

**A PRELIMINARY REPORT ON THE DROSOPHILIDAE  
OF KUMAUN REGION WITH DESCRIPTION OF TWO NEW  
SPECIES AND THREE NEW RECORDS**

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**ABSTRACT.** An account is given of twenty species representing five genera, *Drosophila*, *Leucophenga*, *Zaprionus*, *Lissocephala* and *Scaptomyza* of the family Drosophilidae collected from the Kumaun region since July, 1984 to July, 1986. *Drosophila nainitalensis* and *Leucophenga neolacteusa* are described as new and *Drosophila sulfurigaster* Duda, *Scaptomyza himalayana* Takada and *Lissocephala parasiatica* Takada and Momma are recorded for the first time from India.

The Indian Drosophilid fauna has been studied extensively in recent years and most areas have been collected fairly extensively (Gupta, 1969, 1970, 1971, 1972, 1973, 1974a; Gupta and Ray-Chaudhuri, 1970 a,b,c; Gupta and Singh, 1977, 1979; Singh and Gupta, 1977a, b, 1981; Sajjan and Reddy, 1975; Sajjan and Krishnamurthy, 1975; Prakash and Reddy, 1977, 1978, 1979a, b). These studies have indicated that the members of the family Drosophilidae are widely distributed throughout the Indian subcontinent. This paper summarises the results of several surveys undertaken in Kumaun region from July, 1984 to July, 1986. This region has not been extensively collected so far.

The Kumaun region, a hilly area is located at an elevation of about 1828 metres (6,000 feet) from the sea level on the northeast periphery of the state of Uttar Pradesh. It includes three border districts of the State, Nainital, Almora and Pithoragarh. 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 shows collection localities.

Under the head Specimens examined, "M" denotes males, and "F" denotes females.

**Genus *Drosophila* Fallén**

*Drosophila* Fallén, 1923. Diptera Sueciae Geomyzides, 2: 4. Type-species: *Musca funebris* Fabricius; Sweden.

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 hairs and 2 pairs of dorsocentral bristles; prescutellar acrostichals enlarged or not; sternopleuron with up to three macrochaetae and several microchaetae.

**Subgenus *Sophophora* Sturtevant**

*Sophophora* Sturtevant, 1939. Proc. Natl. Acad. Sci., 25: 137. Type-species: *Drosophila melanogaster* Meigen, 1830; Austria and Germany.

Apical bands on anterior abdominal tergites, when present, not interrupted in midline; second oral bristle relatively large, cheek usually relatively narrow; prescutellar bristles absent; propleural bristle absent.

**1. *Drosophila melanogaster* Meigen**

*Drosophila melanogaster* Meigen, 1830. Syst. Besch., 6: 85.

*Specimens examined*: INDIA: Uttar Pradesh: Nainital district, Bhowali, 180 M, 160 F, VII. 1984; Pithoragarh district, Gangolihat, 98 M, 80 F, VII. 1985, Coll. Singh and Bhatt.

*Distribution*: Cosmopolitan.

**2. *Drosophila jambulina* Parshad and Paika**

*Drosophila jambulina* Parshad and Paika, 1964. Res. Bull. Punjab Univ., 15: 240. Type locality: Chandigarh and Malerkotla, India.

*Specimens examined*: INDIA: Uttar Pradesh: Nainital district, Bhowali, 150 M, 135 F, VII. 1984; Almora district, Chaubattiya, 98 M, 95 F, VIII. 1985; Pithoragarh district, Kanalichhina, 55 M, 52 F, VII. 1986, Coll. Singh and Bhatt.

*Distribution*: Asia, Taiwan to India.

**3. *Drosophila kikkawai* Burla**

*Drosophila kikkawai* Burla, 1954a. Rev. Brasil. Biol., 14: 47. Type-locality: Rio de Janeiro, Brazil.

*Specimens examined*: INDIA: Uttar Pradesh: Nainital district, Tanakpur, 150 M, 110 F, VII. 1984; Almora district, Ranikhet, 85 M, 75 F, VIII. 1985; Pithoragarh district, Gangolihat, 50 M, 48 F, VII. 1986, Coll. Singh and Bhatt.

*Distribution*: Samoa, Japan, Hawaii, Fiji, Micronesia, New Guinea, China, South America, Nepal, Taiwan, Korea, India, Malaya, Thailand, Sumatra, Borneo.

*Comments*: *Drosophila kikkawai* is the most widespread species of the *montium* subgroup, now known from the Ethiopian, Oriental, Neotropical and Eastern Palearctic regions. The species has been recorded from several localities in India in Uttar Pradesh, Punjab, Bihar, West Bengal, Karnataka, Orissa, Assam and Manipur. There has been great confusion regarding the identity of this species in the past. It was formerly identified as *D. montium* de Meijere, but Burla (1954a) established the identities of *montium* (from Java) and *kikkawai* (widespread). Baimai (1979) has also indicated the occurrence of several Asian sibling species of *kikkawai*.

**4. *Drosophila takahashii* Sturtevant**

*Drosophila takahashii* Sturtevant, 1927. Philippine J. Sci., 32: 371. Type-locality: Taihoku, Taiwan.

*Specimens examined*: INDIA: Uttar Pradesh: Nainital district, Bhowali, 100 M, 92 F, VII. 1984; Almora district: Ranikhet, 55 M, 45 F, VIII. 1985; Pithoragarh district, Gangolihat, 80 M, 75 F, VII. 1986, Coll. Singh and Bhatt.

*Distribution:* Taiwan, Japan, Korea, Manchuria, China, Nepal, India, Thailand, Borneo, Philippines and Micronesia.

5. ***Drosophila suzukii indicus*** Parshad and Paika

*Drosophila suzukii indicus* Parshad and Paika, 1964. Res. Bull. Punjab Univ., 15: 230. Type-locality: Chandigarh and Manimajra, India.

*Specimens examined:* INDIA: Uttar Pradesh: Pithoragarh district, Gangolihat, 20 M, 18 F, VII. 1985, Coll. Singh and Bhatt.

*Distribution:* India.

6. ***Drosophila bifasciata*** Pomini

*Drosophila bifasciata* Pomini, 1940. Boll. Ent. R. Univ. Bologna, 12: 155. Type-locality: Italy.

*Specimens examined:* INDIA: Uttar Pradesh: Nainital district, Bhimtal, 150 M, 130 F, VII. 1984; Almora district, Ranikhet, 210 M, 200 F, VIII. 1985; Pithoragarh district, Gangolihat, 80 M, 75 F, VII. 1986, Coll. Singh and Bhatt.

*Distribution:* Japan, Taiwan, India, Nepal, Borneo, Thailand, Philippines, New Guinea, Micronesia, Fiji, Samoa, Taiwan and Sumatra.

Comments: *Drosophila bifasciata* was common at all collection sites and was collected by bait trapping as well as by net sweeping.

7. ***Drosophila nepalensis*** Okada

*Drosophila nepalensis* Okada, 1955. Flora and Fauna, Nepal Himalaya, 1: 388. Type-locality: Nepal.

*Specimens examined:* INDIA: Uttar Pradesh: Nainital district, Bhowali, 309 M, 290 F, VII. 1984; Pithoragarh district, Gangolihat, 200 M, 190 F, VIII. 1985; Almora district, Chaubattiya 110 M, 95 F, VII. 1986, Coll. Singh and Bhatt.

*Distribution:* Nepal and India.

Subgenus ***Drosophila*** Fallén, s. str.

*Drosophila* Fallén, 1823. Diptera Sueciae Geomyz., 2: 4. Type-species: *Musca funebris* Fabricius, 1787: 345.

Cheek 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.

8. ***Drosophila immigrans*** Sturtevant

*Drosophila immigrans* Sturtevant, 1921. Carn. Inst. Wash. Publ., 301: 83. Type-locality: New York, U. S. A.

*Specimens examined:* INDIA: Uttar Pradesh: Almora district, Chaubattiya, 250 M, 220 F, VII. 1984; Pithoragarh district, Gangolihat, 150 M, 110 F, VIII. 1985; Nainital district, Bhowali, 95 M, 90 F, VII. 1986, Coll. Singh and Bhatt.

*Distribution:* Cosmopolitan.

Comments: *Drosophila immigrans* is a Cosmopolitan species very common on all the collection sites. The species does not tolerate hot or dry environment, thus the species can be easily collected from cold and humid climate but only few from

hot and dry climate. *D. immigrans* and several dozen of its relatives comprise the *immigrans* species group which is centred in southeast Asia and New Guinea, but *immigrans* itself appears to be extremely rare in the region. Two types of karyotypes have been reported in this species (Patterson and Stone, 1952); on this basis they are designated as *immigrans* I and *immigrans* II. Singh and Gupta (1979) has established that the karyotype of the Indian species is similar to *immigrans* II, consisting of two pairs of rods, one pair of J and one pair of V-shaped chromosomes. However, the small arm of the J-shaped chromosome is heterochromatic in Indian specimens.

9. ***Drosophila lacertosa* Okada**

*Drosophila lacertosa* Okada, 1956. Systematic Studies on Drosophilidae and allied Fauna of Japan, p. 158. Type-locality: Hakamoriama, Iwete Pref., Japan.

*Specimens examined*: INDIA: Uttar Pradesh: Nainital district, Bhimtal, 190 M, 175 F, VII. 1984; Almora district, Ranikhet, 150 M, 110 F, VIII. 1985; Pithoragarh district, Gangolihat, 95 M, 92 F, VII. 1986, Coll. Singh and Bhatt.

*Distribution*: Japan, Korea, Nepal and India.

10. ***Drosophila repleta* Wollaston**

*Drosophila repleta* Wollaston, 1858. Ann. Mag. Nat. Hist., 41: 117. Type-locality: Madeira.

*Specimens examined*: INDIA: Uttar Pradesh: Nainital district, Tanakpur, 15 M, 10 F, VIII. 1984; Pithoragarh district, Gangolihat, 6 M, 4 F, VII. 1985, Coll. Singh and Bhatt.

*Distribution*: Cosmopolitan.

11. ***Drosophila nainitalensis* Singh and Bhatt, sp. nov. (Figs. 2 A-E)**

*Male and female*: Dark brown. Mean body length, males (4 males) 3.38 mm; females (2 females) 3.61 mm.

*Head*: Arista with 4-5 dorsal and 2-3 ventral branches in addition to the terminal fork. Antennae light yellow. Frons tan to light brown. Orbital bristles in the ratio of 9:4:10. Carina pale yellow, narrow and high. Second oral bristle subequal to vibrissa. Palpus pale with 3-4 marginal setae. Face and cheek tan, greatest width of cheek from base of oral to eye border about one-sixth greatest diameter of eye. Eyes bright red.

*Thorax*: Acrostichal hairs regular, in 8 rows in front of dorsocentrals. Prescutellars well developed. Anterior scutellars convergent. Distance from anterior dorso-central to posterior dorso-central about one-third distance between two anterior dorso-centrals. Mesonotum and scutellum unicolourous, brown. All three sternopleural bristles moderately strong. Sterno-index about 0.76. Legs (Fig. 2 C) brown. Preapicals on all three tibiae; apicals on first and second tibiae. Wings (Fig. 2 D) clear. Anterior and posterior crossveins fuscous. Indices: C-index 3.3; 4 V-index 1.5; 4 C-index 0.72; 5 X-index 1. Two equal bristles at the apex of first costal section; heavy bristles on about basal two thirds of third costal section. Halteres yellow.

*Abdomen:* Yellow with thin black abdominal bands. Periphallidic organs (Fig. 2 B): Genital arch broad dorsally and narrowing ventrally, upper portion bare, lower portion with about 16-18 bristles. Primary clasper with about 15-20 stout black teeth arranged on outer concave row and about 8-10 short stout setae at lower tip. Anal plate oval, with about 26 long bristles above, lower tip slightly narrowed and with about 7-8 short bristle like teeth. Phallic organs (Fig. 2 A): Aedeagus short and straight, club-shaped, apically swollen with two lateral processes; basal apodeme of aedeagus short. Anterior parameres fused with novasternum and with one large apical sensilla. Posterior parameres large, broad above and narrow below. Ventral fragma somewhat triangular. Egg-guides (Fig. 2 E): Lobes broadly rounded at tip, with about 9 marginal and 9 discal teeth. Basal isthmus narrow and short.

*Holotype:* Male, INDIA: Uttar Pradesh: Kumaun Hills: Nainital district: Nainital: Barapathar, 15. VII. 1985, Coll. B. K. Singh and M. Bhatt. Deposited in the Department of Zoology, Kumaun University, Nainital. *Paratypes:* 4 males and 2 females, same locality and collectors as holotype. In the Department of Zoology, Kumaun University, Nainital and Department of Biology, Tokyo Metropolitan University, Tokyo, Japan.

*Distribution:* India: Uttar Pradesh: Kumaun, Nainital.

This species belongs to the subgenus *Drosophila*.

## 12. *Drosophila sulfurigaster* (Duda) (Figs. 2 F-J)

*Drosophila spinulolophila sulfurigaster* Duda, 1923. Ann. Hist. Nat. Mus. Natl. Hung., 20: 48. Type-locality: New Guinea.

*Male and female:* Head: Arista with 3 dorsal and 2 ventral branches in addition to the terminal fork. Antennae light yellow. Carina narrow and high. Face and cheek dark brown. Frons including ocellar triangle yellow. Greatest width of cheek from base of oral to eye border about one ninth greatest diameter of eye. Second oral subequal to vibrissa. Eyes bright red.

*Thorax:* Acrostichal hairs regular, in 8 rows between dorsocentrals. Preapicals well developed. Anterior scutellars convergent. Distance from anterior dorsocentral to posterior dorsocentral approximately half distance between two anterior dorsocentrals. Thoracic pleura dark brown. Other details as described by Duda (1923). Wings (Fig. 2 I): Hyaline. Indices: C-index 3.3; 4 V-index 1.5; 4 C-index 0.75; 5 X-index 1.

*Periphallidic organs* (Fig. 2 G): Genital arch broad dorsally and narrowing ventrally, upper portion bare and pubescent, lower portion with about 9-10 large bristles. Primary clasper with about 7-8 stout black teeth arranged on outer concave row and with about 2 large and 4 short stout bristles. Anal plate oval with about 20 large, thick and several small thin stout setae on the lower tip. Phallic organs (Fig. 2 F): Aedeagus short, subapically swollen. Basal apodeme of aedeagus thick and short. Anterior parameres large with about one apical sensilla. Posterior parameres fused with novasternum. Ventral fragma somewhat triangular. Egg guides (Fig. 2 J): Lobes somewhat rounded at tip, with about 15 marginal and 7 discal teeth. Basal isthmus narrow and short.

*Specimens examined*: INDIA: Uttar Pradesh: Nainital district: Bhowali, 4 M, 2 F, VII. 1984; Pithoragarh district, Gangolihat, 3 M, 2 F, VIII. 1985, Coll. Singh & Bhatt.

*Distribution*: Widespread in Polynesia, Micronesia and Asia (new record).

*Comments*: *Drosophila sulfurigaster* is the most widespread member of the *nasuta* subgroup of the *immigrans* species group. The *immigrans* species group is a large species group and is centered in Southeast Asia (Wilson et al., 1969). *D. sulfurigaster* is the only species in which three subspecies have been recognized: *sulfurigaster bilimbata* Bezzi extends from Fiji through Palmyra and Hawaii to Guam; *sulfurigaster albostrigata* Wheeler occurs in Southeast Asia from Borneo and continental Malaysia and Thailand eastwards to the Philippine islands; and *sulfurigaster sulfurigaster* is known from New Guinea, New Ireland and northern Queensland (Wilson et al., 1969). *D. sulfurigaster* is recorded for the first time from India and the identities of the subspecies require further study.

#### Subgenus *Scaptodrosophila* Duda

*Scaptodrosophila* Duda, 1923. Ann. Mus. Nat. Hungarici, 20: 37. Type-species: *Scaptodrosophila scaptomyzoidea*; New Guinea.

Vibrissa single; three strong subequal sternopleural bristles; prescutellars present, prescutellar pair of acrostichal bristles usually enlarged, sometimes as large as anterior dorsocentrals; posterior gonapophysis of male copulatory apparatus fused or contiguous with penis; egg with 6 or more filaments.

#### 13. *Drosophila coracina* Kikkawa and Peng

*Drosophila coracina* Kikkawa and Peng, 1938. Japan J. Zool., 7: 523.

*Specimens examined*: INDIA: Uttar Pradesh: Nainital district, Tanakpur, 50 M, 46 F, VII. 1984; Almora district, Chaubattiya, 15 M, 13 F, VII. 1985, Singh & Bhatt.

*Distribution*: Japan, China and India.

#### Subgenus *Dorsilopha* Sturtevant

*Dorsilopha* Sturtevant, 1942. Univ. Texas Publ., 4213: 28. Type-species: *Drosophila busckii* Coquillette; U.S.A.

Yellowish species; mesonotum with longitudinal stripes; preapicals evident only on third tibiae; egg with four filaments; the largest axis of eye exceedingly oblique to body axis.

#### 14. *Drosophila buckii* Coquillette

*Drosophila busckii* Coquillette, 1901. Ent. News, 12: 16. Type-locality: U.S.A.

*Specimens examined*: INDIA: Uttar Pradesh: Nainital district, Bhowali, 110 M, 98 F, VII. 1984; Almora district, Ranikhet, 90 M, 85 F, VIII. 1985; Pithoragarh district, 50 M, 48 F, VII. 1986, Coll. Singh and Bhatt.

*Distribution*: Cosmopolitan.

*Comments*: *Drosophila busckii* was found to be very common on all the collection sites.

**Genus *Leucophenga* Mik**

*Leucophenga* Mik, 1886. Wiener Ent. Zeitung, 5: 317. Type-species: *Drosophila maculata* Dufour; Europe.

Arista with several straight rays both above and below terminal fork; Front narrow, in several species narrower in male than in female; Carina rudimentary or absent; Cheek usually very narrow, with single vibrissa; Eyes very large, bright red, bare; all three orbital bristles large; posterior reclinate typically closer to inner vertical than to proclinate orbital; Mesonotum with numerous rows of acrostichal hairs and pair of large prescutellar bristles.

**15. *Leucophenga neolacteusa* Singh and Bhatt, sp. nov. (Figs. 3 A-E)**

*Male and female:* Pale brown. Mean body length, males (4 males) 3.25 mm; females (2 females) 3.55 mm.

*Head:* Arista with about 5-7 dorsal and 3-4 ventral branches in addition to small terminal fork. Antennae with second segment pale brown; third segment yellow. Frons including ocellar triangle brown. Carina light brown, narrow and high. Orbitals in the ratio of 7:5:9, anterior reclinate orbital closer to proclinate. Vibrissa well developed. Second oral not differentiated. Palpi yellow, slender, with one apical and 3-4 ventral setae. Face and cheek pale, greatest width of cheek one-sixth greatest diameter of eye. Clypeus dark brown. Eyes bright red.

*Thorax:* Acrostichal hairs in about ten irregular rows. Anterior scutellars parallel, posterior crossing each other. Anterior dorsocentral two fifth the length of posterior dorsocentral; distance between anterior and posterior dorsocentral one-third of distance between two anterior dorsocentrals. Mesonotum tan. Scutellum dark brown with yellow apex. Thoracic pleura black. Sterno-index about 0.75. Legs (Fig. 3 C) entirely pale tan; preapicals on all tibiae; apicals on mid and hind tibiae. Wings (Fig. 3 D): Hyaline. Cl bristles two, unequal; C3 bristles on basal about two-third of third costal section. Indices: C-index 2.5; 4 V-index 2.00; 4 C-index 1.28; 5 X-index 1.6. Halteres yellow. Length (holotype): 3.2 mm.

*Abdomen:* Abdominal tergites yellow with a pattern of dark areas. In male tergite 1 yellow. Tergite 2 yellow with two lateral black spots. Last three tergites completely black. In female tergite 1 and 2 yellow with black bands; tergite 3,4 and 5 completely black. Periphallallic organs (Fig. 3 B): Genital arch broad above, narrow below, completely bare and pubescent. Clasper large, pubescent and with about 16-17 short setae. Anal plate elongate, semilunar, pubescent with about 25-30 bristles. Phallic organs (Fig. 3 A): Aedeagus slender, apically narrow and serrated with a short apodeme. Anterior parameres small, leaf-like with one apical sensilla. Posterior parameres long, broad above and narrow below. Ventral fragma rectangular. Egg-guides (Fig. 3 E): Lobe pale yellow, lobed anteriorly, fused posteriorly and with about 20-25 long bristles.

*Holotype:* Male, INDIA: Uttar Pradesh: Kumaun Hills: Nainital district: Tanakpur, 10. VII. 1984, Coll. B.K. Singh and M. Bhatt. Deposited in the Department of Zoology, Kumaun University, Nainital. Paratypes: 4 males & 2 females, same locality and collectors as holotype. In the Department of Zoology, Kumaun

University, Nainital and Department of Biology, Tokyo Metropolitan University, Tokyo, Japan.

*Distribution:* India: Uttar Pradesh: Kumaun, Nainital.

This species resembles *Leucophenga lacteusa* Takada and Wakahama but differs from it by black thoracic pleura.

#### 16. *Leucophenga bellula* (Bergrowth)

*Drosophila bellula* Bergrowth, 1894. Stettiner Entomol., (2) 55: 75. Type-locality: Central Queensland, Australia.

*Specimens examined:* INDIA: Uttar Pradesh: Nainital district, Tanakpur, 3 M, 2 F, VII. 1984; Pithoragarh district, Gangolihat, 2 M, 1F, VIII. 1985, Coll. Singh and Bhatt.

*Distribution:* Australia through Southeast Asia to Micronesia, Taiwan, Japan, India and Nepal.

*Comments:* Considerable variability in the abdominal pattern of this species has been reported by various authors and workers have sometimes experienced difficulties in separating the species. Okada (1970) figured *bellula* (*guttiventris*) abdominal patterns from localities in Japan, Taiwan, India, Java and Nepal. A certain amount of variability is evident in both the presence and size of the spots on the abdominal tergites. There is less variability among the Indian specimens so far examined from the Kumaun region; tergite 2 with two large lateral black spots, tergite 3 with one central black spot somewhat pointed anteriorly, tergite 4 with two large lateral black spots and one small central black spot and in some specimens, smaller lateral black spots.

#### Genus *Zaprionus* Coquillett

*Zaprionus* Coquillett, 1902. Proc. U. S. Natl. Mus., 24: 31. Type-species: *Zaprionus vitizer* Coquillett; Rhodesia, Southern Africa.

Carina exceedingly swollen; a row of cuneiform bristles present on mid and hind tarsi.

#### 17. *Zaprionus indiana* Gupta

*Zaprionus indiana* Gupta, 1970. Proc. Indian Natl. Sci. Acad., 36: 63. Type-locality: Allahpur, Badaun district, Uttar Pradesh, India.

*Specimens examined:* INDIA: Uttar Pradesh: Nainital district, Bhowali, 150 M, 120 F, VII. 1984; Almora district, Chaubattiya, 85 M, 80 F, VIII. 1985; Pithoragarh district, Gangolihat, 35 M, 32 F, VII. 1986, Coll. Singh and Bhatt.

*Distribution:* India.

#### Genus *Lissocephala* Malloch

*Lissocephala* Malloch, 1929. Ann. Mag. Nat. Hist., (10) 4: 250. Type-species: *Lissocephala unipunctata* Malloch, 1929; Salisburg, Rhodesia.



Entire front highly polished, with metallic sheen; mesonotum and abdomen glossy, usually with metallic sheen, scutellum dull or subshiny; wing without anal vein; C-index low.

18. ***Lissocephala parasiatica*** Takada and Momma (Fig. 4 F-J)

*Lissocephala parasiatica* Takada and Momma, 1975. J. Fac. Sci. Hokkaido Univ. (Ser. 6, Zool.) 20: 24. Type-locality: Malaysia.

*Male and female:* Head: Arista with 3 dorsal and 2 ventral branches in addition to terminal fork. Palpi yellowish, with 3 prominent marginal setae. Antennae dark brown. Frons including ocellar triangle yellow. Face and cheek brown.

*Thorax:* Mesonotum shining tan, scutellum yellow. Two dark brown rounded spots present on the lateral sides of the thorax. Distance from anterior dorsocentral to posterior dorso-central two-third distance between two anterior dorsocentrals. Other details as described by Takada and Momma (1975). Wings (Fig. 4 I): Transparent. Light patch, anteriorly beginning from 2nd longitudinal vein through IIIrd and IVth longitudinal vein; posteriorly beginning from IIIrd longitudinal vein through IVth and Vth longitudinal vein. Indices: C-index 3.1;4 V-index 2.42; 4 C-index 1.57; 5 X-index 1.6.

*Periphallial organs* (Fig. 4 G): Genital arch dark, broad above and narrow below, upper portion bare, lower portion pubescent and with about 6 marginal bristles. Clasper small, brown with about 15 short stout teeth-like bristles. Phallic organs (Fig. 4 F): Not examined thoroughly as only a few flies were collected. Egg-guides (Fig. 4 J): Lobe pale yellow, with about 10 marginal yellowish brown teeth.

*Specimens examined:* INDIA: Uttar Pradesh: Nainital district, Tanakpur, 2 M, 2F, VII. 1985, Coll. Singh and Bhatt.

*Distribution:* Malaysia and India (new record).

Genus ***Scaptomyza*** Hardy

*Scaptomyza* Hardy, 1849. Proc. Berwicksh. Nat. Club, 2: 361. Type-species: *Drosophila graminum* Fallén, 1823, by designation of Coquillett (1910. 603).

Arista plumose, with 1-2 ventral rays; acrostichal hairs in 2-4 rows; prescutellar bristles absent; small, slender species resembling *Drosophila*; larvae often leaf mining.

19. ***Scaptomyza graminum*** Fallén

*Drosophila graminum* Fallén, 1823. Dipt. Suec. Geomyz., p. 8. Type-locality: Europe.

*Specimens examined:* INDIA: Uttar Pradesh: Nainital district, Bhimtal, 5 M, 2 F, VII. 1984; Pithoragarh district, Kanalichhina, 11 M, 7F, VIII. 1985, Coll. Singh and Bhatt.

*Distribution:* Europe, Canary Is., Hawaii, Canada, Lebanon, Japan and India.

20. ***Scaptomyza himalayana*** Takada (Figs. 4 A-E)

*Scaptomyza himalayana* Takada, 1970. Annot. Zool. Japan, 43: 146. Type-locality: Larjung, Palpa, Nepal.

*Male and female:* Head: Arista with 4 rays above and 1-2 rays below in addition to small terminal fork. Second and third antennal segments tan. Frons including ocellar triangle light brown. Carina nose-like. Face and cheek yellow. Greatest width of cheek from the base of oral to eye border about one-tenth greatest diameter of eye.

*Thorax:* Acrostichal hairs in 4 rows in front of dorsocentral bristles, 4 rows decreasing to 2 between dorso-centrals. Mesonotum tan. Scutellum black. Anterior scutellar bristles a little larger than posterior scutellars. Legs (Fig. 4 C) tan; preapicals present on all tibiae; apicals on second tibia only. Other details as described by Takada (1970). Wings (Fig. 4 D): Hyaline. Indices: C-index 3.3, 4 V-index 1.46; 4 C-index 0.66; 5 X-index 1.2. Third costal section with heavy setation on basal 0.4.

*Periphallic organs* (Fig. 4 B): Genital arch brownish, upper portion pubescent and bare, lower portion with about 13 short stout marginal setae and 14 large bristles. Clasper with 2 large and 2 small black curved teeth and a tuft of small bristles. Anal plate dark brownish black, rounded, separated from genital arch, pubescent and with about 12-14 bristles. Phallic organs (Fig. 4 A): Aedeagus small, yellowish brown and oval. Apodeme black, narrow, long and straight. Anterior parameres small, oval, pubescent, brownish black with one apical sensilla. Ventral fragma almost triangular, lateral arm somewhat S-shaped. Egg-guides (Fig. 4 E): Lobe dark brownish black, distal margin obliquely truncate with about 7 marginal strong black teeth. Basal isthmus short.

*Specimens examined:* INDIA: Uttar Pradesh: Almora district, Chaubattiya, 3 M, 2 F, VII. 1984; Pithoragarh district, Gangolihat, 2 M, 1 F, VIII. 1985; Coll. Singh and Bhatt.

*Distribution:* Nepal and India (new record).

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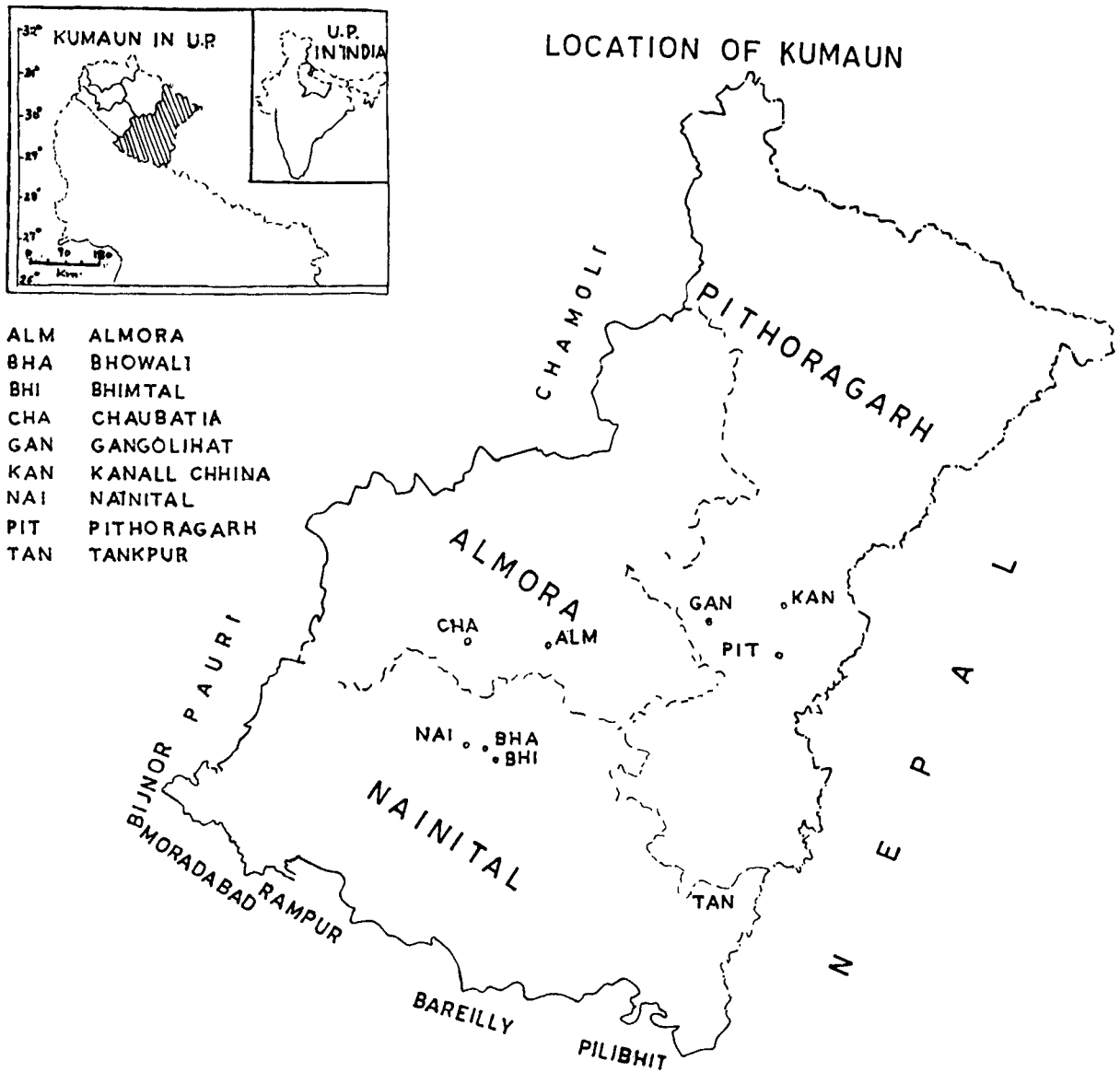


Fig. 1. Map of Kumaun region showing collection localities.

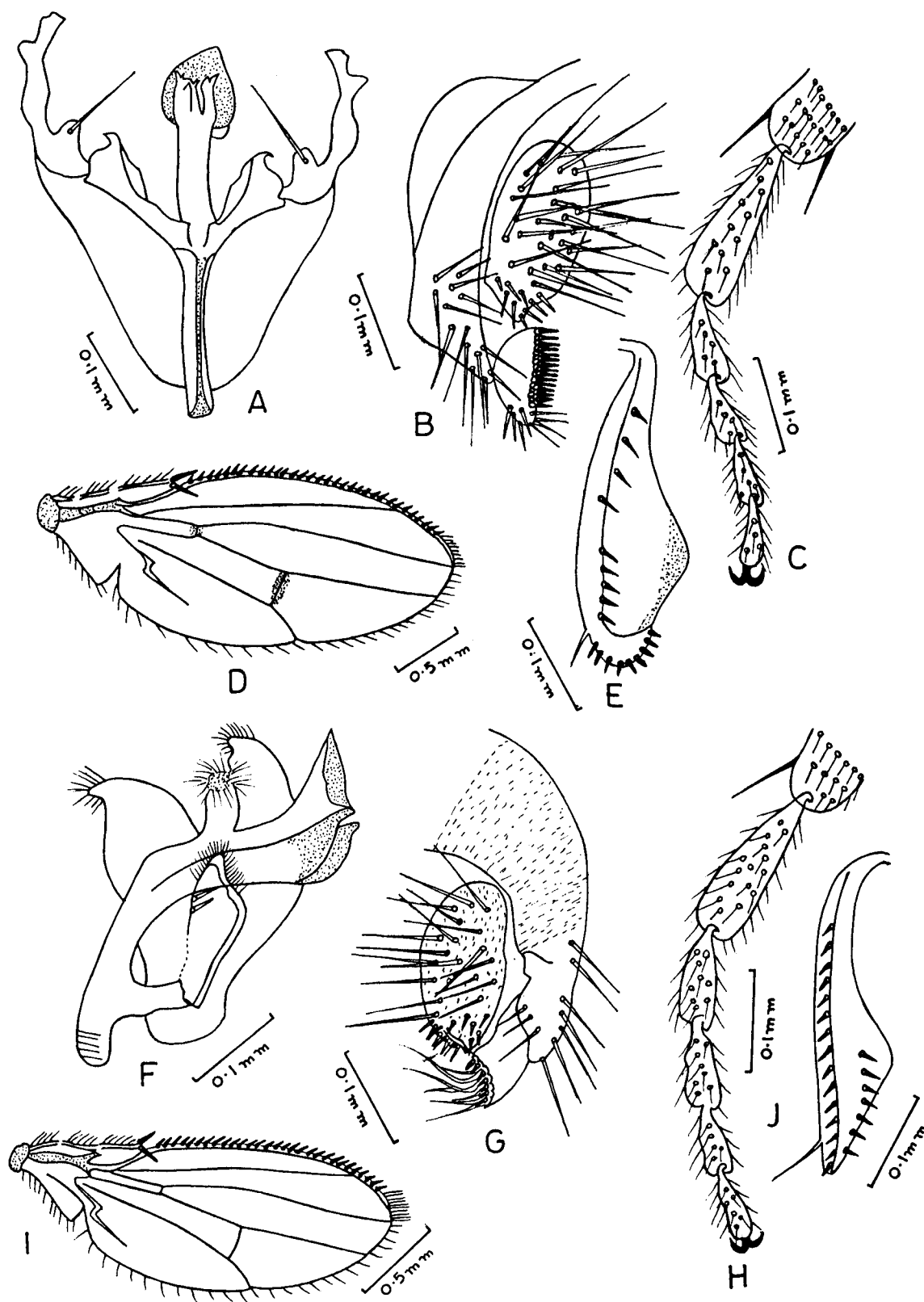


Fig. 2. A-E: *Drosophila nainitalensis*, sp. nov.: A, phallic organs; B, periphallic organs; C, male fore leg; D, wing; E, egg-guide. F-J: *Drosophila sulfurigaster*: F, phallic organs; G, periphalli; H, male fore leg; I, wing; J, egg-guide.

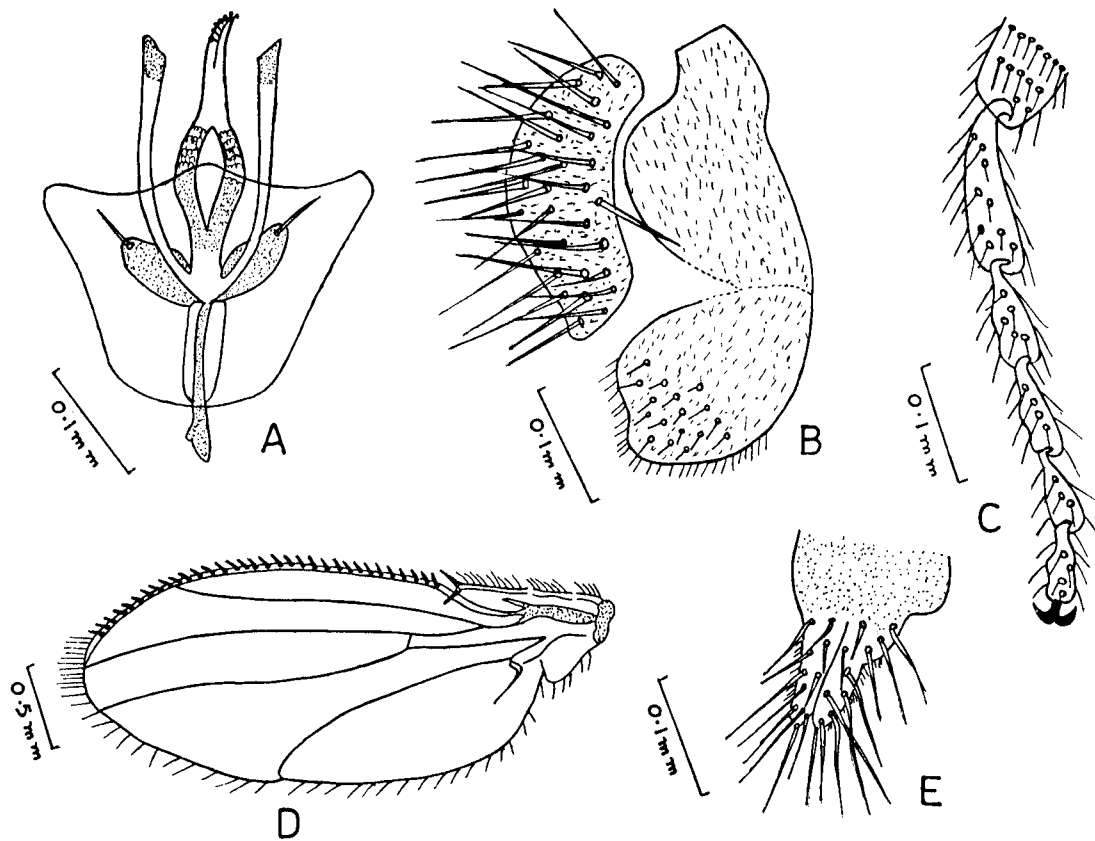


Fig. 3. A-E: *Leucophenga neolacteusa*, sp. nov.: A, phallic organs; B, periphallic organs; C, male fore leg; D, wing; E, egg-guide.

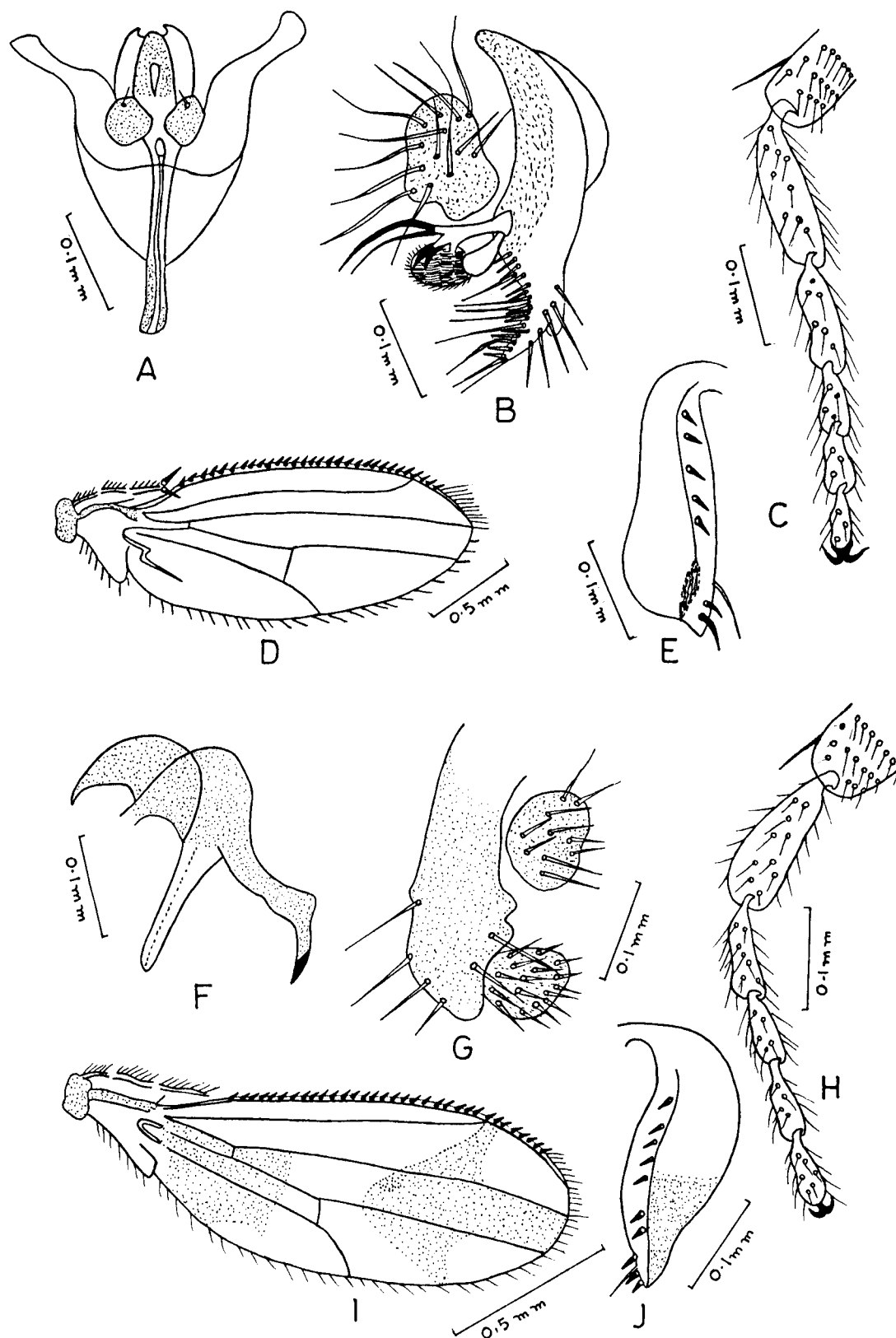


Fig. 4. A-E: *Scaptomyza himalayana*: A, phallic organs; B, periphallalic organs; C, male fore leg; D, wing; E, egg-guide. F-J: *Lissocephala parasiatica*: F, phallic organs; G, periphallalic organs; H, male fore leg; I, wing; J, egg-guide.

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### BOOK REVIEW

**CHITIN AND BENZOYLPHENYL UREAS.** Edited by James E. Wright and Arthur Retnakaran. Series Entomologica, Volume 38. Dr. W. Junk Publishers, a member of the Kluwer Academic Publishers Group, The Netherlands. 1987. Pages I-X + 1-309. Price Dfl. 200.00, US\$ 86.00, UK£ 62.25. ISBN 9061936128.

This book is an outcome of a symposium on "Chitin and Benzoylphenyl Urea" organized by the co-editors at the International Congress of Entomology, Hamburg, W. Germany in 1984. It consists of 10 chapters: (1) Chitin and the fine structure of cuticles by R. H. Hackman, (2) Regulation of chitin synthesis: mechanisms by Edwin P. Marks and Gordon B. Ward, Jr., (3) Interference with chitin biosynthesis in insects by Ephraim Cohen, (4) Mode of action and insecticidal properties of Diflubenzuron by A. C. Grosscurt and B. Jongma, (5) Chitin biosynthesis after treatment with Benzoylphenyl ureas by Bernard Mauchamp and Odile Perrineau, (6) Structure-activity relationships of Benzoylphenyl ureas by Takahiro Haga, Tadaaki Toki, Tohru Koyanagi, and Ryuzo Nishiyama, (7) Toxicity of two benzoylphenyl ureas against insecticide resistant mealworms by Issac Ishaaya and Saka Yablonski, (8) Environmental fate and properties of 1-(4-chlorophenyl)-3(2,6-Difluorobenzo-yl) urea (Diflubenzuron, Dimilin) by Gary M. Booth, Daniel C. Alder, Milton G. Gee, Melvin W. Carter, Robert C. Whitmore, and Robert E. Seegmiller, (9) Control of insect pests with benzoylphenyl ureas by Arthur Retnakaran and James E. Wright, and (10) Potential of Benzoylphenyl ureas in integrated pest management by Jeffrey Granett.

As stated by the co-editors in their preface, this collection of articles on chitin represents an opportunity to understand the interaction of chitin ultrastructure, biochemistry and benzoylphenyl ureas a single biological system, and apply the results of modern basic research on chitin to insect pest control, as disruption of chitin formation and deposition may be fatal to insects.

All articles are of high quality and the research results have been nicely summarized. The printing and get up are excellent. It is a valuable addition in the Series Entomologica.

Virendra Gupta