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Taximetrical Analyses of Costal Chaetotaxy of the Genus *Drosophilella* DUDA, with Description of a New Species from Sri Lanka (Diptera, Drosophilidae)

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Synopsis

OKADA, T. 1986——Taximetrical analyses of costal chaetotaxy of the genus *Drosophilella* DUDA, with description of a new species from Sri Lanka (Diptera, Drosophilidae). *Proc. Japn. Soc. syst. Zool., Tokyo*, No. 34: 53–59.

The costal chaetotaxy of the genus *Drosophilella* DUDA is taximetrically analysed in relation to other diagnostic characters and the host plants. A new species, *D. zeylanica*, is described from Sri Lanka. This species is found to have the chaetotaxy common among the family Drosophilidae but unique in the genus.

Through courtesy of Mr. R. DANIELSSON of the Zoological Museum, Lund, I was able to study a series of drosophilid specimens of the Lund Collection from Sri Lanka, in which I have found a new species of the genus *Drosophilella* DUDA. The relationships of the species of this genus including the new species are taximetrically analysed with special regard to the types of costal chaetotaxy classified after HACKMAN & VÄISÄNEN (1985).

I thank Mr. DANIELSSON for providing me with material.

Drosophilella zeylanica n. sp.

(Fig. 1A–F)

♂. Body (Fig. 1A) 1.8 mm in length. Head (Fig. 1B) black. Eye dark red, with pile. Antenna brownish black, antennal bases widely separated. Arista twice as long as antenna, merely pubescent. Palpus yellow. Ocellar triangle grayish black. Ocellars outside triangle made by ocelli. Periorbit grayish brown. Postverticals short. Frons mat black, quadrate, broader than long. Face yellowish gray. Carina large, broad and flat. Cheek yellowish gray, 1/3 as broad as greatest diameter of eye. Clypeus large, swollen, mat grayish black. Anterior reclinate orbital minute. Second oral small. Thorax entirely mat black. Humerals 2. Acrostichal hairs in 6 rows. Anterior dorsocentrals 1/5 as long as posteriors; length distance of dorsocentrals subequal to cross distance. Lateral scutellars nearly parallele, as long as apicals, which are nearer

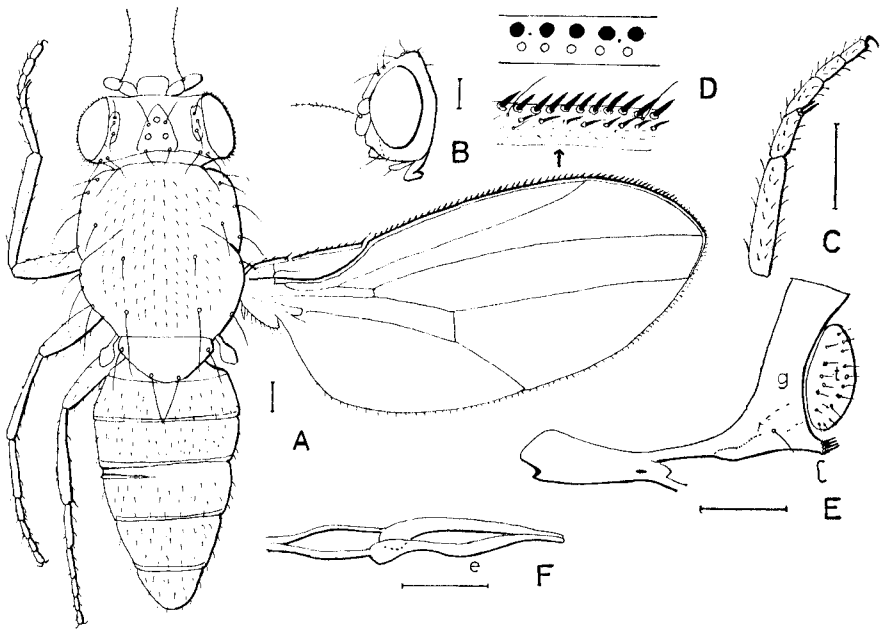

Fig. 1. *Drosophilella zeylanica* n. sp., ♂. A, Body; B, head; C, fore leg; D, costal chaetotaxy, lower figure ventral aspect of costa; E, periphallic organs; F, phallic organs. c, surstylus; e, aedeagus, g, epandrium. Scales 0.1 mm.

to each other than to laterals. Legs fuscous; femora black; metatarsi as long as 3 succeeding tarsal joints, 2nd joint of fore leg (Fig. 1C) apically prolonged and with 2 black stout bristles. Wing hyaline, costal fringe thick and heavy (Fig. 1D). C-index 1.7; 4V-index 2.8; 4C-index 1.6; 5x-index 3.0; Ac-index 1.7. C1-bristle 1; C3-fringe 3/5. Halter yellowish gray. Abdominal tergites mat black. Abdominal sternites pale, without protuberance on 6th sternite. Periphallic organs (Fig. 1E) black; epandrium caudoanteriorly elongate, subbasally without upper process; cercus elliptical; surstylus apparently fused to epandrium, distally with 4 black teeth. Phallic organs (Fig. 1F) black, elongate; aedeagus without basal upper process.

Holotype ♂, Province of Uva, stream, alt. 3,600 ft, 2 miles NW of Haldemmuila, Sri Lanka, 2.III.1962 (Loc. 111) (BRINCK-ANDERSON-CEDERHOLM). Type deposited in the Zoological Museum, Lund.

Distribution. Sri Lanka.

Relationships. This species resembles *D. seminigra* DUDA in having large carina, widely separated antennal bases, and six rows of acrostichal hairs, but differs from the latter by having longer arista, darker thoracic pleura and stronger costal bristles.

Remarks. Although unknown to be associated with flowers, this

species is thought to be pistilicolous in larval habit by reason of the absence of subbasal dorsal processes of epandrium and aedeagus, which is characteristics of the known pistilicolous species.

Costal chaetotaxy

HACKMAN and VÄISÄNEN (1985) made a thorough investigation of costal chaetotaxy in as many as 875 species of Diptera belonging to 128 families. They classified the arrangement of the costal setae (macrotrichia) in several types. All of the species of Drosophilidae they studied belong to B_2 type: *Amiota*, *Leucophenga*, *Scaptomyza*, *Drosophila* (*Idiomyia*), in which "Setae are dimorphous, a subdorsal row of spinulae and a subventral row of hairs or bristles". The terms spinulae and spines they used should be better replaced by the terms heavy bristles and heavy long bristles, because the costal setae are cuticular appendages (IMMS) and not cuticular processes which have no alveoles.

My cursory examination of costal chaetotaxy of Drosophilidae has proved B_2 type also in the genera *Stegana*, *Erima*, *Microdrosophila*,

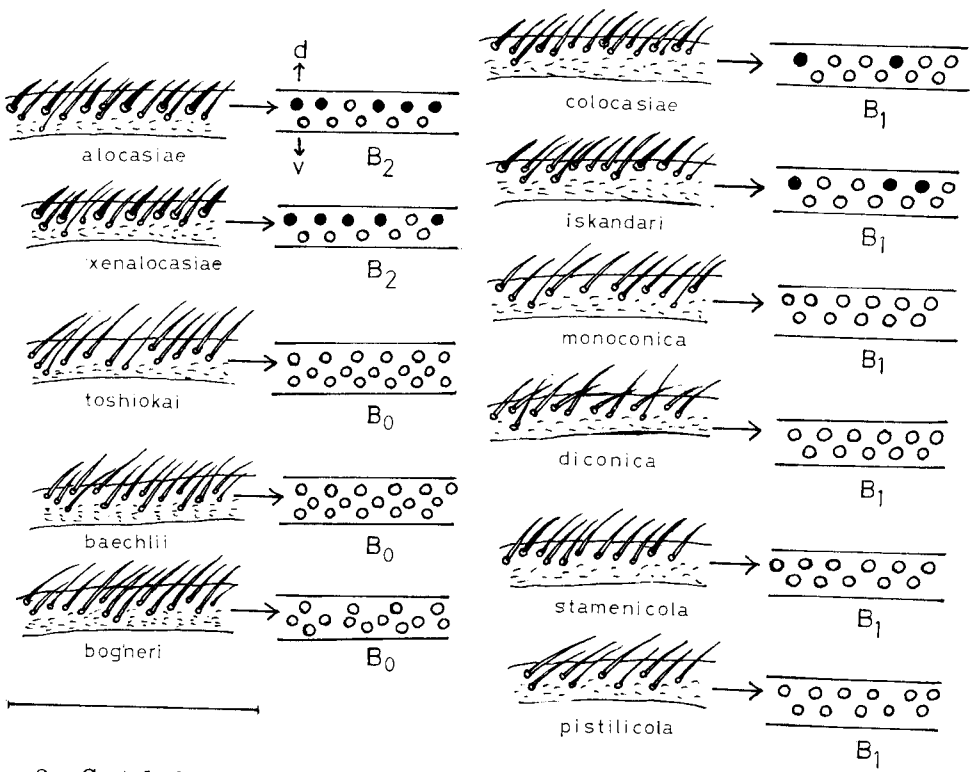

Fig. 2. Costal chaetotaxy of *Drosophilella* species. B_0, B_1, B_2, chaetotaxy types; left figure for each species, ventral aspect of costa at middle part of wing. Solid circle, heavy bristles; open circle, weaker bristles. Scale 0.1 mm.

Nesiodrosophila, *Hypselothyrea*, *Tambourella*, *Mycodrosophila*, *Paramycodrosophila*, *Jeannelopsis*, *Zaprionus* and *Liodrosophila*. On the other hand, in the genus *Drosophilella* (Fig. 2), typical B_2 type is found only in *zeylanica*, atypical B_2 type with subdorsal row of heavy bristles partially intermittent with weaker bristles in *alocasiae* and *xenalocasiae*, typical B_1 type with homomorphous two rows of weaker bristles in *colocasiae* and *iskandari*, and atypical B_1 type with three rows of homomorphous weaker bristles (designated here B_0 type) is found in *toshiokai*, *baechlii*, and *bogneri*.

HACKMAN and VÄISÄNEN (1985) suggested that usual steps of evolutional changes of costal chaetotaxy in Diptera are $B_0 \rightarrow B_1 \rightarrow B_2$, but they recognized reverse steps in some cases, *e.g.*, $B_2 \rightarrow B_1$ in Agromyzidae. Likewise, *Drosophilella* seem to have taken reverse steps $B_2 \rightarrow B_1 \rightarrow B_0$. I (OKADA, 1986) have estimated three routes of distribution in *Drosophilella* species: *Alocasia* route, *Colocasia* route and *Homalomena* route. It is concluded for the time being that the species of *Alocasia* route are B_2 type, those of *Colocasia* route are B_1 type and those of *Homalomena* route are B_0 type (Table 1). The route leading to *D. zeylanica* is not clear because the host plant is unknown.

Table 1. The relationships between costal chaetotaxy, distribution route and distribution area of the synhospitalic couples of *Drosophilella* species.

Synhospitalic couple		Costal chaetotaxy	Distribution route	Distribution area
stamenicolous	pistilicolous			
?	*zeylanica*	B_2 (typical)	?	Sri Lanka
alocasiae	*xeyalocasiae*	B_2 (atypical)	*Alocasia*	Taiwan etc.
monoconica	*diconica*	B_1	*Colocasia*	Burma
colocasiae	*iskandari*	B_1	*Colocasia*	Indonesia
stamenicola	*pistilicola*	B_1	*Colocasia*	New Guinea
baechlii	*bogneri*	B_0	*Homalomena*	Malaysia
?	*toshiokai*	B_0	*Homalomena*	Philippines

Taximetrical analyses

The relationships of the species of the genus *Drosophilella* including *D. zeylanica* are analysed taximetrically by S_{sm} proximity analysis and UPGMA cluster analysis, with special regard to the costal chaetotaxy. *D. seminigra* is excluded from the analyses because of insufficient information about male genitalia. Eighteen diagnostic characters are used, of which 17 ("A"-"T" ad "A′"-"K′") are as used in TODA and OKADA (1983) and one, "H′", is newly adopted: paramere present (H′=0) or absent (h′=1). The character state A corresponds to the type B_2 of costal chaetotaxy, and state a to the types B_1 and B_0.

From the original n (character) × t (species) matrix (Table 2), the dendrogram of relationships of the species (Fig. 3) is obtained.

Table 2. Original n (character) × t (species) matrix.

n / t	A	A′	B	C	C′	D	D′	E	E′	F	G	H	H′	I	I′	J	K	K′
zeylanica	0	1	0	1	0	NC	0	0	0	1	0	0	1	NC	NC	NC	NC	NC
alocasiae	0	1	0	0	0	1	1	1	0	0	0	1	0	1	1	1	1	0
xenalocasiae	0	1	0	0	0	1	1	0	0	1	1	0	0	0	1	0	0	0
stamenicola	1	1	0	1	0	1	1	1	0	0	0	1	0	1	1	0	1	0
pistilicola	1	1	1	0	0	0	1	1	0	1	0	0	0	0	1	0	0	0
monoconica	1	1	0	0	0	1	1	1	0	0	1	1	0	1	1	0	1	0
diconica	1	1	0	0	0	0	1	1	0	0	0	0	0	0	1	0	0	0
colocasiae	1	1	0	0	0	1	1	1	0	1	1	1	0	1	1	0	1	0
iskandari	1	1	0	0	0	1	1	1	0	1	0	0	0	0	1	0	0	0
toshiokai	1	0	1	1	1	NC	0	1	1	0	0	1	1	0	0	1	0	1
baechlii	1	0	1	1	0.5	NC	0	1	1	0	1	0	0	NC	NC	1	1	0
bogneri	1	0	1	1	0.5	NC	0	1	1	0	0	0	0	NC	NC	1	1	0

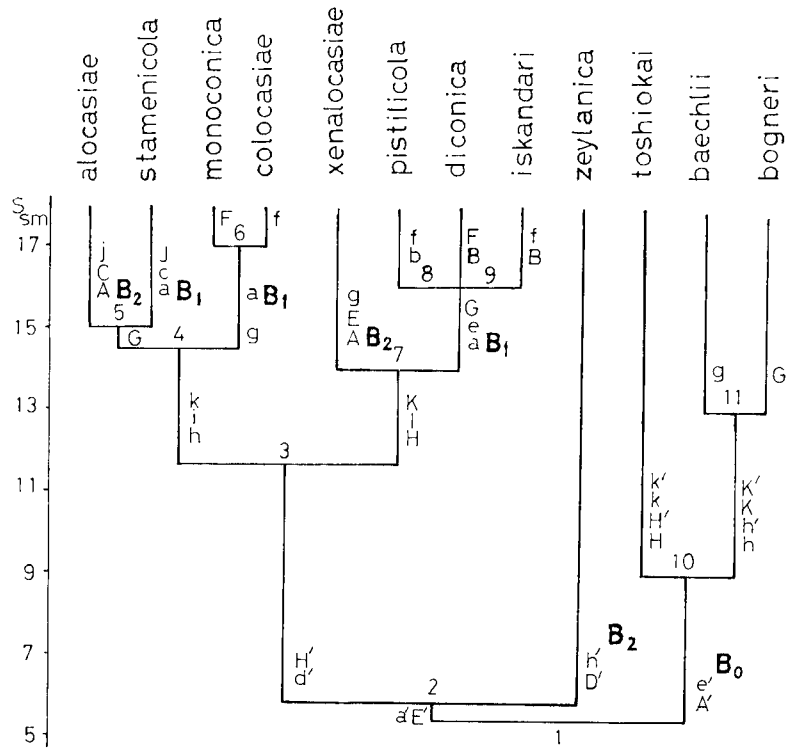

Fig. 3. A dendrogram of the relationships of the *Drosophilella* species. B_0, B_1, B_2, chaetotaxy types; alphabetical signs, character states derived from the original n × t matrix; numerical figures, order of key couplets; S_{sm}, simple matching similarity coefficient.

The species of B_0 type costal chaetotaxy: *toshiokai*, *baechlii* and *bogneri*, make a major cluster. Another major cluster is divided into *zeylanica* (B_2 type) and a group of the remaining species (B_1 and B_2 types). The latter group is subdivided into stamenicolous species (*alocasiae*, *stamenicola*, *monoconica*, *colocasiae*) and pistilicolous species (*xenalocasiae*, *pistilicola*, *diconica*, *iskandari*).

From the dendrogram a key to species of the genus *Drosophilella* is automatically constructed as below.

Key to species of the genus *Drosophilella*

1. Costal chaetotaxy B_1 or B_2 type; arista pubescent (a'); male cercus ventrally not prolonged (E') 2
– Costal chaetotaxy type B_0; arista plumose (A'); male cercus ventrally prolonged (e') 10
2. Costal chaetotaxy type B_2; conical process of male 6th abdominal sternite absent (D'); paramere present (h') ..... *zeylanica*
– Conical process of male 6th abdominal sternite present (d'); paramere absent (H') 3
3. Basal process of aedeagus present (h); stalk of ejaculatory apodeme broader than long (i); ovipositor narrow especially distally (k) .. 4
– Basal process of aedeagus absent (H); stalk of ejaculatory apodeme longer than broad (I); ovipositor broad, black-like (K) 7
4. Surstylus present (G) 5
– Costal chaetotaxy type B_1; surstylus absent (g) 6
5. Costal chaetotaxy type B_2; costal bristles strong at least partially (A); stout teeth of 2nd tarsal joint of fore leg four or more (C); female anal lobe crescent (j) ..... *alocasiae*
– Costal chaetotaxy type B_1; costal bristles fine (a); stout teeth of 2nd tarsal joint of fore leg two (c); female anal lobe triangular (J) ..... *stamenicola*
6. Caudoventral corner of epandrium rectangular (F) ... *monoconica*
– Caudoventral corner of epandrium acute-angular (f) .... *colocasiae*
7. Costal chaetotaxy type B_2; costal bristles strong at least partially (A); male cercus oblong (E); surstylus absent (g) .... *xenalocasiae*
– Costal chaetotaxy type B_1; costal bristles fine (a); male cercus oval (e); surstylus present (G) 8
8. Tarsal joints of fore leg compressed (b); caudoventral corner of epandrium acute-angular (f) ..... *pistililola*
– Tarsal joints of fore leg elongated (B) 9
9. Caudoventral corner of epandrium rectangular (F) ..... *diconica*

– Caudoventral corner of epandrium acute-angular (f) .... *iskandari*
10. Basal process of aedeagus absent (H); paramere absent (H'); ovipositor narrow especially distally (k) and segmented (k') .... *toshiokai*
– Basal process of aedeagus present (h); paramere present (h'); ovipositor broad, blade-like (K) and not segmented (K') 11
11. Surstylus absent (g) ..... *baechlii*
– Surstylus present (G) ..... *bogneri*

摘　　要

岡田豊日（東京都）——前縁脈剛毛配列型を中心としたタロイモショウジョウバエ属 (*Drosophilella*) の分類と1新種の記載.

Lund 博物館所蔵のスリランカのショウジョウバエ標本中に，タロイモショウジョウバエ属の1新種を発見記載した．本種を含めて同属の種の前縁脈剛毛型を中心とした数量分類を行い，それと寄主植物との関連を考察した.

Literature cited

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TODA, M. J. and T. OKADA, 1983. Ecological studies of floricolous *Drosophilella* in Burma with descriptions of three new species from Burma and the Philippines (Diptera, Drosophilidae). *Kontyû, Tokyo*, 51: 169–184.

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ADDENDUM (ERRATA)

OKADA, T. 1986. Proc. Japn. Soc. syst. Zool., (33):

p.	line	for	read
32	1....	Routs	Routes
33	27	***Drosophila bogneri***	***Drosophilella bogneri***