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Descriptions of Three New Species of *Stegana* (*Stegana*) MEIGEN (Diptera, Drosophilidae) from Sichuan Province, China, and Formosa, with Taximetrical Analyses of the Subgenus

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Abstract Three new species of *Stegana* (*Stegana*) MEIGEN are described: *sinica* from Sichuan Province, China, and *taiwana* and *antlia* from Formosa. Taximetrical analyses of eleven species of the subgenus are made and a key to the species is automatically constructed.

Key words: Drosophilidae; *Stegana* (*Stegana*); new species; taximetry; China; Formosa.

Up to 1981, the nominate subgenus of the genus *Stegana* MEIGEN contained 8 species (WHEELER, 1981): *annulosa* (DUDA, 1929), Buru; *bakeri* STURTEVANT, 1927, Philippines; *furta* (LINNÉ, 1776), Europe, Ussuri; *lateralis* (WULP, 1897), Sri Lanka, Java, Sumatra; *sibirica* DUDA, 1934, Siberia; *taba* OKADA, 1971, Japan, Korea; *undulata* DE MEIJERE, 1911, Java, Sumatra; and *vittata* (COQUILLETTE, 1901), USA. *S.* (*S.*) *bakeri* was moved to *Eostegana* and later supposed to belong to *Amiota* (*A.*) by OKADA (1971, 1982). After that, *S.* (*S.*) *crescentica* GUPTA et PANIGRAHY, 1987, was added from India.

During the study on the collection of Drosophilidae in the Zoological Institute (Leningrad, USSR), two damaged specimens of *Stegana* (*S.*) from East Tibet were found by the senior author. Those are ascertained to be of a new species by the senior author. In addition, two new species from Formosa are described by the junior author.

Stegana (*Stegana*) *sinica* SIDORENKO, sp. nov.

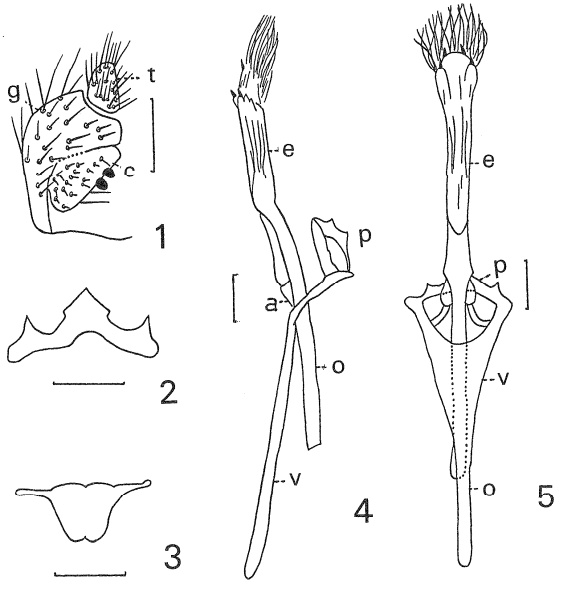
(Figs. 1–5)

♂♀. Body about 2.5–3.5 mm in length. Eye red, bare. Third antennal joint yellow. Arista with six upper and four lower branches in addition to a small fork. Anterior reclinate orbital slightly shorter than other orbitals. Frons yellow, yellowish gray in upper part, with numerous fine hairs. Ocellar triangle blackish

brown. Periorbits narrow, yellowish gray. Face yellow. Carina short. Clypeus yellow. Cheek yellow, yellowish brown at bases of orals. Postgena broad. Palpus black, with an apical and five marginal hairs. Vibrissa strong; or_2 1/3 as long as vibrissa; or_3 and or_4 2/5 as long as vibrissa. Proboscis yellow.

Mesoscutum red brown, with five indistinct dark longitudinal stripes. Thoracic pleura yellow, with a broad black longitudinal stripe above, without black patches below. Ac in 10–12 irregular rows. Only one prominent humeral. Apical scutellars 1/2 as long as laterals. Sterno-index 0.8. Legs yellow; mid and hind femora fuscous at apical one third. Mid tibia with four short bristles basally above. Wing darkened anteriorly, paler posteriorly; veins darkened. C-index 2.0; 4V-index 2.0; 4C-index 1.2; 5x-index 1.25; Ac-index 5.0 in ♂, 7.0 in ♀. C3-fringe 0.6.

Abdominal tergites nearly entirely black in ♂, yellowish brown in ♀. Periphallic organs (Fig. 1): Epandrium (g) yellowish brown, with about eight strong bristles and numerous short ones. Cercus (t) with about 30 setae. Surstylus (c) yellowish brown, semicircular, with two black teeth distally and about 18 short setae on entire surface. Phallic organs (Figs. 4, 5): Hypandrium (v) anteriorly strongly elongated. Anterior paramere (a) minute. Aedeagus (e)



Figs. 1–5. *Stegana* (*Stegana*) *sinica* sp. nov. —— 1, Periphallic organs; 2, posterior paramere; 3, decasternum; 4, 5, phallic organs, lateral and ventral views. a, Anterior paramere; c, surstylus; e, aedeagus; g, epandrium; o, apodeme of aedeagus; p, posterior paramere; t, cercus; v, hypandrium. Scale: 0.28 mm.

elongated, cylindrical, apically slightly widened, with four teeth and a hair crown, basally connected to apodeme (o) at obtuse angle. Posterior paramere (p, Fig. 2) heavily sclerotized, with lateral arms slightly bent caudally. Decasternum (Fig. 3) heavily sclerotized, quadrate.

Holotype: ♂, Si-ch (Sichuan), Pasinkou Riv., Zhumme, China, 19.VI.1893, G. N. POTANIN leg. Paratype ♀, Si-ch (Sichuan), Tajinlu, Zhunge, China, 16.VI.1893, G. N. POTANIN leg. Type locality is vicinity of Yajiang. Type series are deposited in the Zoological Institute, Leningrad, USSR.

Distribution. China (Sichuan).

Relationships. This species is closely related to *S.* (*S.*) *sibirica*, which was described for a single female from Ussuri region, in having black palpi and yellow clypeus, but differs from the latter by the colour of mesoscutum and smaller C- and 4V-indices. Male genitalia resemble those of *S. furta* illustrated by LAŠTOVKA and MÁCA (1982), but differs by the shape of aedeagus.

Stegana (*Stegana*) *taiwana* OKADA, sp. nov.

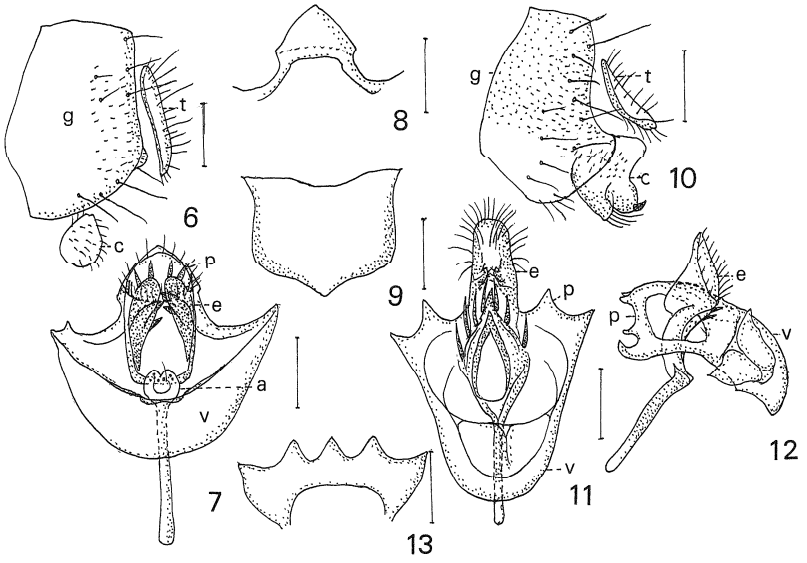
(Figs. 6–9)

♂♀. Body about 2.5 mm in length. Eye dark purple brown, bare. Second antennal joint yellowish gray, third yellowish gray, long. Arista with seven upper and five lower branches in addition to a small fork. Anterior reclinate orbital shorter than other orbitals. Frons longer than broad, orange, caudally grayish brown. Carina undeveloped. Clypeus brown. Cheek yellowish brown, about 1/10 as broad as largest diameter of eye. Palpus black. Vibrissa strong; other orals fine.

Mesoscutum subshining brown, with dark patches anteriorly and laterally. Scutellum subshining brown, marginally pale. Thoracic pleura pale yellowish brown, with two dark brown longitudinal stripes; upper one broader and longer than lower one. Ac in about 10 rows. Humeral one. Anterior dorsocentrals 2/5 as long as posteriors. Lateral scutellars divergent, as long as apicals. Legs yellow; femora distally brownish black, mid tibia with about 4 bristles above. Wing darker anteriorly. C-index 1.8; 4V-index 1.9; 4C-index 1.3; 5x-index 1.3; Ac-index 9.1. C3-fringe 0.6. Halter with knob basally dark brown, apically white; stalk yellowish orange.

Abdominal tergites black. Periphallic organs (Fig. 6) pale brown. Epandrium (g) broad. Cercus (t) vertically elongate. Surstylus (c) rounded, without heavy bristles. Decasternum (Fig. 9) large, quadrate, distally slightly pointed. Phallic organs (Fig. 7) pale brown. Aedeagus (e) robust, distally hairy, ventrally with a few strong black spines. Anterior paramere (a) small, rounded. Hypandrium (v) broader than long. Posterior paramere (Fig. 8) triangular, black.

Holotype: ♂, Kuang-tsu-lin, Tainan County, Formosa, 7.IV.1965, SAIGUSA leg. Allotype ♀, *ibid.*, 28–29.V.1971, KANMIYA leg. Paratypes, 3♂, collected



Figs. 6–9. *Stegana* (*Stegana*) *taiwana* sp. nov. 10–13. *S.* (*S.*) *antlia* sp. nov —— 6, 10, Periphallic organs; 7, 11, 12, phallic organs; 8, 13, posterior paramere; 9, decasternum. Alphabetical signs as in Figs. 1–5. Scale: 0.1 mm.

together with the holotype; 1 ♀, Fenchifu, Chiay-i Hsien, Formosa, 12.IV.1965, SAIGUSA leg.; 1 ♀, Chiaoliping, Chiay-i Hsien, Formosa, 13.IV.1965, SAIGUSA leg. Type series are deposited in the National Science Museum, Tokyo.

Distribution. Formosa.

Relationships. This species resembles *S.* (*S.*) *lateralis* in having yellow antenna, black palpus, yellow face and thoracic pleura with two black longitudinal stripes, but differs from the latter in having brown frons (yellow in *lateralis*) and mesoscutum which is mostly black (yellow in *lateralis*).

Stegana (*Stegana*) *antlia* OKADA, sp. nov.

(Figs. 10–13)

♂♀. Body about 2.5 mm in length. Eye dark red, bare. Antenna with second joint yellowish orange; third grayish brown. Arista with about eight upper and five lower branches in addition to a small fork. Anterior reclinate orbital half as long as other orbitals. Frons quadrate, orange yellow. Carina undeveloped. Clypeus yellowish brown. Cheek yellowish white, about 1/8 as broad as largest diameter of eye. Palpus black, broad. Vibrissa strong; other orals fine.

Mesoscutum dark brown, laterally and caudally brownish black. Scutellum

brownish black. Thoracic pleura yellowish brown, with two longitudinal black stripes. Ac in about 10 irregular rows. Humeral one, strong. Anterior dorsocentrals about 1/3 as long as posteriors. Lateral scutellars divergent. Legs yellowish white; mid and hind femora and fore tibia mostly black; mid tibia with about 10 bristles above. Wing brownish black, caudally paler. C-index 1.9; 4V-index 1.5; 5x-index 1.2; Ac-index 8.3. C3-fringe 0.45. Halter orange brown.

Abdominal tergites mat black. Periphallic organs (Fig. 10) mostly black. Epandrium (g) paler below. Cercus (t) vertically elongate. Surstylus (c) with a heavy bristle distally. Phallic organs (Fig. 11) dark brown. Aedeagus (e) situated in lateral aspect, distally with hair crown, ventrally with several long black spines. Hypandrium (v) triangular, as broad as long. Posterior paramere (Fig. 13) with three dentations distally.

Holotype: ♂, Kuang-tsu-lin, Tainan Hsien, Formosa, 7.IV.1965, SAIGUSA leg. Allotype ♀, same data as the holotype. Paratypes; 2 ♀, same data as the holotype; 1 ♀, Kenting, Tainan Hsien, Formosa, 19.V.1971, KANMIYA leg. Type series are deposited in the National Science Museum, Tokyo.

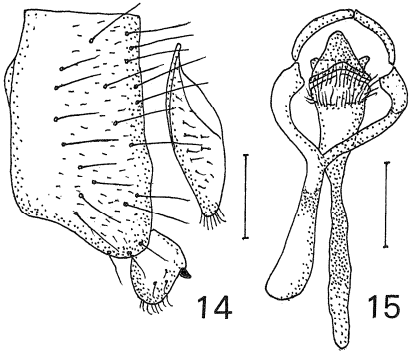
Distribution. Formosa.

Relationships. This species resembles the foregoing species, *taiwana*, in having black palpus, yellow face, thoracic pleura with two black longitudinal stripes, and hypandrium which is broader than long, but differs from the latter in having antenna with brown third joint, mesoscutum which is yellowish brown, and surstylus with a black tooth distally.

Etymology. antlia is named for a horn-like aedeagus.

Taximetrical analyses and key to the species

The eleven species of *Stegana* (*S.*) (t=11) are taximetrically analysed using



Figs. 14–15. *Stegana* (*Stegana*) *undulata* DE MEIJERE, 1911; male sample from Bogor, Java, 27.VI.1971, OKADA leg. —— 14, Periphallic organs; 15, phallic organs. Scale: 0.1 mm.

fourteen diagnostic characters (A-N, n=14) each divided into two states (0, 1).

A. Antenna with second joint black above (A=0) or yellow (a=1).
B. Antenna with third joint black (B=0) or yellow (b=1).
C. Arista with upper branches 8 or more (C=0) or 7 or less (c=1).
D. Palpus black (D=0), yellow (d=1), or yellow with distal end black

Table 1. Original n (character) × t (taxon) matrix of *Stegana* (*Stegana*).

t \ n	A	B	C	D	E	F	G	H	I	J	K	L	M	N
undulata	0	1	0	0.5	0.5	0	0	1	1	1	1	1	1	1
annulosa	1	0	0	NC	0	0	0	1	1	0	0	0	NC	NC
furta	1	1	1	0	0	1	1	0	0	0	NC	0	1	1
taba	1	1	1	0	0	0	0	1	NC	1	1	0	1	1
vittata	1	1	0	0	NC	0	1	1	1	1	NC	0	0	0
crescentica	1	1	1	1	0.5	0.5	NC	1	1	1	1	1	0	0
taiwana	1	1	1	0	0.5	0	1	0	1	0	0	1	0	0
antlia	1	0	1	0	0.5	1	1	1	1	0	0	0	0	1
lateralis	1	1	1	0	NC	1	1	1	NC	0	NC	1	NC	NC
sibirica	1	1	1	0	1	NC	0	0	0	1	NC	1	NC	NC
sinica	1	1	1	0	1	1	1	1	1	1	0	0	1	1

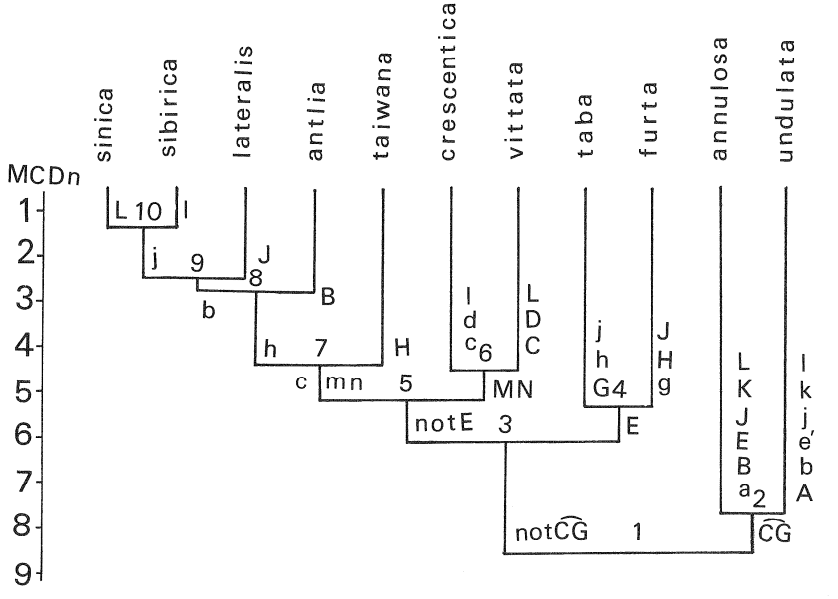


Fig. 16. A dendrogram of relationships of the species of *Stegana* (*Stegana*), constructed by means of MCD proximity analysis and UPGMA cluster analysis. Alphabetical signs on the branches are character states; numerical figures at the branching points are key couplets.

(d′=0.5).

E. Clypeus black (E=0), yellow (e=1), or brown (e′=0.5).

F. Frons brown (F=0) or yellow (f=1).

G. Face black above or laterally (G=0) or yellow (g=1).

H. Mesoscutum black at least anteriorly (H=0) or yellowish brown (h=1).

I. Scutellum black (I=0) or yellow to brown (i=1).

J. Thoracic pleura with two black longitudinal stripes (J=0) or one such stripe (j=1).

K. Humerals only one (K=0) or two (k=1).

L. Legs mostly black (L=0) or yellow (l=1).

M. Hypandrium broader than long (M=0) or longer than broad (m=1).

N. Surstylus without apical teeth (N=0) or with one or two apical teeth (n=1).

MCD (mean character difference) proximity analysis and UPGMA (unweighted pair group method using arithmetic average) cluster analysis are applied to the n×t matrix (Table 1) to establish a dendrogram of relationships of the species (Fig. 13), from which a key to the species is automatically constructed.

Key to the species of *Stegana* (*Stegana*)

1. Arista with upper branches 8 or more (C); face black above or laterally (G). 2
— Not simultaneously arista with upper branches 8 or more and face black above or laterally (not CG). 3
2. Antenna with second joint black above (A); third joint yellow (b); clypeus brown (e′); thoracic pleura with one black longitudinal stripe (j); humerals two (k); legs mostly yellow (l). ..... *undulata**
— Antenna with second joint yellow (a); third joint black (B); clypeus black (E); thoracic pleura with two black longitudinal stripes (J); humeral only one (K); legs mostly black (L). ..... *annulosa*
3. Clypeus black (E). 4
— Clypeus not black (not E). 5
4. Face yellow (g); mesoscutum black at least anteriorly (H); thoracic pleura with two black longitudinal stripes (J). ..... *furta*
— Face black above or laterally (G); mesoscutum yellowish brown (h); thoracic pleura with one black longitudinal stripe (j). ..... *taba*
5. Hypandrium broader than long (M); surstylus without apical teeth (N). 6
— Hypandrium longer than broad (m); surstylus with one or two apical teeth (n). 7

* For male genitalia, see Figs. 14–15.

6. Arista with upper branches 8 or more (C); palpus black (D); legs mostly black (L). ..... *vittata*
— Arista with upper branches 7 or less (c): palpus yellow (d); legs yellow (l). ..... *crescentica*
7. Mesoscutum black at least anteriorly (H). ..... *taiwana*
— Mesoscutum yellowish brown (h). 8
8. Antenna with third joint black (B). ..... *antlia*
— Antenna with third joint yellow (b). 9
9. Thoracic pleura with two black longitudinal stripes (J). ..... *lateralis*
— Thoracic pleura with one black longitudinal stripe (j). 10
10. Legs yellow (l). ..... *sibirica*
— Legs mostly black (L). ..... *sinica*

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