* Kerremans, 1895. One of the goals of these field observations was to increase the knowledge of the biology of these common but localized species. In May 2011, an adult of *S. infuscata* was discovered inside the taproot of a *Combretum collinum* Fresen. (Combretaceae) sapling. This well-developed adult was found seven centimeters below the soil surface and ready to emerge. Prior to pupation, the mature larva had cut along the bottom of the taproot, thus facilitating the emergence of the adult.

Résumé. – **A propos de la biologie de *Steraspis infuscata* Théry et des références sur d'autres espèces de *Steraspis* collectées au Bénin (Coleoptera, Buprestidae)**. Au Bénin, quatre espèces de *Steraspis* Dejean, 1883, ont été capturées dans le centre et le nord du pays : *Steraspis fastuosa* Gerstaecker, 1871, *Steraspis infuscata* Théry, 1908, *Steraspis laetitia* Curletti, 2011, et *Steraspis modesta* Kerremans, 1895. Une des finalités de ces observations était d'essayer de mieux connaître la biologie de ces espèces parfois communes mais souvent localisées. En mai 2011, nous avons eu la chance de trouver un adulte de *S. infuscata* dans le pivot d'un très jeune arbre de *Combretum collinum* Fresen. (Combretaceae). Parfaitement formé avec les élytres durcis, cet adulte était prêt à prendre son envol. Il était situé à sept centimètres au-dessous de la surface du sol. La larve avait découpé le haut de la racine principale, facilitant ainsi la sortie de l'adulte.

Keywords. – Buprestidae, *Steraspis*, biology, ecology, development, taproot, host plant, *Combretum*, Benin.

Steraspis are large species of buprestid beetles belonging to the subfamily Chrysochroinae, subtribe Eucallopistina (BELLAMY, 2008), most recently revised by CURLETTI (2009), with nearly all species restricted to habitats in sub-saharan Africa, while two [*Steraspis speciosa* (Klug, 1829) and *S. squamosa* (Klug, 1829)] are known from parts of North Africa and the Middle East. These beetles are difficult to catch during the warmth of the day because of their large eyes and excellent vision as they are highly alert and quickly fly when approached. The first goal of this project was to locate and identify host plant species. Moreover, trying to capture them during the day can be a real sport. For high trees a long-handled tropics net was usually needed. Beating the trees at dawn may be really profitable as they would more likely be too cold to escape.

Although many adults have been captured all over Africa, little is known about the biology of the species of *Steraspis* (CURLETTI, 2009), especially in West Africa; few data on their host plants are available. For instance, *Steraspis* (*Steraspis*) *speciosa* was recorded from *Acacia raddiana* Savi in desert areas of southern Morocco (MATEU, 1972). *S.* (*S.*) *squamosa* was recorded from *Tamarix gallica* L. in Israel (HALPERIN, 1976) and from *Tamarix spp*. in Egypt (HAGAG *et al.*, 1996). In Mauritania, we collected three specimens of *S. squamosa* on *Tamarix senegalensis* DC (R.I.M., Nouakchott: 25.XI.1987, JFV coll.). Another large species,

Steraspis ambigua (Fåhraeus, 1851) was collected at rest, mating and feeding on the leaves of *Combretum molle* R. Br. ex G. Don. and *Terminalia sericea* Burch ex DC (BELLAMY *et al.*, 1988) in South Africa. In Mauritania, we collected several specimens of *Steraspis speciosa* on *Acacia raddiana* in Trarza (R.I.M., Tiguent: 20.X.1987; 04.XI.1987, JFV coll.), and also on *Acacia nilotica* (L.) Willd. ex Del. in Gorgol (R.I.M., Maghama: 26.IX.1988, JFV coll.). The larval damage of *S. speciosa* and the emergence holes of adults were clearly visible on the main branches of these *Acacia* species.

In Benin, four species of *Steraspis* have been found: *Steraspis* (*Steraspis*) *fastuosa* Gerstaecker, 1871, *S.* (*Pissteras*) *infuscata* Théry, 1908, *S.* (*Pissteras*) *laetitia* Curletti, 2011, and *S.* (*Steraspis*) *modesta* Kerremans, 1895. The first three species were collected in the north (departments of Atacora, Borgou) and are widespread during the rainy season but not very numerous. The last one, collected in the center of Benin (department of Collines), is localized and scarce.

In Benin, nothing is known about the biology and the ecology of *Steraspis spp*. Looking for their larvae and their host plants was always a goal during the collecting trips in Benin for several years. In this note, we present a short list of *Steraspis* species captured with their localities, dates and tree species on which they were collected. Discovering their larval hosts remains one of the main goals.

MATERIAL AND METHODS

Field observations on* Steraspis *adults and their host feeding. – The first objective concerns an inventory of all tree species on which the *Sterapis* species can be found. In most cases these beetles eat, rest and mate sometimes on the same tree species. As in most of the northern sites, *S. infuscata* and *S. modesta* have been seen to eat and rest on trees of the family Combretaceae. So an inventory was taken in 2011 of all the *Combretum* and *Terminalia* species where *Steraspis* adults can be found.

Research of immature stages in the soil. – The second objective was to look for larvae and adults inside the prospective host species. During the year, the first *Steraspis* adults are usually captured in late May or early June according to the species. The last adults can be captured until mid-November. Thus, it is very important to conduct host species investigations prior to adult emergence in late May. Earlier this year, several days (11-13.V.2011) were spent investigating in the area of Tanguieta species of Combretaceae on which *S. infuscata* and *S. modesta* can be found. During these three days, we explored the branches and the trunk to be sure that larvae were not living in the upper part of the tree. As predicted, it was found that larvae develop in the lower part of the tree which resulted in the soil at the base of each tree species being excavated. While the goal was to investigate 100 trees per species per day, only 50 trees of each species per day were excavated (total of 200 trees per day).

RESULTS

Field observations on adults and their host feeding. – These beetles were captured on several trees species from the plant families Combretaceae (*Combretum*, *Terminalia*) and Fabaceae (*Acacia*). In the departments of Atacora (Tanguieta, Nanebou) and Borgou (Kika, Sirarou, Ina, N'Dali, Koroborou, Tchatchou, Papane), *Steraspis infuscata* was collected on four tree species: *Combretum collinum* Fresen. (fig. 1-2) near the mountain Atacora (fig. 3), *Combretum fragrans* F. Hoffm., *Terminalia albida* Sc. Elliot and *Terminalia avicennioides* Guill. & Perr.

In the departments of Atacora (Tanguieta, Nanebou) and Borgou (Kika, Kpessou-Samari, Bétérou, Ina, N'Dali, Komiguea, Koroborou, Thatchou, Papane), *Steraspis modesta* was collected on six tree species: *Combretum collinum, C. fragrans, C. micranthum, C. nigricans* Lepr. ex Guill. & Perr., *Terminalia albida* and *T. avicennioides* and *Steraspis fastuosa* was collected on one tree species: *Acacia hockii* De Wild.

Fig. 1-3. – 1-2, *Steraspis infuscata* Théry, 1908, on *Combretum collinum* Fresen. near Tanguieta (Atacora). – 3, Young *Combretum collinum* at the basis of the mountain Atacora.

In the department of Collines (Akofodioulé), *Steraspis laetitia* was only collected on one tree species: *Terminalia glaucescens* Planch.

On these trees, adults of *Steraspis* were observed resting, eating the leaves and also sometimes mating. A list of these captures is given (Table I).

Table I. – List of localities and dates for captures of *Steraspis spp*. in Benin (2005-2010).

Species	Climatic zone	Depart-ment	Locality	Date of capture	Trees on which they were captured	Family	Longitude	Latitude	Altitude (m)
Steraspis infuscata	Sudanian	Atacora	Tanguieta	27.VI.2010	*Combretum collinum*	Combretaceae	10°36'53"N	1°16'20"E	246
	Sudanian	Atacora	Tanguieta	27.V.2009	*Combretum collinum*	Combretaceae	10°36'53"N	1°16'20"E	246
	Sudanian	Atacora	Tanguieta	31.X.2009	*Combretum collinum*	Combretaceae	10°36'53"N	1°16'20"E	246
	Sudanian	Atacora	Tanguieta	28.VII.2007	*Combretum fragrans*	Combretaceae	10°36'53"N	1°16'20"E	246
	Sudanian	Atacora	Nanebou	1.VIII.2009	*Combretum collinum*	Combretaceae	10°59'48"N	1°31'52"E	257
	Sudano-Guinean	Borgou	Kika	25.VI.2006	*Terminalia albida*	Combretaceae	9°23'17"N	2°07'13"E	371
	Sudano-Guinean	Borgou	Kika	16.VIII.2005	*Combretum collinum*	Combretaceae	9°23'13"N	2°07'15"E	371
	Sudano-Guinean	Borgou	Sirarou	9.VIII.2006	*Combretum collinum*	Combretaceae	9°50'34"N	2°59'01"E	353
	Sudano-Guinean	Borgou	Sirarou	9.VIII.2006	*Terminalia albida*	Combretaceae	9°50'34"N	2°59'01"E	353
	Sudano-Guinean	Borgou	Ina	8.VIII.2006	*Combretum collinum*	Combretaceae	9°59'39"N	2°52'48"E	388
	Sudano-Guinean	Borgou	N'Dali	8.VIII.2006	*Combretum fragrans*	Combretaceae	9°55'50"N	2°57'19"E	390
	Sudano-Guinean	Borgou	Koroborou	10.VII.2006	*Combretum collinum*	Combretaceae	9°17'41"N	2°57'08"E	362
	Sudano-Guinean	Borgou	Koroborou	10.VII.2006	*Terminalia albida*	Combretaceae	9°17'41"N	2°57'08"E	362
	Sudano-Guinean	Borgou	Tchatchou	25.VI.2006	*Terminalia avicennioides*	Combretaceae	9°16'00"N	2°55'10"E	365
	Sudano-Guinean	Borgou	Papane	9.VII.2006	*Terminalia avicennioides*	Combretaceae	8°42'03"N	2°58'20"E	350
	Sudano-Guinean	Borgou	Papane	16.VII.2006	*Combretum collinum*	Combretaceae	8°42'19"N	2°59'10"E	350
	Sudano-Guinean	Borgou	Papane	9.VII.2006	*Combretum collinum*	Combretaceae	8°42'03"N	2°58'20"E	350
S. modesta	Sudanian	Atacora	Tanguieta	31.X.2009	*Combretum collinum*	Combretaceae	10°36'53"N	1°16'20"E	246
	Sudanian	Atacora	Tanguieta	31.X.2009	*Combretum fragrans*	Combretaceae	10°36'53"N	1°16'20"E	246
	Sudanian	Atacora	Nanebou	31.X.20009	*Combretum collinum*	Combretaceae	10°59'50"N	1°31'52"E	257
	Sudano-Guinean	Borgou	Kika	16.VIII.2005	*Combretum collinum*	Combretaceae	9°23'13"N	2°07'15"E	371
	Sudano-Guinean	Borgou	Kika	25.VI.2006	*Terminalia albida*	Combretaceae	9°23'17"N	2°07'13"E	371
	Sudano-Guinean	Borgou	Kpessou-Samari	13.VII.2006	*Combretum collinum*	Combretaceae	9°30'00"N	2°17'31"E	380
	Sudano-Guinean	Borgou	Bétérou	25.VI.2006	*Combretum micranthum*	Combretaceae	9°17'14"N	2°27'18"E	363
	Sudano-Guinean	Borgou	Ina	8.VIII.2006	*Terminalia albida*	Combretaceae	9°59'39"N	2°52'48"E	387
	Sudano-Guinean	Borgou	Ina	8.VIII.2006	*Combretum collinum*	Combretaceae	9°59'39"N	2°52'48"E	387
	Sudano-Guinean	Borgou	N'Dali	24.VII.2008	*Terminalia avicennioides*	Combretaceae	9°55'51"N	2°57'07"E	390
	Sudano-Guinean	Borgou	Komiguea	25.VII.2007	*Combretum nigricans*	Combretaceae	9°23'16"N	2°59'43"E	370
	Sudano-Guinean	Borgou	Koroborou	10.VII.2006	*Combretum collinum*	Combretaceae	9°17'01"N	2°07'08"E	362

	Sudano-Guinean	Borgou	Tchatchou	24.VII.2008	*Terminalia avicennioides*	Combretaceae	9°16'00"N	2°55'03"E	365
	Sudano-Guinean	Borgou	Papane	16.VII.2006	*Combretum collinum*	Combretaceae	8°42'19"N	2°59'10"E	350
	Sudano-Guinean	Borgou	Papane	9.VII.2006	*Terminalia avicennioides*	Combretaceae	8°42'03"N	2°58'20"E	350
S. fastuosa	Sudanian	Atacora	Tanguieta	15.X.2010	*Acacia hockii*	Fabaceae	10°36'53"N	1°16'20"E	246
	Sudanian	Atacora	Tanguieta	15.VIII.2010	*Acacia hockii*	Fabaceae	10°36'53"N	1°16'20"E	246
	Sudanian	Atacora	Tanguieta	1.XI.2009	*Acacia hockii*	Fabaceae	10°36'53"N	1°16'20"E	246
	Sudanian	Atacora	Tanguieta	1.VIII.2009	*Acacia hockii*	Fabaceae	10°36'53"N	1°16'20"E	246
	Sudanian	Atacora	Tanguieta	26.IX.2007	*Acacia hockii*	Fabaceae	10°36'53"N	1°16'20"E	246
	Sudanian	Atacora	Nanebou	26.IX.2007	*Acacia hockii*	Fabaceae	10°59'50"N	1°31'52"E	257
S. laetitia	Guinean	Collines	Akofo-dioulé	16.V.2011	*Terminalia glaucescens*	Combretaceae	7°55'27"N	2°17'34"E	196

Research of immature stages in the soil. – A number of trees were targeted for the excavation of soil at their base to allow the roots and lower trunk of each tree to be stripped. During this work, many insects were found belonging to other beetle families including: Bostrichidae, Carabidae, Cerambycidae, Elateridae and Scarabaeidae.

Much of this exploratory work took place at several sites near Tanguieta, and yet the only positive record was from a sapling of *Combretum collinum* (fig. 4) just before mid-May 2011 (14.V.2011). This young tree showed some symptoms of physiological stress with a few yellow leaves, yet no gallery or damage on the stems was observed. It was surprising to see that the *C. collinum* sapling hosted an imago of *Steraspis infuscata* (fig. 4), ready to emerge. The specimen was within the pupal chamber in the entirely hollowed-out taproot (fig. 5). The gallery was 20 cm long and the pupal chamber got about 5 cm. It was noted that the larva had opened the upper part (fig. 5) of the taproot, thus facilitating the emergence of the adult. After leaving the top of the taproot through this window, the adult beetle had only to cross about 4 cm of soil before reaching the surface. As this adult was completely developed and likely only awaiting an emergence cue, it was good fortune to capture it. After searching for some *Steraspis* larvae in the soil and/or lower trunk of the trees, a live adult was found inside the taproot of a young tree.

Fig. 4-5. – 4, Young *Combretum collinum* Fresen. with taproot infested by *Steraspis infuscata* Théry, 1908. – 5, Living adult of *Steraspis infuscata* in the taproot of *Combretum collinum.*

DISCUSSION

Few data about the specificity of tropical xylophagous beetles towards forest trees and more generally tropical woody plants are available. About forest trees of tropical areas, one well-known study was done in South America (TAVAKILIAN *et al.*, 1997). Among other results, it showed that a high proportion of species was closely specific to a plant genus or family. Here, this is the case with the specificity of these two species of black *Steraspis* (*S. infuscata* and *S. modesta*) to the family Combretaceae. This is also the case with another genus of buprestid, *Evides* Dejean, 1833, in relation with the plant family Anacardiaceae. For instance, the host tree of *Evides pubiventris* (Laporte & Gory, 1835) is *Lannea discolor* (Sonder) Engl. in South Africa (MACFADYEN *et al.*, 2007) and the host tree of *Evides intermedia* Saunders, 1874, is *Lannea acida* A. Rich., in Benin (Kika, Kpessou-Samary: 23.VI.2007, JFV coll.).

In West Africa, the main data about the specificity of xylophagous beetles are provided by DUFFY's synthesis (1980) and by WAGNER *et al.* (1991). Fourty years ago, a masterpiece was published by MATEU (1972) on the xylophagous study on different trophic levels associated with Saharo-sahelian *Acacia* species. The biology of *Steraspis speciosa* is described therein and shows that the egg is deposited on the top of a branch of *Acacia raddiana*. After emergence, the larvae work their way down inside the branch with visible damage (MATEU, 1972). *S. speciosa* is a primary xylophagous beetle which can inflict serious damage to *Acacia* trees (MATEU, 1972). This species is quite widespread throughout the Sahara and also common in sahelian zones from western to eastern Africa (DESCARPENTRIES, 1976).

In West Africa, the few data we have shown that:

– *S. speciosa* lives inside the branches and/or trunk of *Acacia spp*.;

– *S. squamosa* lives inside the branches-trunk of *Tamarix senegalensis* DC.

But for many other West African species of *Sterapis*, their host-trees are yet to be determined. So, our observation seems to be the first one of a *Steraspis* species living below the soil surface until emergence. In the future, confirmation of this biological trait of *S. infuscata* in the *C. collinum* taproot will be sought and while finding the host trees of *S. modesta* and *S. fastuosa* in the same locality is continued.

Many xylophagous beetles are good flyers showing high dispersal capacity in the habitat. Dispersion behavior seems conditioned by the necessity of having good oviposition sites for future generations but also for nutritional needs (MATEU, 1972; HANKS, 1999). According to HANKS (1999), if the same woody plant can harbor the larva and is also eaten by the adult, then the xylophagous species is more sedentary. In fact, we could have sedentary populations of good flyers of *S. infuscata* in Tanguieta where *C. collinum* is quite common.

Generally, adults of xylophagous beetles are highly attracted by allelochemical compounds emitted by trees under physiological stress (ALLISON *et al.*, 2004). This may be the case with *Steraspis infuscata* because this little, stunted tree demonstrated an external sign of weakness (*i. e.* yellow leaves). By the way the larvae of *Steraspis* can also reinforce this statement. These plant symptoms could be used in the future to select the target trees with more effectiveness. Other field experiments at different times of the year could yield interesting data on larval development. After this preliminary study the discovery of the larval stages may occur and therefore yield a more complete life-cycle of this species as well as the other *Steraspis* species from Benin.

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Thierry DEUVE. – **Deux nouvelles *Crepidogaster* Boheman, 1848, de Sri Lanka et de l'Inde (Col., Caraboidea, Brachinidae)**

Au sein des Brachinidae, les Crepidogastrini forment une tribu "gondwanienne" essentiellement répandue en Afrique et à Madagascar, mais avec une unique espèce décrite de l'Inde (CHAUDOIR, 1876) et une autre de Sri Lanka (DUPUIS, 1914). Une clé d'identification des espèces africaines a été donnée par BASILEWSKY (1988) et une clé des espèces malgaches par DEUVE (2005).

Ces espèces sont généralement rarissimes dans les collections et la plupart ne sont connues que par un exemplaire isolé ou tout au plus quelques unités. Dans ces conditions, la quasi-absence de ces insectes en Inde et à Sri Lanka est probablement liée à une carence de prospections.

Les découvertes d'une autre espèce à Sri Lanka et d'une autre en Inde s'avèrent donc remarquables, d'autant qu'elles sont très proches morphologiquement l'une de l'autre et se distinguent peu des taxons malgaches.

Crepidogaster ceylanica n. sp. (fig. 1)

HOLOTYPE : ♀, Sri Lanka, Nuwara Eliya (*E. Bugnion*, 2.III.1907), *in* coll. Muséum national d'Histoire naturelle, Paris (MNHN).

Description. – Longueur : 6,0 mm (jusqu'à l'apex de l'abdomen) ou 5,0 mm (jusqu'à l'apex des élytres). Coloris brun sombre mat, le clypéo-front et les appendices éclaircis, plus ou moins testacés, les tibias cependant rembrunis. Tégument pubescent et fortement alutacé, les mailles isodiamétriques.

Tête épaisse, arrondie, la constriction collaire non marquée, les yeux peu convexes, non vraiment saillants. Front aplani mais sans fossettes distinctes. Labre octochète, à marge antérieure non incurvée.

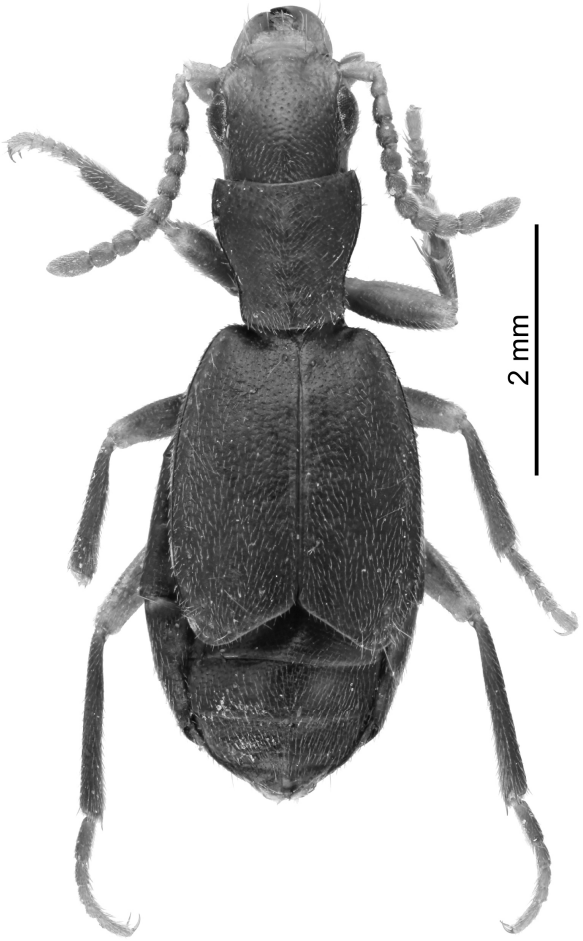

Fig. 1. – *Crepidogaster ceylanica* n. sp., holotype.

Mandibules courtes mais robustes, striées, le scrobe avec une soie principale à l'avant, mais d'autres, secondaires et petites, en marges. Dernier article des palpes globuleux et pubescent. Antennes courtes, le 3e article plus court que le scape mais plus long que le 4e ; celui-ci plus long que le 2e.

Pronotum aussi long que large, sa plus grande largeur au sixième antérieur, bien rétréci en arrière, les côtés faiblement arrondis, puis longuement sinués en arrière avant les angles postérieurs qui sont subdroits, un peu obtus et arrondis. Angles antérieurs aigus et vifs. Disque modérément mais régulièrement convexe, le sillon médian fin, estompé en avant, les fossettes et les gouttières indistinctes, les marges avec seulement un fin rebord saillant. De chaque côté (nonobstant la pubescence) : une soie médiane vers le quart antérieur ; une soie basale au quart postérieur et donc éloignée de la base.

Elytres courts, obliquement tronqués, le pli épipleural atténué en arrière, mais cependant distinct jusqu'à l'angle latéro-postérieur ; celui-ci largement arrondi. Deux séries ombiliquées marginales, assez irrégulières. Disque modérément convexe, la striation complètement effacée. Soie basale à peine plus éloignée du scutellum que de la suture.

Caractères diagnostiques. – De prime abord, cette espèce ressemble beaucoup à *Crepidogaster peyrierasi* Deuve & Mateu, 1986, décrite de Madagascar dans le massif de l'Ankaratra, mais les appendices sont plus sombres, les yeux moins convexes, le 3e article des antennes plus court, les élytres avec le pli épipleural distinct jusqu'à l'apex. Ces différences apparaissent étonnamment faibles pour deux espèces si éloignées géographiquement.

L'autre espèce connue de Sri Lanka, *C. horni* Dupuis, 1914, est en revanche très différente : beaucoup plus petite (4,5 mm), la teinte bicolore délavée de brun et de jaune, le pronotum plus transverse, 1,35 fois plus large que long, les élytres avec des traces de costulations.

Crepidogaster indica n. sp.

HOLOTYPE : ♀, Inde, Madura, Shembaganur, *ex* coll. Ch. Alluaud, *in* coll. MNHN.

Diagnose. – Longueur : 6,0 mm (jusqu'à l'apex de l'abdomen) ou 5,3 mm (jusqu'à l'apex des élytres). Mêmes caractères que l'espèce précédente, seulement le pronotum plus transverse, 1,17 fois plus large que long, et les élytres au contraire nettement plus allongés.

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