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Pseudostegana, a New Subgenus of the Genus *Stegana* MEIGEN (Diptera, Drosophilidae)*

Toyohi OKADA

Gotokuji 2–30–18, Setagayaku, Tokyo 154, Japan

Synopsis A new subgenus, *Pseudostegana*, of the genus *Stegana* MEIGEN is described with four species: *grandipalpis* TAKADA and MOMMA, 1975 (type), *flexi-mediata* TAKADA, MOMMA, and SHIMA, 1973, *janana* sp. n., and *malayana* sp. n., all from the Southeast Asia. Systematic position of this subgenus and relationships of these four species are analysed taxometrically. From this analysis sequential and simultaneous keys to the subgenera and the species are automatically constructed.

Stegana (*Pseudostegana*), subgen. nov.

Body slender, abdomen somewhat narrowing at base. Antenna with arista plumose, only one branch below fork. Frons with ocellar triangle small and frontal triangle narrowly prolonged to reach the anterior margin of frons. No frontal hairs. Ocellars inserted outside ocellar triangle. Carina undeveloped. Vertex sharply ridged. Postverticals absent. Anterior reclinate orbitals minute; posterior reclinate orbitals nearer proclinates than inner verticals. Humeral one, strong. Anterior pair of dorsocentrals small, close to the posteriors. Prescutellars absent. Sterno-index about 0.7. Legs slender, metatarsus as long as or longer than the rest of tarsal joints taken together. Wings banded, discal and 2nd basal cells often weakly separated, C extending beyond tip of R_{4+5}, 3rd costal section with a row of several heavy warts, R_{4+5} and M distally much convergent. Abdomen slender. Male surstylus without teeth, apodeme of aedeagus nearly as long as aedeagus itself.

Type-species: *Stegana* (*Parastegana*) *grandipalpis* TAKADA and MOMMA, 1975.

Relationships: Resembling the subgenus *Parastegana* OKADA in having anterior reclinate orbitals minute, posterior reclinate orbitals situated nearer proclinates than inner verticals, mid tibia without bristles proximally above, scutellum more or less convexed with scutellars inserted below the dorsal surface, metatarsus as long as or longer than the rest of tarsal joints taken together, and in having costa extending beyond tip of R_{4+5}. Distinctly different from *Parastegana*, however, in having sharply defined elongate frontal triangle and in the absence of postverticals. This subgenus approaches to the subfamily Drosophilinae in having following features common to the latter: posterior reclinate orbitals nearer proclinates than inner

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verticals, discal and 2nd basal cells of wings weakly separated, prescutellars absent.

Stegana* (*Pseudostegana*) *grandipalpis TAKADA and MOMMA (Figs. 1, 2)

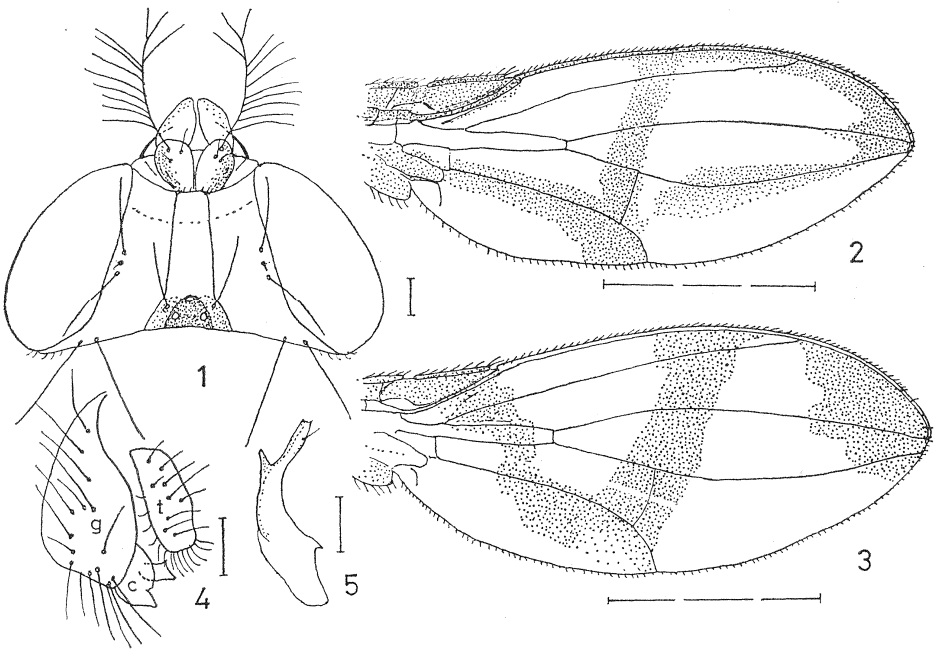
Stegana (*Parastegana*) *grandipalpis* TAKADA and MOMMA, 1975. J. Fac. Sci. Hokkaido Univ., VI, 20: 12 (type ♂, Kuala Lumpur, W. Malaysia).

♂. Ocellar triangle black, frontal triangle glossy orange brown. Frons reddish brown, anteriorly paler (Fig. 1). Anterior reclinate orbitals minute but distinct, just between proclinates and posterior reclinates. Wing pattern as in fig. 2. Anterior dorsocentrals hair-like, close to posteriors. Other features as described by TAKADA and MOMMA (1975).

Specimens examined. 3 ♂, Penang, W. Malaysia, 20 VII, 1971 (OKADA, KUROKAWA), 1 ♂, Cameron Highland, W. Malaysia, 27 X 1975 (SHINONAGA).

Stegana* (*Pseudostegana*) *javana OKADA, sp. n. (Figs. 3–5)

♂. Body brown, about 3 mm in length. Eyes purple red, bare. Antennae dark brown, inner half of 2nd joint pale. Arista with 8–9 upper long and one lower long subterminal branches in addition to a large fork. Palpi slender, brown, with



Figs. 1, 2. *Stegana* (*Pseudostegana*) *grandipalpis* Takada and Momma. 1, head; 2, wing. Figs. 3–5. *S.* (*P.*) *javana* sp. n. 3, wing; 4, periphallic organs; 5, paramere. c, surstylus; g, epandrium; t, cercus. Scales 0.1 mm, for wings 1.0 mm.

a few setae, the apical one the longest. Ocellar triangle and frontal triangle black. Frons orange brown. Face yellowish grey. Clypeus black. Cheek rather narrow, narrower than the width of the 3rd antennal joint. Anterior reclinate orbitals very fine. Vibrissa and 2nd oral equally strong, other orals fine. Mesoscutum mat orange, scutellum mat orange, apically pale. Thoracic pleura dark brownish black. Humeral one, strong. Acrostichal hairs in 8 rows. Anterior dorsocentrals one fourth as long as posteriors, situated close to the latters. Anterior scutellars parallel, longer than posteriors, which are twice as apart from anteriors as from each other. Legs yellow, mid metatarsus slender, much longer than the rest of tarsal joints taken together. Wings hyaline, with black patches as in Fig. 3. Third costal section with about 5 warts. R_{2+3} straight. C-index 1.8; 4V-index 2.6; 4C-index 1.6; 5x-index 0.9; Ac-index 15.4; Cl-bristles 2, equal; C3-fringe on basal two thirds. C not reaching M. Halteres yellow, subapically black. Abdominal tergites black, 1T medially yellow; 2T anteriorly broadly yellow; 3T fuscous yellow at anterior half.

Periphallic organs (Fig. 4) dark brown. Surstylus pointed below. Epandrium narrowing above. Cercus oblong. Phallic organs with anterior paramere (Fig. 5) apically divided, medially without sensillar pits.

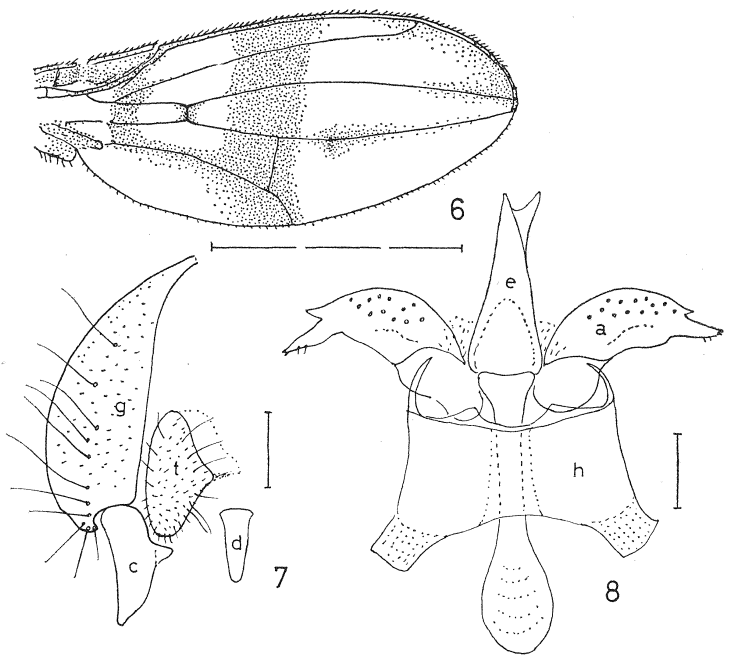
Holotype: ♂, Tugu, near Tjibodas, Java, 27 VII, 1971 (OKADA).

Distribution. Java, Indonesia.

Relationships. Distinguished from *S. grandipalpis* in having black frontal triangle, paler halteres, ventrally pointed surstylus, straight R_{2+3}, and broader median oblique black stripe of wing, covering posterior crossvein.

Stegana (*Pseudostegana*) *malayana* OKADA, sp. n. (Figs. 6–8)

♂. Body about 2.7 mm in length, dark brown. Eyes dark red, bare. Antennae with 2nd joint orange, 3rd grey, both anteriorly black. Arista with about 5 upper and one lower long branches in addition to a large fork. Palpi yellowish brown, long. Ocellar triangle glossy black. Frontal triangle orange grey, black above. Frons orange brown. Clypeus dark brown, medially pale grey. Face grey, concaved. Cheek narrow, yellow. Anterior reclinate orbital minute; proclinate slightly shorter than posterior reclinate. Vibrissa short, 2nd oral as long as vibrissa. Mesoscutum mat orange, caudally darker. Scutellum brownish black, apically orange yellow. Thoracic pleura brownish black. Humeral one. Acrosichal hairs in 8 somewhat irregular rows. Anterior dorsocentrals short, one-fourth as long as posteriors, just before posteriors. Anterior scutellars parallel, posteriors nearer each other than anteriors. Legs yellowish grey, mid and hind tibiae black, hind femora distally black, mid and hind coxae white, metatarsi longer than the rest of tarsal joints taken together. Wings with patches as in Fig. 6. R_{2+3} curved to costa at apex. C-index 1.9; 4V-index 2.5; 4C-index 1.4; 5x-index 1.4; Ac-index 15. Cl-bristle one, short; C3-fringe on basal three fourths. Third costal section with 5–7 warts. C reaching tip of M. Halteres mat black, stalk yellow. Abdomen



Figs. 6–8. *Stegana* (*Pseudostegana*) *malayana* sp. n. 6, wing; 7, periphallic organs; 8, phallic organs. a, paramere; d, bridge connecting cerci; e, aedeagus; h, hypandrium. Other signs and scales as in Figs. 1–5.

slender, tergites glossy black, anterior segments mat orange brown.

Periphallic organs (Fig. 7): Surstylus yellowish brown, caudally with a hyaline conical process; epandrium narrowing above. Phallic organs (Fig. 8): Aedeagus apically truncate in lateral view, slightly shorter than its apodeme; anterior paramere brown, distally divided, discally with many sensillar pits.

Holotype: ♂, Cameron Highland, W. Malaysia, 27 X 1974 (SHIMA).

Distribution. West Malaysia.

Relationships. Resembling *S. javana* in having median oblique black band of wing broad and covering posterior crossvein, but distinguished from the latter in having merely faint apical black patch of wing, and fewer upper branches of arista.

Stegana* (*Pseudostegana*) *fleximediata TAKADA, MOMMA and SHIMA

Stegana (*Parastegana*) *fleximediata* TAKADA, MOMMA and SHIMA, 1973. J. Fac. Sci. Hokkaido Univ., VI, 19: 74 (Type ♂, Mt. Kinabalu, Sabah).

TAKADA has personally informed me that he had ever collectd another species closely related to this species also at Mt. Kinabalu, Sabah.

Taxometric analysis of systematic position of *Pseudostegana* among the genus *Stegana*

To find systematic position of the new subgenus, *Pseudostegana*, among the genus *Stegana*, subgeneric characters, N—X, mostly adopted from OKADA (1971), S and T especially from WHEELER (1960), are taxometrically treated. Each character is coded in two states (0, 1), according to presumed deviation from generalized features of the genus *Stegana*.

N, Face with black and white bands (0) or n, nearly unicolorous (1).

O, Scutellum nearly flat and marginally ridged (0) or o, dorsally convexed and marginally not ridged (1).

P, Mid tibia with strong bristles proximally above (0) or p, without such bristles (1).

Q, Prescutellars well developed (0) or q, undeveloped (1).

R, Wings largely black (0) or r, hyaline and with or without black patches (1).

S, Postgena broad (0) or s, narrow and linear (1).

T, Frons and face in profile make a rectangle (0) or t, make an obtuse angle (1).

U, Wings curved down while resting (0) or u, not curved down (1).

V, Postverticals present (0) or v, absent (1).

W, Posterior reclinate orbital nearer inner vertical than proclinate orbital (0) or v, nearer proclinate orbital than inner vertical (1).

X, Frontal triangle obscure (0) or x, distinct, parallel-sided (1).

The n (characters) $\times$t (taxa) matrix (Table 1) is prepared from above list and is put in SCD (sum of character differences) proximity analysis and UPGA cluster analysis to obtain a dendrogram (Fig. 9). Differentiation of each character into two states is shown on the dendrogram by means of a large letter (state 0) attached to a white bar and a small letter (state 1) attached to a black bar.

The result show that *Pseudostegana* is nearest to *Parastegana* OKADA, 1971 and they are separated from the other four subgenera: *Stegana* MEIGEN, 1830, *Steganina* WHEELER, 1960, *Orthostegana* HENDEL, 1913, and *Oxyphortica* DUDA, 1924. It is also revealed that *Pseudostegana* is most deviated from generalized members of the

Table 1. The subgenera of the genus *Stegana*: n (characters) $\times$t (taxa) matrix

	n										
t	N	O	P	Q	R	S	T	U	V	W	X
1. *Steganina*	0	0	0	0	0	0	0	0	0	0	0
2. *Stegana*	1	0	0	0	0	0	1	0	0	0	0
3. *Orthostegana*	1	0	0	0	0	1	1	1	0	0	0
4. *Oxyphortica*	1	0	0	0	0	1	1	1	0	0	0
5. *Parastegana*	1	1	1	1	1	1	1	1	0	1	0
6. *Pseudostegana*	1	1	1	1	1	1	1	1	1	1	1

Table 2. The species of the subgenus *Pseudostegana*: n (characters) ×t (taxa) matrix

	n										
t	A	B	C	D	E	F	G	H	I	J	K
1. *grandipalpis*	1	0	1	1	0	0	1	1	1	0	0
2. *fleximediata*	0	1	0	0	0	0	0	0	0	1	0
3. *javana*	1	1	0.5	0	1	1	1	1	0	0	1
4. *malayana*	0	1	1	0	1	1	0	1	0.5	1	0

genus *Stegana*, and that *Oxyphortica* should better be treated as consubgeneric with *Orthostegana*, as done by HENDEL, 1914.

Taxometric analysis of the relationships of the *Pseudostegana* species

A series of taxometric analyses, similar as applied above is adopted here also to find relationships of four *Pseudostegana* species. Because of obscureness of the direction of character differentiation, the order of coding, 0 and 1, is often chosen at random. The n×t matrix is shown in Table 2, and the dendrogram in Fig. 10.

A, Arista with 5–6 upper branches (0) or a, with 8–9 (1).
B, 4V-index about 1.5 (0) or b, about 2.5 (1).
C, 5x-index about 1.0 (0) or c, about 1.5 (1).
D, Ac-index is about 15 (0) or d, about 20 (1).
E, Basal band of wing absent (0) or e, present (1).
F, Middle band of wing narrow (0) or f, broad (1).
G, Apical patch of wing small (0) or g, large (1).
H, Proximal streak of wing absent (0) or h, present (1).
I, Distal streak of wing absent (0) or i, present (1).
J, Anterior crossvein clear (0) or j, clouded (1).
K, Mid and hind tibiae black (0) or k, yellow (1).

From the dendrogram it is assumed that among the four species *javana* and *malayana* are closest to each other and *grandipalpis* is remotest from other three.

Automatic construction of sequential and simultaneous keys

The sequential keys are usually dichotomous in structure and either monothetic or polythetic. If they are polythetic, not all of the characters are equally considered for each taxon. The simultaneous keys are characteristic in that each taxon is keyed out by all characters considered, and usually taking form of n×t tables (SOKAL and SNEATH, 1973). The present attempt is to automatically construct these keys from the dendrograms (Figs. 9, 10). In the followings the simultaneous keys involve citations in square parentheses.

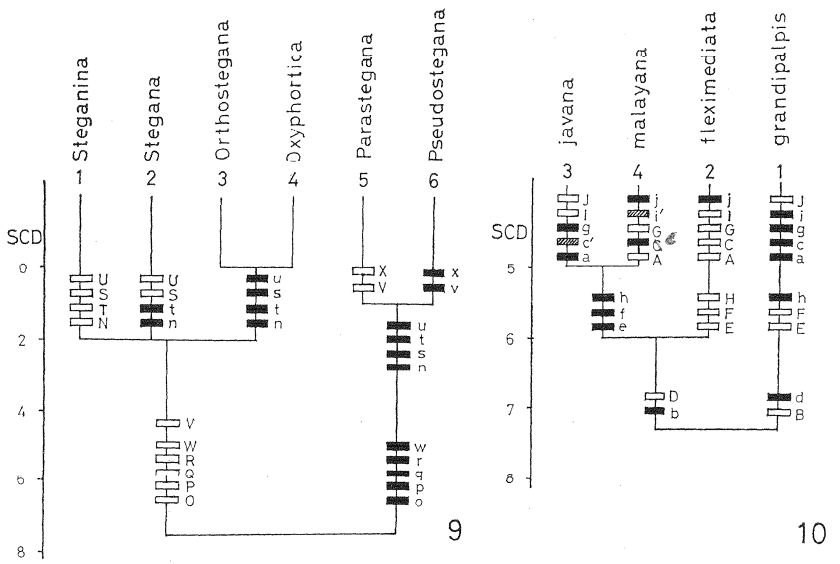


Fig. 9. A dendrogram of the subgenera of the genus *Stegana*, obtained by SCD proximity analysis and UPGA cluster analysis. Differentiations of characters are expressed by white and black cross bars. Fig. 10. A dendrogram of the species of the subgenus *Pseudostegana*. Procedure and expression as in fig. 9.

Key to subgenera of the genus *Stegana*

1. Scutellum nearly flat and marginally ridged (O); mid tibia with a few strong bristles proximally above (P); prescutellars well developed (Q); wings largely black (R); posterior reclinate orbital nearer inner vertical than proclinate orbital (W); [postverticals present (V)]. 2
— Scutellum dorsally convexed and marginally not ridged (o); mid tibia without strong bristles proximally above (p); prescutellars undeveloped (q); wings hyaline and with or without black patches (r); posterior reclinate orbital nearer proclinate than inner vertical (w); [face nearly unicolorous (n); postgena narrow and linear (s); frons and face in profile make an obtuse angle (t); wings not curved down while resting (u)]. 4
2. Postgena narrow and linear (s); wings not curved down while resting (u); [face nearly unicolorous (n); frons and face in profile make an obtuse angle (t)] .... *Orthostegana* and *Oxyphortica*
— Postgena broad (S); wings curved down while resting (U) 3
3. Face with black and white bands (N); frons and face in profile make a rectangle (T) .... *Steganina*
— Face nearly unicolorous (n); frons and face in profile make an obtuse angle (t) ..*Stegana*
4. Postverticals present (V); frontal triangle obscure (X) .....*Parastegana*
— Postverticals absent (v); frontal triangle distinct, parallel-sided (x). ....*Pseudostegana* 5

Key to species of the subgenus *Pseudostegana*

5. Ac-index about 20 (d); 4V-index about 3.5 (B); [basal band of wing absent (E); middle band of wing narrow (F); proximal streak of wing present (h); arista with 8–9 upper branches (a); 5x-index about 1.5 (c); apical patch of wing large (g); distal streak of wing present (i); anterior crossvein clear (J)] ..... *grandipalpis*
— Ac-index about 15 (D); 4V-index about 2.5 (b) 6
6. Basal band of wing absent (E); middle band of wing narrow (F); proximal streak of wing absent (H); [arista with 5–6 upper branches (A); 5x-index about 1.5 (C); apical patch of wing small (G); distal streak of wing absent (I); anterior crossvein clouded (j)] ..... *fleximediata*
— Basal band of wing present (e); middle band of wing broad (f); proximal streak of wing present (h). 7
7. Arista with 8–9 upper branches (a); 5x-index about 1.0 (c′); apical patch of wing large (g); distal streak of wing absent (I); anterior crossvein clear (j). ..... *javana*
— Arista with 5–6 upper branches (A); 5x-index about 1.5 (c); apical patch of wing small (G); distal streak of wing fine (i′); anterior crossvein clouded (j). ..... *malayana*

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陸高維 多田内 斉藤 野村 Wheeler 西浦 北沢 倉橋 内藤 金子 今立
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