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A new species of *Systropha* from Thailand (Hymenoptera: Halictidae: Rophitinae)

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Abstract. *Systropha sirikitae* de Silva & Packer, new species, from Thailand is described and illustrated. It is known only from the male. Patiny & Michez’s (2006) key to males of *Systropha* is modified to permit its identification. It would seem to be the second known species of the subgenus *Systrophidia* Cockerell.

INTRODUCTION

The halictid genus *Systropha* Illiger has an Old World distribution, occurring from Spain to southeast Asia and throughout Africa (Baker, 1996; Patiny & Michez, 2006). With 29 species (Ascher & Pickering, 2015), it is the second largest genus within the Rophitinae (Michener, 2007). As far as is known, all species are oligolectic upon members of the Convolvulaceae: *Convolvulus* L. in temperate regions and *Ipomoea* L. or *Merremia* Dennst. ex Endl. in the tropics (Baker, 1996; Patiny & Michez, 2007; Patiny *et al.*, 2013; Gonzalez *et al.*, 2014). Species of *Systropha* have often been regarded as the most interesting of the four Old-World restricted rophitine genera (Patiny & Michez, 2007), in large part due to their striking appearance including the male antennae which vary greatly in structure and the number of flagellomeres (Batra & Michener, 1966). Reduction in the number of flagellomeres is rare among the bees (Michener, 2007; Packer & Ratti, 2009), as is the progressive diminution of the apical flagellomeres. This latter is often coupled with a remarkable spiral arrangement of the last three or more flagellomeres in most species, giving them their common name “spiral-horned bees”. Other distinctive characters of males are the narrowness of the head, which is often narrower than the mesosoma (Dubitzky, 2004), and the common occurrence of moderate to large processes on the second metasomal sternum and often other sterna. The females have less conspicuous modifications, although they are often noted for the large amounts

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of pollen they carry on the plumose scopal hairs which extend even to the sides of the entire metasoma (Westrich, 1989; Patiny & Michez, 2006; see especially Gonzalez *et al.*, 2014: their figure 2).

Patiny & Michez (2006) divided *Systropha* into three subgenera as the result of phylogenetic analysis based on 34 morphological characters: *Systropha s.str.*, *Systrophidia* Cockerell, and *Austrosystropha* Patiny & Michez. These results were further supported in subsequent studies (Patiny & Michez, 2007). Table 2 of Patiny & Michez (2006) builds on work by Cockerell (1936) and Batra & Michener (1966) to include an updated morphological comparison for both sexes of the three subgenera (although females of *Systrophidia* remain unknown). Many species are still poorly represented in collections; especially within *Austrosystropha*, for which both sexes have been described for only five of its 11 representatives. Similarly, a number of sex associations are lacking in the predominantly Eurasian *Systropha s.str.* and the sole *Systrophidia* is known only from the male.

Here we describe the new species *Systropha sirikitae*, and incorporate it into the key to males of the genus provided by Patiny & Michez (2006). It would seem to be the second species within the subgenus *Systrophidia*.

MATERIAL AND METHODS

Specimens of the genus were obtained from the Smithsonian Institution, National Museum of Natural History (Washington, DC: USNM, thanks to Seán Brady), the Snow Entomological Museum (Lawrence, KS: SEMC, thanks to Jennifer Thomas), the National Insect Collection, Islamabad (thanks to Anjum Shezad), and the Packer Collection at York University (PCYU), or graciously provided by Sébastien Patiny and Denis Michez (Belgium, UMONS). The holotype of *S. inexpectata* Ebmer was observed at the Natural History Museum in London (courtesy of Michael Kuhlmann).

Images were taken using a Visionary Digital BK Plus system with a Canon 40D DSLR camera and further edited using Photoshop CS4. The description of *S. sirikitae* new species, is based on material collected as part of the Thailand Insect Group for Entomological Research (TIGER) project (<http://www.qsbginsects.org/projectcurrent.php>). Code numbers beginning with a T are provided for all TIGER project specimens and refer to specific sampling events. Locality data are transcribed directly from the label, and follows the terminology standardized by TIGER.

Terminology for surface sculpture generally follows Harris (1979), and for structure Michener (2007). In addition, the list below outlines common abbreviations used in descriptions of *Systropha* (Patiny & Michez, 2006, 2007).

- F: flagellomere [with a number used to designate which flagellomere(s)].
- Fm: femur (with a number used to designate which femur – 1 referring to most anterior).
- S: metasomal sternum (with a number used to designate the segment – 1 referring to most anterior).
- T: metasomal tergum (with a number used to designate the segment – 1 referring to most anterior).
- Tb: tibia (with a number used to designate which tibia – 1 referring to most anterior).
- i-d: interspace length to puncture diameter ratio (to indicate relative proportions, *e.g.*, $i>2d$).
- L-D: length of pubescence relative to diameter of median ocellus (*e.g.*, $L=0.5D$).

The terminalia and T7 are described and illustrated from the single paratype male.

SYSTEMATICS

Genus *Systropha* Illiger, 1806*Systropha (Systropha) sirikitae* de Silva & Packer, new species

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(Figs. 1, 2, 5, 6, 8, 9, 10)

DIAGNOSIS: Males can be differentiated from all other congeners globally by the combination of the nature of the antennal flagellum and that of S2. The flagellum has six well-defined flagellomeres of normal size and an additional two or three that are minute (Figs. 1, 2). The second metasomal sternum has a well-defined transverse ridge (Fig. 10). Only *S. glabriventris* Friese, from Namibia and Zimbabwe, has a similarly structured flagellum but it lacks protuberances on S2. *Systropha glabriventris* also differs in having a lateral tooth on each of T6 and T7 (Patiny & Michez, 2006: cf. their figure 4 and Fig. 7); *S. sirikitae* lacks such teeth (Figs. 5, 6). There are only two known *Systropha* from southeastern Asia: *S. difformis* Smith known only from the Republic of the Union of Myanmar [Burma] and *S. inexpectata* from Thailand. The males of these both have the normal 11 flagellomeres (Fig. 4) (although the apical ones are narrow and form a spiral in both species), and a single, median process on S2 (e.g., Fig. 11; see also Ebmer, 1994: figures 10, 11 therein).

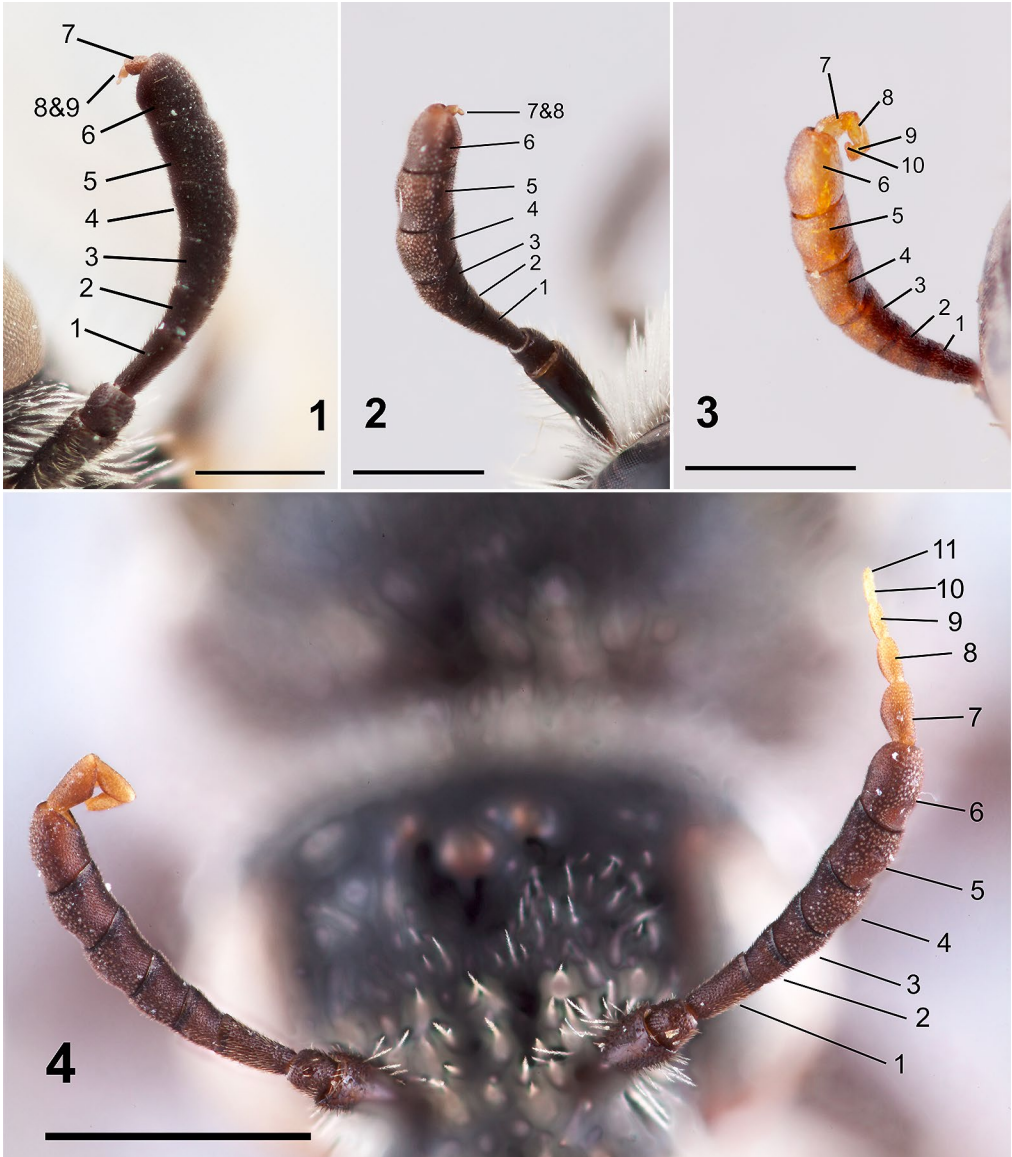
DESCRIPTION: ♂: Body length 11 mm, forewing length 6.8 mm, intertegular width 1.8 mm, head width 2.3 mm.

Coloration. Black except as follows: F7–F9 very pale to light brown; tegula brown, translucent posteriorly and laterally; wing veins translucent brown; T6 entirely red-brown, somewhat translucent apically; pretarsal claws red-brown; metatibial spurs brown, becoming darker distally; antennal cleaner almost entirely transparent.

Structure. Head broader than long, width to length ratio 4:3. Labrum slightly shiny, basal area with irregular carinulae, apical area distinctly punctate. Mouthparts long; length of labial palpus approximately 1.5X length of head; glossa approximately 1.5X as long as labial palpus. Clypeus basal two fifths with dense, small punctures, $i < d$, rest shiny with large, sparse, longitudinally effaced punctures, $i < d$; with dull yellow hairs. Supraclypeal area densely and finely punctured ($i < d$). Frontal area densely punctate, $i < d$; upper paraoocular area minutely and sparsely punctate, ocellocular area largely impunctate. Scape minutely and densely punctate; F1 twice as long as greatest breadth. Antenna reduced apically, F7–F9 minute, superficially appearing as if with only 7 flagellomeres. Genal area shiny, obscurely and sparsely punctate ($i > 3d$); genal beard long ($L < 2D$).

Mesoscutum doubly and finely punctate, $i < 1.5d$ between median and parapsidal lines; large punctures sparse except on anterior one third ($i = 1-3d$); pubescence sparse, short ($L < 1.3D$, somewhat longer anteriorly $L < 2D$). Mesoscutellum with punctures as on mesoscutum except smaller and somewhat sparser. Metanotum with transversely effaced punctures $i < 2d$. Metapostnotum imbricate, dull, margins smooth, lacking microsculpture, side of propodeum shiny, distinctly punctate, $i = 2d$; pubescence long ($L < 2D$). Mesosoma lacking ventral protuberances. Fm1 and Fm3 thickest at basal one quarter, Fm2 thickest at midlength. Tb1 and Tb2 unmodified, Tb3 somewhat swollen, thickest subapically. Anterior metatibial spur curved apically, shorter than posterior spur.

Terga without lateral spines or teeth. T1 distinctly and regularly punctate ($i \approx d$), apical impressed area more finely and sparsely punctate ($i > d$); pilosity pale, longest



Figures 1-4. Antennae of species of *Systropha* to show variation in number of flagellomeres. **1.** *Systropha sirikitae*, new species, holotype, with six normal-sized flagellomeres and three minute apical ones forming a small hook (scale bar = 0.5 mm). **2.** Paratype of *S. sirikitae* with the apical hook formed from two flagellomeres (scale bar = 1 mm). **3.** *S. punjabensis* Batra & Michener, paratype, with 10 flagellomeres (scale bar = 0.5 mm). **4.** *S. inexpectata* Ebmer, with the normal condition of 11 flagellomeres, right antenna (on the left) in the normal, spiral-horned position; left antenna with the spiral straightened after relaxing (scale bar = 2 mm).

apicolaterally ($L \approx 1.5D$), remaining hairs short ($L < D$). T2-T3 as for T1 except basal areas depressed and with punctures similar to those on apical impressed areas, apical impressed area longer, hairs towards side of disc short, thick, and dark brown; T4-T6 lacking basal depressed areas, punctures on discs smaller. Hairs increasing in length from T2 to T6, on T6 $\approx 3D$, proportionately more dark brown hairs on more posterior



Figure 5. Holotype of *Systropha sirikitae*, new species, in lateral view (scale bar = 2 mm).

terga; hairs simple except somewhat plumose towards sides of terga. Sterna shiny, with row of hairs subapically; sparsely and irregularly punctate ($i > 2d$). S2 with a pronounced transverse ridge extending almost entirely across exposed portion of sternum. S5 weakly concave basomedially. S6 with raised area medially ending in short blunt process. Erect hairs longest on S1 and towards sides of S3–S4 ($L < 2D$). T7 lacking lateral tooth but with broadly rounded convexity on either side.

♀: Unknown.

HOLOTYPE: ♂, THAILAND: Chaiyaphum, Pha Hin Ngam NP. $15^{\circ}37.683'N$ $101^{\circ}23.323'E$ 681 m. malaise trap. 19–26.ix.2006. coll: Sa-nog & Adnafai. T856B. To be deposited in Queen Sirikit Botanical Gardens (QSBG).

PARATYPE: ♂, THAILAND: Loei, Phu Kradeung NP. $16^{\circ}49.099'N$ $101^{\circ}47.624'E$ 275m. MT. 14.xi.2006. coll: S. Gong-lasae. T1074A. Deposited in PCYU.

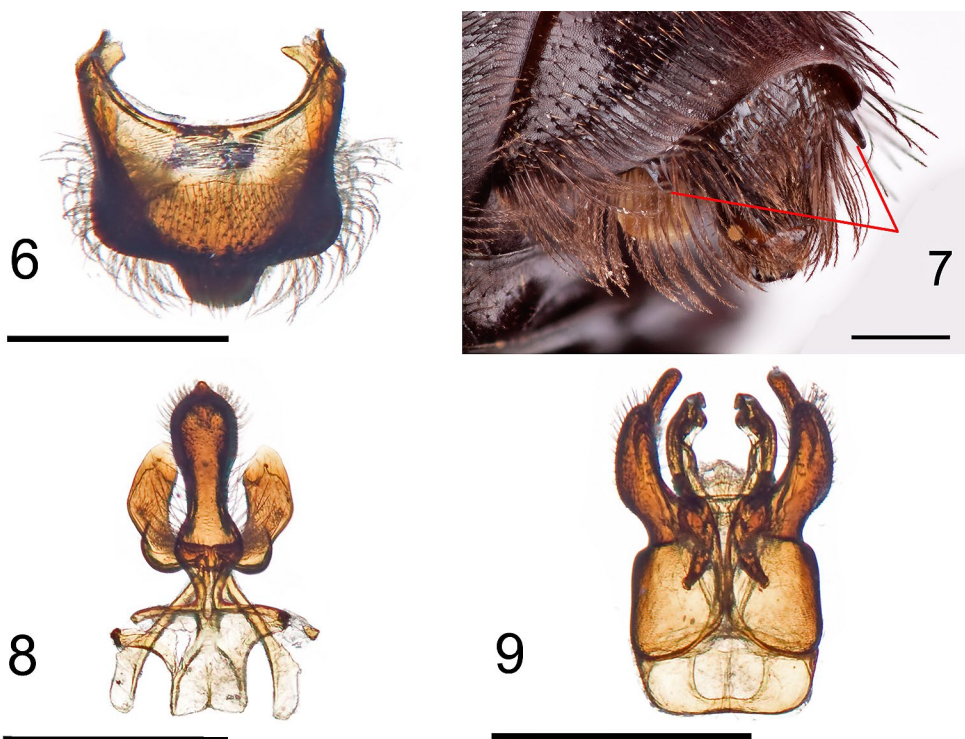
VARIATION: Paratype as in holotype except: only 8 flagellomeres, F7–F8 minute, forming a hook, and bee slightly smaller, head width 2.2 mm. Terminalia as in figures 8–9.

ETYMOLOGY: The species is named after the botanical gardens where the holotype will be deposited, QSBG, Thailand.

COMMENTS: In the locality labels, NP refers to 'National Park': both of the known specimens are from national parks. The two localities are less than 150 km apart.

DISCUSSION

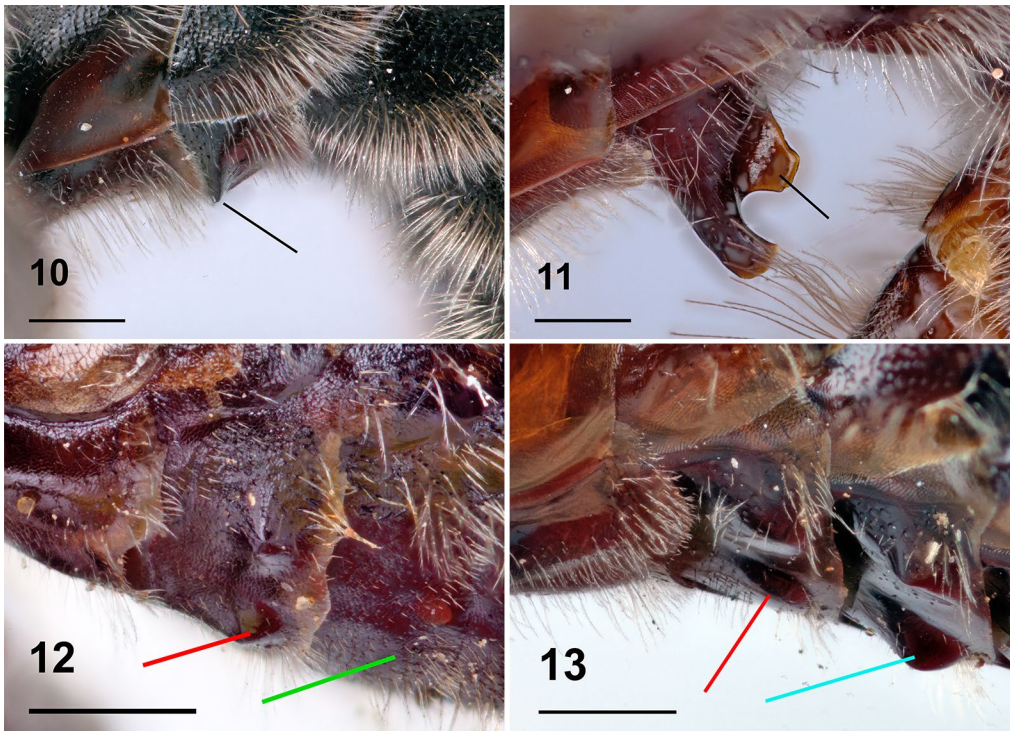
The new species is clearly distinctive as demonstrated by the diagnosis above. We here modify Patiny & Michez' (2006) key to males of *Systropha* to include the new species. While there are no other female *Systropha* definitively identified to named



Figures 6–9. Apical metasomal terga and terminalia of species of *Systropha* (all scale bars = 1 mm). 6. *Systropha sirikitae*, new species, paratype, T7 to show lack of spines. 7. *S. tropicalis* Cockerell, oblique view to show spines (indicated by red lines). 8. S7 and S8, not separated, of paratype of *S. sirikitae*. 9. Genital capsule, dorsal view, of *S. sirikitae*.

species from Southeast Asia, we have specimens of three species at hand. They can be differentiated from one another on the basis of tongue length (one longer than in the other two) and metasomal pubescence (distinctive for all three). However, in the absence of associated and identifiable males, we do not treat these specimens further. The modified key couplets are as follows:

1. Antenna with less than 11 well-differentiated flagellomeres (Figs. 1–3) 2
- . Antenna with 11 well-differentiated flagellomeres (Fig. 4) 4
2. Antenna with six flagellomeres of normal size, additional apical flagellomeres minute, forming a hook (Figs. 1, 2; see also figure 2 in Patiny *et al.*, 2006) 2A
- . Antenna with nine or 10 well defined flagellomeres, apical flagellomeres forming a spiral (Fig. 3; see also figures 1, 3 in Patiny & Michez, 2006) 3
- 2A. S2 lacking protuberance(s) (as in Fig. 12); at least two of T5–T7 with lateral spines (Fig. 7; also see figure 4 in Patiny & Michez, 2006, where T6 and T7 are stated to possess spines, but figure suggests T5 and T6 have them) [southern Africa (Namibia, Zimbabwe)] *S. glabriventris* Friese
- . S2 with strongly developed transverse ridge (Fig. 10); T6–T7 without lateral spines (Figs. 5, 6) [Southeast Asia (Thailand)] *S. sirikitae* de Silva & Packer, n. sp.



Figures 10–13. Metasomal S2 or S2 and S3 of select species of *Systropha* (all scale bars = 0.5 mm). **10.** Transverse process on S2 in profile (black line) of *Systropha sirikita*, new species, paratype. **11.** Elongate, medial process on S2 (black line) of *S. inexpectata* Ebmer, or a closely related, undescribed species. **12.** Absence of processes on S3 (green line), and weak paired convexities on S2 (red line) of *S. punjabensis* Batra & Michener, paratype. **13.** More strongly developed convexities on S3 (blue line), than S2 (red line) of *S. tropicalis* Cockerell.

Using the key provided by Patiny & Michez (2006), the most similar appearing species to *S. sirikita* is *S. glabriventris*. Males of *S. sirikita* are differentiated easily from *S. glabriventris* based on the lack of lateral spines on the more apical terga (present in *S. glabriventris*) and the presence of a transverse ridge on S2 (*S. glabriventris* entirely lacks ornamentation on S2). The two species are also found on different continents. Two species of *Systropha* other than *S. sirikita* are known from southeast Asia, *S. inexpectata* and *S. difformis*, from Thailand and Myanmar, respectively. These are distinguished readily based upon the differences in the antennal flagellomeres, both have 11 well differentiated flagellomeres as opposed to six large and two or three minute ones as in *S. sirikita*. They also are separated easily based upon the ornamentation of S2 which has an elongate process, “T”-shaped in ventral view (as in figure 8 of Patiny & Michez, 2006; Baker, 2006 illustrates the process of *S. inexpectata* in lateral view in his figure 12, and our Fig. 11 shows this for a male that may be *S. inexpectata*), but only a transverse ridge in *S. sirikita* (Fig. 10).

Two other tropical Asian *Systropha* are known: *S. punjabensis* Batra & Michener and *S. tropicalis* Cockerell. The former is a small species from India and Pakistan, and its males have 10 flagellomeres (Fig. 3), and two small, rounded convexities on S2 and none on S3 (Fig. 12). *Systropha tropicalis* is from Sri Lanka, and its males have 11 flagellomeres (as in Fig. 4), and two weak, mammiform tubercles on S2 that are less

strongly developed than those on S3 (Fig. 13). Thus, our new species differs from all other known tropical Asian *Systropha* both in the form of the antennal flagellum and in the ornamentation of the metasomal sterna.

Based upon the structure of the male flagellum, our new species would seem to belong to the subgenus *Systrophidia* Cockerell, hitherto known only from the male of *S. glabriventris*. *Systropha glabriventris* is known only from Namibia and Zimbabwe and so the discovery of an apparently closely related species from tropical Asia is of some biogeographic interest.

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