

## A survey of the genus *Stegana* Meigen from southern Japan (Diptera, Drosophilidae), with descriptions of three new species

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Nine species of genus *Stegana* from southern Japan, including three new species, *S. (Oxyphortica) nigripennis* Hendel, *S. (Steganina) ctenaria* Nishiharu, *S. (Steganina) izu* Sidorenko, *S. (Steganina) kanmiyai* Okada and Sidorenko, *S. (Steganina) masanoritodai* Okada and Sidorenko, *S. (Steganina) ornatipes* Wheeler and Takada, *S. (Oxyphortica) dendrobium* sp. nov., *S. (Steganina) biprotrusa* sp. nov. and *S. (Steganina) bacilla* sp. nov. are surveyed and described with designation of a new synonym *S. (Steganina) maymyo* Sidorenko. A key to all species of genus *Stegana* from southern Japan is provided.

KEYWORDS: Diptera, Drosophilidae, *Stegana*, new species, southern Japan.

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### Introduction

The adult flies of the genus *Stegana* Meigen (1830) are brown to black in colour, and often collected from fallen logs and tree trunks near streams in forested areas. *Stegana* is a large genus of the subfamily Steganinae, with five subgenera and about 90 species, 70% of them from eastern Asia. However, the occurrence of this genus in the southern portion of Japan appears to be under-reported. Southern Japan (~24–34°N latitude) extends across the Palearctic and Oriental zoogeographic regions, with a temperate climate in the northern portion (Kyushu Island) and a subtropical climate in the southern portions (Ryukyu Archipelago). Despite the range of habitats, only five species of *Stegana* from southern Japan have been reported. In contrast, many more species are found in neighbouring regions: 11 spp. from northern Japan and 12 spp. from Taiwan (Okada, 1968, 1971; Sidorenko and Okada, 1991; Okada and Sidorenko, 1992; Sidorenko, 1997a, 1997b, 1998). In this paper, I more than double the number of known *Stegana* in southern Japan by reporting three new records and three new species. So, up to the present, a total of 11 *Stegana* species are found from this region, including four species that co-occur in Taiwan, and five species that co-occur in northern Japan. These records show the

faunal character of the region to be a zoogeographic encounter zone for the Palearctic and Oriental Regions.

The examined specimens are deposited in the following institutions: Department of Entomology, South China Agriculture University, China. New records are indicated by an asterisk (\*).

#### Genus *Stegana* Meigen

*Stegana* Meigen, 1830: 79; Wheeler, 1960: 109; Okada, 1971: 81; Okada, 1978: 398; Laštovka and Máca, 1982: 1; Toda and Peng, 1992: 209; Sidorenko, 2002: 12.

Type species: *Stegana nigra* Meigen, 1830.

*Protostegana* Hendel, 1920: 53.

*Chaetocnema* Duda, 1926: 242.

*Diagnosis.* Posterior reclinate orbital seta nearer to inner vertical than proclinate orbital; prescutellar setae well developed; scutellum nearly flat; wing brown to brownish black; mid tibia basally with a row of *ca* two to six strong postero-dorsal setae (after Okada, 1978).

#### Subgenus *Oxyphortica* Duda, 1923

*Stegana (Oxyphortica)* Duda, 1923: 34 (as subgenus of *Phortica*); Okada, 1971: 90; Okada, 1978: 398; Toda and Peng, 1992: 210. Type species: *Drosophila convergens* de Meijere, 1911.

*Diagnosis.*  $M_{1+2}$  distally weakly curved to  $R_{4+5}$ ; mid tibia basally with two to three long, strong postero-dorsal setae (after Okada, 1971).

#### *Stegana (Oxyphortica) nigripennis* (Hendel)

*Orthostegana nigripennis* Hendel, 1914: 115.

*Chaetocnema (Oxyphortica) poeciloptera* Duda, 1926: 243; synonymized by Okada, 1971: 89.

*Protostegana katoi* Okada, 1956: 14; synonymized by Okada, 1968: 304.

*Stegana (Stegana) nigripennis*: Okada, 1968: 304.

*Stegana (Orthostegana) nigripennis*: Okada, 1971: 89.

*Stegana (Oxyphortica) nigripennis*: Wheeler, 1981: 30; Okada, 1988: 27.

*Specimen examined.* Japan: Iriomote Is, Ryukyu Is, 9♂, 12♀, 10–20 June 1999, H.-W. Chen leg.

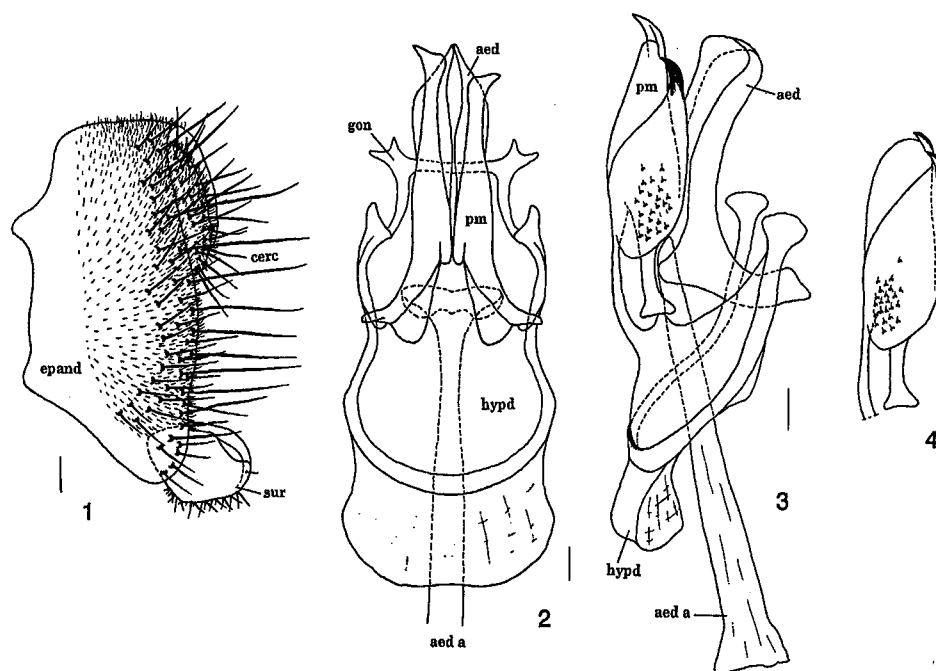
*Distribution.* China (Taiwan), Japan (Ryukyu Is).

#### *Stegana (Oxyphortica) dendrobium* sp. nov.

(figures 1–3)

*Diagnosis.* Submedial stripes of mesonotum converge on prescutum; fifth tergite nearly entirely black; paramere distally narrowed, apically pointed, asymmetrical laterally: right part longer and bigger than left part (figure 2).

*Description.* Head: eyes red, medially with pale band. Ocellar triangle black. Frons black, submedially with one yellow band; interfrontal setulae dense, thick. Fronoto-orbital plate yellow. Pedicel yellow; first flagellomere greyish yellow. Lunule black. Face yellow, with one black band below; facial carina low. Clypeus greyish yellow. Gena yellow. Palpus greyish yellow, with several setulae ventrally. Vibrissa prominent.



FIGS 1-4. (1-3) *Stegana (Oxyphortica) dendrobium* sp. nov., ♂. (1) Epandrium (epand), cercus (cerc) and surstylus (sur), lateral view. (2, 3) Hypandrium (hypd), paramere (pm), aedeagus (aed) and aedeagal apodeme (aed a): (2) ventral view; (3) lateral view. (4) *Stegana (Oxyphortica) nigripennis* Hendel, ♂ paramere, lateral view. Scale bars: 0.1 mm.

Thorax: mesonotum yellow, with three black, longitudinal stripes per side: submedial and lateral stripes extend to prescutum, while sublateral stripes short between scutal and scutellar sulci. Postpronotal lobe yellow, with one long seta and several small setae. Pleura yellow, with one black, longitudinal stripe below wing. Scutellum medially black, laterally yellow. Anterior dorsocentral seta sometimes minute. Katepisternal setae 3, medial one smaller than the others. Wing: dark brown, pale basal part and along posterior margin, with four yellow patches each in  $r_{4+5}$  cell, dm cell and its outside. Basal medial-cubital crossvein present. Costal vein between  $R_{2+3}$  and  $R_{4+5}$  with *ca* eight peg-like spinules on ventral surface. M1 distally weakly convergent to  $R_{4+5}$ . Halter greyish black. Legs: yellow, dark brown on all of the knees; mid femur with two to three rows of strong, anterior setae; mid tibia basally with two long, strong postero-dorsal setae. Abdomen: first and fourth tergites yellow; second to fourth tergites with laterally protruded, black band on posterior margin, which also medially protruded in third and fourth; fifth and sixth nearly entirely black. Sternites yellow.

Male terminalia: epandrium broad, with one row of long, strong setae and two rows of short setae along posterior margin, pubescent except for anterior to ventral margins (figure 1). Surstylus lacking pubescent, with several setae on distal margin, and one hole near posterior margin (figure 1). Cercus small, separated from epandrium, pubescent and setigerous (figure 1). Hypandrium somewhat oblong, antero-medially and laterally elongated and fused with paramere. Gonopods

seemingly bilobed, laterally contiguous to posterior ends of hypandrium. Paramere submedially with several small sensilla; basally contiguous to arm of aedeagal apodeme and hypandrium (figures 2, 3). Aedeagal apodeme long rod-shaped.

For morphological terminology and indices for the definitions, see Chen and Toda (2001) or Chen and Aotsuka (2003).

Measurements: BL=8.10 mm in the holotype (range in 1♂ and 1♀ paratypes: 8.17 in ♂, 8.23 in ♀); ThL=3.00 mm (3.13 in ♂, 3.10 in ♀); WL=6.40 mm (6.33 in ♂, 6.50 in ♀); WW=2.40 mm (2.40 in ♂, 2.42 in ♀).

Indices: arb=10–11/6–7 (10–11/6–7), avd=0.90 (0.85–0.90), adf=2.30 (2.40), flw=2.60 (2.50–2.60), FW/HW=0.40 (0.40–0.45), ch/o=0.10 (0.10), prorb=1.00 (0.95–1.00), rcorb=0.55 (0.50–0.55), vb=0.50 (0.50), dcl=0.55 (0.55–0.60), sctl=0.80 (0.80), sterno=1.00 (1.00), orbito=2.00 (1.90–2.00), dcp=0.15 (0.15–0.17), presctl=0.70 (0.65–0.70), sctlp=1.20 (1.20–1.30), C=2.80 (2.76–2.78), 4c=0.63 (0.62–0.65), 4v=1.10 (1.13–1.20), 5x=0.43 (0.40–0.45), ac=4.17 (4.20–4.25), M=0.15 (0.13–0.15), C3F=1.00 (1.00).

HOLOTYPE: ♂, Japan: Tomochi, Kumamoto, 17 August 2002, H.-W. Chen leg.

PARATYPES: 2♂, 2♀, same data as holotype.

*Remarks.* This species closely resembles *S. (O.) nigripennis* in morphological characters, but can be distinguished from it by the submedial stripes of mesonotum, fifth tergite colour and paramere (in *nigripennis*: submedial stripes of mesonotum separated on prescutum in female; fifth tergite yellow with black band on posterior margin; paramere distally narrowed only in right one; figure 4).

*Etymology.* In reference to the dendrophilous behaviour.

#### Subgenus *Steganina* Wheeler

*Stegana (Steganina)* Wheeler, 1960: 110; Okada, 1971: 81; Okada, 1978: 398; Laštovka and Máca, 1982: 1; Okada and Sidorenko, 1992: 415; Sidorenko, 2002: 12. Type species: *Musca coleoprata* Scopoli, 1763.

*Diagnosis.* Face with brown to black band; wing curved down in resting posture;  $M_{1+2}$  distally strongly curved to  $R_{4+5}$ ; mid tibia basally with four to six strong postero-dorsal setae (after Okada, 1971, 1978).

#### *Stegana (Steganina) ctenaria* Nishiharu

*Stegana (Steganina) ctenaria* Nishiharu, 1979: 38; Okada and Sidorenko, 1992: 421; Sidorenko, 1997b: 171.

*Stegana (Steganina) lacunata* Krivosheina, 1987: 33 (synonymized by Toda *et al.*, 1996: 462).

*Specimen examined.* Japan: Tomochi, Kumamoto, 6♂, 3♀, 17, 18 August 2002, T. Saigusa and H.-W. Chen leg.

*Distribution.* Russia (Far East), China (Central), Japan (Hokkaido, Honshu, Kyushu), Korea.

#### *Stegana (Steganina) izu* Sidorenko

*Stegana (Steganina) izu* Sidorenko, 1997b: 167.

*Specimen examined.* China: Kangting, Taiwan, 1♂, 1♀, 19 October 1992, M. J. Toda leg. Japan: Iriomote Is, Ryukyu Is, 2♂, 14, 18 June 1999, H.-W. Chen leg.

*Distribution.* China\* (Taiwan), Japan (Hachijo Is, Ryukyu Is\*).

*Stegana (Steganina) kanmiyai* Okada and Sidorenko*Stegana (Steganina) kanmiyai* Okada and Sidorenko, 1992: 419.*Stegana (Steganina) maymyo* Sidorenko, 1997b: 169. **Syn. nov.**

*Specimen examined.* HOLOTYPE: ♂, China: Kang-tsulin, Taiwan, 28–29 May 1971, Kanmiya leg. (National Science Museum, Tokyo, Japan). PARATYPE: 1♂, Japan: Wakayama, Kozagawa, 16 April 1982, M. J. Toda (NSTM). Iriomote Is, Ryukyu Is, 2♂, 1 July 1998, M. J. Toda leg. Myanmar: Pyin Oo Lwin (May Myo), 1♂, 6 January 1982, M. J. Toda leg. (holotype of *S. maymyo* Sidorenko, 1997).

*Distribution.* China (Taiwan), Japan (Honshu, Ryukyu Is\*), Myanmar.

*Stegana (Steganina) masanoritodai* Okada and Sidorenko*Stegana (Steganina) masanoritodai* Okada and Sidorenko, 1992: 415.

*Specimen examined.* Japan: Tomochi, Kumamoto, 2♂, 2♀, 17 August 2002, T. Saigusa and H.-W. Chen leg. Uenohara, Yamanashi, 3♂, 28 May 2002, H.-W. Chen leg.

*Distribution.* Russia (Far East), China (north-east), Japan (Hokkaido, Honshu\*, Kyushu\*).

*Stegana (Steganina) ornatipes* Wheeler and Takada*Stegana (Steganina) ornatipes* Wheeler and Takada, 1964: 233; Okada, 1968: 304; Okiada, 1971: 81; Okada, 1988: 27; Sidorenko, 1998: 297.

*Specimen examined.* Japan: Iriomote Is, Ryukyu Is, 1♂, 2♀, 17 June 1999, H.-W. Chen leg.

*Distribution.* China (Taiwan), Japan (Ryukyu Is), Caroline Is.

*Stegana (Steganina) biprotrusa* sp. nov

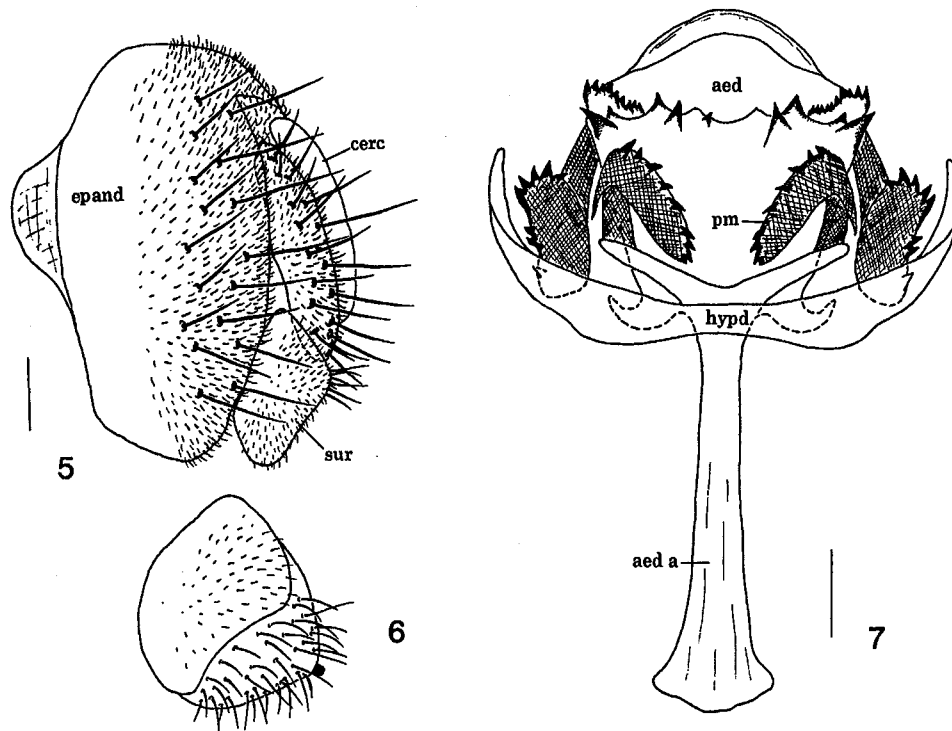
(figures 5–7)

*Diagnosis.* Paramere strongly sclerotized, distally with several small, acute projections, medially with one pointed process (figure 7); gonopod laterally protruded one long, strongly sclerotized process with several, acute projections; aedeagus with several, acute projections on antero-ventral margin (figure 7).

*Description.* Head: eyes brownish red, lacking narrow band; maximum diameter of eye perpendicular to body axis. Ocellar triangle and frons glossy black. Interfrontal setulae minute and thin below. Fronoto-orbital plate brownish red above, black below. Pedicel and first flagellomere black. Face black, with one narrow, yellow band below; facial carina low. Clypeus, gena and palpus yellow; palpus slender.

Thorax: mesonotum medially dark brown, laterally brownish yellow. Postpronotal lobe brown, with two long seta. Pleura yellow, with one black, longitudinal stripe below wing. Katapisternal setae 2. Scutellum black, brown laterally, yellow at tip. Wing brown, unicolourous at tip; r-m and dM-cM crossveins clouded. Halter greyish white. Legs mostly yellow; fore knees yellowish brown; mid and hind femur distally and tibia basally black. Abdominal tergites black. Sternites brown, shorter than wide.

Male terminalia: Epandrium broad, with two rows of ca 17–18 setae near posterior margin, pubescent except for anterior margin (figure 5). Surstylus with one



FIGS 5–7. *Stegana (Steganina) biprotrusa* sp. nov., ♂. (5) Epandrium (epand), cercus (cerc) and surstylus (sur), lateral view. (6) Surstylus, façade view. (7) Hypandrium (hypd), paramere (pm), aedeagus (aed) and aedeagal apodeme (aed a), lateral view. Scale bars: 0.1 mm.

short prensisetae on postero-ventral corner, and clothed with pubescent on basal half and fine setae on distal half (figure 6). Cercus long, separated from epandrium, pubescent and setigerous. Hypandrium narrow, lacking paramedian seta. Gonopods forming postero-median, short rod. Paramere lacking sensilla; basally contiguous to arm of aedeagal apodeme. Aedeagal apodeme long rod-shaped with one pair of long arms (figure 7).

Measurements: BL = 3.80 mm in holotype (3.95 in 1♀ paratype); ThL = 1.40 mm (1.50); WL = 3.35 mm (3.30); WW = 1.55 mm (1.45).

Indices: arb = 8/5 (7–8/5), avd = 0.85, adf = 1.50 (1.40), flw = 2.10 (2.00), FW/HW = 0.30, ch/o = 0.15 (0.16), prorb = 1.00 (1.10), rcorb = 0.60 (0.50), vb = 0.35 (0.40), dcl = 0.40 (0.45), presctl = 0.70 (0.75), sctl = 1.15, sterno = 0.80, orbito = 2.00, dcp = 0.15, sctlp = 1.80, C = 1.77 (1.84), 4c = 1.50 (1.47), 4v = 2.25 (2.25), 5x = 1.53 (1.97), ac = 24.00 (22.50), M = 0.72 (0.73), C3F = 0.79 (0.78).

HOLOTYPE: ♂, Japan: Tomochi, Kumamoto, 17 August 2002, H.-W. Chen leg.

PARATYPE: 1♀, same data as holotype.

*Remarks.* This species is very characteristic in having gonopod laterally protruded one long, strongly sclerotized process with several, acute projections; but the other characters resemble *S. kanmiyai*.

*Etymology.* A combination of the Latin words: ‘bi-’ + ‘protrusa’ means two processes for the gonopod.

*Stegana (Steganina) bacilla* sp. nov.  
(figures 8, 9)

*Diagnosis.* Paramere short rod-shaped, basally fused with hypandrium, apically with five to six sensilla; aedeagus broad lobe-shaped, glabrous (figure 9).

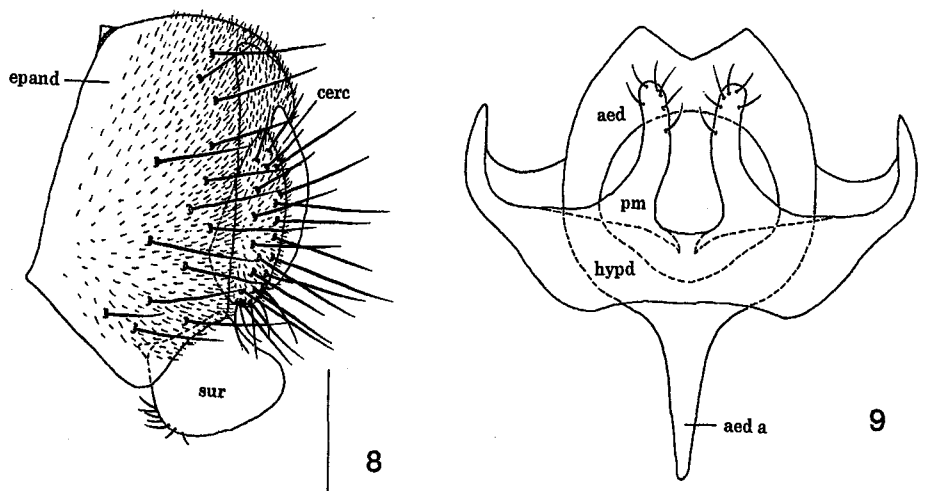
*Description.* Head: eyes brownish red, medially lacking narrow band; maximum diameter of eye perpendicular to body axis. Ocellar triangle and frons glossy brown, black below. Interfrontal setulae minute and thin below. Fronto-orbital plate brownish red above, black below. Pedicel greyish yellow; first flagellomere black. Face dark brown, with one narrow, yellow band below; facial carina developed. Clypeus, gena and palpus yellow; palpus slender.

Thorax: mesonotum brown. Postpronotal lobe brownish yellow, with one long seta. Pleura yellow, with one dark brown, longitudinal stripe below wing. Katepisternal setae 2. Scutellum brown. Wing brown, unicolourous at tip; r-m and dM-cM crossveins clouded. Halter greyish black. Legs mostly yellow; fore knees brownish yellow; mid and hind femur distally and tibia basally dark brown. Abdominal tergites brown. Sternites brownish yellow, shorter than wide.

Male terminalia: epandrium broad, with *ca* 14 setae near posterior margin, pubescent except for anterior margin (figure 8). Surstylus lacking prenisetae and pubescent, with a few fine setae on antero-ventral corner (figure 8). Cercus separated from epandrium, pubescent and setigerous. Hypandrium narrow, lacking paramedian seta. Gonopods forming postero-median rod. Aedeagal apodeme short rod-shaped, fused with aedeagus (figure 9).

Measurements: BL=2.50 mm, ThL=1.00, WL=2.15 mm, WW=0.96 mm.

Indices: arb=6-7/4, avd=0.70, adf=1.30, flw=1.80, FW/HW=0.35, ch/o=0.13, prorb=1.20, rcorb=0.60, vb=0.25, dcl=0.55, presctl=0.60, sctl=1.15, sterno=0.80, orbito=1.90, dcp=0.16, sctlp=1.50, C=1.86, 4c=1.40, 4v=2.25, 5x=1.66, ac=1.86, M=0.75, C3F=0.64.



FIGS 8, 9. *Stegana (Steganina) bacilla* sp. nov., ♂. (8) Epandrium (epand), cercus (cerc) and surstylus (sur), lateral view. (9) Hypandrium (hypd), paramere (pm), aedeagus (aed) and aedeagal apodeme (aed a), ventral view. Scale bars: 0.1 mm.

HOLOTYPE: ♂, Japan: Iriomote Is, Ryukyu Is, 14 June 1999, H.-W. Chen leg.

*Remarks.* This species resembles *S. castanea* Okada, 1988 from Sri Lanka, based on the paramere, but can be clearly distinguished from it by the aedeagus slightly bilobed apically and glabrous subapically (in *castanea*: aedeagus round apically and serrate subapically).

*Etymology.* In reference to the small, rod-like paramere in the Latin word.

#### Key to the all species of the genus *Stegana* from southern Japan

##### Male

- 1 Posterior reclinate orbital seta nearer to inner vertical than proclinate orbital; rescutellar setae well developed; scutellum nearly flat; wing brown to brownish black; mid tibia basally with a row of *ca* two to six strong postero-dorsal setae (genus *Stegana* Meigen) . . . . . 2
- 2  $M_{1+2}$  distally weakly curved to  $R_{4+5}$ ; mid tibia basally with two long, strong postero-dorsal setae (subgenus *Oxyphortica*) . . . . . 3
  - Face with brown to black band;  $M_{1+2}$  distally strongly curved to  $R_{4+5}$ ; mid tibia basally with four to six strong postero-dorsal setae (subgenus *Steganina*) . . . . . 4
- 3 Fifth tergite yellow with black band on posterior margin; paramere distally not narrowed . . . . . *nigripennis* Hendel
  - Fifth tergite nearly entirely black; paramere distally narrowed . . . . . *dendrobium* sp. nov.
- 4 Katepisterna brown; mid and hind tibiae subapically with dark brown ring; gonopod with five pairs of sclerotized, pointed processes . . . . . *ornatipes* Wheeler and Takada
  - Katepisterna yellow; mid and hind tibiae subapically yellow; gonopod without five pairs of sclerotized, pointed processes . . . . . 5
- 5 Scutellum black, yellow at tip; gonopod baso-laterally protruded one long, strongly sclerotized process with several, acute projections . . . . . *biprotrusa* sp. nov.
  - Scutellum entirely black . . . . . 6
- 6 Aedeagus with tentacle-like processes or hair crown on apical margin . . . . . 7
  - Aedeagus without tentacle-like processes or hair crown on apical margin process . . . . . 10
- 7 First flagellomere distally black; wing pale at tip, mesoscutum laterally with distinct stripes . . . . . 8
  - First flagellomere black; wing unicolourous at tip; mesoscutum laterally without distinct stripes . . . . . 9
- 8 Palpus and clypeus nearly yellow . . . . . *ctenaria* Nishiharu
  - Palpus distally and clypeus medially black . . . . . *masanoritodai* Okada and Sidorenko
- 9 Body length less than 3.0 mm; median flaps of hypandrium large, broad, semicircular; paramere absent . . . . . *nigrithorax* Strobl
  - Body length more than 4.0 mm; median flaps of hypandrium narrow; paramere present with three to four setulae . . . . . *unidentata* Takada
- 10 Surstylus apically with one preniseta . . . . . *izu* Sidorenko
  - Surstylus lacking prenisetae . . . . . 11
- 11 Paramere small with two sensilla; aedeagus with fine hair and serrate on anterior lobe, and serrate process on lateral processes . . . . . *kammiyai* Okada and Sidorenko
  - Paramere longer, with *ca* five to six sensilla apically; aedeagus large, broad, semicircular, glabrous . . . . . *bacilla* sp. nov.



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