

♠ New or Unrecorded Species of *Stegana* (*Steganina*)  
(Diptera, Drosophilidae) from the Old World,  
Especially Japan and Russia

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**Abstract** Five new species of *Stegana* (*Steganina*) (Diptera, Drosophilidae) from the Old World are described: *masanoritodai* (Japan, Russia), *toyaensis* (Japan), *kanmiyai* (Formosa), *ikedai* (Ethiopia) and *papuana* (Papua New Guinea). *S. (S.) ctenaria* NISHIHARU and *S. (S.) nigrithorax* STROBL are recorded from Russia for the first time.

**Key words:** Drosophilidae; *Stegana* (*Steganina*); Old World; taximetry.

More than 50 species of *Stegana* (*Steganina*) are known from various regions of the world (WHEELER, 1981, 1986; TSACAS, 1990). Present report is to add to this subgenus five new species from Russia, Japan, Formosa, Ethiopia and Papua New Guinea. Taximetical analyses of these species and other related species are made.

Types of new species are deposited in the Entomological Institute, Hokkaido University, Sapporo, Japan (EHU), National Science Museum, Tokyo, Japan (NSM), Institute of Biology and Pedology, Russian Academy of Sciences, Vladivostok, Russia (IBP) and Bernice P. Bishop Museum, Honolulu, Hawaii, USA (BM).

### Descriptions of New Species

♣ *Stegana* (*Steganina*) *masanoritodai* sp. n.

(Fig. 1 A-F)

♂, ♀. Body about 4.3-4.5 mm in length. Eye red, bare. Third antennal joint dark gray. Arista with 9 upper and 6 lower branches besides a fine fork. Palpus yellow, grayish apically, with 7-8 ventral setae. Ocellar triangle black. Periorbits pale brown. Clypeus black. Anterior one-fourth of frons dark brown, succeeding one-fourth pale brown, posterior two-fourth dark brown, excepting

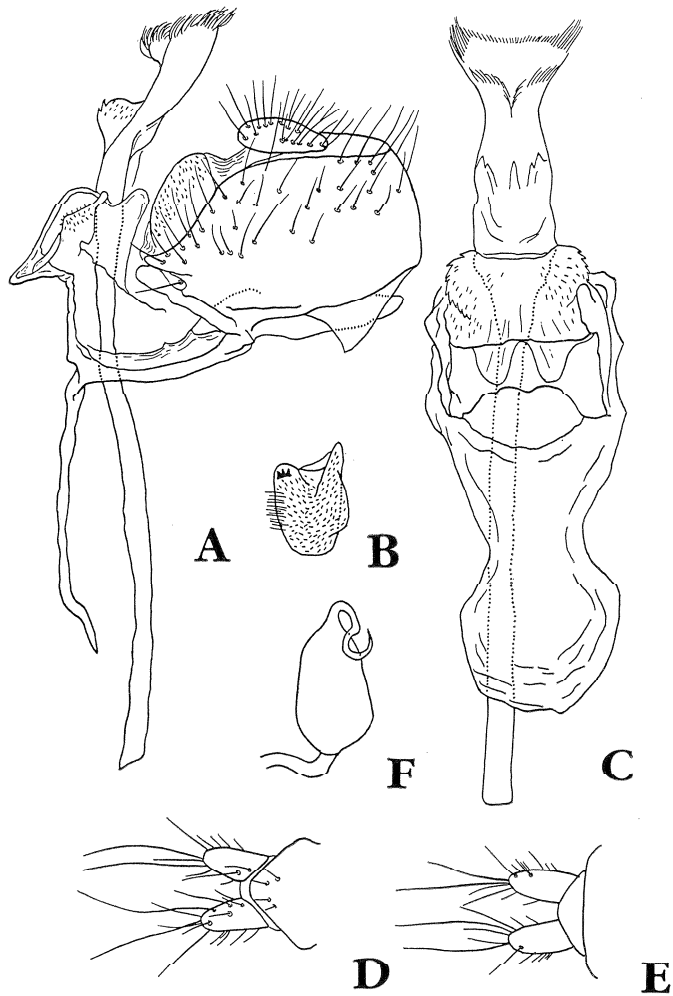


Fig. 1 A–F. *Stegana (Steganina) masanoritodai*. — A, Periphallallic and phallic organs, lateral view; B, surstylus; C, phallic organs, ventral view; D, female terminalia, dorsal view; E, *ibid.*, ventral view; F, spermatheca.

around ocellar triangle, which is pale brown. Face yellow, with two black bands medially and near buccal margin, lower cross band broadened medially. Carina short. Cheek yellowish white. Anterior reclinate orbital  $2/3$  as long as other orbitals. Vibrissa long and strong, or,  $1/2$  as long as vibrissa. Mesoscutum brownish yellow, with brownish black longitudinal markings. Thoracic pleura white, with a broad black longitudinal stripe. Humerals 2, lower longer. Scutellum brownish black. Acrostichal hairs in 10–12 irregular rows. Sterno-index 0.6–0.7. Legs yellowish white, knee joints fuscous. Preapicals on all tibiae, apicals

prominent on mid. Wing black, paler toward caudal margin, apically yellow. C-index 2.2 (2.0–2.5); 4 C-index 1.0 (1.0–1.1); 4 V-index 1.7 (1.7–1.8); 5 x-index 1.2 (1.0–1.4); Ac-index 11.2 (9.1–14.0). C 3-fringe on basal 3/4. Halter yellowish white. Abdominal tergites entirely black, subshining.

Periphallalic organs (Fig. 1 A): Epandrium acute triangular below. Cerci oval. Surstylus (Fig. 1 B) dark brown, micropubescent, distally deeply excavated, with 3–5 flat apical teeth and long hairs ventrally. Phallic organs (Fig. 1 C): Aedeagus cylindrical, apically with hair crown, medioventrally serrated with large and complicated processes. Anterior hypandrial lobe basally as wide as hypandrium. Female cercus (Fig. 1 D–E) elongate oval, with long hairs apically. Spermatheca as in Fig. 1 F.

Holotype: ♂, Russia, Primorye, Ussurian Reserve, Valley of stream, 17. VIII. 1988 (SIDORENKO) (IBP). Paratypes: 2 ♀, same data as holotype, 13. VIII. 1988; 1 ♀, Primorye, mouth of Armu River, 15. VI. 1990 (SIDORENKO); 1 ♀, Japan, Hokkaido, Tomakomai, 17. VII. 1984 (TODA); 2 ♀, *ibid.*, 20. VII. 1984 (TODA). Types in EHU and IBP.

*Distribution.* Russia (Primorye); Japan (Hokkaido).

*Relationships.* This species is closely related to *S. ctenarta* NISHIHARU in having complicated processes of aedeagus but differs from the latter in having black clypeus, fewer teeth of surstylus, and wider abdominal sternites of male and female.

*Remarks.* This species is named in honor of Dr. Masanori TODA (Sapporo, Japan) who provided the junior author with the Japanese specimens.

#### J *Stegana (Steganina) toyaensis* sp. n.

(Fig. 2 A–E)

♂. Body about 4.5 mm in length. Eye bare, red. Third antennal joint gray, micropubescent. Arista with 8 upper and 5 lower branches besides a fine fork. Palpus yellow. Ocellar triangle black. Periorbits brown, narrowing anteriorly. Clypeus yellow. Frons pale brown, anterior one-third dark brown. Face yellow, with two black cross bands on its medium and near buccal margin, lower cross band slightly broadened medially. Carina short. Cheek yellow. Vibrissa long and strong, more than twice as long as other orals. Mesoscutum brownish yellow, with two pairs of brownish black longitudinal stripes, inner pair broadened caudally. Thoracic pleura white, with a broad black longitudinal stripe above. Scutellum brownish black. Acrostichal hairs in 10–12 irregular rows. Sternoindex 0.8. Legs white, mid knee joint broadly black, fore and hind knee joints fuscous. Preapicals on all tibiae, apicals on mid. Wing black, paler caudally. C-index 2.4; 4V-index 1.6; 5x-index 1.2; Ac-index 8.7. C3-fringe on basal 3/4. Halter yellowish white. Abdominal tergites entirely black, subshining. Abdominal sternites dark brown.

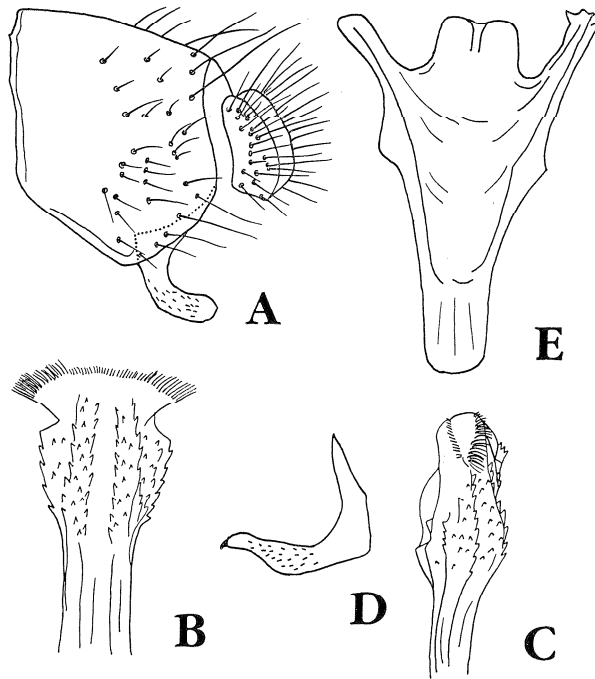


Fig. 2 A-E. *Stegana (Steganina) toyaensis*. — A, Periphallitic organs, lateral view; B, apex of aedeagus, dorsal view; C, *ibid.*, lateral view; D, surstylus; E, hypandrium, ventral view.

Holotype: ♂, Japan, Hokkaido, Lake Tōya, 6. VIII. 1964 (TODA) (EHU).

*Distribution.* Japan (Hokkaido).

*Relationships.* This species is closely related to *S. (S.) longifibula* TAKADA, especially in the pattern of mesoscutum, but differs from the latter by the shapes of surstylus and aedeagus.

#### ↓ *Stegana (Steganina) papuana* sp. n.

(Fig. 3 A-C)

♂, ♀. Body about 2.2 mm in length. Eye dark red, bare. Antenna with 2nd joint yellowish gray; 3rd black, basally yellowish gray. Arista with about 8 upper and 6 lower rather short branches. Palpus yellowish gray. Ocellar triangle black. Frons subshiny black. Clypeus gray. Face (Fig. 3 A) grayish white, black above. Carina low. Cheek white, about 1/7 as broad as eye length. Anterior reclinate orbital as long as and at middle of others. Vibrissa long, other orals short. Mesoscutum subshiny brownish black. Scutellum reddish brown. Thoracic pleura white, with a broad black longitudinal stripe above. Humeral

1. Prescutellars well developed. Acrostichal hairs in about 12 rows. Anterior dorsocentrals 1/3 posteriors; length distance of dorsocentrals about 1/4 cross distance. Lateral scutellars parallel, slightly longer than apicals, which are nearer to each other than to laterals. Sterno-index about 1.0. Legs yellow, femora apically black, mid tibia with about 12 spicules above. Wing dark brown especially anteriorly. C-index 2.6; 4V-index 1.8; 4C-index 1.4; 5x-index 1.7; Ac-index 10.0. C3-fringe 2/3. Halter yellowish white, knob black. Abdominal tergites subshiny black.

Male genitalia as in Fig. 3 B-C. Surstylus without teeth. Aedeagus cylindrical, bare. Paramere slender, laterally serrated. Hypandrium as broad as long.

Holotype: ♂, Wau, Papua New Guinea, 24. IX. 1977 (OKADA). Allotype: ♀, same data as holotype. Paratypes: 2 ♂, 8 ♀, Wau, Papua New Guinea, 9-24. IX. 1977 (OKADA); 1 ♂, Mc Adams Park, Wau, 4. IX. 1971 (W. C. GAGNE). Types in BM and NSM.

*Distribution.* Papua New Guinea.

*Relationships.* This species resembles *S. (S.) varipes* TSACAS, 1990, in the shape of male genitalia, but differs by leg coloration and absence of surstylus teeth.

### *Stegana (Steganina) kanmiyai* sp. n.

(Fig. 3 D-G)

♂. Body about 3 mm in length, subshining dark brownish black. Eye red, bare. Antenna with 2nd joint yellowish gray, third grayish black. Palpus pale. Ocellar triangle black. Periorbit orange brown, anteriorly narrowing. Frons shiny black, laterally orange brown. Face (Fig. 3 D) black, lower 1/3 yellowish white. Clypeus brown. Cheek shiny silvery whitish yellow, broad, about 1/3 eye length. Orbitals 3, long. 2nd oral 1/3 vibrissa. Mesoscutum brownish black, laterally paler. Scutellum brownish black. Thoracic pleura pale below, with a broad black longitudinal stripe above. Humeral 1 long and 2 upper shorter. Acrostichal hairs ia about 8 rows. Lateral scutellars divergent, apicals shorter than and nearer to each other than to laterals. Sterno-index about 1.0. Legs yellowish white, femora distally and tibiae proximally black. Wing black especially anteriorly, C-index 2.5; 4V-index 1.5; 4C-index 0.9; 5x-index 1.2; Ac-index 10.0. C3-fringe 1/2. Halter gray. Abdominal tergites dark brownish black. Periphallic organs (Fig. 3 E): Epandrium broad below; surstylus quadrate, without teeth. Phallic organs (Fig. 3 F-G): aedeagus distally hairy; hypandrium narrower than long.

Holotype: ♂, Formosa, Kang-tsulín, 28-29. V. 1971 (KANMIYA). Paratype: 1 ♂, Japan, Wakayama, Kozagawa, 16. IV. 1982 (TODA). Types in NSM.

*Distribution.* Formosa, Japan (Honshu).

*Relationships.* This species resembles *S. (S.) ctenaria* NISHIHARU in the shapes

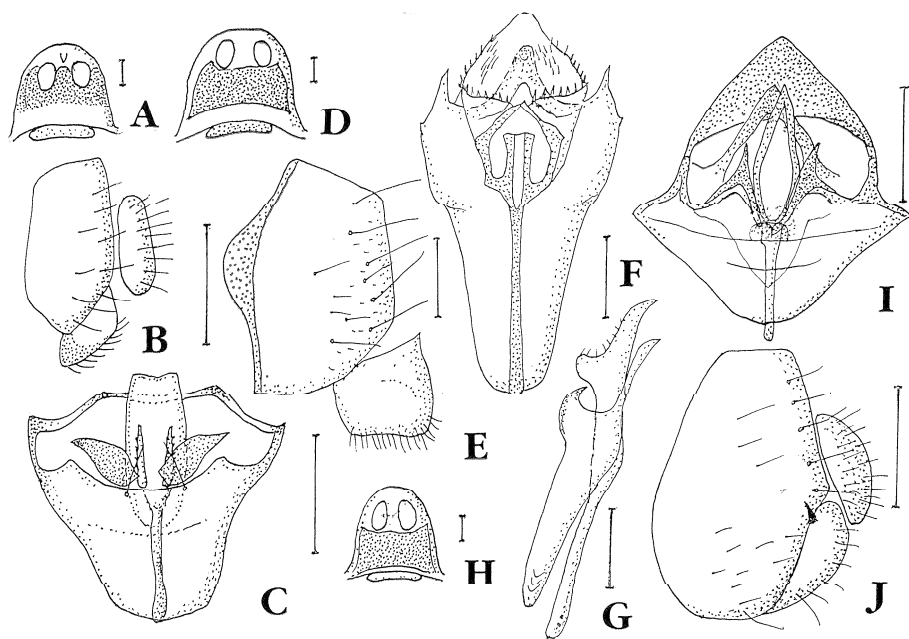


Fig. 3 A-C. *Stegana (Steganina) papuana*; D-G. *S. (S.) kanmiyai*; H-J. *S. (S.) ikedai*. —  
A, D, H, Frons and clypeus; B, E, J, peripheral phallic organs; C, F, G, I, phallic organs.  
Scale: 0.1 mm.

of aedeagus and surstylus, but differs from the latter by having no teeth of surstylus.

√ *Stegana (Steganina) ikedai* sp. n.

(Fig. 3 H-J)

♂, ♀. Body about 2.2 (♂) to 2.5 (♀) mm in length. Eye red black, bare. Antenna with 2nd joint brown, 3rd yellowish brown. Arista with about 6 upper and 5 lower rather short branches. Palpus deep black, with short setae. Ocellar triangle black. Periorbit yellowish brown. Frons brownish black, anterior half orange brown. Face (Fig. 3 H) dark brown, buccal margin narrowly yellowish brown. Clypeus yellowish gray. Carina short, low. Cheek yellowish gray, about 1/9 as broad as eye length. Orbitals 3, long. 2nd oral half vibrissa. Mesoscutum dark brown, subshining. Scutellum darker. Thoracic pleura pale brown, with black patches on mesopleura and sternopleura. Humeral 1, long. Acrostichal hairs in 12 rows. Anterior dorsocentrals 1/3 as long as posteriors, cross distance of dorsocentrals 1/5 length distance. Lateral scutellars slightly divergent, longer than apicals, which are nearer to each other than to laterals. Sterno-index about 0.8. Legs yellow. Wing dark, paler caudally. C-index 2.7; 4V-index

1.9; 4C-index 1.1; 5x-index 1.1; Ac-index 6.0. C3-fringe 1/2. Halter orange brown. Abdominal tergites dark brownish black, anteriorly brownish orange.

Male genitalia (Fig. 3 I–J) dark brown. Epandrium broad below. Surstylus oval, with a black tooth. Aedeagus fusiform; paramere slender, serrated marginally, hypandrium broader than long.

Holotype: ♂, Ethiopia, Nazret, 14–15. IX. 1971 (IKEDA). Allotype: ♀, same data as holotype. Types in NSM.

*Distribution.* Ethiopia.

*Relationships.* This species resembles *S. (S.) varipes* TSACAS especially in the shape of male genitalia, but body is darker and paramere is longer.

### New Distribution Records

(New record is indicated by an asterisk.)

#### ✓ *Stegana (Steganina) ctenaria* NISHIHARU

*Stegana (Steganina) ctenaria* NISHIHARU, 1979, *Kontyû, Tokyo*, 47: 38.

*Material examined.* Russia, Primorye, Ussurian Reserve: 1 ♂, 9. VIII. 1988; 1 ♀, 13. VIII. 1988 (SIDORENKO).

*Distribution.* Russia\* (Far East), Japan (Honshu). *Korea*

#### ✓ *Stegana (Steganina) nigrithorax* STROBL

*Stegana coleoprata* var. *nigrithorax* STROBL, 1898, *Mitt. naturw. Ver. Steierm.*, 34: 266.

*Material examined.* Russia: Primorye, Ussurian Reserve, 2 ♂, 1 ♀, 12–13. VIII. 1988, 26. V. 1990 (SIDORENKO); 15 km SWW Neshino, Ananevka River, 1 ♂, 1. VI. 1991 (SIDORENKO); Khabarovsk Prov., Komsomolsky Reserve, 50 km of the mouth of Gorian River, 1 ♂, 30. VII. 1990 (SIDORENKO). Japan: Koryukozan, Sapporo, Hokkaido, 1 ♀, 17. VIII. 1976 (TODA); River Otarinai, Sapporo, Hokkaido, 1 ♂, 14. VIII. 1987 (TODA).

*Distribution.* Europe, Russia\* (Far East), Korea, Japan (Hokkaido\*, Honshu).

### Taximetric Analyses

Five new species described above and 15 known species of the Old World (t=20) are put in taximetric analyses, using 14 diagnostic characters (n=14) adopted from OKADA (1971) and LAŠTOVKA and MÁČA (1982) as listed below.

A. Face parallel-sided (A=0) or broadened below (a=1).

B. Face with conspicuous black bands below (B=0) or without such band (b=1).

- C. Carina short and low (C=0) or long and high (c=1).  
 D. Clypeus black (D=0) or yellow or yellowish brown (d=1).  
 E. Mesoscutum often striped (E=0) or not striped (e=1).  
 F. Scutellum unicolorous (F=0) or apically or laterally pale (f=1).  
 G. Halter yellow (G=0) or brownish black (g=1).  
 H. Ac-index 15.0 or less (H=0) or 20.0 or more (h=1).  
 I. Surstylus globular, distally not deeply excavated (I=0) or deeply excavated (i=1).  
 J. Surstylus with or without 1 tooth (J=0) or with 3 or more teeth (j=1).  
 K. Periandrium with or without short anterior process (K=0) or with long process (k=1).  
 L. Aedeagus apically not haired ((L=0) or haired (l=1)).  
 M. Aedeagus without (M=0) or with (m=1) complicated processes.  
 N. Anterior hypandrial lobe as broad as or broader than hypandrium (N=0) or narrower than hypandrium (n=1).

Basing on  $n \times t$  matrix (Table 1), a dendrogram of relationships of the species is constructed by means of  $S_{sm}$  proximity analysis and UPGMA cluster analysis (Fig. 4). A key to the species is automatically provided from the dendrogram.

This subgenus is subdivided into 3 unnamed groups (1-3) by OKADA (1971), and the *coleoptrata* group (1c) is proposed by LAŠTOVKA and MÁČA (1982) for most of the first group. The dendrogram shows, however, these groups excepting

Table 1. Original  $n$  (character)  $\times$   $t$  (taxon) matrix of *Stegana* (*Steganina*)<sup>†</sup>

t \ n	A	B	C	D	E	F	G	H	I	J	K	L	M	N
<i>coleoptrata</i>	0	0	0	1	1	0	0	0	1	0	0	1	0	1
<i>cenariu</i>	0	0	0	1	0	0	0	0	1	1	NC	1	1	0
<i>masanoritodai</i>	0	0	0	0	0	0	0	0	1	1	NC	1	1	0
<i>subexcavata</i>	0	0	0	1	1	0	0	0	1	0	0	1	0	0
<i>nigrithorax</i>	0	0	0	1	0	1	0	0	1	0	0	1	0	0
<i>toyaensis</i>	0	0	0	1	0	0	0	0	1	0	NC	1	0	0
<i>longifibula</i>	0	0	1	1	0	0	0	0	1	0	1	1	0	0
<i>hypoleuca</i>	1	0	1	1	0	1	0	0	1	0	0	1	0	0
<i>unidentata</i>	0	0	0	1	0	1	0	0	0	0	NC	1	0	0
<i>shirozui</i>	0	0	0	1	0	1	0	0	0	0	1	1	1	1
<i>kanmiyai</i>	0	1	0	0	1	0	0	0	0	0	0	1	0	1
<i>papuana</i>	0	1	0	1	1	0	1	0	0	0	0	0	0	1
<i>ikedai</i>	0	1	0	1	1	0	0	0	0	0	0	0	0	1
<i>castanea</i>	0	1	1	1	1	0	0	0	0	0	0	0	0	1
<i>undulata</i>	1	0	0	0	0	0	0	0	0	0	0	1	0	1
<i>scutellata</i>	0	1	1	0	1	1	1	0	0	0	1	0	0	0
<i>ornatipes</i>	NC	0	0	0	1	1	1	0	0	0	0	1	0	0
<i>penihexata</i>	0	1	1	0	0	0	NC	1	0	0	0	1	0	1
<i>nigrolimbata</i>	NC	0	0	0	1	0	0	0	0	1	0	0	1	1
<i>nigrifrons</i>	0	1	1	1	1	0	1	1	NC	NC	NC	1	0	0



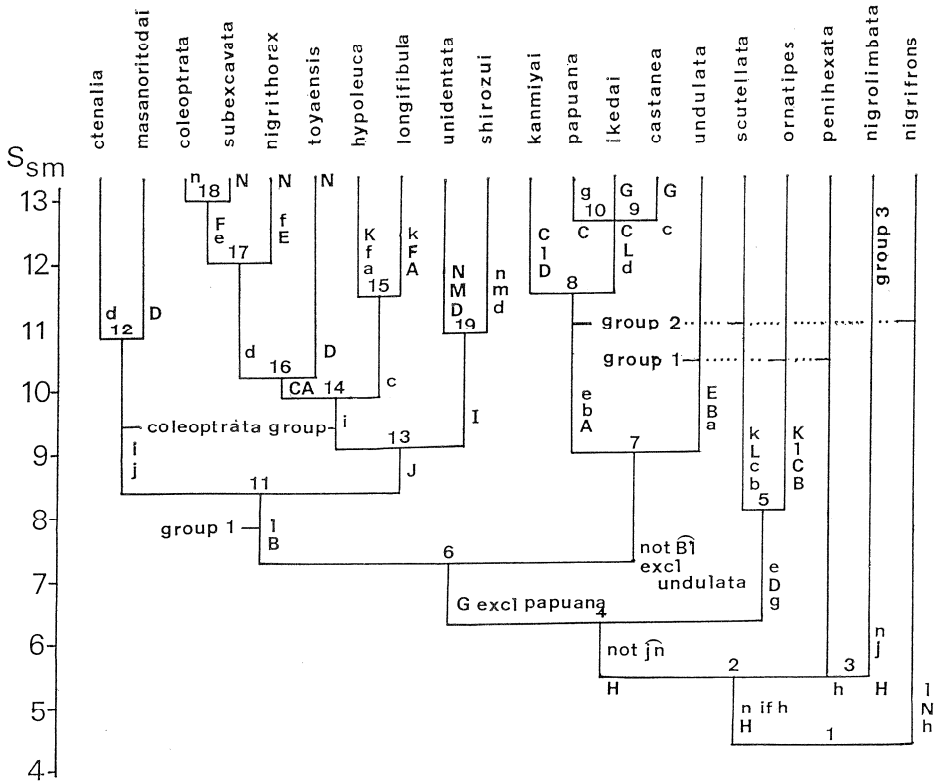


Fig. 4. A dendrogram of relationships of 20 species of *Stegana (Steganina)*, based on  $S_{sm}$  proximity analysis and UPGMA cluster analysis. Alphabetical signs on the branches: character states selected from the original  $n \times t$  matrix. Numerical figures at the branching points: key couplets.

the *coleoprata* group are not well discriminated from each other.

Diagnosis of groups: 1, IBl or iBl (1c); 2, IbL or Ibl; 3, IBL.

A list of species used in the taximetical analyses

Species	Group	Distribution
<i>Stegana (Steganina) castanea</i> OKADA, 1988	2	Sri Lanka
<i>S. (S.) coleoprata</i> (SCOPOLI, 1768)	1c	Europe
<i>S. (S.) ctenaria</i> NISHIHARU, 1979	1c	Japan, Russia <i>Korea</i>
<i>S. (S.) hypoleuca</i> MEIGEN, 1830	1c	Europe
<i>S. (S.) ikedai</i> n. sp.	2	Ethiopia
<i>S. (S.) kanmiyai</i> n. sp.	2	Formosa, Japan
<i>S. (S.) longifibula</i> TAKADA, 1968	1c	Japan, Europe
<i>S. (S.) masanoritodai</i> n. sp.	1c	Japan, Russia

<i>S. (S.) nigrifrons</i> MEIJERE, 1911	2	Formosa, Sri Lanka, Indonesia
<i>S. (S.) nigrithorax</i> STROBL, 1898	1c	Europe, Russia, Japan, Korea
<i>S. (S.) nigrolimbata</i> DUDA, 1924	3	Formosa
<i>S. (S.) ornatipes</i> WHEELER et TAKADA, 1964	1*	Micronesia
<i>S. (S.) papuana</i> n. sp.	2	Papua New Guinea
<i>S. (S.) penihexata</i> GUPTA et PANIGRAHY, 1987	1	India
<i>S. (S.) scutellata</i> MEIJERE, 1911	2	Japan, Nepal, Indonesia
<i>S. (S.) shirozui</i> OKADA, 1971	1	Formosa, India
<i>S. (S.) subexcavata</i> VAIDIA et GODBOLE, 1976	1c	India
<i>S. (S.) toyaensis</i> n. sp.	1c	Japan
<i>S. (S.) undulata</i> MEIGEN, 1911	1	Indonesia
<i>S. (S.) unidentata</i> TAKADA, 1968	1	Japan

\* formerly placed in group 3.

**Key to the Species of *Stegana* (*Steganina*) under Consideration**

1. Ac-index 20.0 or more (h); anterior hypandrial lobe as broad as hypandrium (N); aedeagus apically haired (I) ..... *nigrifrons*  
 — Ac-index 15.0 or less (H); anterior hypandrial lobe narrower than hypandrium if Ac-index is 20.0 or more (n if h) ..... 2
2. Ac-index 20.0 or more (h) ..... *penihexata*  
 — Ac-index 15.0 or less (H) ..... 3
3. Surstylus with 3 or more teeth (j); anterior hypandrial lobe narrower than hypandrium (n) ..... *nigrolimbata*  
 — Not simultaneously surstylus with 3 or more teeth and anterior hypandrial lobe narrower than hypandrium (not jn) ..... 4
4. Halter brownish black (g); clypeus black (D); mesoscutum not striped (e) ... 5  
 — Halter yellow (G) (excluding *papuana*) ..... 6
5. Face with conspicuous black band below (B); carina short and low (C); periandrium without short anterior process (K); aedeagus apically haired (I) ...  
 ..... *ornatipes*  
 — Face without black band (b); carina long and high (c); periandrium with long process anteriorly (k); aedeagus apically not haired (L) ..... *scutellata*
6. Surstylus globular, distally not deeply excavated (I); not simultaneously face with conspicuous black band below and aedeagus apically haired (not Bl excluding *undulata*) ..... 7  
 — Face with conspicuous black band below (B); aedeagus apically haired (I) .. 11
7. Face broadened below (a) and with conspicuous black band below (B); mesoscutum striped (E) ..... *undulata*  
 — Face parallel-sided (A) and without conspicuous black band below (b); mesoscutum not striped (e) ..... 8
8. Clypeus black (D); surstylus deeply excavated distally (l); carina short and

- low (C) ..... *kanmiyai*
- Clypeus yellowish (d); aedeagus apically not haired (L) ..... 9
9. Carina long and high (c); halter yellow (G) ..... *castanea*
- Carina short and low (C) ..... 10
10. Halter brownish black (g) ..... *papuana*
- Halter yellow (G) ..... *ikedai*
11. Surstylus with 3 or more teeth (j); surstylus distally deeply excavated (i) .... 12
- Surstylus with or without a tooth (J) ..... 13
12. Clypeus yellow or yellowish brown (d) ..... *ctenaria*
- Clypeus black (D) ..... *masanoritodai*
13. Surstylus distally deeply excavated (i) ..... 14
- Surstylus globular, distally not deeply excavated (I) ..... 19
14. Carina long and high (c) ..... 15
- Carina short and low (C) ..... 16
15. Face parallel-sided (A); scutellum unicolorous (F); perianthium with long process anteriorly (k) ..... *longifibula*
- Face broadened below (a); scutellum not unicolorous, apically or laterally pale (f); perianthium with or without short anterior process (K)... *hypoleuca*
16. Clypeus black (D); anterior hypandrial lobe as broad as hypandrium (N) ..... *toyaensis*
- Clypeus yellowish (d) ..... 17
17. Mesoscutum striped (E); scutellum not unicolorous, apically or laterally pale (f); anterior hypandrial lobe as broad as hypandrium (N) ..... *nigrithorax*
- Mesoscutum not striped (e); scutellum unicolorous (F) ..... 18
18. Anterior hypandrial lobe as broad as hypandrium (N) ..... *subexcavata*
- Anterior hypandrial lobe narrower than hypandrium (n) ..... *coleoprata*
19. Aedeagus with complicated processes (m); clypeus yellowish (d); anterior hypandrial lobe narrower than hypandrium (n) ..... *shirozui*
- Aedeagus without complicated process (M); clypeus black (D); anterior hypandrial lobe as broad as hypandrium (N) ..... *undentata*

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