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## DROSOPHILID SURVEY OF INDIA

## III. THE DROSOPHILIDAE OF KASHMIR VALLEY

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## ABSTRACT

The present investigations are based on the 20 species of the family Drosophilidae collected from Kashmir Valley during June-July, 1963. Of these, two belong to the genus *Scaptomyza*, one each to the subgenera *Dorsilopha* and *Pholadoris*, 11 to the subgenus *Sophophora* and the remaining five to the subgenus *Drosophila*. Three species, one each belonging to the subgenera *Pholadoris*, *Sophophora* and *Drosophila*, are novo. The relationship of these novo species has been discussed in detail.

## INTRODUCTION

The present investigations, third of the series on the Indian Drosophilidae, are based on 20 species belonging to *Scaptomyza* and *Drosophila* collected from Kashmir Valley from June 18, 1963, to July 22, 1963. During this period 3,159 flies were collected which belonged to as many as 20 species—two of the genus *Scaptomyza*, one each of the subgenera *Dorsilopha* and *Pholadoris*, 11 of the subgenus *Sophophora* and the remaining five of the subgenus *Drosophila*. Three out of these, *D. (Pholadoris) ebonata*, *D. (Sophophora) epiobscura* and *D. (Drosophila) pentaspina*, are novo. while *Scaptomyza pallida*, *Scaptomyza graminum*, *D. busckii*, *D. helvetica*, *D. pulchrella*, *D. brachynephros*, *D. testacea* and *D. curviceps* are being reported for the first time from India.

## MATERIAL AND METHODS

The collection of the various species was made either from baits which were charged with over ripe banana, tomato or black cherry or by sweep. The source and the locality of collection for the various species are given in Table I.

The collection and the treatment of the flies for various studies were carried out in the same way as described in the earlier communication (Parshad and Paika, 1964). The holotypes and paratypes of the novo species, as indicated in the text, are with the senior author.

## DESCRIPTION OF THE SPECIES

## Genus SCAPTOMYZA Hardy, 1849

I. *Scaptomyza (Parascaptomyza) Pallida* Zetterstedt, 1847

*Scaptomyza pallida* Zetterstedt, 1847. Diptera Scandinaviae, 6, 275.

*Scaptomyza dischica* Duda, 1921, Jeharesh Ver. Schles, Insktenk. Breslau, 13, 64; Okada, 1956. Syst. St. Drosophilidae allied Fam. Japan: 67.

*Parascaptomyza dischica* Basden, 1954. Trans. R. Soc. Edinburgh, 72, 617; Okada and Kurokawa, 1957. Kontyu, 25, 4.

*Male*.—Front 1/5 the width of head;  $or_2$  about 1/2 the vibrissa. Cheeks yellow, their greatest width about 1/4 the greatest diameter of eye. Wing with C-index 3.23.

TABLE I  
*Method of collection, source and locality of the various species of Indian Drosophilidae*

Name of the species	Method of collection	Source	Locality
1. <i>Scaptomyza pallida</i>	Sweep	Over dry leaves, grassy lawns and vegetation near rivulets	Gulmarg
2. <i>Scaptomyza graminum</i>	Sweep	Over dry leaves, grassy lawns and vegetation near rivulets	Gulmarg
3. <i>D. ebolata</i> sp. novo	Bait	Tomato, black cherry and banana	Srinagar and Pahalgam
4. <i>D. busckii</i>	Bait	Tomato, black cherry and banana	Pahalgam
5. <i>D. sp. cf. helvetica</i>	Bait	Tomato, black cherry and banana	Gulmarg and Pahalgam
6. <i>D. eriosecura</i> sp. novo	Bait	Tomato, black cherry and banana	Gulmarg and Pahalgam
7. <i>D. bifasciata</i>	Bait	Tomato, black cherry and banana	Gulmarg and Pahalgam
8. <i>D. melanogaster</i>	Sweep and bait	Over discarded fruits, tomato, black cherry and banana	Srinagar, Gulmarg and Pahalgam
9. <i>D. nepalensis</i>	Sweep and bait	Over discarded fruits, tomato, black cherry and banana	Srinagar and Pahalgam
10. <i>D. suzukii</i> subspecies <i>indicus</i>	Sweep and bait	Over discarded fruits, tomato, black cherry and banana	Srinagar, Gulmarg and Pahalgam
11. <i>D. palchella</i>	Bait	Tomato, black cherry and banana	Pahalgam
12. <i>D. ananassae</i>	Sweep	Over fermenting fruits	Srinagar
13. <i>D. kikkawai</i>	Sweep	Over fermenting fruits	Srinagar
14. <i>D. jambulina</i>	Sweep	Over fermenting fruits	Srinagar
15. <i>D. rufa</i>	Bait	Tomato, black cherry and banana	Gulmarg and Pahalgam
16. <i>D. brachynephros</i> sp.	Bait	Tomato, black cherry and banana	Pahalgam
17. <i>D. testacea</i>	Bait	Tomato, black cherry and banana	Pahalgam
18. <i>D. trimigrans</i>	Sweep and bait	Over fermenting fruits, tomato, black cherry and banana	Srinagar and Pahalgam
19. <i>D. sp. cf. curviceps</i>	Bait	Tomato, black cherry and banana	Pahalgam
20. <i>D. pentaspms</i> sp. novo	Bait	Tomato, black cherry and banana	Srinagar, Gulmarg and Pahalgam

Other characters as described by Okada (1956) and Okada and Kurokawa (1957). Periphallalic organs as described by Hsu (1949) and Okada (1956) and indicated by Okada and Kurokawa (1957); decasternum and phallic organs as figured by Okada (1956) and described by Okada and Kurokawa (1957).

*Specimens examined.*—Six males from Gulmarg.

## II. *Scaptomyza graminum* Fallen, 1823

*Drosophila graminum* Fallen, 1827. Dipt. Suec. Geomyz., 8.

*Scaptomyza graminum* Duda, 1935. Die Fliegen, 58, 67; Okada, 1956. Syst. St. Drosophilidae allied Fam. Japan: 75.

*Male.*—Front dark-brown, about  $1/3$  the width of head,  $orb_2$  about  $7/10 orb_1$  and  $orb_3$ .  $Or_2$  about  $5/7$  the vibrissa. Carina yellowish-white, flat; face yellow-white. Palpus yellow with two prominent unequal apical and a number of fine subapical bristles. The greatest width of cheeks about  $1/5$  the greatest diameter of eye. Sterno-index 0.64. Last tarsus apically black. First femur with a long bristle along its inner margin. Halteres dull-yellow. Wings with costal index 3.82 and 5X-index 1.27. Other characters as described by Okada (1956).

*Periphallic organs.*—The upper portion of the genital arch slightly pubescent, primary clasper with 12 teeth; other characters as described by Okada (1956).

*Phallic organs.*—As described by Okada (1956) except that the submedian process of novasternum is large.

*Specimens examined.*—Four males from Gulmarg.

## Genus DROSOPHILA Fallen, 1823

### Subgenus PHOLADORIS Sturtevant, 1942

## III. *Drosophila (Pholadoris) ebonata* sp. novo

### Male Imago

1. *External characters.*—Arista with three dorsal and two ventral branches in addition to the terminal fork; antenna tan-brown. Front over  $1/5$  the width of head, reddish-brown, narrow above.  $Orb_1$  equal to  $orb_3$ ,  $orb_2$  about  $1/5$  of either. Only vibrissa prominent. Carina yellowish-brown, raised, broader below; face brown; clypeus tan-brown. Palpus yellowish-brown with two prominent and a number of smaller bristles. Cheeks dark-brown, their greatest width about  $1/8$  the greatest diameter of eye. Eyes brick-red; ocelli yellow.

Acrostichal hairs in six rows; prescutellars present, anterior scutellars divergent, posterior scutellars convergent. Mesonotum and scutellum tan-brown. Humerals two, equal. Pleura tan-brown. Sterno-index 0.77.

Legs brown, femurs and tibiae of prothoracic legs tan-brown; preapicals on all the three tibiae, apicals only on the first two. Abdomen black, sternites squarish. Halteres light-brown.

Wing (Fig. 1) clear, C-1 bristles two, equal, C-3 bristles on basal  $3/5$  the third costal section. C-index 2.08, 4V-index 2.89, 4C-index 1.33 and 5X-index 2.00.

Length of the body .. 2.70 mm.

Length of the wing .. 2.34 mm.

rufifrons from Swin  
arista  $3/2$

$orb_2$   $1/2$  other

$Or_2$   $2/5$  vib

ocellus: triangular, prosoble  
bl. br., adult 9.1

AC 8

median pleoptil long

12 / 12  
2 / 1 / 12  
St. margin 8  
C 304 3/5

2. *Periphallie organs* (Fig. 2).—Genital arch dark-brown; posterior half slightly pubescent, narrow above, upper posterior margin with six and the lower half with about 20 bristles; heel observable, produced into a horn-like process; under-margin inwardly folded; toe rounded, pointed downwards and inwards. Anal plate long, rear angle with a cluster of short bristles. Clasper single, separate from genital arch, dark-brown, with ten primary teeth, arranged in a concave row along the margin on the upper 3/4 region of the clasper.

3. *Phallic organs* (Fig. 3).—Tan-brown in general. Aedeagus bifid, with numerous fine, headed, thread-like structures, profusely entangled. Anterior paramere orange-brown, with sensillae arranged along the entire length, posterior paramere in the form of vertical rod, contiguous to the base of aedeagus and meeting at their tips. Novasternum broad with eight pairs of well-developed submedian spines. Ventral fragma triangular. Basal apodeme basally bifid and with a short vertical ventral process. PI. 0.72.

4. *Holotype*.—One male from Pahalgam.

5. *Paratypes*.—Two males from Pahalgam.

6. *Specimens examined*.—Fourteen males from Srinagar and seven from Pahalgam.

*Relationship*.—*Drosophila ebonata* belongs to the species group *victoria* (Wheeler, 1949) of the subgenus *Pholadoris* (Sturtevant, 1942) because of shining black body colour, acrostichal hairs in six rows, anterior scutellers divergent, the presence of a prominent projecting horn-like process on the heel, anal plate with dense bristles, especially at the lower tip, and the primary teeth extended outward beyond primary clasper and with numerous hairs.

Morphologically, this species is more near to *D. rufifrons* Loew (Okada, 1956) than to any other member of the *victoria* subgroup. The close resemblances between *D. ebonata* and *D. rufifrons* include minute *orb*<sub>2</sub>, *or*<sub>2</sub> feebly developed, about 1/4 vibrissa, sterno-index approximately 0.8, 5X-index about 2.0, aedeagus bifid and with numerous tightly entangled hairy structures, anterior paramere as long as aedeagus, basal apodeme of aedeagus bifid and with a short vertical ventral rod, submedian spines of the novasternum long and in more than one pair and ventral fragma triangular.

#### Subgenus DORSILOPHA Sturtevant, 1942

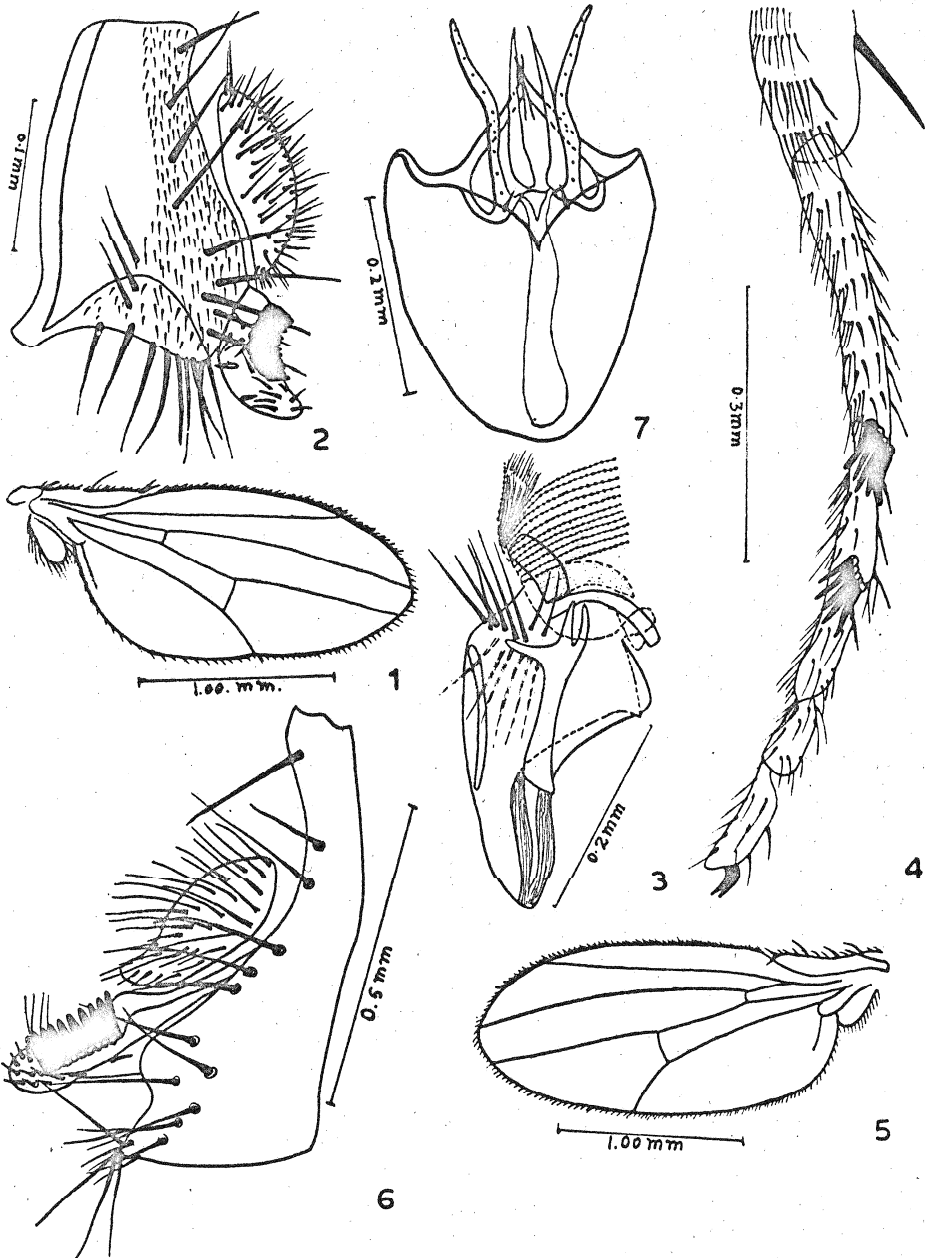
#### IV. *Drosophila (Dorsilopha) busckii* Coquillett, 1901

*Drosophila busckii* Coquillett, 1901. Ent. News, 12, 16; Sturtevant, 1921. Carn. Inst. Publ., 301, 77; Kikkawa and Peng, 1938. Japan. Journ. Zool., 7, 541.

*Drosophila (Dorsilopha) busckii* Sturtevant, 1942. Univ. Texas Publ., 4213, 29; Patterson, 1943. Univ. Texas Publ., 4313, 63; Patterson and Mainland, 1944. Univ. Texas Publ., 4445, 25; Hsu, 1949. Univ. Texas Publ., 4920, 171; Tan, Hsu and Sheng, 1949. Univ. Texas Publ., 4920, 197; Okada, 1956. Syst. St. Drosophilidae allied Fam. Japan: 89; Mather, 1960. Univ. Queensland paper I, 232.

*Male and female*.—Front over 1/3 the width of head. *Orb*<sub>2</sub> equal to *orb*<sub>3</sub> and *orb*<sub>3</sub> 1/2 of *orb*<sub>1</sub>. The greatest width of cheek about 1/4 the greatest diameter of eye. 4V-index 1.88. Other characters as described by Sturtevant (1921), Kikkawa and Peng (1938) and Patterson (1943). *Periphallie organs* as described by Hsu (1949) and indicated by Okada (1956), anal plate triangular. *Phallic organs* and egg-guide as described by Okada (1956).

*Specimens examined*.—One male and two females from Pahalgam.



FIGS. 1 TO 7. 1 TO 3, *Drosophila ebonata*; 4 TO 7, *Drosophila epiobscura*. 1 AND 5, WINGS; 2 AND 6, PERIPHALLIC ORGANS; 3 AND 7, PHALLIC ORGANS; 4, LEG.

## Subgenus SOPHOPHORA Sturtevant, 1939

*obscura* species group Sturtevant, 1942V. *Drosophila (Sophophora) sp. cf. helvetica* Okada, 1956

*Drosophila* sp. like *helvetica* Okada, 1953. Zool. Mag., 62, 284.

*Drosophila (Sophophora) sp. cf. helvetica* Okada, 1956. Syst. St. Drosophilidae allied Fam. Japan: 104.

*Male*.—Front over  $1/2$  the width of head,  $orb_2$   $2/5 orb_3$  and  $2/3 orb_1$ ; cheeks black, their greatest width about  $1/10$  the greatest diameter of eye. Sterno-index 0.55. Wings clear, C-1 bristles two, equal, C-3 bristles on basal  $1/3$  the third costal section. C-index 2.71, 4V-index 2.15, 4C-index 1.00 and 5X-index 2.13. Other characters as described by Okada (1956). Genital arch with four bristles along the upper posterior margin and eight along the lower posterior margin, primary teeth seven. Decasternum and phallic organs as described by Okada (1956), PI = 0.56.

*Specimens examined*.—Three males from Gulmarg and 20 males from Pahalgam.

VI. *Drosophila (Sophophora) epiobscura* sp. novo

## Male Imago

1. *External characters*.—Arista with three branches above and two below excluding the terminal fork; antenna tan-brown. Front over  $1/3$  the width of head.  $Orb_2$  about  $1/2 orb_1$  and  $2/3 orb_3$ .  $Or_2$  minute, only vibrissa prominent. Carina yellow, slightly raised, broader below; face yellow; clypeus reddish-brown. Palpus with two prominent (one apical and one subbasal) bristles and a number of fine setae. Cheeks yellow, their greatest width about  $1/4$  the greatest diameter of eye. Eye brick-red; ocelli yellow.

Acrostichal hairs in eight rows; prescutellars absent, anterior scutellars convergent, posterior scutellars crossed. Mesonotum and scutellum tan-brown. Humerals two, equal. Pleura tan-brown. Sterno-index about 0.40. Legs yellow, with preapicals on all the three tibiae and apicals only on the first two. Sex-comb (Fig. 4) in the form of oblique rows of seven and six well-developed bristles on the first and second tarsal joints respectively. Abdominal tergites completely black. Halteres yellow.

Wing (Fig. 5) clear; C-1 bristles two, equal, C-3 bristles on basal  $2/5$  the third costal section. C-index 2.72, 4V-index 1.88, 4C-index 0.91 and 5X-index 1.77.

Length of the body .. 2.70 mm.

Length of the wing .. 3.00 mm.

2. *Periphallic organs* (Fig. 6).—Genital arch light-brown, narrow above, upper portion with six bristles along the posterior margin and lower portion with about 15, mostly congregated at the toe; heel observable; under-margin flat; toe pointed downwards and inwards. Anal plate light-brown, with about 26 bristles, lower portion produced into a lobe. Clasper in two sets; primary clasper with ten well-developed primary teeth arranged in a straight row and three marginal bristles, secondary teeth absent; secondary clasper beneath the primary clasper and with 11 setae congregated at the tip and three arranged in a row along the body.

3. *Phallic organs* (Fig. 7).—Aedeagus pale-brown, bifid, pointed at the apex. Anterior paramere arising from the side of the basal apodeme, just below the aedeagus,

light-brown, gently curved and pointed distally and with ten sensillae arranged along the entire length; posterior paramere light-brown, pointed at tip and bi-lobed below, touching each other distally. Novasternum with a pair of submedian spines. Ventral fragma almost triangular. Basal apodeme slightly shorter than ventral fragma.  $PI = 0.72$ .

4. *Holotype*.—One male from Pahalgam.

5. *Paratypes*.—Two males from Pahalgam.

6. *Specimens examined*.—Forty-one males from Gulmarg and 19 from Pahalgam.

7. *Relationship*.—This species closely resembles *D. pseudo-obscura* Frolowa (Patterson, 1943 and Hsu, 1949) of the subgroup  $\Lambda$  of the *obscura* species subgroup (Sturtevant, 1942) but can be distinguished from the latter by the absence of long crooked process and secondary teeth and a large number of primary teeth on the clasper.

#### LVII. *Drosophila (Sophophora) bifasciata* Pomini, 1940

*Drosophila bifasciata* Pomini, 1940. Bull. Ent. R. Univ. Bologna, 12, 155.

*Drosophila (Sophophora) bifasciata* Hsu, 1949. Univ. Texas Publ., 4920, 98; Wheeler, 1949. Univ. Texas Publ., 4920, 175; Okada, 1956. Syst. St. Drosophilidae allied Fam. Japan: 101; Parshad and Paika, 1964. Res. Bull. Panjab Univ., 15, 225.

*Male and female*.—General features, periphallie organs, decasternum and phallic organs, as described by Okada (1956), sex comb, sterno-index, C-3 bristles as described by Parshad and Paika (1964).

*Distribution*.—This species was most abundant at Gulmarg and Pahalgam and comprised a collection of 1965 males and 277 females from June 25 to July 18, 1963. Quite a large number of specimens were checked from both the places.

*melanogaster* species group Sturtevant, 1942

*melanogaster* species subgroup Hsu, 1949

#### VIII. *Drosophila (Sophophora) melanogaster* Meigen, 1830

*Drosophila melanogaster* Meigen, 1830. Syst. Besch., 6, 85; Sturtevant, 1921. Carn. Inst. Publ., 301, 89; Sturtevant, 1927. Phil. Journ. Sci., 32, 370; Kikkawa and Peng, 1938. Japan. Journ. Zool., 7, 534.

*Drosophila (Sophophora) melanogaster* Sturtevant, 1942. Univ. Texas Publ., 4213, 29; Patterson, 1943. Univ. Texas Publ., 4313, 71; Hsu, 1949. Univ. Texas Publ., 4920, 96; Okada, 1956. Syst. St. Drosophilidae allied Fam. Japan: 110; Parshad, Narda and Paika, 1964. Res. Bull. Panjab Univ., 15, 7.

*Male and female*.— $Orb_2$  about  $1/2 orb_1$  and  $orb_3$ .  $Or_2$  equal to vibrissa. C-index about 2.20 and 5X-index 2.00. Other characters including periphallie organs, decasternum, phallic organs and egg-guide as described by Parshad, Narda and Paika (1964) in the collection from Mutanga (India).

*Distribution*.—At Srinagar these flies were in abundance and as many as 111 females and 165 males were collected, from Gulmarg only two females and from Pahalgam two females and three males were available.

*takahashii* species subgroup Hsu, 1949IX. *Drosophila (Sophophora) nepalensis* Okada, 1955

*Drosophila* sp. Okada, 1954. Kontyu, 22, 38.

*Drosophila (Sophophora) nepalensis* Okada, 1955. Sci. Res. Japan. Exped. Nepal. Himalaya, 1, 388; Parshad and Paika, 1964. Res. Bull. Panjab Univ., 15, 225.

*Male and female*.—General features, periphallallic organs, phallic organs and egg-guide as described by Okada (1955) and Parshad and Paika (1964).

*Distribution*.—This species was found in abundance at Srinagar and Pahalgam only. Four hundred and seventy-two males and 191 females were collected from June 25 to July 18, 1963. Quite a large number of specimens were examined from both the places.

*suzukii* species subgroup Hsu, 1949X. *Drosophila (Sophophora) suzukii* subspecies *indicus* Parshad and Paika, 1964

*Drosophila (Sophophora) suzukii* subspecies *indicus* Parshad and Paika, 1964. Res. Bull. Panjab Univ., 15, 225.

*Male and female*.—Sex comb: tarsal comb of 1-2 rows of two to six bristles. C-index 3.70 and 5X-index 2.00. Other characters including periphallallic organs, decasternum, phallic organs and egg-guide as described and figured by Parshad and Paika (1964).

*Distribution*.—As many as 307 females and 1,576 males were collected from Srinagar, Gulmarg and Pahalgam during June 18 to July 21, 1963, and quite a large number of individuals were checked from all the three stations.

XI. *Drosophila (Sophophora) pulchrella* Tan, Hsu and Sheng, 1949

*Drosophila (Sophophora) pulchrella*—Tan, Hsu and Sheng, 1949, Univ. Texas Publ., 4920, 198; Hsu, 1949. Univ. Texas Publ., 4920, 97; Okada, 1956. Syst. St. Drosophilidae allied Fam. Japan; 196.

*Male*.—Humeral two, equal; sterno-index 0.66. Metatarsal sex comb of two transverse rows of four bristles each and tarsal comb of two transverse rows of two and three bristles respectively. Wings with C-3 bristles on basal 1/2 the third costal section. C-index 3.10. Other characters as described by Tan, Hsu and Sheng (1949) and indicated by Okada (1956).

*Periphallallic organs*.—Anal plate with rear angle produced into a small lobe, carrying 11 small and stout bristles. Other characters as described and figured by Hsu (1949) and indicated by Okada (1956).

*Phallic organs* (Fig. 8).—Light-brown in general. Aedeagus bifid, distally pointed and slightly curved. Anterior paramere large, dark-brown, with a slender curved apex and three subapical sensillae; posterior paramere large, without branches, not contiguous. Novasternum pubescent, without median process and with a pair of submedian spines. Ventral fragma triangular, broader than long. Basal apodeme very long, about twice as long as aedeagus. PI = 0.60.

*Specimens examined*.—Two males from Pahalgam.



*ananassae* species subgroup Hsu, 1949XII. *Drosophila (Sophophora) ananassae* Doleschall, 1858

*Drosophila ananassae* Doleschall, 1858. Nat. Tijds. Ned. Ind., 17, 128; Kikkawa and Peng, 1938. Japan. Journ. Zool., 7, 508.

*Drosophila (Sophophora) ananassae* Patterson, 1943. Univ. Texas Publ., 4313, 74; Hsu, 1949. Univ. Texas Publ. 4920, 96; Okada, 1956. Syst. St. Drosophilidae allied Fam. Japan: 116; Parshad and Paika, 1964. Res. Bull. Panjab Univ., 15, 225.

*Male*.—5X-index 2.6. Other characters as described by Kikkawa and Peng (1938), Patterson (1943) and Parshad and Paika (1964).

*Periphallitic organs*.—As figured by Kikkawa and Peng (1938), figured and described by Hsu (1949) and indicated by Parshad and Paika (1964).

*Decasternum and phallic organs*.—As described and figured by Okada (1956) and indicated by Parshad and Paika (1964).

*Specimen examined*.—A single male from Srinagar.

*montium* species subgroup Hsu, 1949XIII. *Drosophila (Sophophora) kikkawai* Burla, 1954

*Drosophila (Sophophora) kikkawai* Burla, 1954. Rev. Brasil. Biol., 14, 4; Okada, 1956. Syst. St. Drosophilidae allied Fam. Japan: 118; Parshad and Paika, 1964. Res. Bull. Panjab Univ., 15, 225.

*Male and female*.—Antenna with third segment yellow.  $Orb_2$  about  $1/2 orb_1$  and  $orb_3$ . Costal index 1.66. Other characters as described by Kikkawa and Peng (1938), Burla (1954), Okada (1956) and Parshad and Paika (1964).

*Periphallitic organs*.—As figured by Kikkawa and Peng (1938), Burla (1954) and Parshad and Paika (1964). Decasternum as described and figured by Okada (1956) and indicated by Parshad and Paika (1964).

*Phallic organs*.—As described and figured by Burla (1954) and indicated by Okada (1956).

*Egg-guide*.—As described and figured by Burla (1954), Okada (1956) and indicated by Parshad and Paika (1964).

*Specimens examined*.—Twenty-four males and 21 females from Srinagar.

XIV. *Drosophila (Sophophora) jambulina* Parshad and Paika, 1964

*Drosophila (Sophophora) jambulina* Parshad and Paika, 1964. Res. Bull. Panjab Univ., 15, 225.

*Male*.—Arista with four dorsal and three ventral branches, excluding the terminal fork. C-index 2.05, 5X-index 3.25. Other characters including periphallitic organs, decasternum and phallic organs as described by Parshad and Paika (1964).

*Specimen examined*.—A single male from Srinagar.

XV. *Drosophila (Sophophora) rufa* Kikkawa and Peng, 1938

*Drosophila rufa* Kikkawa and Peng, 1938. Japan. Journ. Zool., 7, 229.

*Drosophila (Sophophora) rufa* Sturtevant, 1942. Univ. Texas Publ., 4213, 29; Hsu, 1949. Univ. Texas Publ., 4920, 97; Okada, 1956. Syst. St. Drosophilidae allied Fam. Japan: 121; Parshad and Paika, 1964. Res. Bull. Panjab Univ., 15, 225.

*Male*.—Arista with four branches above and three below, excluding the terminal fork. Wing with 4V-index about 3.00. Other characters as described by Kikkawa and Peng (1938), Okada (1956) and Parshad and Paika (1964).

*Periphallic organs, decasternum and phallic organs.*—As indicated by Parshad and Paika (1964).

*Specimens examined.*—One male from Gulmarg and five males from Pahalgam.

Subgenus *DROSOPHILA* Fallen, 1823

*quinaria* species group Sturtevant, 1942

✓ XVI. *Drosophila (Drosophila) brachynephros* Okada, 1956

*Drosophila (Drosophila) brachynephros* Okada, 1956. Syst. St. Drosophilidae allied Fam. Japan: 126.

*Male.*—Arista with five branches above and three below, excluding the terminal fork.  $Or_2$  about  $3/4$  the vibrissa. Wings with C-index 3.05 and 4C-index 0.77. Other characters including periphallic organs and phallic organs as described and figured by Okada (1956).

*Specimen examined.*—A single male from Pahalgam.

*testacea* species group Sturtevant, 1942

✓ XVII. *Drosophila (Drosophila) testacea* Van-Roser, 1840

*Drosophila testacea* Van-Roser, 1840. Wurttemb. Corrb1: 62.

*Drosophila (Drosophila) testacea.* Sturtevant, 1942. Univ. Texas Publ., 4213, 30; Hsu, 1949. Univ. Texas. Publ., 4920, 103; Okada, 1956. Syst. St. Drosophilidae allied Fam. Japan: 134.

*Male.*—Wings with costal index 3.00 and 5X-index 1.50. Other characters as described by Okada (1956).

*Periphallic organs.*—Toe of the genital arch with five bristles, otherwise as described and figured by Hsu (1949) and indicated by Okada (1956).

*Phallic organs.*—As described and figured by Okada (1955a) and described by Okada (1956).

*Specimen examined.*—A single male from Pahalgam.

*immigrans* species group Sturtevant, 1942

✓ XVIII. *Drosophila (Drosophila) immigrans* Sturtevant, 1921

*Drosophila immigrans* Sturtevant, 1921. Carn. Inst. Publ., 301, 83.

*Drosophila (Spinulophila) immigrans* Sturtevant, 1927. Phil. Journ. Sci., 32: 367; Kikkawa and Peng, 1938. Japan. Journ. Zool., 7, 524.

*Drosophila (Drosophila) immigrans* Sturtevant, 1942. Univ. Texas Publ., 4213, 32; Patterson, 1943. Univ. Texas Publ., 4313, 180; Hsu, 1949. Univ. Texas Publ., 4920, 111; Okada, 1956. Syst. St. Drosophilidae allied Fam. Japan: 147.

*Male and female.*— $Orb_2$   $1/3$  the length of the other two.  $Or_2$  about  $2/3$  the vibrissa. Sterno-index 0.65. Wings with C-3 heavy bristles on basal  $1/3$  the third costal section; C-index 4.10. Other characters as described by Sturtevant (1921), Kikkawa and Peng (1938), Patterson (1943) and indicated by Okada (1955b, 1956).

*Periphallic organs.*—As figured by Kikkawa and Peng (1938), figured and described by Hsu (1949) and indicated by Okada (1956).

*Decasternum, phallic organs and egg-guide.*—As figured and described by Okada (1956).

*Distribution*.—Thirty-seven females and 42 males from Srinagar and nine females and six males from Pahalgam.

XIX. *Drosophila (Drosophila) sp. cf. curviceps* Okada and Kurokawa, 1957

*Drosophila (Drosophila) sp. of immigrans group*. Okada, 1956. Syst. St. Drosophilidae allied Fam. Japan: 148.

*Drosophila (Drosophila) curviceps* Okada and Kurokawa, 1957. Kontyu, 25, 8.

Male Imago

1. *External characters*.—Arista with four dorsal and one ventral branches in addition to the terminal fork; antenna yellow. Front over  $1/3$  the width of head, yellow.  $Orb_3$  slightly smaller than  $Orb_1$ ,  $Orb_2$  about  $1/2 Orb_3$ .  $Or_2$  about half the vibrissa. Carina yellow, raised, narrow; face yellow; clypeus light-brown. Palpus yellow with one small and two prominent bristles. Cheeks yellow with shaded gena, their greatest width about  $1/3$  the greatest diameter of eye. Eyes brick-red; ocelli yellow.

Acrostichal hairs in six rows; prescutellars absent, anterior scutellars convergent, posterior scutellars crossed. Mesonotum yellowish-brown with six longitudinal dark-brown stripes, of which the two innermost (mid-dorsal in position) touch each other, except distally. Scutellum yellowish-brown, with the continuation of the innermost stripes of the mesonotum. Humerals two, unequal. Pleura yellow with two faint-brown longitudinal stripes. Sterno-index 0.64. Legs yellow, femur of the prothoracic leg with a row of minute spinules along their inner side; preapicals on all the three tibiae, apicals only on the first two. Abdominal tergites yellowish-brown, with black caudal interrupted bands. Last two tergites completely black. Halteres milky white.

Wing (Fig. 9) clear; posterior cross-vein clouded. C-1 bristles two, equal; C-3 bristles on basal  $1/3$  the third costal section. C-index 3.87, 4V-index 1.40, 4C-index 0.66 and 5X-index 1.11.

Length of the body . . . 3.18 mm.

Length of the wing . . . 3.60 mm.

2. *Periphallial organs* (Fig. 10).—Genital arch broad above, narrow below, posterior half pubescent, upper half tan-brown, with ten bristles arranged in a row. Lower half pale-brown, with 19 bristles mostly congregated at the toe; heel absent; toe rounded and pointed downwards. Anal plate separate from the genital arch, pubescent, inwardly produced into a curved process at its rear angle, having a cluster of spines at its distal end. The two processes, one on each side, are approximated. Clasper single, upper two-thirds bare, lower one-third having about seven primary teeth arranged in a concave row and a bunch of marginal and discal bristles.

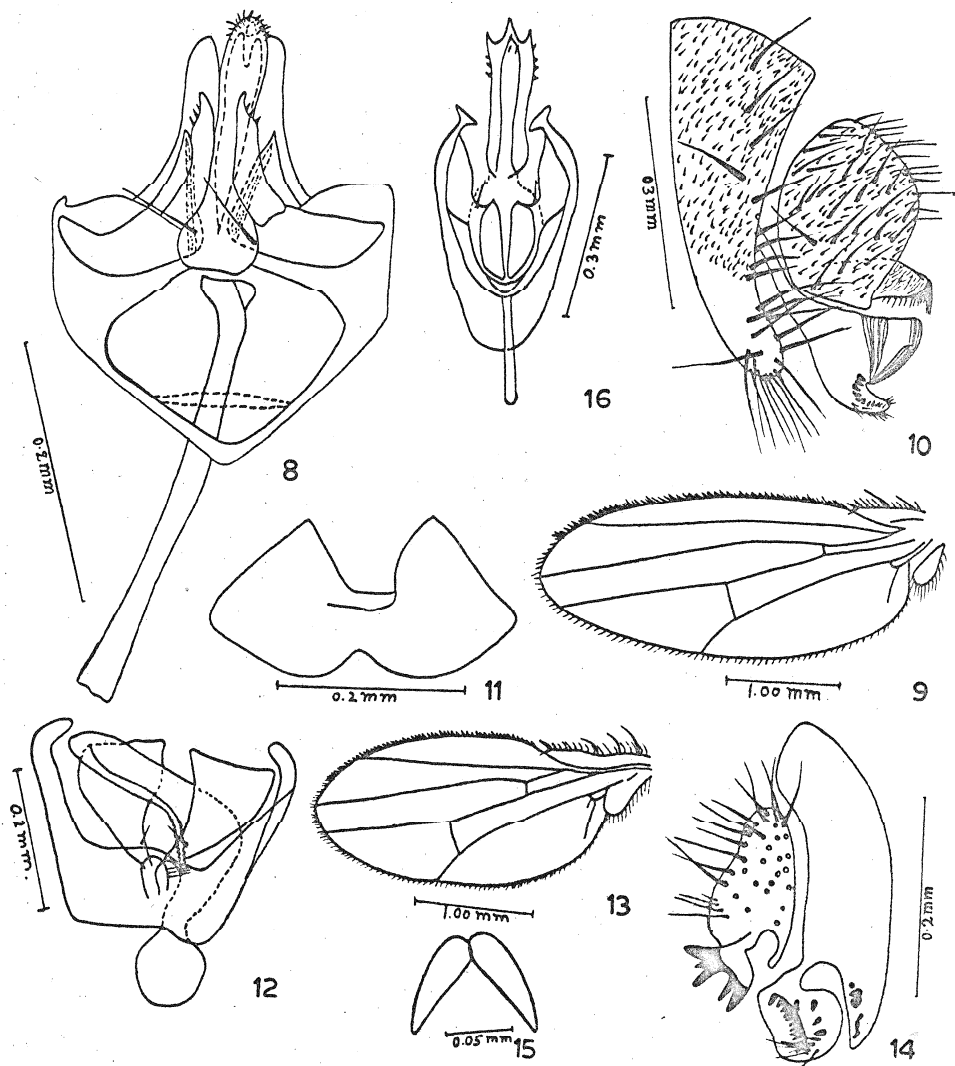
*Decasternum* (Fig. 11).—Light-brown, in the form of two triangular pieces, connected by a short narrow bridge.

3. *Phallic organs* (Fig. 12).—Aedeagus light-brown, sinuated and curved downwards. Anterior paramere egg-shaped, provided with three sensillae in the middle, posterior paramere absent. Novasternum bi-lobed, lobes triangular, each having a submedian spine. Ventral fragma broader than long, laterally produced into lobes. Basal apodeme small, distally swollen. Phallosomal index 2.50.

✓ *Holotype* . . . One male from Pahalgam.

✓ *Paratypes* . . . Two males from Pahalgam.

*Specimens examined*.—Four males from Pahalgam.



FIGS. 8 TO 16. 8, *Drosophila pulchrella*, phallic organs; 9 to 12, *Drosophila curviceps* of; 13 to 16, *Drosophila pentaspina*. 9 and 13, wings; 10 and 14, peripheral phallic organs; 11 and 15, decasternum; 12 and 16, phallic organs.

*funnebris* species group Sturtevant, 1942XX. *Drosophila (Drosophila) pentaspina* sp. novo

## Male Imago

1. *External characters*.—Arista with five branches above and three below, excluding the terminal fork; antenna dirty-yellow. Front brown, broader above, about  $1/2$  the width of head.  $Orb_3$  about  $1/2 orb_1$  and  $orb_2$  about  $1/5 orb_1$ .  $Or_2$  about  $3/4$  vibrissa. Carina yellow, raised, broader below; face yellow; clypeus yellowish-brown. Palpus yellow with three prominent and a number of small bristles. Cheeks yellow, their greatest width about  $1/3$  the greatest diameter of eye. Eyes dark-red; ocelli yellow.

Acrostichal hairs in eight rows; prescutellars absent; anterior scutellars convergent, posterior scutellars crossed. Mesonotum yellowish-brown, scutellum light-brown. Humerals two, equal. Pleura yellowish-brown. Sterno-pleura yellow, sterno-index 0.50. Legs yellow; sex comb absent; preapicals on all the three tibiae, apicals only on the first two. Abdominal tergites completely black, basal four with yellowish-brown bands interrupted in the middle. Halteres yellow.

Wing (Fig. 13) clear, C-1 bristles two, equal, C-3 bristles on basal  $2/5$  the third costal section. C-index 3.13, 4V-index 1.40, 4C-index 0.71 and 5X-index 1.00.

Length of the body .. 3.48 mm.

Length of the wing .. 3.36 mm.

2. *Periphallalic organs* (Fig. 14).—Genital arch brown, high and somewhat rectangular, upper portion bare, lower portion with five to seven teeth, arranged in a slightly irregular row; heel absent; toe pointed downwards and inwards. Anal plate brown, separate from the genital arch and with about 40 bristles and five large teeth at its rear angle. Clasper single, quadrate, with 11 primary teeth arranged in an oblique row; secondary teeth five, stout and black, marginal bristles numerous.

*Decasternum* (Fig. 15).—In the form of two narrow, fusiform, lateral pieces, contiguous to each other.

3. *Phallic organs* (Fig. 16).—Aedeagus light-brown, upper half straight, sinuated and apically serrated, with three projections, subbasally swollen and with a ventral process. Anterior paramere fused with the novasternum. Novasternum bifid, with a pair of well-developed submedian spines. Ventral fragma longer than broad, with lateral lobes. Basal apodeme ventrally compress. Phallosomal index 2.50.

4. *Holotype*.—One male from Srinagar.

5. *Paratypes*.—Three males from Srinagar.

6. *Specimens examined*.—Ten males from Srinagar, 11 from Pahalgam and one from Gulmarg.

7. *Relationship*.—*D. pentaspina* is closely related to *D. multispina* Okada (1956) in most of its morphological detail except the following difference:—

Characters	<i>D. pentaspina</i>	<i>D. multispina</i>
1. Cheek width/diameter of eye	.. $1/3$	$1/4$
2. C-index	.. 3.13	3.60
3. Anal plate with	.. 5 spikes	7 spikes
4. Primary teeth	.. 11	13
5. Secondary teeth	.. 4.5	7
6. Phallosomal index	.. 2.50	5.00

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