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A TAXONOMIC REVIEW OF *STACHYOTIS* (LEPIDOPTERA: YPONOMEUTOIDEA: PLUTELLIDAE) WITH DESCRIPTION OF A NEW SPECIES FROM CHINA

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ABSTRACT

The genus *Stachyotis* (Lepidoptera, Yponomeutoidea, Plutellidae) is reviewed by re-description of the type species, *Stachyotis epichrysa* Meyrick from Sri Lanka and description of a new species, *S. chunshengwui* **sp. nov.** from China. These 2 congeners are distinguished from each other in their forewing patterns and male genitalia. The diagnostic features of *Stachyotis* are proposed from the forewing venation, structures of the second sternite and the tergites, and the male genitalia. A possible association of *Stachyotis* and *Orthenches*-group is discussed.

Key Words: China, *Orthenches*-group, Plutellidae, Sri Lanka, *Stachyotis chunshengwui* **n. sp.**, Yponomeutoidea

RESUMEN

Se revise el género *Stachyotis* (Lepidoptera, Yponomeutoidea, Plutellidae) con la re-descripción de la especie tipo, *Stachyotis epichrysa* Meyrick de Sri Lanka y la descripción de una nueva especie, *S. chunshengwui* **sp. nov.** de China. Estos 2 congéneres se distinguen por el patrón de las alas anteriores y la genitalia del macho. Se provee características diagnósticas de *Stachyotis* para la venación de las alas anteriores, la estructura del segundo esternito y los tergitos y la genitalia masculina. Se discute una posible asociación de *Stachyotis* y el grupo *Orthenches*.

Palabras Clave: China, grupo *Orthenches*, Plutellidae, Sri Lanka, *Stachyotis chunshengwui* **n. sp**., Yponomeutoidea

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The genus *Stachyotis* was originally described in Plutellidae by Meyrick (1905). Since then, the systematic position of the genus has not been revised. Kyrki (1984) characterized Plutellidae (*Plutella*-group auct) by the presence of the curved teguminal processes surrounding the anal tube in the male genitalia. This character is not found in *Stachyotis*. Meyrick (1905) suggested that the genus may be related to *Orthenches* that he believed also belonged to Plutellidae. In accordance with his opinion, *Stachyotis* is treated as a plutellid genus in this study, although the plutellid association of *Orthenches* needs further attention (Dugdale 1996).

Meyrick (1905) defined *Stachyotis*, based on the head, hindleg, and wing venation characteristics. These superficial features are apparently insufficient to differentiate the genus from other similar yponomeutoids. *Stachyotis* includes only the type species, *S. epichrysa* Meyrick, 1905, from Sri Lanka. This species has never been illustrated or described with genital features, which are often crucial in defining taxonomic relationships. Nothing is known about the biology of *Stachyotis*. Because the yponomeutoid fauna of the Oriental Region is poorly known (Lewis & Sohn, in preparation), there may exist other congeners in the region, especially on the Indochina Peninsula.

The aims of this paper are to re-describe *Stachyotis* and its type species, *Stachyotis epichrysa* Meyrick, to describe a new congener from southern China, and to discuss the morphological similarities between *Stachyotis* and the *Orthenches*-group sensu Dugdale (1996). The abbreviations in the specimen data are as follows:

BMNH (Natural History Museum, London, UK); GSN (genitalia slide number); and USNM (National Museum of Natural History, Washington, DC, USA).

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Systematic Account

Stachyotis Meyrick

Stachyotis Meyrick, 1905: 612.

Type species: *Stachyotis epichrysa* Meyrick, 1905, by monotypy.

Diagnosis

The yponomeutoid association of this genus is substantiated by having 2 autapomorphies for the superfamily: the presence of the posteriorly expanded male pleuron VIII, also known as pleural lobes, and the transverse ridge near the posterior margin of sternite II. *Stachyotis* is similar to *Rhabdocosma* Meyrick, 1935 (Ypsolophidae) in the shape of the pleural lobes but differs from the latter in the male genitalia: processes on uncus in addition to socii present in *Stachyotis*, absent in *Rhabdocosma*; gnathos acuminate medially, upcurved in *Stachyotis*, with linguiform medial plate in *Rhabdocosma*; and saccus longer in *Stachyotis* than in *Rhabdocosma*. The diagnostic features of *Stachyotis* include the forewing veins CuA_1 and CuA_2 stalked (Fig. 4); the sternite II with a V-shaped transverse ridge on the posterior margin (Fig. 5); tergites with scattered short setae (Fig. 5); lateral arms of gnathos convergent to medial process (Figs. 10 and 11); and valva divided into 2 portions distally (Figs. 10 and 11).

Redescription

Head (Figs. 1 and 2) with vestiture of vertex appressed with piliform scales; frons with elongate scales; ocelli absent [Meyrick (1905) erroneously stated that *Stachyotis* possessed ocelli on the head]; antenna filiform in both sexes; flagellomere with 2 whorls of elongate scales; labial palpus slightly upcurved, 1st segment 2 × as long as 2nd, 2nd segment as long as 3rd; maxillary palpus 4-segmented; proboscis naked. Hind tibia (Fig. 3) with piliform scales denser dorsally. Forewing with pterostigma spanning one half of costa and Rs_3; costa slightly curved; apex narrowly round; termen slightly concave medially; tornus subtruncate; dorsal margin arched at distal ⅓. Hindwings with costa slightly emarginated near midlength. Forewing venation (Fig. 4) with Sc reaching margin slightly before middle of costa; R arising from near basal $^2/_5$ of radius; Rs_{1-3} reaching margin above apex; Rs_1 arising from anterior margin of accessory cell near midlength, parallel to R; Rs_1 parallel to Rs_2; Rs_2 and Rs_3 connate basally, then divergent; Rs_4 reaching margin below apex at the anterior ¼ of termen; M with 3 branches; M_1 parallel to M_2; M_3 and M_2 close basally, then divergent; CuA_1 and CuA_2 stalked, reaching dorsal margin; CuA_2 slightly curved after stalk; CuP vestigial as fold in basal ¾; basal fork of 1A+2A near ⅓ of length. Hindwing venation (Fig. 4) with $Sc+R_1$ reaching margin at distal 1/4 of costa; Rs reaching margin above apex, slightly arched; M stem vestigial; M_1 divergent from Rs; M_2 nearly parallel to M_3; M_3 connate with CuA_1; CuA_1 parallel to CuA_2; CuP present; 1A + 2A slightly divergent from CuP in distal ⅓, with basal fork $^1/_5$ of length. Abdominal tergites (Fig. 5) with minute setae uniformly scattered on entire area. Sternum II (Fig. 5) with apodeme and venula ⅓ as long as pleura II; anterior margin notched and sclerotized medially. Tergum VIII (Fig. 6) fused with pleuron VIII, broadly rounded posteriolaterally, broadly emarginated posteriomedially. Male genitalia with socii and teguminal processes; subscaphium present; gnathos upcurved; valva elongate; saccus as an elongate arm; vesica with cornutal zone comprised of spinules. Female genitalia unknown.

Included species

Stachyotis chunshengwui Sohn, **sp. nov.**
Stachyotis epichrysa Meyrick, 1905

Stachyotis epichrysa Meyrick
(Figs. 1, 3-8, 10)

Stachyotis epichrysa Meyrick, 1905: 612.

Diagnosis

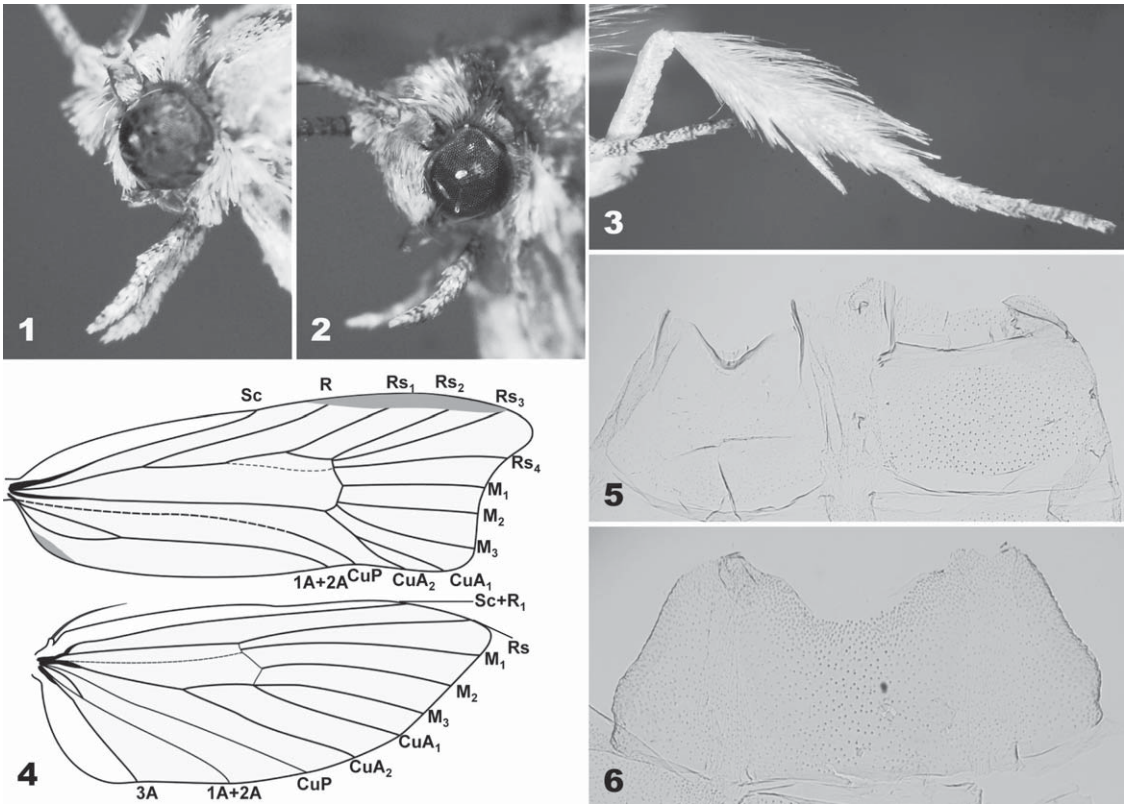
This species is similar to *Prays peregrina* Agassiz, 2007, from England in superficial appearance, but the latter belongs to Praydidae, which can be characterized by the presence of the broadly enlarged male sternum VIII.

Redescription

Head (Fig. 1): Scales on vertex white, with dark brown band subterminally; frons white, tinged with dark brown laterally. Antenna $^4/_5$ as long as forewing; scape brownish white, scales with dark brown band subterminally; flagellomere pale gray on basal half, dark brownish gray on distal half. Labial palpus 1st segment white, dark brown terminally, with elongate scales ventrally; 2nd segment dark brown, speckled with white laterally, white, sparsely peppered with dark brown mesally; 3rd segment white, tinged with dark brown on basal and apical areas and at middle.

Thorax: Patagium pale brownish gray; tegula dark brown; mesonotum white, sparsely peppered with dark brown spots on anterior half, dark brownish gray on posterior half. Fore- and midlegs with coxa and femur white, sparsely peppered with dark brown; tibia dark brown, white terminally; tarsomere dark brown, with

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Figs. 1-6. Generic characteristics of *Stachyotis*. 1. head of *S. epichrysa*; 2. head of *S. chunshengwui* **sp. nov.**; 3. hind leg of *S. epichrysa*; 4. wing venation of *S. epichrysa*; 5. abdominal segment I-II of *S. epichrysa* (inset: enlarged tergal setae); 6. abdominal segment VIII of *S. epichrysa*.

broad white band at basal ⅓. Hindleg with coxa to tibia pale brownish gray; tibia with long hairs dorsally, spiniform scales ventrally; tarsomere white, densely speckled with dark brownish gray, with dark brownish gray band distally. Forewing length 7.4-8.8 mm (n = 7) slightly dilated distally, white, suffused with pale brownish gray on basal area and anterior $^{4}/_{5}$ of costal area, speckled with dark brown; sparse dark brown strigulae near to costa on basal ⅓ ; subbasal, antemedial and postmedian lines brownish gray, with golden luster, dark brown on dorsum; subbasal line rhomboid; postmedian line slender, sinuous on costal area; fringe dark brown with golden luster. Hindwing pale brownish gray; fringe pale yellowish gray.

Abdomen: Tergites pale brown; sternites pale orange. Male genitalia (Fig. 10) with uncus trapezoidal, posterior margin emarginated medially, with a digitate process and an elongate, distally-curved, apically-obtuse process posteriolaterally; socius elongate, slender, as long as valva, setose dorsally; V-shaped ridge at junction between uncus and tegumen. Tegumen subtrapezoidal in posterior half, subrectangular in anterior half. Gnathos V-shaped, upcurved medially. Valva elongate, rectangular, divided into 2 setose portions apically, upper portion semicircular, lower portion digitate; sacculus slightly convex. Vinculum subquadrate; saccus slender, 2x longer than valva, dilated terminally. Phallus (Fig. 10a) elongate, slightly curved medially; cornutal zone ⅓ as long as phallus.

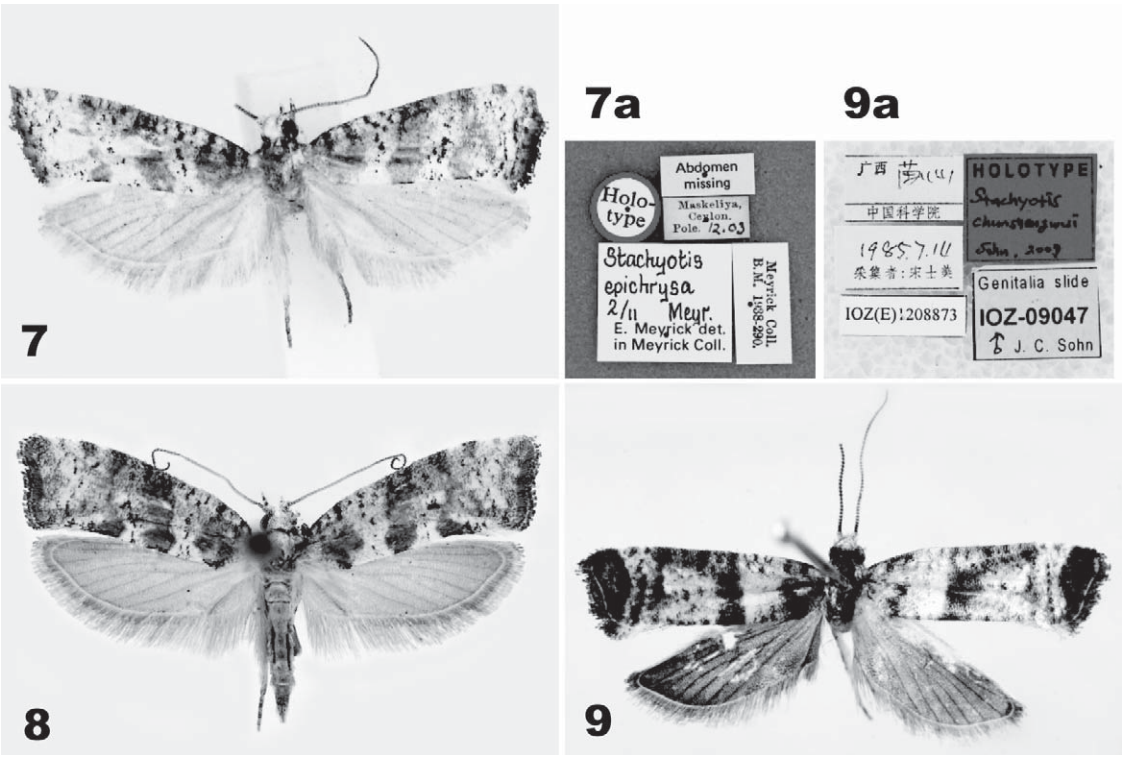
Type

HOLOTYPE (Fig. 7) - male, “Holo-type” [circular label with red border], “Maskeliya, Ceylon. Pole. 12.03”, “Meyrick Coll. B.M. 1938-290.”, “*Stachyotis epichrysa* 2/11 Meyr. E. Meyrick det. in Meyrick Coll.”, “Abdomen missing” [pale blue label], deposited in the Natural History Museum, London, United Kingdom.

Material Examined

[Sri Lanka] 1♂ Maskeliya, “04” (Pole), BMNH, GSN: BM-32855; 1♂, ditto, “10.04” (Pole), USNM. 7♂, North East Prov., Kanda-ela Reservoir, 5.6 mi SW Nuwara Eliya, 6200 ft., 9-21 Feb. 1970 (Davis & Rowe), USNM, GSN: USNM-96420.

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Figs. 7-9. Adults of *Stachyotis*. 7-8. *S. epichrysa* (7: holotype; 7a: type labels); 9. *S. chunshengwui* **sp. nov.**, holotype (9a: type labels).

Distribution

Sri Lanka (Central, North East).

STACHYOTIS CHUNSHENGWUI **SP. NOV.**
(Figs. 2, 9, 11)

Diagnosis

This species closely resembles *Stachyotis epichrysa* but can be distinguished from the latter in having the forewings with narrower subbasal, antemedian, and postmedian lines and a dark yellowish brown, semicircular patch along the terminal area; the male genitalia with shorter posterior processes on the uncus and upper apical portion of the valva tapering.

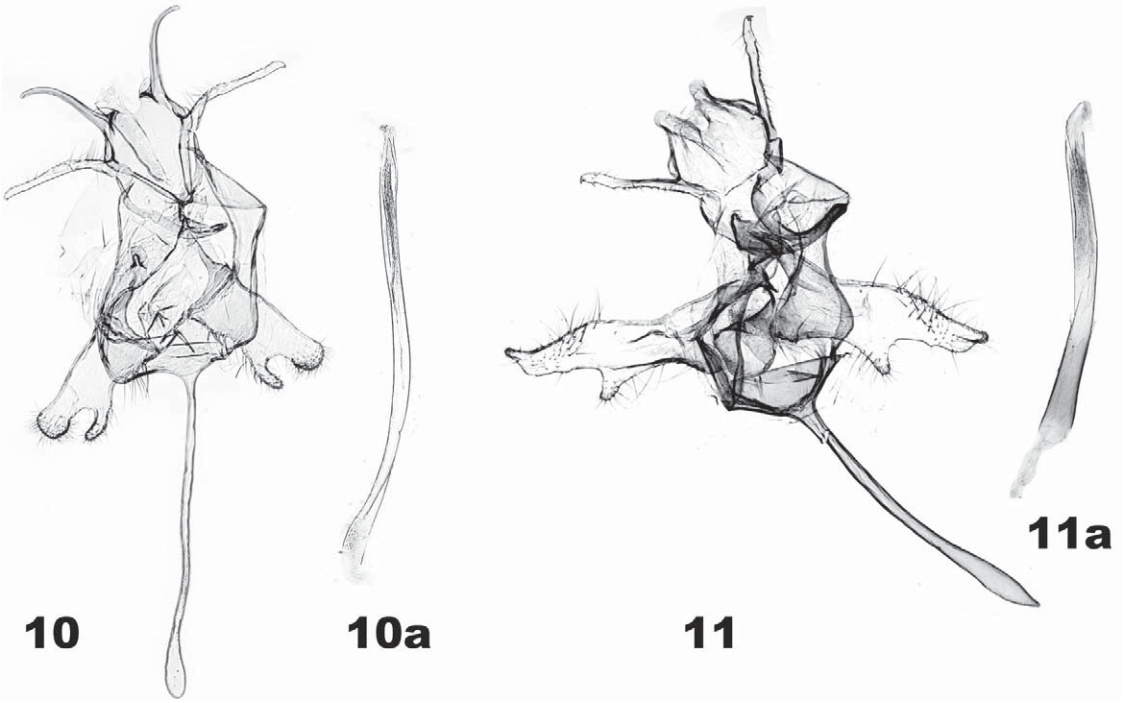
Description

Head (Fig. 2): Scales on vertex white, with dark brown tip; frons white. Antenna 2/3 as long as forewing; scape white, intermixed with dark brown scales dorsally; flagellomeres white, annulated with dark brown dorsally. Labial palpus 1st segment dark brown, intermixed with pale brown scales; 2nd and 3rd segments brownish white, mottled with dark brown at middle; scale tuft on 2nd segment, white with dark brown tip.

Thorax: Patagium and mesonotum dark brown with purplish luster; tegulae white, suffused with dark brown basally and distally. Fore- and midlegs with coxa, femur, and tibia dark brown, intermixed with white scales dorsally, white ventrally; tarsomeres dark brown, with a white ring basally. Hindleg with coxa, femur, and tibia brownish gray dorsally, white ventrally; tibia with gray hairs dorsally, white hairs ventrally; tarsomeres entirely dark brown, except 1st segment white ventrally. Forewing length 6.9 mm (n = 1), white, with dark brown, irregular strigulae along costa and posterior margin; subbasal and antemedian lines dark brown, almost perpendicular to dorsum; postmedian line ½ as wide as medial line, constricted around anterior ⅓, blurred posteriorly; subterminal line dark brown, narrower than and almost parallel to postmedian line; terminal area with semicircular, dark yellowish brown patch; fringe mostly dark brown, white with dark brown tip on tornus Hindwing dark brownish gray, with dark brown streaks along veins; fringe dark yellowish gray.

Abdomen: Tergites dark gray; sternites pale orange. Male genitalia (Fig. 11) with uncus broad, subhexagonal, with bifid projection posteriorly; each process digitate, sparsely setose; socii 3x longer than posterior uncal processes, slender,

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Figs. 10-11. Male genitalia of *Stachyotis*. 10. *S. epichrysa* (10a: phallus), 11. *S. chunshengwui* **sp. nov.**, holotype (11a: phallus).

straight, slightly enlarged terminally, with 2 short spines apically, setose. Tegumen 2 × as long as uncus, relatively narrow, slightly angulated on distal ⅓; medial process of gnathos robust, strongly sclerotized. Valva elongate, relatively narrow, shallowly convex at distal ¼ of costal margin, with a short, digitate process protruding from costal side of apex; a robust, digitate saccular process rising from ½ of valva. Vinculum rectangular; saccus with a narrow basal plate and a slender process 1.5x longer than valva; anellus relatively narrow, with minute setae. Phallus relatively slender, slightly bent medially, 1.5x longer than saccus; cornutal zone ½ as long as phallus.

Type

HOLOTYPE (Fig. 9)—male, "HOLOTYPE *Stachyotis chunshengwui* Sohn, 2009" [red label], "Guangxi Miaoershan Chinese Academy of Sciences" [in Chinese], "1985.7.14 Collector: Shi Mei Song" [in Chinese], "Genitalia slide IOZ-09047 ♂ J. C. Sohn" [green label], deposited in the Institute of Zoology, Chinese Academy of Sciences, Beijing, China.

Distribution

China (Guangxi).

Etymology

This species is named after Dr. Chun-Sheng Wu who assisted me with my research.

Discussion

Stachyotis has been associated with Plutellidae, since Meyrick (1905, 1914). The evidence justifying this relationship are, however, tenuous. In fact, the genus lacks an autapomorphy of Plutellidae proposed by Kyrki (1984). Kyrki (1990) stated 2 other diagnostic characteristics for Plutellidae from the female genitalia and the shape of cocoon. These cannot be evaluated for *Stachyotis* because no females and immature stages are known for the genus. Kyrki (1990) characterized Plutellidae based on the Holarctic species (Sohn et al. 2013). Future efforts toward better characterization of Plutellidae need to consider the world species and may find useful characters in evaluating the plutellid association of *Stachyotis*.

Meyrick (1905) noted superficial similarities between *Stachyotis* and *Orthenches*. *Orthenches* once included 4 species groups. Dugdale (1996) found that these differ from one another in host plant, cocoon structures, adult external and genital structures. Regarding these differences, he assigned one group including 10 species to a separate genus, *Chrysorthenches*, and established

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the *Orthenches* group including about 25 species from New Zealand, Australia, eastern Pacific and South America. The *Orthenches* group is similar to Plutellidae in larval and pupal characteristics but differs from the latter in having the male gnathos narrowly fused with the tegumen laterally, and the larval setal group SV unisetose, not bisetose, on the abdominal segment IX (Dugdale 1996). The latter characteristic was suggested as an autapomorphy of the *Orthenches* group by Dugdale (1996). This feature, however, cannot be evaluated for *Stachyotis* whose larvae remain unknown. Therefore, an association of *Stachyotis* with the *Orthenches* group remains tenuous. Interestingly, *Stachyotis* shares at least two characteristics with some species of *Orthenches* from Neotropics (e.g. *O. osteacma* Meyrick, 1931) in the male genitalia: 2 pairs of processes on uncus, each possibly corresponding to socii and teguminal processes, and an upcurved gnathos. There, however, are several differences between *Stachyotis* and the *Orthenches* group (John S. Dugdale 2014, personal communication): i) elongate scale covering on the antennal scape present in several species of the *Orthenches* group but absent in *Stachyotis* and *Chrysorthenches*; ii) the forewing veins CuA_1 and CuA_2 stalked in *Stachyotis*, but separate in *Orthenches* and *Chrysorthenches*; and iii) the male gnathos absent (*Chrysorthenches*) or without medial process in Australian and New Zealand species of the *Orthenches* group, but with an elongate medial process in *Stachyotis*.

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