

**Revision of the species of the subgenus *Drosophila* (*Drosophila*) of the
Kumaon Region, India, with the description of eight new species
(Insecta, Diptera, Drosophilidae)**

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Abstract

An account is given of nineteen species representing the subgenus *Drosophila* of the genus *Drosophila* collected from the Kumaon region, India, since July 1989 to July 1995. *D. bageshwarensis*, *D. paramarginata*, *D. hexaspina*, *D. surangensis*, *D. paharpaniensis*, *D. serrata*, *D. khansuensis* and *D. elongata* are described as new species. Holotype males are deposited in Department of Zoology collection, Kumaon University, Nainital, India.

Key words: *Drosophila*, new species, Diptera, Drosophilidae, Kumaon, India.

Introduction

The Drosophilid fauna of most countries is now well established in view of the great significance of Drosophilidae in genetic and evolutionary studies. The Indian subcontinent, however, still remains an exception. Although recent surveys have yielded considerable data on Indian Drosophilid species (GUPTA 1981, 1985, SINGH & BHATT 1988, SINGH & NEGI 1989, 1992, 1995, SINGH & DASH 1993, 1998, SINGH et al. 2000, SINGH & FARTYAL 2002). Many parts of the Indian subcontinent still await exploration. The present paper deals with the results of survey undertaken in the still unexplored Kumaon region of Uttaranchal.

Materials and methods

The Kumaon region includes six border districts of the state Uttaranchal, viz., Nainital, Almora, Pithoragarh, Bage-

shwar, Champawat and Udham Singh Nagar and located at an elevation of just below 2000 m. The area is characterized by having dense evergreen coniferous forest with medium to very steep slopes and extremely moist condition due to heavy rainfall. The flies were collected at several collecting stations. Several different methods were employed to collect Drosophilidae, like

- (i) sweeping through undergrowth or above debris on the forest floor;
- (ii) sweeping above rotting native fruits and artificially yeasted fruit baits; and
- (iii) from fungi growing on decaying logs.

Fig. 1 (map) shows collection localities.

Terminologies for the description follow that given in McEVEY (1990). Aedeagus refers to the structure phallus, cercus for anal plate; epandrium for genital arch; surstylus for primary clasper. Indices are derived using formulae given by STURTEVANT (1942) and BOCK (1976).

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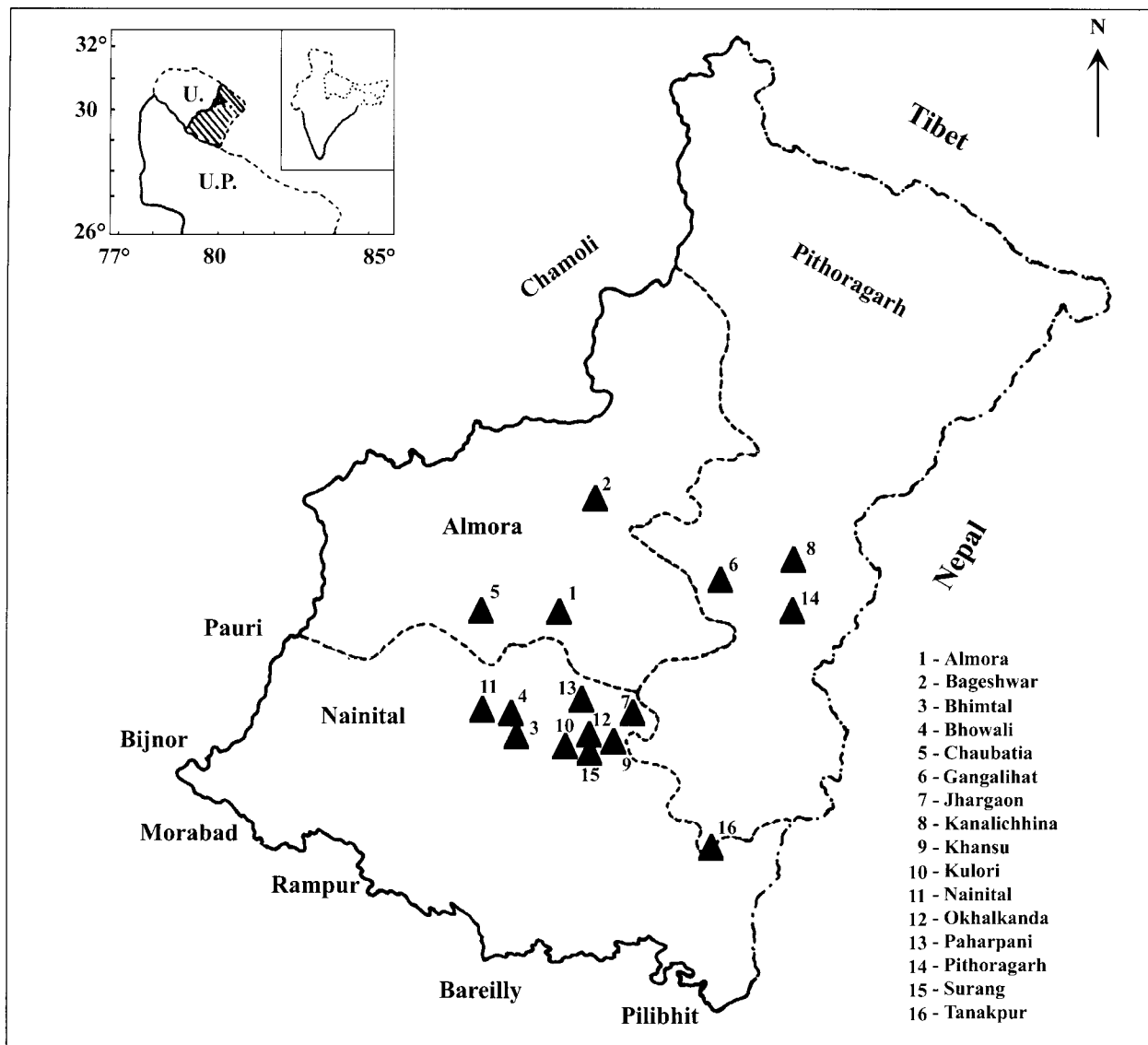


Fig. 1. Map of Kumaon region showing collecting localities.

Key to the identification of the species of the subgenus *Drosophila* of the Kumaon region

- | | |
|--|---|
| 1. Mesonotum grey, with many dark brown spots
..... <i>repleta</i> WOLLASTON 1858 | 3. Primary clasper with 6–7 small black teeth
..... <i>sulfurigaster</i> DUDA 1923 |
| — Mesonotum not grey and not with dark brown spots 2 | — Primary clasper not with 6–7 small black teeth ... 4 |
| 2. Tips of longitudinal veins black, male fore metatarsi with a dense cluster of fine hair
..... <i>immigrans</i> STURTEVANT 1921 | 4. Aedeagus club-shaped and trilobed
..... <i>nainitalensis</i> SINGH & BHATT 1988 |
| — Tips of longitudinal veins not black. Male fore metatarsi without a dense cluster of fine hair 3 | — Aedeagus not club-shaped and trilobed 5 |
| | 5. Anal plate with a large black teeth
..... <i>analspina</i> SINGH & NEGI 1995 |
| | — Anal plate not with a large black teeth 6 |
| | 6. Aedeagus small and bifid
..... <i>bishti</i> SINGH & NEGI 1995 |
| | — Aedeagus not small and bifid 7 |
| | 7. Primary clasper with about 15 stout black teeth
..... <i>painii</i> SINGH & NEGI 1995 |
| | — Primary clasper not with 15 stout black teeth 8 |

8. Body large and black *lacertosa* OKADA 1956
 — Body not large and black 9
9. Primary clasper with 6 stout black teeth arranged on outer margin *paunai* SINGH & NEGI 1989
 — Primary clasper not with 6 stout black teeth arranged on outer margin 10
10. Posterior parameres forming a large distal bow *trizonata* OKADA 1966
 — Posterior parameres not forming a large distal bow 11
11. Frons with a shining white spot *nasuta* LAMB 1914
 — Frons without a shining white spot 12
12. Aedeagus large and trilobed *elongata* n. sp.
 — Aedeagus not large and trilobed 13
13. Aedeagus small and serrated *serrata* n. sp.
 — Aedeagus not small and serrated 14
14. Anal plate quadrangular and separated from the genital arch *paharpaniensis* n. sp.
 — Anal plate not quadrangular and separated from the genital arch 15
15. Anterior gonapophyses with 6 black teeth *hexaspina* n. sp.
 — Anterior gonapophyses not with 6 black teeth ... 16
16. Primary clasper with 21–22 small black teeth *khansuensis* n. sp.
 — Primary clasper not with 21–22 small black teeth 17
17. Novasternum S-shaped *paramarginata* n. sp.
 — Novasternum not S-shaped 18
18. Male fore leg with tuft of hair on metatarsal and tarsal segments *surangensis* n. sp.
 — Male fore leg not with tuft of hair on metatarsal and tarsal segment, epandrium bow-shaped *bageshwarensis* n. sp.

Systematic section

Genus *Drosophila* FALLÉN 1823

- Drosophila* FALLÉN (1823, Diptera Sveciae, Geomyzides, 2: 4). Type species: *Musca funebris* FABRICIUS 1787(: 345), by subsequent designation by ZETTERSTEDT (1847); type locality Europe.
- Chaetodrosophilella* DUDA 1923(: 40). Type species: *Drosophila quadrilineata* DE MEIJERE 1911 by monotypy. Type locality Java (WILSON *et al.* 1969). [*Chaetodrosophila* DUDA 1924 a: 180 is apparently an error for *Chaetodrosophilella*].
- Hirtodrosophila* DUDA 1923(: 41). Type species: *Drosophila latifrontata* FRONTA-PESSOA 1945 (replacement name for *carinata* DUDA 1923, preoccupied in *Drosophila* by *carinata* GRIMSHAW 1901) by subsequent designation (FRONTA-PESSOA 1945). Type locality Taiwan. (DUDA 1924 a: *Hirtodrosophila* as subgenus of *Drosophila*).
- Paradrosophila* DUDA 1923(: 43). Type species: *Drosophila pictipennis* KERTÉSZ 1901 by subsequent designation (STURTEVANT 1927). Type locality New Guinea. (DUDA 1924 a: *Paradrosophila* as subgenus of *Drosophila*).
- Scaptodrosophila* DUDA 1923(: 43). Type species *S. scaptomyzoidea* DUDA 1923 by monotypy. Type locality New Guinea (WHEELER & TAKADA 1964).
- Spinulophila* DUDA 1923(: 37). Type species: *S. signata* DUDA 1923 by subsequent designation (STURTEVANT 1927). Type locality Taiwan. (DUDA 1924 a: *Spinulophila* as subgenus of *Drosophila*).
- Spuriostyloptera* DUDA 1923(: 38). Type species: *S. multipunctata* DUDA 1923 by subsequent designation (BOCK & PARSONS 1978). Type locality Taiwan (BOCK & PARSONS 1978).

Tanygastrilla DUDA 1924(: 254). Type species: *T. hypopygalis* DUDA 1924 by subsequent designation (BOCK & PARSONS 1978). Type locality Sumatra (BOCK & PARSONS 1978).

Dasydrosophila DUDA (1925: 152). Impermissible substitution for *Hirtodrosophila* DUDA.

Adrosophila SÉGUY (1938: 344). Type species *A. minuta* SÉGUY, 1938 by original designation. Type locality Africa.

Several groups endemic to the Hawaiian islands and previously described as „genera“ may now also be regarded as synonyms of *Drosophila* (see KARESHIRO 1976).

Diagnosis: Arista usually plumose (exceptionally with reduced rays; never micro-pubescent); anterior reclinate orbital bristle small; post vertical bristles well developed; mesonotum typically with 6 or more rows of acrostichal hair and 2 pairs of dorsocentral bristles; pre-scutellar acrostichal enlarged or not; sternopleuron with up to three macrochaetae and several microchaetae.

Subgenus *Drosophila* FALLÉN 1823

Drosophila FALLÉN (1823, Diptera Sveciae Geomyzides, 2: 4). Type species: *Musca funebris* FABRICIUS 1787(: 345).

Diagnosis: Gena often broad; second oral bristle large; prescutellar acrostichals not, or barely, enlarged; propleural bristle absent; apical bands on anterior abdominal tergites, when present, usually interrupted in midline; usually rather large species.

1. *Drosophila (Drosophila) immigrans* STURTEVANT
1921

Drosophila immigrans STURTEVANT (1921: 83). Type locality:
New York, U.S.A.

Specimens examined: India: Uttaranchal: Almora district, Bageshwar, 290 ♂♂, 230 ♀♀, VII. 1989; Pithoragarh district, Gangolihat, 160 ♂♂, 130 ♀♀, VIII. 1990; Nainital district, Bhowali, 350 ♂♂, 310 ♀♀, VI. 1991; coll. SINGH & DASH.

Distribution: Cosmopolitan.

2. *Drosophila (Drosophila) lacertosa* OKADA 1956

Drosophila lacertosa OKADA (1956: 158). Type locality: Hakamoriama, Iwate Pref., Japan.

Specimens examined: India: Uttaranchal: Nainital district, Tanakpur, 50 ♂♂, 30 ♀♀, VIII. 1989; Almora district, Chaubattia, 25 ♂♂, 20 ♀♀, VII. 1990; coll. SINGH & DASH.

Distribution: Japan, Korea, Nepal and India.

3. *Drosophila (Drosophila) nasuta* LAMB 1914

Drosophila nasuta LAMB (1914: 346). Type locality: Seychelles.

Specimens examined: India: Uttaranchal: Nainital district, Tanakpur, 40 ♂♂, 38 ♀♀, VII. 1990; coll. SINGH & DASH.

Distribution: Borneo, Sumatra, Seychelles, Taiwan, Mollucas, New Guinea, Samoa, Fiji, Hawaii, Micronesia and India.

4. *Drosophila (Drosophila) repleta* WOLLASTON 1858

Drosophila repleta WOLLASTON (1858: 117). Type locality: Spain (Holotype in London).

Specimens examined: India: Uttaranchal: Nainital district, Bhowali, 75 ♂♂, 65 ♀♀, VII. 1989; Pithoragarh district, Gangolihat, 39 ♂♂, 35 ♀♀, VIII. 1991; coll. SINGH & DASH.

Distribution: Cosmopolitan.

5. *Drosophila (Drosophila) trizonata* OKADA 1966

Drosophila trizonata OKADA (1966: 97). Type locality: above Sangu, Taplejung, Nepal.

Specimens examined: India: Uttaranchal: Almora District, Chaubattia, 25 ♂♂, 23 ♀♀, VII. 1990; Nainital district, Okhalkanda, 36 ♂♂, 21 ♀♀, VII. 1991; coll. SINGH & DASH.

Distribution: Nepal and India.

6. *Drosophila (Drosophila) paunai* SINGH & NEGI 1989

Drosophila paunai SINGH & NEGI (1989: 19). Type locality: Chamoli district, Chamoli, Garhwal.

Specimens examined: India: Uttaranchal: Almora district, Almora, 40 ♂♂, 39 ♀♀, VII. 1990; Nainital district, Nainital, 10 ♂♂, 6 ♀♀, VIII. 1991; coll. SINGH & DASH.

Distribution: India.

7. *Drosophila (Drosophila) bishti* SINGH & NEGI 1995

Drosophila bishti SINGH & NEGI (1995: 430). Type locality: Nainital, India.

Specimens examined: India: Uttaranchal: Nainital district, Nainital, 19 ♂♂, 11 ♀♀, VII. 1990; Almora district, Almora, 16 ♂♂, 12 ♀♀, VIII. 1991; coll. SINGH & DASH.

Distribution: India.

8. *Drosophila (Drosophila) nainitalensis* SINGH & BHATT 1988

Drosophila nainitalensis SINGH & BHATT (1988: 150). Type locality: Nainital, India.

Specimens examined: India: Uttaranchal: Almora district, Ranikhet, 25 ♂♂, 17 ♀♀, VIII. 1990; Pithoragarh district, Pithoragarh, 18 ♂♂, 11 ♀♀, VIII. 1991; coll. SINGH & DASH.

Distribution: India.

9. *Drosophila (Drosophila) painii* SINGH & NEGI 1995

Drosophila painii SINGH & NEGI (1995: 432). Type locality: Nainital, India.

Specimens examined: India: Uttaranchal: Nainital district, Pines, Nainital, 25 ♂♂, 20 ♀♀, VII. 1991; Almora district, Almora, 16 ♂♂, 18 ♀♀, VIII. 1992; coll. SINGH & DASH.

Distribution: India.

10. *Drosophila (Drosophila) sulfurigaster* DUDA 1923

Drosophila sulfurigaster DUDA (1923: 48). Type locality: New Guinea.

Specimens examined: India: Uttaranchal: Nainital district, Ranikhet, 9 ♂♂, 7 ♀♀, VII. 1988; Almora district, Ranikhet, 5 ♂♂, 2 ♀♀, VIII. 1990; coll. SINGH & DASH.

Distribution: Widespread in Polynesia, Micronesia and Asia.

11. *Drosophila (Drosophila) analspina* SINGH & NEGI
1995

Drosophila analspina SINGH & NEGI (1995: 428). Type locality: Nainital, U.P., India.

Specimens examined: India: Uttaranchal: Nainital district, Nainital, 11 ♂♂, 9 ♀♀, VIII. 1990; Almora

district, Ranikhet, 6 ♂♂, 3 ♀♀, VII. 1991; coll. SINGH & DASH.

Distribution: India.

12. *Drosophila (Drosophila) serrata* n. sp.

(Figs. 2 A–E)

Holotype: ♂ (Accession No. NTL-68), Sattal, Nainital District, Uttaranchal, India, VII. 1992, SINGH & DASH leg. — In Dept. Zool., Kumaon University, Nainital.

Paratypes: 5 ♂♂, 3 ♀♀ (Accession No. NTL-69), in „*Drosophila* Collection“, Cytogenetics Lab., Department of Zoology, Kumaon University, Nainital, and Senckenberg-Museum (SMF D3708); all same data as holotype.

Derivatio nominis: The specific name *serrata* refers to the serrated structure of aedeagus.

Diagnosis: Abdomen yellowish brown, tergites with dark apical bands. Anterior and posterior crossveins clear.

Description: Head (♂, ♀): Arista with 4 dorsal and 3 ventral branches in addition to terminal fork. Antennae 2nd and 3rd segment light brown. Frons including ocellar triangle dark brown. Orbital bristles in the ratio of 6: 3: 8. Second oral bristle half the length of first oral bristle. Palpi brown. The greatest width of cheek from the base of oral bristle to eye border about one-eighth greatest diameter of eye. Eyes red.

Thorax (♂, ♀): Acrostichal hair regular in 7 rows. Anterior scutellars divergent, distance between anterior and posterior dorsocentrals about one fourth distance between two anterior dorsocentrals. Mesonotum and scutellum unicolourous light brown. Sterno-index 0.6. Humerals two equal.

Legs (♂, ♀): Light brown, preapicals on all three tibiae, apicals on fore and mid tibiae (Fig. 2 C).

Wings (♂, ♀): Transparent. C1 bristles two, equal. C3 bristles on basal about ¼ of third costal section. Approximate indices: C-index 2.34; 4 V-index 2.3; 4 C-index 1.22; 5 X-index 183 (Fig. 2 E).

Abdomen (♂, ♀): abdominal bands in male and female yellowish with dark apical bands.

Average length of body: 5.2 mm. (♂); 5.5 mm. (♀).

Periphallalic organs (Fig. 2 A): Epandrium broad above and narrow below. Upper portion bare, lower portion with about 11–12 bristles. Surstylus small, quadrate and with about 6–7 small black teeth on the outer margin and 7–8 small bristles. Ventral cercal lobe absent. Cerci small, oval separated from epandrium and with about 17–18 large bristles.

Phallic organs (Fig. 2 B): Aedeagus small, curved and serrated at the tip. Anterior gonapophyses large, club shaped anteriorly and pointed posteriorly with one large sensilla at the base. Posterior gonapophyses absent. Basal apodeme slightly larger than ventral phragma. Novasternum pointed. Ventral phragma triangular.

Egg-guide (Fig. 2 D): Lobe pointed at the tip with about 18 marginal teeth and one marginal bristle. Basal isthmus short and narrow.

Remarks: This species belongs to the subgenus *Drosophila* of the genus *Drosophila* where it resembles *D. trisetosa* OKADA 1966 in having similarity of periphallalic organs (presence of 6–7 short black teeth on the outer margin of surstylus) but the phallic organs are distinctly different in both the species.

13. *Drosophila (Drosophila) bageshwariensis* n. sp.

(Figs. 2 F–J)

Holotype: ♂, (Accession No. NTL-70), Bageshwar, Almora district, Uttaranchal, India, VII. 1991, SINGH & DASH leg. — In Dept. Zool., Kumaon University, Nainital.

Paratypes: 7 ♂♂, 2 ♀♀, (Accession No. NTL-71), in „*Drosophila* Collection“, Cytogenetics Lab., Dept. Zool., Kumaon University, Nainital, and Senckenberg Museum (SMF D3704); all same data as holotype.

Derivatio nominis: The specific name *bageshwariensis* refers to the district Bageshwar in Uttaranchal from where holotype came.

Diagnosis: Yellow brown flies. Abdomen with narrow apical bands.

Description: Head (♂, ♀): Arista with about 5 dorsal and 3 ventral branches including terminal fork. Frons including the ocellar triangle light brown. Orbital bristles in the ratio of 6: 2: 4. Palpi light brown, greatest width of cheek from the base of oral bristle to eye border about one sixth greatest diameter of eye. Eyes red.

Thorax (♂, ♀): Acrostichal hair regular in 8 rows. Anterior scutellars convergent, posterior crossing each other; distance between anterior and posterior dorsocentral about half the distance between the two anterior dorsocentrals. Mesonotum and scutellum light brown. Sterno-index about 0.5.

Wings (♂, ♀): Clear. C1 bristles two, unequal. C3 bristles on basal about two third of third costal section. Approximate indices: C-index 3.58; 4 V-index 1.85; 4 C-index 1.2; 5 X-index 1.51. Halteres yellow (Fig. 2 F).

Legs (♂, ♀): Light brown. Preapicals on all three tibiae, apicals on fore and mid tibiae (Fig. 2 J).

Abdomen (♂, ♀): Abdominal tergites yellowish brown with narrow apical bands.

Average length of body: 5.1 mm. (♂); 5.56 mm. (♀).

Periphallalic organs (Fig. 2 G): Epandrium narrow above and broad below, pubescent, lower portion with about 8 large bristles. Cerci somewhat oval shaped, pubescent, separated from the epandrium and with about 6 bristles.

Phallic organs (Fig. 2 H): Aedeagus large, pubescent, rounded, with 15 large bristles. Anterior and posterior gonapophyses not visible. Ventral phragma somewhat rectangular in shape.

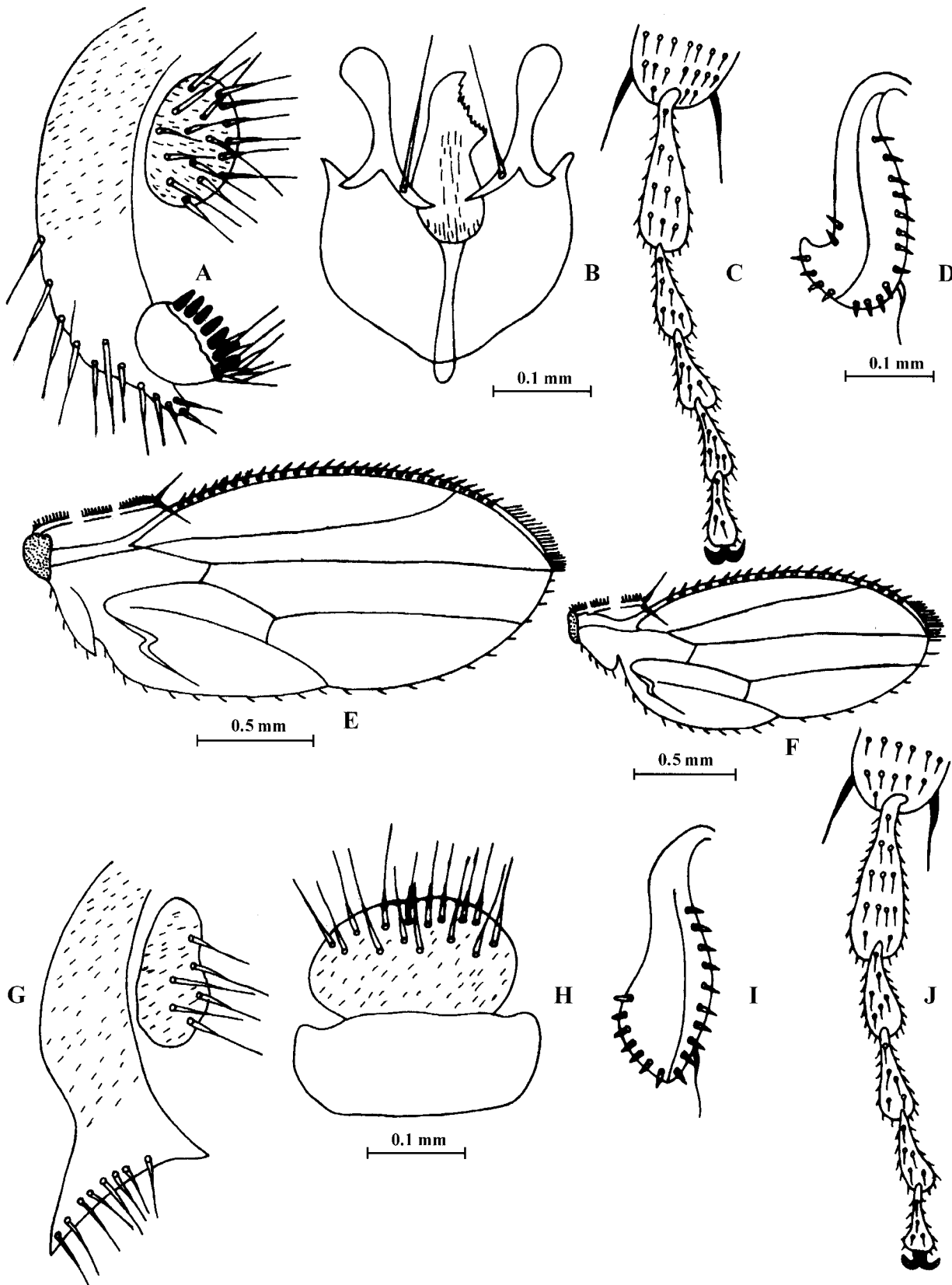


Fig. 2. A–E: *Drosophila serrata* n. sp. A: periphallial organs. B: phallic organs. C: Male foreleg. D: Egg-guide. E: wing. F–J: *Drosophila bageshwarensis* n. sp. F: wing. G: periphallial organs. H: phallic organs. I: Egg-guide. J: male foreleg.

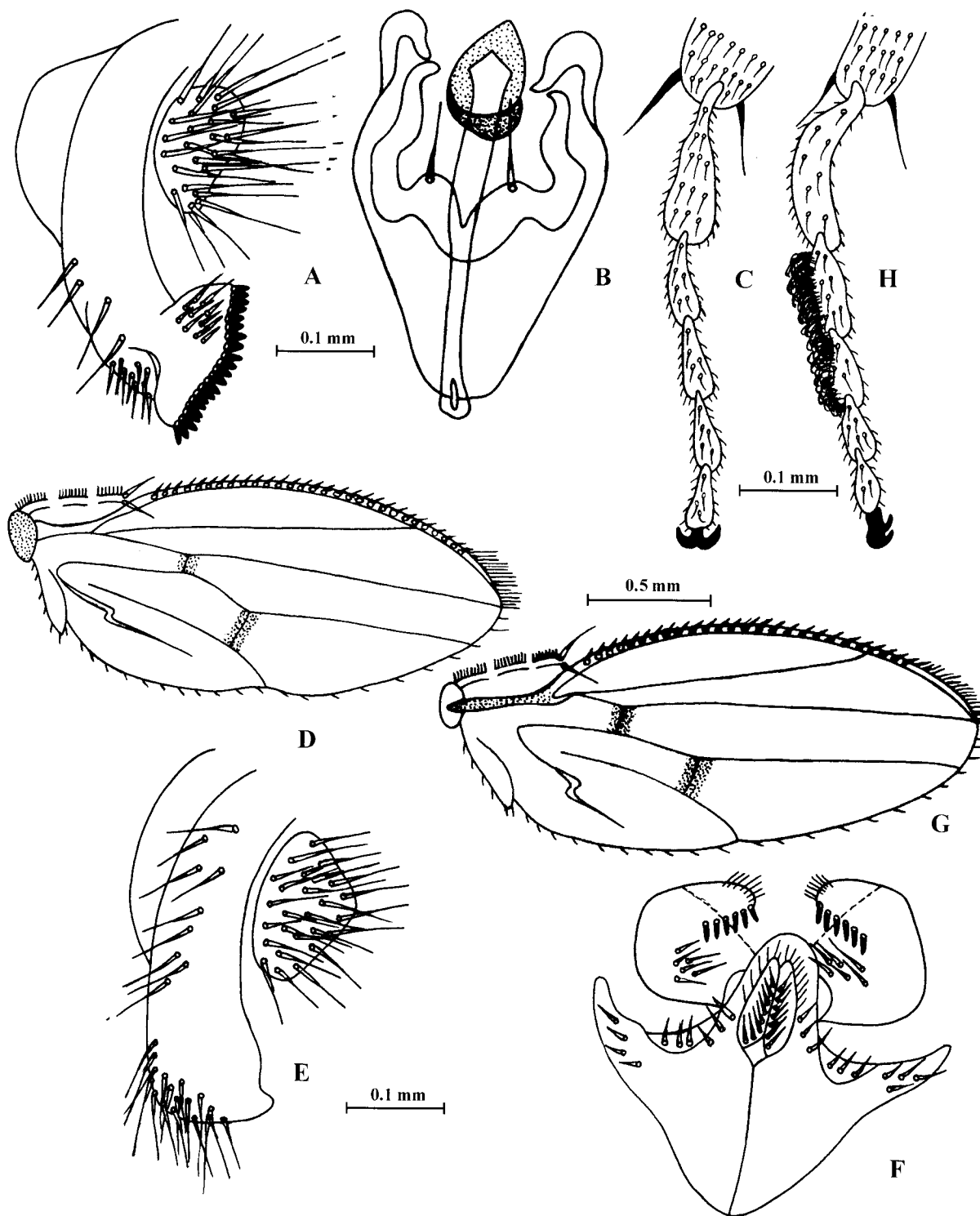


Fig. 3. A–D: *Drosophila paramarginata* n. sp. A: periphallallic organs. B: phallic organs. C: Male fore leg. D: wing. E–H: *Drosophila hexaspina* n. sp. E: periphallallic organs. F: phallic organs. G: wing. H: male foreleg.

Egg-guide (Fig. 2 I): Lobe elongated, pointed at the tip with about 17 marginal teeth and a marginal bristle.

Remarks: This species is a member of the sub-genus *Drosophila* of the genus *Drosophila* where it re-

sembles *D. bishti* SINGH & NEGI 1995 in the structure of periphallallic organs (epandrium pubescent above, lower portion with about 6–8 large bristles; cerci somewhat oval) but the phallic organs are distantly different in both the species.

14. *Drosophila (Drosophila) paramarginata* n. sp.

(Figs. 3 A–D)

Holotype: ♂ (Accession No. NTL-72), Jhargaon, Nainital District, Uttaranchal, India, VII. 1990, SINGH & DASH leg. — In Zool. Dept., Kumaon University, Nainital.

Paratypes: 5 ♂♂, 3 ♀♀ (Accession No. NTL-73), in „*Drosophila* Collection“, Cytogenetics Lab., Dept. Zool., Kumaon University, Nainital, and Senckenberg Museum (SMF D3706); all same data as holotype.

Derivatio nominis: The specific name *paramarginata* refers to the peculiar structure of the paramere.

Diagnosis: Pale brown flies. Abdomen with black apical bands. Anterior and posterior cross-veins fuscous.

Description: Head (♂, ♀): Arista with 4 dorsal and 2 ventral branches including the terminal fork. Antennae with second and third segment dark brown. Frons including ocellar triangle dark brown. Carina light brown, narrow and high. Orbitals in the ratio of 8: 5: 10. Palpitant, carina dark brown. The greatest width of the cheek from the base of the oral bristle to the eye border about 1/7 th of the greatest diameter of the eye. Eyes dark red.

Thorax (♂, ♀): Acrostichal hair regular in 8 rows. Anterior scutellars divergent, posterior crossing each other. Distance between anterior and posterior dorsocentral about one-third the distance between two anterior dorsocentrals. Mesonotum and scutellum dark brown. Humeral two equal. Thoracic pleura light brown. Sterno-index 0.53.

Wings (♂, ♀): Yellowish. Anterior and posterior cross-veins fuscous. C1 bristles, two unequal, C3 bristles on basal about half of the third costal section. Approximate indices: C-index 3.42; 4 V-index 1.6; 4 C-index 0.75; 5 X-index 1.11 (Fig. 3 D).

Legs: Light brown. Preapicals on all three tibiae, apicals on fore and mid tibiae (Fig. 3 C).

Abdomen (♂, ♀): Abdominal tergites yellowish with dark apical bands.

Average length of body: 5.7 mm (♂), 6.3 mm (♀).

Periphallalic organs (Fig. 3 A): Epandrium narrow above and below. Upper portion bare, lower portion with about 11–12 small bristles. Surstylus large with about 21–22 small black teeth on the outer margin, 10–12 bristles on the upper side and 4–5 medium size bristles on the lower side. Cerci triangular with about 24–25 large bristles.

Phallic organs (Fig. 3 B): Aedeagus short, swollen at tip. Anterior gonapophyses large leaf like and fused with novasternum, with one apical sensilla. Posterior gonapophyses absent. Novasternum S-shaped. Basal apodeme of aedeagus short, equal to ventral phragma. Ventral phragma triangular.

Remarks: This species is a member of the subgenus *Drosophila* of the genus *Drosophila* where it resembles *D. painii* SINGH & NEGI 1995 in the structure of periphallalic and phallic organs (surstylus with 20–21 short

black teeth on the outer margin and aedeagus swollen at the tip) but distinctly differs from it in other details.

15. *Drosophila (Drosophila) hexaspina* n. sp.

(Figs. 3 E–H)

Holotype: ♂ (Accession No. NTL-74), Jhargaon, Nainital District, Uttaranchal, VII. 1990, SINGH & DASH leg. — In Dept. Zool., Kumaon University, Nainital.

Paratypes: 5 ♂♂, 3 ♀♀ (Accession No. NTL-75) in „*Drosophila* Collection“, Cytogenetics Lab., Dept. Zool., Kumaon University, Nainital, and Senckenberg Museum (SMF D3710); all same data as holotype.

Derivatio nominis: The specific name *hexaspina* refers to the presence of six spines on the anterior gonapophyses.

Diagnosis: Yellowish brown flies. Anterior and posterior cross-vein fuscous. Male foreleg with a tuft of hairs.

Description: Head (♂, ♀): Arista with 4 dorsal and 2 ventral branches including the terminal fork. Antennae 2 nd segment light brown; 3 rd segment dark brown. Frons including ocellar triangle light brown. Carina light and narrow. Orbitals in the ratio of 5: 7: 6. Face and cheek pale, greatest width of cheek one-tenth greatest diameter of eye. Palpi light brown. Eyes bright red.

Thorax (♂, ♀): Acrostichal hair regular in 8 rows. Anterior scutellars convergent, posterior crossing each other. Distance between anterior and posterior dorsocentrals about one-half the distance between the two anterior dorsocentrals. Mesonotum and scutellum light brown. Thoracic pleura dark brown. Humeral two, equal. Sterno-index 0.83.

Wings (♂, ♀): Hazy. Crossveins fuscous. C1 bristles two, unequal; C3 bristles on basal about one-third of third costal section. Approximate Indices: C-index 3.93; 4 V-index 1.56; 4 C-index 0.6. 5 X-index 1.04 (Fig. 3 G).

Legs (♂, ♀): Light brown. Preapicals on all three tibiae. Fore metatarsal segments in male with cluster of dense hair (Fig. 3 H).

Abdomen (♂, ♀): Abdominal tergites yellowish brown with dark apical bands.

Average length of body: 6.7 mm (♂), 6.8 mm (♀).

Periphallalic organs (Fig. 3 E): Epandrium narrow above and broad below. Upper portion with 9 bristles and lower portion with 14–15 bristles. Cerci somewhat oval separated from epandrium with about 26 large bristles. Surstylus absent.

Phallic organs (Fig. 3 F): Aedeagus short and fused with novasternum with about 7 sensilla. Basal apodeme thin and equal to ventral phragma. Anterior gonapophyses large, leaf like with about 6 short black teeth and 6–7 small sensilla. Posterior gonapophyses absent. Novasternum pointed with about 4–5 sensilla. Ventral phragma triangular.

Remarks: This species is a member of the subgenus *Drosophila* of the genus *Drosophila* where it resembles *D. immigrans* STURTEVANT (presence of tuft of

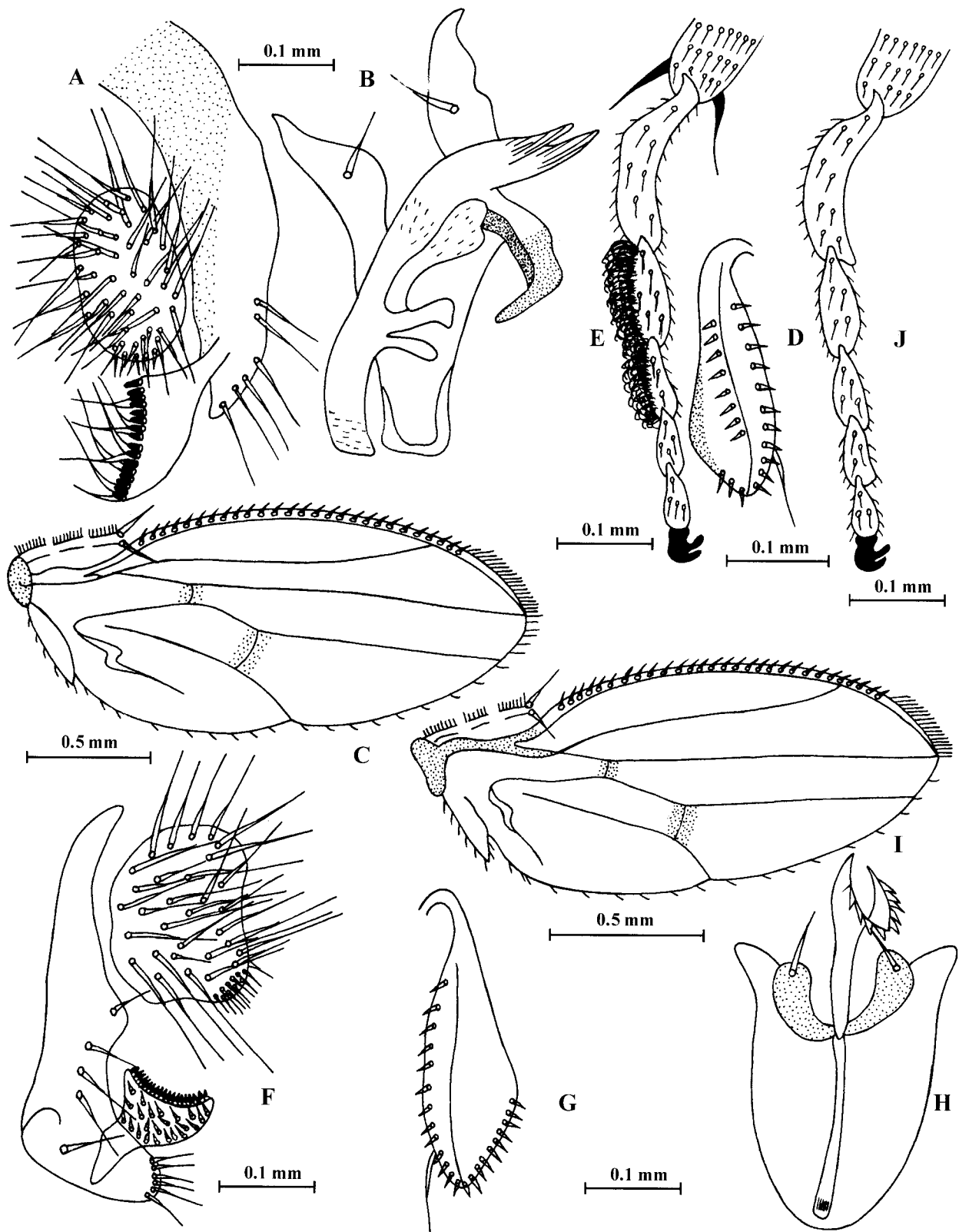


Fig. 4. A–E: *Drosophila surangensis* n. sp. A: periphallallic organs. B: phallic organs. C: wing. D: egg-guide. E: male foreleg. F–J: *Drosophila paharpaniensis* n. sp. F: periphallallic organs. G: Egg-guide. H: phallic organs. I: Wing. J: male foreleg.

hair on male fore leg) but are distinctly different in the structure of periphallic and phallic organ.

16. *Drosophila (Drosophila) surangensis* n. sp.

(Figs. 4 A–E)

Holotype: ♂ (Accession No. NTL-76), Surang, Nainital District, Uttaranchal, India, VII. 1990, SINGH & DASH leg. — In Dept. Zool., Kumaon University, Nainital.

Paratypes: 5♂♂, 2♀♀, (Accession No. NTL-77) in „*Drosophila* Collection“, Cytogenetics Lab., Department of Zoology, Kumaon University, Nainital and Senckenberg Museum (SMF D3705); all same data as holotype.

Derivatio nominis: The specific name *surangensis* refers to the locality Surang from where the holotype came.

Diagnosis: Dark brown flies. Anterior and posterior cross-veins fuscous.

Description: Head (♂, ♀): Arista with 5 dorsal and 2 ventral branches including the terminal fork. Antennae with second and third segments light brown. Frons including ocellar triangle light brown. Carina light brown and narrow. Orbitals in the ratio of 3: 2: 3. Palpi yellowish brown. Face and cheek pale, greatest width of cheek from the base of oral to eye border about one-tenth greatest diameter of eye. Eyes red.

Thorax (♂, ♀): Acrostichal hair regular in 8 rows. Anterior scutellars convergent, posterior crossing each other. Anterior dorsocentral two-fifth the length of posterior dorsocentral; distance between anterior and posterior dorsocentral about one-third of distance between two anterior dorsocentrals. Mesonotum and scutellum light brown. Humeral two, equal. Sterno-index about 0.68.

Legs (♂, ♀): light brown, preapicals on all three tibiae. Fore metatarsal segment in male with a cluster of dense hair (Fig. 4 E).

Wings (♂, ♀): Clear. Crossveins fuscous. C1 bristles two, unequal; C3 bristles on basal about ¼ of the third costal section. Approximate Indices: C-index 2.93; 4 V-index 2.12; 4 C-index 0.96; 5 X-index 1.91 (Fig. 4 C).

Average length of body: 4 mm (♂), 5.12 mm (♀).

Abdomen (♂, ♀): Abdominal tergites light brown with dark apical bands.

Periphallic organs (Fig. 4 A): Epandrium broad above and narrow below. Upper portion pubescent, completely bare, lower portion with 6 marginal bristles. Surstylus broad, attached to the epandrium with 17–18 marginal teeth arranged in a concave row and 8 marginal bristles. Cerci large, oval, separated from epandrium with several large bristles.

Phallic organs (Fig. 4 B): Aedeagus long and trilobed. Basal apodeme of aedeagus short and equal to ventral phragma. Anterior gonapophyses short and leaf like with several sensilla. Novasternum pointed with one sensilla. Ventral phragma triangular.

Egg-guide (Fig. 4 D): Lobe elongated, pointed at the tip with about 14 marginal and 8 discal teeth.

Remarks: This species is a member of the sub-genus *Drosophila* of the genus *Drosophila* where it resembles *D. immigrans* STURTEVANT 1921 in the structure of male fore leg, periphallic and phallic organs (male fore leg with tuft of hair; cerci large and oval shaped, aedeagus tribobed) but distinctly differs from it in other details.

17. *Drosophila (Drosophila) paharpaniensis* n. sp.

(Figs. 4 F–J)

Holotype: ♂ (Accession No. NTL-78), Paharpani, Nainital District, Uttaranchal, India, VII. 1990, SINGH & DASH leg. — In Dept. Zool., Kumaon University, Nainital.

Paratypes: 6♂♂, 4♀♀, (Accession No. NTL-79), in „*Drosophila* Collection“, Cytogenetics Lab., Dept. Zool., Kumaon University, Nainital, and Senckenberg Museum (SMF D3707); all same data as holotype.

Derivatio nominis: The specific name *paharpaniensis* refers to the locality Paharpani from where holotype came.

Diagnosis: Black flies. Anterior and posterior cross-veins fuscous.

Description Head (♂, ♀): Arista with 4 dorsal and 2 ventral branches including the terminal fork. Antennae with second and third segments light brown. Frons including ocellar triangle brown. Carina light brown and narrow. Orbitals in the ratio of 5: 8: 9. Second oral bristles half the length of first oral bristles. Palpi light brown. The greatest width of cheek from the base of oral to eye border about one-twelfth greatest diameter of eye. Eyes red.

Thorax (♂, ♀): Acrostichal hair regular in 8 rows. Anterior scutellars convergent, posterior crossing each other. Distance between anterior and posterior dorsocentral about half the distance between two anterior dorsocentrals. Mesonotum and scutellum light brown. Humeral two, equal. Sterno-index 0.66.

Legs (♂, ♀): brown. Preapicals on all the three tibiae (Fig. 4 J).

Wings (♂, ♀): Yellowish, Crossveins fuscous. C1 bristles two, unequal; C3 bristles on basal about 1/3 of third costal section. Indices: C-index 3.56; 4 V-index 0.62; 4 C-index 0.74; 5 X-index 1.36. Halteres yellow (Fig. 4 I)

Abdomen (♂, ♀): Abdominal tergites black.

Average length of body: 5.3 mm (♂), 6.8 mm (♀).

Periphallic organs (Fig. 4 F): Epandrium narrow above and broad below. Upper portion with about 3–4 bristles and lower portion with 7–8 bristles Primary surstylus large, Cup shaped and with many small black teeth. Secondary surstylus absent. Cerci large separated from epandrium and with about 25–30 large bristles and 11–12 small bristles on the lower side.

Phallic organs (Fig. 4 H): Aedeagus short and cup-shaped with a serrated flap. Anterior gonapophyses small and leaf like with an apical sensilla. Posterior gonapophyses absent. Novasternum cone shaped. Basal apodeme of aedeagus short and equal to ventral phragma. Ventral phragma triangular.

Egg-guide (Fig. 4 G): Lobe elongated, pointed at the tip, with 23 marginal teeth and 1 marginal bristle.

Remarks: This species is a member of the subgenus *Drosophila* of the genus *Drosophila* where it resembles *D. trizonata* OKADA 1966 in the structure of phallic organs (shape of aedeagus) but has entirely different periphallic organs.

18. *Drosophila (Drosophila) khansuensis* n. sp.

(Figs. 5 A–D, G)

Holotype: ♂ (Accession No. NTL-80), Khansu, Nainital District, Uttaranchal, India, VII. 1992, SINGH & DASH leg. — In Dept. Zool., Kumaon University, Nainital.

Paratypes: 5 ♂♂, 3 ♀♀, (Accession No. NTL-81), in „*Drosophila* Collection“, Cytogenetics Lab., Dept. Zoology, Kumaon University, Nainital; all same data as holotype.

Derivatio nominis: The specific name *khansuensis* refers to the locality Khansu from where the holotype came.

Diagnosis: Black flies. Anterior and posterior cross-veins fuscous.

Description: Head (♂, ♀): Arista with 6 dorsal and 2 ventral branches including the terminal fork. Antennae second and third segments dark brown. Frons including ocellar triangle dark brown. Carina dark brown and high. Orbitals in the ratio of 7: 5: 9. Second oral bristle half the length of first oral bristle. Face and cheek light brown, greatest width of cheek one-seventh of the greatest diameter of the eye. Eyes bright red.

Thorax (♂, ♀): Acrostichal hair regular in 7–8 row. Anterior scutellars convergent, posterior crossing each other. Distance between anterior and posterior dorso-central about 1/2 the distance between two anterior dorso-centrals. Mesonotum and scutellum dark brown. Humeral two, equal. Thoracic pleura light brown. Sterno-index about 0.66.

Legs (♂, ♀): Light brown. Preapicals on all three tibiae (Fig. 5 C).

Wings (♂, ♀): Clear. Crossveins fuscous. C1 bristles two, unequal, C3 bristles on basal about 3/4 th of third costal section. Indices: C-index 3.35; 4 V-index 1.54; 4 C-index 0.71; 5 X-index 1.17 (Fig. 5 D).

Abdomen (♂, ♀): Abdominal tergites black.

Periphallic organs (Fig. 5 A): Epandrium narrow above and broad below. Upper portion bare, lower portion with about 21–22 small black teeth and 6–7 small bristles. Cerci quadrangular with about 35–40 large bristles and 11–12 small bristles on the lower side. Surstylus almost triangular with about 21–22 short black teeth on the outer margin and 5–6 small bristles.

Phallic organs (Fig. 5 B): Aedeagus small, swollen at the tip. Anterior gonapophyses small, leaf like with one apical sensilla. Posterior gonapophyses absent. Novasternum pointed. Basal apodeme of aedeagus short, equal to ventral phragma. Ventral phragma triangular.

Egg-guide (Fig. 5 G): Lobe elongated, blunt, having 16 marginal and 6 discal teeth with one marginal bristle.

Remarks: This species is a member of the subgenus *Drosophila* of the genus *Drosophila* where it resembles *D. nainitalensis* SINGH & BHATT 1988 in the structure of periphallic organs (cerci quadrangular and surstylus with about 21–22 short black teeth) but distinctly differs from it in the structure of phallic organs.

19. *Drosophila (Drosophila) elongata* n. sp.

(Figs. 5 E, F, H, I)

Holotypes: ♂ (Accession No. NTL-82), Kulouri, Nainital District, Uttaranchal, India, VII. 1997, SINGH & DASH leg. — In Dept. Zool., Kumaon University, Nainital.

Paratypes: 5 ♂♂, 4 ♀♀, (Accession No. NTL-83), in „*Drosophila* Collection“, Cytogenetics Lab., Dept. Zool., Kumaon University, Nainital, and Senckenberg Museum (SMF D3711); all same data as holotype.

Derivatio nominis: The specific name *elongata* refers to long aedeagus present in the phallic organs.

Diagnosis: Dark brown flies. Aedeagus very long.

Description: Head (♂, ♀): Arista with 5 dorsal and 3 ventral branches including the terminal fork. Antennae with second and third segments dark brown. Carina light brown. Orbitals in the ratio of 7: 4: 9. Frons including ocellar triangle dark brown. Face and cheek pale, greatest width of cheek one-eighth greatest diameter of eye. Eyes bright red.

Thorax (♂, ♀): Acrostichal hair regular in 8 rows. Anterior scutellars convergent, posterior crossing each other. Distance between anterior and posterior dorso-centrals about one-half the distance between two anterior dorso-centrals. Mesonotum and scutellum dark brown. Sterno-index 0.6.

Legs (♂, ♀): Light brown. Preapicals on all three tibiae (Fig. 5 I).

Wings (♂, ♀): Clear. C1 bristles two, unequal. C3 bristles on basal about 1/4 of the third costal section. Halteres yellow. Approximate indices: C-index 3.25; 4 V-index 1.7; 4 C-index 0.76; 5 X-index 1.12 (Fig. 5 H).

Average length of body: 5.4 mm (♂), 5.8 mm (♀).

Abdomen (♂, ♀): Abdominal tergites dark brown with a pattern of dark areas.

Periphallic organs (Fig. 5 E): Epandrium narrow above and broad below, completely bare. Surstylus quadrate with 4 small black teeth at the base and 12–13 black teeth on outer margin. Ventral cercal lobe absent. Cerci quadrate with about 35–40 large bristles.

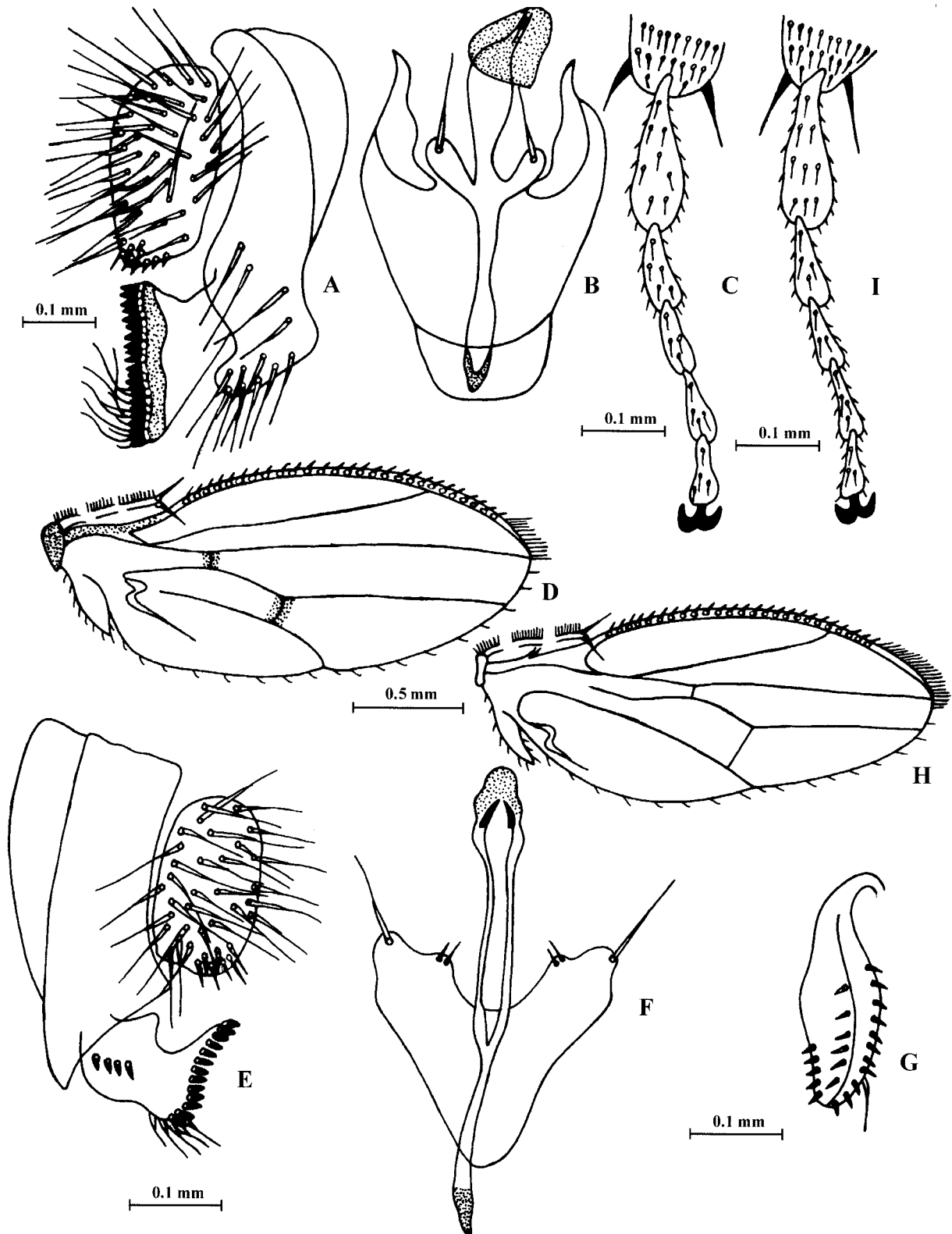


Fig. 5. A–D, G: *Drosophila khansuensis* n. sp. A: periphallallic organs. B: phallic organs. C: male foreleg. D: wing. G: Egg-guide. E–F, H–I: *Drosophila elongata* n. sp. E: periphallallic organs. F: phallic organs. H: wing. I: male foreleg.

Phallic organs (Fig. 5 F): Aedeagus large and trilobed. Basal apodeme of aedeagus slightly larger than ventral phragma. Anterior gonapophyses small, fused with novasternum and with 2 apical sensilla. Novasternum rounded with one large apical sensilla. Ventral phragma triangular.

Remarks: This species is a member of the subgenus *Drosophila* of the genus *Drosophila* where it resembles *D. painii* SINGH & NEGI 1995 in having some similarity of periphallid and phallic organs (surstylus

with several short black teeth on the outer margin and novasternum rounded with one apical sensilla) but differs from it in several other characters.

Acknowledgements

The authors express their gratitude to Dr. T. OKADA, Emeritus Professor, Department of Biology, Tokyo Metropolitan University, Tokyo, Japan, for confirming the identifications. This work has been supported by a research grant to B.K.S. from the D.S.T., Govt. of India.

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Received: 5. IX. 2000, 7. III. 2001, 10. X. 2002, 4. VII. 2003;
accepted: 1. VIII. 2003.