A revision of the Indian species of subgenus Scaptodrosophila (Diptera: Drosophilidae)

A. K. SUNDARAN and J. P. GUPTA

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The subgenus Scaptodrosophila of the genus Drosophila from India is revised, with the description of six new species, D. elenthiensis sp.n., D. ovidenticulata sp.n., D. oviminiatus sp.n., D. paraclubata sp.n., D. paratriangulifer sp.n., D. peniquadrata sp.n. and a new distribution record of D. pressobrunnea Tsacas & Chassagnard. A key to Indian species of Scaptodrosophila is also provided.

A. K. Sundaran & J. P. Gupta, Genetics Laboratory, Centre of Advanced Study in Zoology, Banaras Hindu University, Varanasi 221 005, India.

Introduction

Since Sturtevant's work on subgeneric classification in the genus *Drosophila* several new subgenera have been inducted and altogether fifteen subgenera are now recognised (Wheeler 1981). Among them four subgenera, *Drosophila*, *Sophophora*, *Hirtodrosophila* and *Scaptodrosophila*, are represented by a reasonable number of species.

The subgenus Scaptodrosophila, containing around 215 species, is widely distributed (Wheeler 1981; Bock 1982; Okada 1986; Okada & Carson 1982a, b, 1983). A considerable number of species have been described from Australia only. Recent surveys undertaken in various parts of India have indicated that this subcontinent also seems to harbour many Scaptodrosophila species (Parshad & Duggal 1966; Gupta & Ray-Chaudhuri 1970; Gupta 1971; Parshad & Singh 1971; Nirmala Sajjan & Reddy 1975; Singh & Gupta 1977; Gupta & Panigrahy 1982; Panigrahy & Gupta 1983). This paper attempts to review all information pertaining to Scaptodrosophila species from India including six new species.

The material was collected from two different localities in South India, namely Virajpet, located in Coorg district of Karnataka and Elenthikara in Ernakulam district of Kerala. Both localities are characterised by lush green forests. The collections were largely made by net—sweeping over wild vegetation and occasionally an aspirator was also used to collect flies while they rested on different parts of the plant. The flies were then preserved in 70% alcohol and the taxonomic description was done following the procedure adopted by Gupta (1969). The type specimens and the mounted slides of genitalia have been deposited at the 'Drosophila Collection' of the Zoological Museum, Banaras Hindu University (DCZMBHU) and few specimens of paratype series have also been deposited at the 'Drosophila Collection', Department of Biology, Tokyo Metropolitan University (TMU), Tokyo, Japan.

Genus Drosophila Fallen, 1823

Type species. Musca funebris Fabricius, 1787.

Subgenus Scaptodrosophila Duda, 1923

Paradrosophila Duda, 1923. Pholadoris Sturtevant, 1942. Pugiodrosophila Duda, 1924. Supriostyloptera Duda, 1923. Tanygastrella Duda, 1924. Xiphidiochaeta Duda, 1925 (improper reg

Xiphidiochaeta Duda, 1925 (improper replacement name for Pugiodrosophila).

Diagnosis

The subgenus *Scaptodrosophila* is characterised by a combination of the following: prescutellar bristles well developed; propleural bristles usually present; sternopleural bristles usually subequal; vibrissa single; egg with six or more filaments.

Type species. Scaptodrosophila scaptomyzoidea Duda, 1923.

Drosophila elenthiensis sp.n. (Figs 1-4)

Type material. Holotype, male (DCZMBHU 110), India, Elenthikara, Ernakulam district, Kerala, 1988. Colls. Sundaran and Gupta. Eight male paratypes, 44 females (DCZMBHU 111); 2 males and 2 females in TMU, same data as holotype. Known only from India.

Etymology. The name is given after the locality.

Remarks. Drosophila elenthiensis sp.n. closely resembles D. pictipennis Kertesz (1901). However the presence of pictured wing, anterior gonapophysis with apical sensilla and cercus with 3–4 small tough setae in pictipennis clearly separates this species from D. elenthiensis.

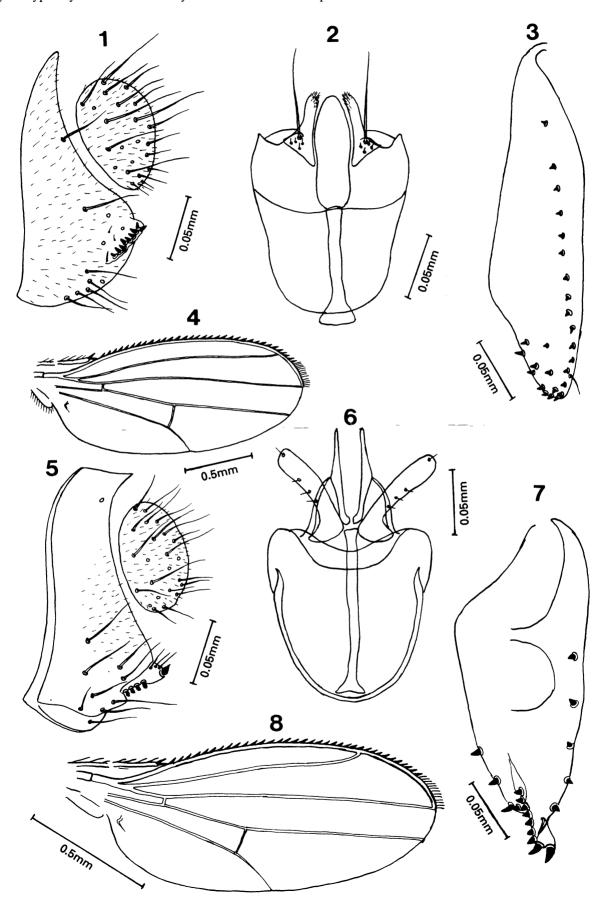
Description

MALE AND FEMALE

Head. Arista with 3 dorsal and 1 ventral branches in addition to a small terminal fork. Antennae with second segment yellowish; third segment pale. From including ocellar triangle yellowish brown. Orbital bristles in ratio

2:1:2. Vibrissa single. Palpus yellow, with 3–4 marginal setae. Carina yellow, high. Face and cheek yellowish brown; greatest width of cheek 1/10 the greatest diameter of eye. Clypeus yellowish brown. Eyes red.

Thorax. Acrostichal hairs in 8 regular rows above dorsocentrals. Anterior scutellars nearly divergent; posterior scutellars convergent. Distance between anterior and posterior dorsocentrals 1/2 the distance between two



Figs 1-8.—1-4. Drosophila elenthiensis sp.n.—1. Periphallic organs.—2. Phallic organs.—3. Egg-guide.—4. Male wing.—5-8. Drosophila ovidenticulata sp.n.—5. Periphallic organs.—6. Phallic organs.—7. Egg-guide.—8. Male wing.

anterior dorsocentrals. Prescutellars well developed. Mesonotum and scutellum unicolorous, dark yellow. Thoracic pleura yellowish brown. Sterno-index 0.69.

Wings (Fig. 4). Clear. Approximate wing-vein indices: C—index 4.63; 4V—index 1.60; 4C—index 0.55; 5X—index 1.28. C₃ fringe 0.33. Halteres yellow.

Legs. Yellow. Preapicals on all three tibiae; apicals on first and second tibiae.

Abdomen. Yellow. 1T yellow, 2T–6T with narrow brown bands not reaching laterally. Average body length: $2.4 \text{ mm} (\circlearrowleft)$, $2.8 \text{ mm} (\circlearrowleft)$.

Periphallic organs (Fig. 1). Epandrium narrowing apically and broad basally, pubescent, with about 10 bristles. Surstylus embedded in the epandrium, with about 9 black short pointed teeth. Cercus oval, pubescent with about 20 bristles.

Phallic organs (Fig. 2). Aedeagus broad and straight, rounded at tip and somewhat swollen subapically. Anterior gonapophysis large, apically narrow and hirsute, basally broad and with 4–5 basal sensilla. Novasternum with a pair of long submedian spines. Ventral fragma nearly quadrate.

Egg-guide (Fig. 3). Lobe fusiform, with slight expansion, rounded at tip, with 20 small marginal and about 6 discal teeth.

Drosophila ovidenticulata sp.n. (Figs 5-8)

Type material. Holotype, male (DCZMBHU 112), India, Elenthikara, Ernakulam district, Kerala, 1988. Colls. Sundaran and Gupta. Twenty male paratypes, 29 females (DCZMBHU 113); two males and two females in TMU, same data as holotype. Known only from India.

Etymology. From Latin *ovidenticulata* describing the peculiarity of teeth on its ovipositor or egg-guide.

Remarks. This species seems to be unique in the subgenus *Scaptodrosophila* with respect to the shape and pattern of teeth on its ovipositor or egg-guide.

Description

MALE AND FEMALE

Head. Arista with 3 dorsal and 1 ventral branches in addition to terminal fork. Antennae with second segment dark brown; third segment little lighter. Frons including ocellar triangle black. Orbital bristles in ratio 2:1:2. Vibrissa single and strong. Palpus yellowish, with 1 prominent apical seta. Carina flat. Face dark brown. Cheek brownish black; greatest width of cheek 1/12 the greatest diameter of eye. Clypeus dark brown. Eyes dark red.

Thorax. Acrostichal hairs in 6 regular rows between dorsocentrals. Anterior and posterior scutellars convergent. Distance between anterior and posterior dorsocen-

trals 1/3 the distance between two anterior dorsocentrals. Prescutellars well developed. Mesonotum and scutellum unicolorous, glossy black. Thoracic pleura brownish black. Sterno-index 0.56.

Wings (Fig. 8). Clear. Approximate wing-vein indices: C—index 2.28; 4V—index 2.08; 4C—index 1.04; 5X—index 2.10. C₃ fringe 0.60. Halteres dark brown, knob centrally enclosing a white area.

Legs. Coxa, femora and last tarsal segments of all legs and only tibia of third leg dark brown. Preapicals on all three tibiae; apicals on first and second tibiae.

Abdomen. Tergites glossy black. Average body length: 1.72 mm (3), 1.87 mm (9).

Periphallic organs (Fig. 5). Epandrium partly pubescent, narrow above and broad below, with 10 bristles on lower portion. Surstylus small, with 4 short and pointed teeth, the first tooth apartly placed from the remaining teeth, and few fine satae. Cercus oval, pubescent, with about 23 bristles.

Phallic organs (Fig. 6). Aedeagus bifid and somewhat dilated medially; basal apodeme nearly twice the length of aedeagus. Anterior gonapophysis long, broad and rounded apically, with 4 fine satae. Novasternal plate shallowly concaved. Ventral fragma rounded basally.

Egg-guide (Fig. 7). Lobe much broader basally, abruptly narrowing and ending in two large strong teeth followed by a straight row of 7 small teeth besides 5 marginal and 3 discal teeth.

Drosophila oviminiatus sp.n. (Figs 9–12)

Type material. Holotype, male (DCZMBHU 115), India, Virajpet, Coorg district, Karnataka, 1988. Colls. Sundaran and Gupta. Nine male paratypes, 1 female (DCZMBHU 116); 1 male in TMU, same data as holotype. Known only from India.

Etymology. From Latin *oviminiatus* referring to the ovipositor being much smaller.

Remarks. This species closely resembles *D. fimbriata* Bock (1976). However, the pale brown thorax and the absence of basal black stout setae on cercus in *fimbriata* distinctly separate this species from *D. oviminiatus*.

Description

MALE AND FEMALE

Head. Arista with 4 dorsal and 2 ventral branches in addition to terminal fork. Antennae with second and third segment dark brown. Frons including ocellar triangle brownish black. Orbital bristles in ratio 6:4:7. Vibrissa single, strong. Palpus brownish black, with 2–3

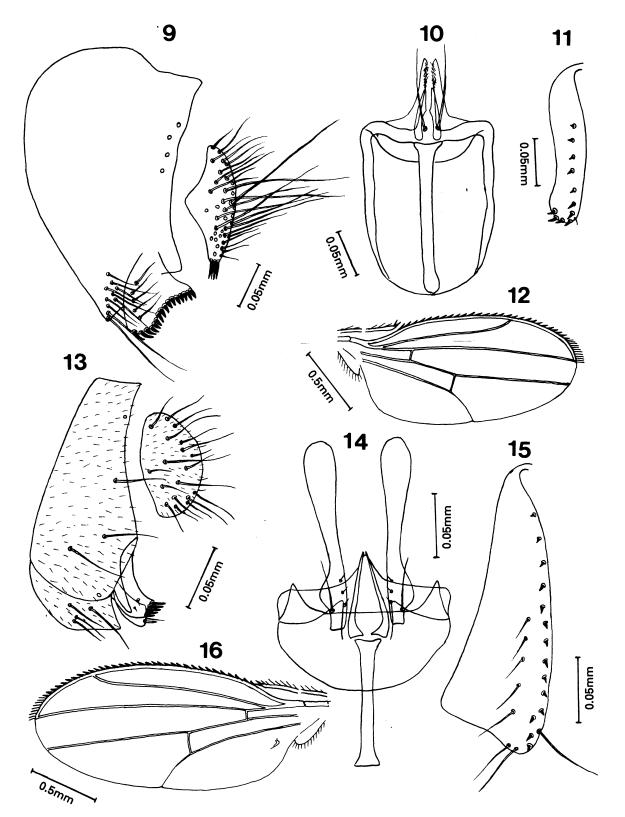
marginal setae. Carina black and narrow. Face black. Cheek brownish black; greatest width of cheek 1/9 the greatest diameter of eye. Clypeus black. Eyes dark red.

Thorax. Acrostichal hairs in 6 regular rows between dorsocentrals. Anterior scutellars nearly parallel; posterior scutellars crossed each other. Distance between anterior and posterior dorsocentrals 1/2 the distance between two anterior dorsocentrals. Prescutellar bristles

well developed. Mesonotum and scutellum unicolorous, glossy black. Thoracic pleura black. Sterno-index 0.66.

Wings (Fig. 12). Clear. Approximate wing-vein indices: C—index 1.52; 4V—index 2.38; 4C—index 1.60; 5X—index 2.40. C₃ fringe 0.70. Halteres white.

Legs. Brown. Coxa and femora of all legs black. Preapicals on all three tibiae; apicals on first and second tibiae.



Figs 9–16.—9–12. Drosophila oviminiatus sp.n.—9. Periphallic organs.—10. Phallic organs.—11. Egg-guide.—12. Male wing.—13–16. Drosophila paraclubata sp.n.—13. Periphallic organs.—14. Phallic organs.—15. Egg-guide.—16. Male wing.

Abdomen. 1T yellowish, 2T with a medially interrupted black broad band, 3T-6T with complete black bands. Average length of the body: 2.05 mm (3), 2.13 mm (9).

Periphallic organs (Fig. 9). Epandrium broad above, narrowing below, with 4 bristles on upper portion and 10 on lower portion. Surstylus triangular, with 16 black teeth arranged in a concave row and 5 long bristles behind the teeth. Cercus narrow, medially swollen, with numerous bristles, many unusually long in middle and with 4 black stout setae basally.

Phallic organs (Fig. 10). Aedeagus bifid, pointed apically, basal apodeme much longer than the aedeagus. Anterior gonapophysis large, apically hirsute, with 3–4 fine basal sensilla. Novasternum with a pair of large submedian spines. Ventral fragma quadrate.

Egg-guide (Fig. 11). Lobe unusually small, rounded apically and with 11 small marginal teeth.

Drosophila paraclubata sp.n. (Figs 13-16)

Type material. Holotype, male in DCZMBHU 116: India, Elenthikara, Ernakulam district, Kerala, 1988. Colls. Sundaran & Gupta. One male paratype, three females in DCZMBHU 117; one male and one female in TMU, same data as holotype. Known only from India.

Etymology. From Latin paraclubata, describing the shape of the anterior paramere (= anterior gonapophysis) which is formed like a club.

Remarks. Drosophila paraclubata sp.n. closely resembles D. riverata Singh & Gupta (1977). However, apically pointed anterior gonapophysis, horse-shoe shaped surstylus with teeth on both ends in riverata clearly separate this species from D. paraclubata.

Description

MALE AND FEMALE

Head. Arista with 2 dorsal and 1 ventral branches in addition to the terminal fork. Antennae with second segment yellow; third segment pale. Frons including ocellar triangle yellowish brown. Orbital bristles in ratio 2:1:2. Vibrissa single. Palpus yellow, with 2–3 marginal setae. Carina yellow, broad and high. Face and cheek yellow; greatest width of cheek 1/9 the greatest diameter of eye. Clypeus yellowish brown. Eyes red.

Thorax. Acrostichal hairs in 8 regular rows between dorsocentrals. Anterior scutellars nearly divergent; posterior scutellars crossed each other. Distance between anterior and posterior dorsocentrals 1/3 the distance between two anterior dorsocentrals. Prescutellars well developed. Mesonotum and scutellum unicolorous, shiny yellow. Sterno-index 0.70.

Wings (Fig. 16). Clear. Approximate wing-vein indices: C—index 2.14; 4V—index 2.50; 4C—index 1.31; 5X—index 2.60. C₃ fringe 0.70. Halteres yellow.

Legs. Yellow. Preapicals on all three tibiae; apicals on first and second tibiae.

Abdomen. Tergites shiny yellow. Average length of the body: 2.21 mm (δ), 2.29 mm (\circ).

Periphallic organs (Fig. 13). Epandrium broad below, pubescent with about 10 bristles on posterior margin. Surstylus quadrate, curved, with 5 upper black and 1 lower pale teeth arranged in a concave row on entire distal margin. Cercus somewhat oval, with about 20 bristles.

Phallic organs (Fig. 14). Aedeagus apparently bifid; basal apodeme little longer than aedeagus. Anterior gonapophysis long, club-shaped, basally with 3 minute sensilla. Novasternum with a pair of submedian spines. Ventral fragma much broader than long, basally rounded.

Egg-guide (Fig. 15). Lobe rounded at tip and triangular at lateral aspect, with about 13 yellowish small teeth and 7 long discal bristles.

Drosophila paratriangulifer sp.n. (Figs 17–20)

Type material. Holotype, male (DCZMBHU 118), India, Virajpet, Coorg district, Karnataka, 1988. Colls. Sundaran & Gupta. Nine male paratypes, 1 female (DCZMBHU 119); 2 males and 1 female in TMU, same data as holotype. Known only from India.

Etymology. From Latin paratriangulifer because of the close resemblance with D. triangulifer.

Remarks. Drosophila paratriangulifer sp.n. closely resembles D. triangulifer Lamb (1914). However, uniformly glossy black mesonotum, yellowish brown third antennal segment and fuscous wing in triangulifer clearly separate this species from D. paratriangulifer.

Description

MALE AND FEMALE

Head. Arista with 3–4 dorsal and 2 ventral branches in addition to terminal fork. Antennae with second segment brown; third segment blackish. Frons including ocellar triangle dark brown. Orbital bristles in ratio 5:3:7. Vibrissa single. Palpus brown, with 3–4 marginal setae. Carina brown, moderately high. Face and cheek brown; greatest width of cheek 1/8 the greatest diameter of eye. Clypeus brown. Eyes dark red.

Thorax. Acrostichal hairs in 6 regular rows between dorsocentrals. Anterior and posterior scutellars convergent. Distance between anterior and posterior dorsocentrals 1/3 the distance between two anterior dorsocentrals. Prescutellars well developed. Mesonotum and scutellum matt brownish black, with a broad dark median longitudinal stripe, becoming much darker with age. Thoracic pleura dark brown. Sterno-index 0.73.

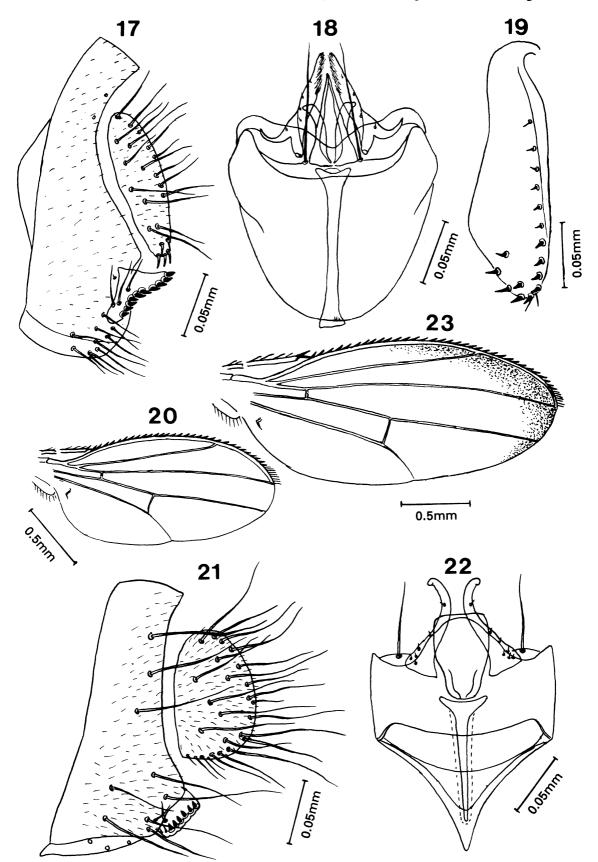
Wings (Fig. 20). Clear. Approximate wing-vein indices: C—index 1.90; 4V—index 2.13; 4C—index 1.20; 5X—index 2.00. C₃ fringe 0.60. Halteres brownish yellow.

Legs. Pale brown. Femora of all legs much darker. Preapicals on all three tibiae; apicals on first and second tibiae. Abdomen. Tergites with dark brown, broad bands. Average length of the body: 2.08 mm (3), 2.39 mm (9).

Periphallic organs (Fig. 17). Epandrium pubescent, broad below and narrowing apically, with 2 bristles on upper portion and 9 at lower portion. Surstylus triangu-

lar, with 11 black teeth and 4 bristles behind the teeth. Cercus elongate, with about 18 bristles and 4 small black setae at lower tip.

Phallic organs (Fig. 18). Aedeagus broad below, tapering apically; basal apodeme much longer than aedeagus.



Figs 17–23.—17–20. Drosophila paratriangulifer sp.n.—17. Periphallic organs.—18. Phallic organs.—19. Egg-guide.—20. Male wing.—21–23. Drosophila peniquadrata sp.n.—21. Periphallic organs.—22. Phallic organs.—23. Male wing.

Anterior gonapophysis large, apically hirsute and with 5 sensilla. Posterior gonapophysis small contiguous with aedeagus. Novasternum with a pair of long submedian spines. Ventral fragma nearly quadrate.

Egg-guide (Fig. 19). Lobe fusiform, somewhat dilated submedially and rounded apically, with about 12 marginal and 4 discal teeth.

Drosophila peniquadrata sp.n. (Figs 21-23)

Type material. Holotype, male (DCZMBHU 120), India, Virajpet, Coorg district, Karnataka, 1988. Colls. Sundaran and Gupta. Two male paratypes, 1 female (DCZMBHU 121); one male in TMU, same data as holotype. Known only from India.

Etymology. The name of this species is based on the shape of the aedeagus.

Remarks. Drosophila peniquadrata sp.n. somewhat resembles D. puncteluta Okada (1988). However, the mesonotum with its brownish stripes and matt black abdomen in puncteluta clearly separate this species from D. peniquadrata.

Description

MALE AND FEMALE

Head. Arista with 4–5 dorsal and 2–3 ventral branches in addition to terminal fork. Antennae with second segment yellow; third segment pale. Frons including ocellar triangle yellowish. Orbital bristles in ratio 6:3:8. Vibrissa single, strong. Palpus yellow, with 2–3 marginal setae. Carina dull yellow, high. Face yellow. Cheek dull yellow; greatest width of cheek 1/9 the greatest diameter of eye. Clypeus dark yellow. Eyes red.

Thorax. Acrostichal hairs in 8 irregular rows between dorsocentrals. Anterior scutellars nearly divergent; posterior scutellars convergent. Distance between anterior and posterior dorsocentrals 1/3 the distance between the two anterior dorsocentrals. Prescutellars well developed. Mesonotum and scutellum unicolorous, shiny yellow. Thoracic pleura yellow. All three sternopleural bristles well developed. Sterno-index 0.64.

Wings (Fig. 23). Fuscous apically and along costal margin. Approximate wing-vein indices: C—index 2.04; 4V—index 1.67; 4C—index 1.00; 5X—index 1.38. C₃ fringe 0.80. Halteres yellow.

Legs. Yellow. Preapicals on all three tibiae; apicals on first and second tibiae.

Abdomen. Yellow. 1T yellow, 2T-6T with narrow medially interrupted brown bands not reaching laterally, 5T-6T with additional dark spot in the area of median interruption. Average length of the body: 2.4 mm (δ), 2.6 mm (\circ).

Periphallic organs (Fig. 21). Epandrium pubescent, basally broad, with 12 long bristles along posterior mar-

gin. Surstylus small, with 6 short and stout teeth arranged in a straight row and with 2–3 fine setae. Cercus oval, pubescent, with about 24 long bristles.

Phallic organs (Fig. 22). Aedeagus small, stout and quadrangular. Anterior gonapophysis large, narrowing apically, with 6–7 sensilla. Novasternum broadly concaved medially, with a pair of long apartly placed submedian spines. Ventral fragma basally tapering.

Drosophila pressobrunnea Tsacas & Chassagnard, 1976 (Figs 24–26)

Material examined. DCZMBHU 122; 18 males, 21 females, India, Karnataka, Coorg, Virajpet.

Description

MALE AND FEMALE

General features as described by Tsacas & Chassagnard (1976).

Periphallic organs (Fig. 24). Epandrium pubescent, broad, below, with about 17 bristles along posterior margin. Surstylus semicircular, with irregularly arranged 12 black teeth. Cercus elongate, pubescent, with about 27 bristles.

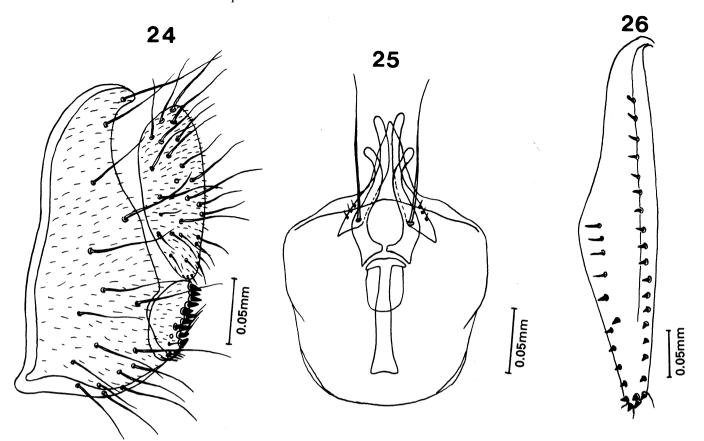
Phallic organs (Fig. 25). Aedeagus long narrowing apically, basal apodeme as long as aedeagus. Anterior gonapophysis elongate, with 3 basal sensilla. Posterior gonapophysis contiguous with aedeagus. Novasternum with a pair of long, stout submedian spines. Ventral fragma quadrate.

Egg-guide (Fig. 26). Lobe elongate, with 28 marginal and 4 bristle-like discal teeth.

Distribution. Sumatra, India (new record).

Key to Indian species of the subgenus Scaptodrosophila, genus Drosophila

Wings fuscous apically and along costal margin
2. Second antennal segment silvery white



Figs 24–26. Drosophila pressobrunnea Tsacas & Chassagnard.—24. Periphallic organs.—25. Phallic organs.—26. Egg-guide.

9. Thoracic pleura dark brown with a yellow median stripe	—Species with silvery-white linear stripes on mesonotum
10. Mesonotum with 2 narrow and faint stripes along the lines of	
dorsocentrals puriensis Gupta & Panigrahy	—Aedeagus not spindle-shaped and bifid apically
—Mesonotum not with 2 narrow and faint stripes along the lines of	16. Novasternum with 4 pairs of submedian spines
dorsocentrals	subtilis Kikkawa & Peng
11. Mesonotum with 3 silvery-white stripes plumata (Singh)	—Novasternum with 8 pairs of submedian spines
—Mesonotum with several silvery-white stripes	ebonata Parshad & Duggal
12. Novasternum with 1–2 pairs of submedian spines	17. Mesonotum with a broad dark brown median stripe
—Novasternum with 4–8 pairs of submedian spines 16	· · · · · · · · · · · · · · · · · · ·
13. Scutellum with black patch on lateral sides	-Mesonotum with a dark brown median stripe, basally swollen
pressobrunnea Tsacas & Chassagnard	squarishly and with two dark spots on either side
—Scutellum with no black patch on lateral sides 17	bansadharae Panigrahy & Gupta
14. Species with silvery-white spots arranged linearly on mesonotum	18. Surstylus teeth arranged in S-shaped manner
& Ray-Chaudhuri	krishnamurthyi Sajjan & Reddy

Table I. Other species of Scaptodrosophila recorded from India

Species	Distribution	Author
Drosophila bambuphila	India	Gupta 1971
D. bansadharae	India	Panigrahy & Gupta 1983
D. bryani	Samoa, Australia, Philippines, Japan, Micronesia, India, Sri Lanka, Ryukyus	Malloch 1934
D. chandraprabhiana	India	Gupta & Ray-Chaudhuri 1970
D. coracina	Borneo, China, Ryukyus, Japan, Korea, India	Kikkawa & Peng 1938
D. ebonata	India	Parshad & Duggal 1966
D. kohimaensis	India	Gupta & Gupta 1990
D. koraputae	India	Gupta & Panigrahy 1982
D. krishnamurthyi	India	Sajjan & Reddy 1975
D. metanthia	India	Gupta & Gupta 1990
D. minima	Nepal, India	Okada 1966
D. mundagensis	India	Sajjan & Reddy 1975
D. neomedleri	India	Gupta & Panigrahy 1982
D. paratriangulata	India	Gupta & Ray-Chaudhuri 1970
D. plumata	India	Singh 1976
D. puriensis	India	Gupta & Panigrahy 1982
D. riverata	India	Singh & Gupta 1977
D. silvalineata	India	Gupta & Ray-Chaudhuri 1970
D. subtilis	China, Japan, India	Kikkawa & Peng 1938

Discussion

Judging from the literature it seems that the world distribution of the species of *Scaptodrosophila* is highly uneven. According to Throckmorton (1975) tropical Asia has been the region of its origin and from there is expanded mainly into Africa and Australia. Most of the species of this subgenus are endemic and none is known to be cosmopolitan. The ecology of most of the *Scaptodrosophila* species is unknown, but it has been reported that breeding and feeding sites of some of these species include tree sap, fungi, fruits and flowers (Throckmorton 1975).

Altogether 26 species of *Scaptodrosophila* have been recorded so far from India but many more are to be expected since a vast area of the Indian subcontinent still awaits exploration.

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