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✓ Drosophilidae (Diptera) in Burma.

I. The Subgenus *Dorsilopha* STURTEVANT of the Genus
Drosophila, with Descriptions of Two New Species

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Drosophilidae (Diptera) in Burma.

I. The Subgenus *Dorsilopha* STURTEVANT of the Genus *Drosophila*, with Descriptions of Two New Species

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Abstract Two new species of the subgenus *Dorsilopha* are described from Burma, and *Drosophila (Dorsilopha) busckii* is redescribed and compared with the two new species. The discovery of close relatives from Burma suggests an Oriental origin of *D. busckii*.

Summary knowledge of drosophilid faunae in the major zoogeographical regions of the world was compiled by ASHBURNER *et al.* (1981). However, there remain areas within each region, where knowledge of the Drosophilidae is completely lacking. Burma was virgin territory for drosophilists until I had a chance to make a brief collection trip from December 1981 to January 1982. Several new species and collection records of some known species have already been reported as a result of those collections (TODA & OKADA, 1983; OKADA & CARSON, 1983 a, b; OKADA, 1984, 1985; HIHARA & LIN, 1984). However, more than 100 unidentified species, including a considerable number of new species, await processing.

This paper, the first in a series on the results of my collections in Burma, describes two new species of the subgenus *Dorsilopha*. This subgenus has hitherto been represented by the single cosmopolitan synanthropic species *Drosophila busckii* COQUILLET. The geographical origin of such a widespread species is difficult to determine. DAVID and TSACAS (1981) remarked, "we are lacking any likely hypothesis about the origin of . . . *D. busckii* . . ." On the other hand, THROCKMORTON (1975) suggests a SE Asian origin. The discovery of two close relatives from Burma supports THROCKMORTON's hypothesis of an Oriental origin of *D. busckii*.

Abbreviations of type-depositories:

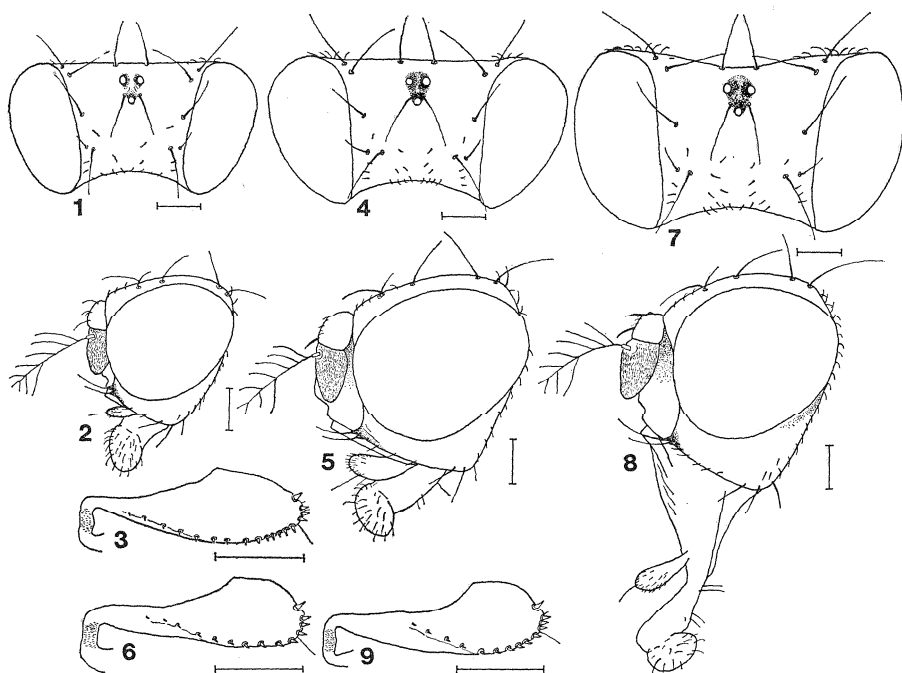
EHU Entomological Institute, Hokkaido University, Sapporo, Japan.

USNM United States National Museum, Smithsonian Institution, Washington, D.C., U.S.A.

Subgenus *Dorsilopha* STURTEVANT

Dorsilopha STURTEVANT, 1942: 28. Type species: *Drosophila busckii* COQUILLET.

Diagnosis. Mesoscutum yellow, with dark brownish longitudinal stripes, median one bifid posteriorly. Preapicals absent on fore and mid tibiae.



Figs. 1-3, *Drosophila (Dorsilopha) linearidentata* sp. nov. Figs. 4-6, *D. (D.) neobusckii* sp. nov. Figs. 7-9, *D. (D.) busckii* COQUILLETT. 1, 4, 7: Head (dorsal view); 2, 5, 8: head (lateral view); 3, 6, 9: ovipositor. (Scale-line=0.1 mm).

Characters common to the following three species. Body generally yellowish. Eye with thick pile. Antenna with 2nd joint yellow, 3rd hairy and brownish. Frons brownish yellow, paler at periorbits, with a few frontal hairs. Anterior reclinate orbital situated just lateral to proclinate. Face yellow, upper part brownish. Carina high, narrow at upper part and slightly flattened at lower part. Clypeus brownish yellow. Cheek pale yellow, brownish at base of vibrissa and 2nd oral. Palpus pale yellow, with one prominent terminal seta. Scutellum yellow, brownish at middle. Thoracic pleura yellow, with 2 dark brownish longitudinal stripes; upper one broad, running from upper part of propleurite to base of halteres, medially paler on episternum; lower one on sternoepisternum narrow. Humerals 2, subequal. Acrostichal hairs in 8 rows, somewhat irregular. Prescutellar bristles absent. Anterior scutellars convergent; posteriors crossed, slightly nearer to each other than to anteriors. Legs pale yellow, with apicals on fore and mid tibiae; fore metatarsus slightly shorter than, mid one slightly longer than, hind one about as long as 3 succeeding tarsal joints together. Wing hyaline, slightly yellowish. Veins yellow. C1-bristles 2. R_{2+3} slightly curved to costa at tip; R_{4+5} and M parallel. Halteres yellowish white, with brownish stalk. Abdominal tergites yellow, each tergite with a brownish black caudal band interrupted at middle and

attenuated or interrupted between middle interruption and lateral margin. Epandrium yellow; upper part pubescent, caudal margin of lower part convex, partly covering surstylus; toe narrowly elongate, sclerotized, curved inward, without bristles (Figs. 10, 14, 18). Cercus oval, pubescent, separate from epandrium. Aedeagus slender and elongate, much longer than aedeagal apodeme, gently curved ventrad, dorso-apically with a pair of sclerotized processes. Anterior paramere fused to novasternum, with *ca.* 5 sensilla. Posterior paramere absent. Novasternum pubescent, with 2 pairs of submedian spines. Ovipositor yellowish brown, rounded at tip, with long subterminal hair; basal isthmus broad, medially pubescent.

✓ *Drosophila (Dorsilopha) linearidentata* sp. nov.

(Figs. 1-3, 10-13)

Diagnosis. Ocellar triangle yellow except for blackish inside margins of ocelli (Fig. 1). Frons slightly narrower than 1/2 of head width (mean=0.48, range: 0.43-0.52, measured at level of anterior ocellus). Cheek relatively narrow, at base of vibrissa and 2nd oral *ca.* 1/10 (0.08-0.13) as broad as maximum diameter of eye, at widest part *ca.* 1/5 (0.18-0.29) as broad as eye diameter (Fig. 2). Surstylus with *ca.* 9 primary teeth, which are black, apically pointed, and arranged nearly in a row (Fig. 11). Aedeagus apicolaterally broadly sclerotized, dorsosubapically swollen and fringed with microscopic hairs (Figs. 12, 13).

Quantitative characters. Body length, ♂ *ca.* 2.1 mm (1.9-2.3), ♀ *ca.* 2.2 mm (2.0-2.5). Thorax length (including scutellum), ♂ *ca.* 0.85 mm (0.64-0.96), ♀ *ca.* 0.89 mm (0.76-1.00). 3rd antennal joint *ca.* 1.4 (1.1-1.7) × as long as broad. Arista with *ca.* 5 (4-6) upper and 2 (seldom 3) lower branches in addition to terminal fork. Anterior reclinate orbital *ca.* 1/2 (0.39-0.68) length of posterior reclinate; proclinate *ca.* 9/10 (0.67-1.00) length of posterior reclinate. 2nd oral *ca.* 9/10 (0.66-1.00) length of vibrissa. Anterior dorsocentrals *ca.* 3/5 (0.54-0.77) length of posteriors; cross distance of dorsocentrals *ca.* 2.2 (1.94-2.59) length distance. Anterior scutellars *ca.* 4/5 (0.74-0.91) length of posteriors. Sterno-index *ca.* 0.5 (0.39-0.53). Wing indices: C *ca.* 2.8 (2.24-3.32), 4V *ca.* 2.2 (1.92-2.53), 4C *ca.* 1.1 (0.90-1.27), 5x *ca.* 2.2 (1.90-2.52), Ac *ca.* 2.3 (1.94-2.62), C3-fringe *ca.* 0.3 (0.16-0.41). Epandrium with *ca.* 3 bristles in upper and middle portion, *ca.* 11 in lower portion. Surstylus apically with *ca.* 3 straight spines and subapically with *ca.* 2 curved ones. Cercus with *ca.* 25 bristles. Ovipositor (Fig. 3) with *ca.* 17 marginal teeth.

Holotype ♂, Burma: Mandalay, 26. XII. 1981-4. I. 1982, ex banana baits (M. J. TODA) (EHU).

Paratypes, Burma: 10 ♂, 12 ♀, same data as holotype; 1 ♂, Rangoon, 18. XII. 1981, by sweeping along a ditch (M. J. TODA); 1 ♀, Maymyo, 30. XII. 1981-6. I. 1982, ex banana baits (M. J. TODA) (EHU, USNM, author's collection).

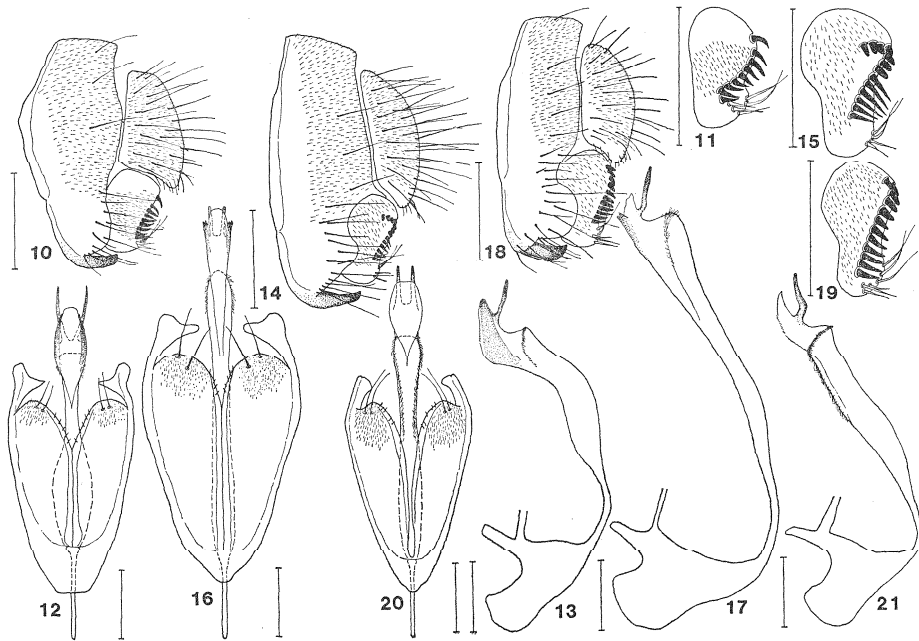
Distribution. Burma: Rangoon, Mandalay, Maymyo.

✓ *Drosophila (Dorsilopha) neobusckii* sp. nov.

(Figs. 4-6, 14-17)

Diagnosis. Ocellar triangle entirely blackish, especially darker at inside margins of ocelli (Fig. 4). Frons slightly narrower than $1/2$ of head width (mean = 0.46, 0.45-0.48). Cheek relatively narrow, at base of vibrissa and 2nd oral $ca. 1/10$ (0.10-0.11) as broad as maximum diameter of eye, at widest part $ca. 1/5$ (0.20-0.24) as broad as eye diameter (Fig. 5). Surstylus with $ca. 13$ primary teeth, upper 7 short and apically rounded, lower 6 long and apically pointed; upper 4 arranged in transverse row nearly at right angle to others (Fig. 15). Aedeagus apicolaterally with a pair of small sclerotized projections that are bifid apically, dorsosubapically swollen, and fringed with microscopic hairs (Figs. 16, 17).

Quantitative characters. Body length, ♂ $ca. 1.9$ mm, ♀ $ca. 2.5$ mm. Thorax length, ♂ $ca. 0.90$ mm (0.82-1.02), ♀ $ca. 0.86$ mm. 3rd antennal joint $ca. 1.3$ (1.1-1.5) \times as long as broad. Arista with 5 (seldom 6) upper and 2 lower branches in addition to terminal fork. Anterior reclinate orbital $ca. 1/2$ (0.46-0.53) length of posterior reclinate; proclinate $ca. 4/5$ (0.78-0.97) length of posterior reclinate. 2nd oral $ca. 9/10$ (0.78-1.00) length of vibrissa. Anterior dorsocentrals $ca. 3/5$



Figs. 10-13, *Drosophila (Dorsilopha) linearidentata* sp. nov. Figs. 14-17, *D. (D.) neobusckii* sp. nov. Figs. 18-21, *D. (D.) busckii* COQUILLET. 10, 14, 18: Periphallallic organs; 11, 15, 19: surstylus; 12, 16, 20: phallic organs (ventral view); 13, 17, 21: aedeagus (lateral view). (Scale-line: 0.1 mm)

(0.53–0.67) length of posteriors; cross distance of dorsocentrals *ca.* 2.3 (2.08–2.37) length distance. Anterior scutellars *ca.* 4/5 (0.79–0.84) length of posteriors. Sterno-index *ca.* 0.5 (0.39–0.57). Wing indices: C *ca.* 3.2 (3.08–3.45), 4V *ca.* 2.0 (1.91–2.18), 4C *ca.* 0.9 (0.82–0.97), 5x *ca.* 1.9 (1.67–2.23), Ac *ca.* 2.1 (1.88–2.31), C3-fringe *ca.* 0.2 (0.19–0.29). Epandrium with *ca.* 3 bristles in upper and middle portion, *ca.* 15 in lower portion. Surstylus apically with *ca.* 2 straight spines, subapically with *ca.* 2 curved ones. Cercus with *ca.* 30 bristles. Ovipositor (Fig. 6) with *ca.* 14 marginal teeth.

Holotype ♂, Burma: Mandalay, 26. XII. 1981–4. I. 1982, *ex* banana baits (M. J. TODA) (EHU).

Paratypes, Burma: 1 ♂, 1 ♀, same data as holotype; 1 ♂, Maymyo, 30. XII. 1981–6. I. 1982, *ex* banana baits (M. J. TODA) (EHU, USNM).

Distribution. Burma: Mandalay, Maymyo.

✓ *Drosophila (Dorsilopha) busckii* COQUILLET

(Figs. 7–9, 18–21)

Drosophila busckii COQUILLET, 1901, Ent. News, 12: 16.

Drosophila rubrostriata BECKER, 1908, Mitt. zool. Mus., Berl., 4: 155.

Drosophila plurilineata VILLENEUVE, 1911, Wien. ent. Ztg., 30: 83.

Diagnosis. Ocellar triangle entirely blackish, especially darker at inside margins of ocelli (Fig. 7). Frons slightly broader than 1/2 of head width (mean = 0.53, range 0.48–0.58, lectotype 0.57). Cheek broad, at base of vibrissa and 2nd oral *ca.* 1/6 (0.11–0.20, 0.20) as broad as maximum diameter of eye, at widest part *ca.* 3/10 (0.22–0.34, 0.29) as broad as eye diameter (Fig. 8). Surstylus with *ca.* 12 primary teeth, shapes changing gradually from (upper) short, apically rounded to (lower) long, apically pointed; upper 2–3 teeth offset from row of remainder (Fig. 19). Aedeagus apicolaterally unsclerotized; microscopic fringe on dorsosubapical portion extending to submedial lateral margins (Figs. 20, 21).

Quantitative characters. Body length, ♂ *ca.* 2.3 mm (1.6–2.8), ♀ *ca.* 2.6 mm (2.1–3.1, lectotype 2.1). Thorax length, ♂ *ca.* 0.91 mm (0.76–1.05), ♀ *ca.* 1.03 mm (0.79–1.12, 1.07). 3rd antennal joint *ca.* 1.3 (1.1–1.6, 1.2) × as long as broad. Arista with *ca.* 5 (4–6, 5) upper and 2 lower branches in addition to terminal fork. Anterior reclinate orbital *ca.* 3/5 (0.43–0.73, 0.66) length of posterior reclinate; proclinate *ca.* 9/10 (0.70–1.03, 0.74) length of posterior reclinate. 2nd oral *ca.* 5/6 (0.65–1.00, 0.88) length of vibrissa. Anterior dorsoœentrals *ca.* 3/5 (0.54–0.75, 0.64) length of posteriors; cross distance of dorsocentrals *ca.* 2.3 (1.83–2.67, 1.83) length distance. Anterior scutellars *ca.* 4/5 (0.74–0.98, 0.82) length of posteriors. Sterno-index *ca.* 0.5 (0.37–0.57, 0.55). Wing indices: C *ca.* 3.1 (2.82–3.46, 3.26), 4V *ca.* 2.1 (1.93–2.35, 2.09), 4C *ca.* 0.9 (0.82–1.00, 0.91), 5x *ca.* 2.0 (1.61–2.36, 2.09), Ac *ca.* 2.2 (2.02–2.60, 2.09), C3-fringe *ca.* 0.2 (0.13–0.34, 0.20). Epandrium with *ca.* 4 bristles in upper and middle portion, *ca.* 20 in lower portion. Surstylus apically with *ca.* 3 straight spines, subapically with *ca.* 2 curved ones. Cercus with

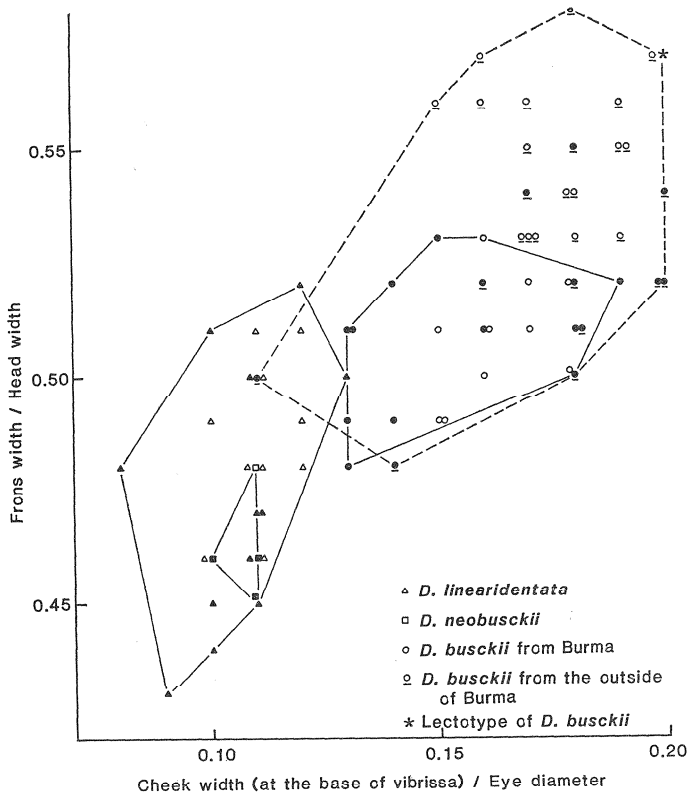


Fig. 22. Comparison of two quantitative characters, frons width/head width and cheek width/eye diameter, among three species of the subgenus *Dorsilopha*. Open mark: female; closed mark: male.

ca. 31 bristles. Ovipositor (Fig. 9) with ca. 15 marginal teeth.

Specimens examined. Lectotype ♀, U.S.A.: (type locality not determined), 17. XI. 1892, ex rotten potatoes (USNM No. 5396). Paralectotypes, U.S.A.: 4 ♀, same data as lectotype; 2 ♀, same data except 1. XII. 1892; 1 ♀, Algonquin III (State's name not labelled), 13. X. 1895 (W. A. NASON); 1 ♂, Washington, D.C., (collecting date not labelled), (D. W. COQUILLET) (USNM).

Other specimens. U.S.A.: 1 ♂, Missouri, St. Louis, 18–19. VI. 1969 (H. IKEDA) (author's collection). Burma: 46 ♂, 46 ♀, Mandalay, 26. XII. 1981–4. I. 1982, ex banana baits (M. J. TODA) (author's collection). Thailand: 1 ♀, Chaing Mai, 19. VI. 1971 (O. KITAGAWA) (author's collection). Malaysia: 1 ♀, Sabah, Mt Kinabalu, 28. VI. 1972 (H. TAKADA) (H. TAKADA's collection). Taiwan: 1 ♂, Alishan, 14–15. VIII. 1967 (T. OKADA); 1 ♀, same data except (L. H. THROCKMORTON); 1 ♂, Byoritsu-ken, Nihonmatsu, Taiko, 9. IV. 1967. (T. SHIROZU); 1 ♀, Chitau 16–17. VIII. 1967 (T. OKADA); 1 ♀, Taipei, Kashonan, 18. V. 1971

(K. KANMIYA); 1 ♀, Tainan Hsien, Kuantzuling, 6. IV. 1965 (T. SAIGUSA) (author's collection). Japan: 3 ♂, Amami, 28–29. IV. 1970 (K. KANMIYA); 2 ♀, Aomori Pref., Mimmaya, 5–11. X. 1983 (M. J. TODA); 1 ♀, Hokkaido, Matsumae, 8–15. X. 1984 (M. J. TODA); 1 ♂, 3 ♀, Hokkaido, Mt. Usu, 2–9. VIII. 1978 (M. J. TODA); 4 ♂, Hokkaido, Sapporo, 30. VIII. 1983 (M. J. TODA); 1 ♀, same data except 20. IX. 1984; 5 ♂, Hokkaido, Hiroshima-cho, 15. VI. 1984 (M. J. TODA); 1 ♀, same data except 25. VI. 1984; 2 ♀, Hokkaido, Kushiro, 5. XI. 1982 (E. TAKEDA) (author's collection).

Distribution. Cosmopolitan. Burma (new record): Mandalay.

Remarks

As noted in the diagnoses, the three species are clearly distinguishable from one another by reference to the male genitalia. However, specific identification of females is difficult. Females of *D. linearidentata* are distinguishable from those of the other two species by the paler coloration of the ocellar triangle. Females of *D. neobusckii* and *D. busckii* can be distinguished from each other by two quantitative characters, the relative width of frons to head and the relative width of cheek to eye diameter. In Fig. 22, these two quantitative characters are compared among the three species for both males and females. The range for *D. neobusckii* is completely separate from that of *D. busckii*, but it is contained within the range of *D. linearidentata*. There is slight overlap between ranges of *D. linearidentata* and *D. busckii*. The smaller values of these characters in the two new species indicate the relatively larger sizes of the eyes. In *D. busckii*, the range for Burmese specimens is included in the range for specimens from various localities outside Burma. In all three species, female specimens tend to be larger in values of these two ratios than males.

Concerning the relationship of the subgenus *Dorsilopha* to other taxa, THROCKMORTON (1975, pers. commun.) suggests that the subgenus originated as part of the Old World *Hirtodrosophila* radiation, and is relatively close to some species of *Drosophila* (*Hirtodrosophila*), *Zygothrica*, and *Nesiodrosophila*. Furthermore, THROCKMORTON (pers. commun.) and BOCK (1976) questioned the validity of the subgenus *Dorsilopha* because the characters which were used in the subgeneric diagnosis by STURTEVANT (1942) appear of less significance in the light of more recent work. However, change in the taxonomic status of the subgenus awaits more comprehensive studies on related taxa. The two new species and *D. busckii* are provisionally here retained in *Dorsilopha*.

In addition to the two new species found in Burma, several species also related to *D. busckii* are known from Taiwan, although they have not yet been described (TODA, unpub.; THROCKMORTON & OKADA, pers. commun.). These findings provide strong evidence to suggest that the geographical origin of the cosmopolitan *D. busckii* and the center of speciation of its relatives are in the Oriental region.

Table 1. Number of individuals, total (♀/♂), of *Drosophila (Dorsilopha)* spp. collected by traps in various environments in Mandalay.

Environment	Trap (Height, m)	<i>linearidentata</i>	<i>neobusckii</i>	<i>busckii</i>
Grove	A (12.0)	12 (7/5)	1 (1/0)	26 (10/16)
	B (8.3)	7 (3/4)	2 (0/2)	12 (8/ 4)
	C (1.0)	1 (1/0)	—	8 (2/ 6)
	D (0.2)	2 (1/1)	—	8 (3/ 5)
Grove edge	E	—	—	18 (13/ 5)
	F	—	—	1 (0/ 1)
Human habitation	G	—	—	16 (10/ 6)

The absence or rarity of *D. busckii* in truly tropical countries, except at high altitudes, and its high adaptability at relatively low temperature (DAVID & TSACAS, 1981) suggests its subtropical origin.

According to the collection records in Burma, the three species are sympatric at least in Mandalay. A brief note on interspecific habitat differentiation is given below, based on the results of trap collections in Mandalay. The collections were made in a village in the suburbs of Mandalay for ten days, December 26, 1981, to January 4, 1982. "Retainer type-I" traps (TODA, 1977) baited with fermented banana were set in various environments, e.g., the canopy (12.0 m high), the floor (0.2 m high) and the edge of a grove, and human habitation. The results are shown in Table 1. The distribution of *D. linearidentata* and *D. neobusckii* was virtually restricted to the upper layer of the grove, while *D. busckii* was eurytopic, occurring frequently not only in the grove canopy but also at the grove edge and in human habitation. Practically the same habitat preference was reported for *D. busckii* from southern Japan (TODA, 1984). Although the difference in habitat preference between the two new species was unclear, *D. linearidentata* seems to prefer the canopy layer, while *D. neobusckii* prefers the subarboreal layer. The collection records in a natural forest at Maymyo (ca. 1,000 m in altitude, ca. 50 km east of Mandalay) favors this speculation. One female specimen of *D. linearidentata* was collected by a trap at 13.5 m high, and one male specimen of *D. neobusckii* at 8 m high.

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and MYA MAUNG, Rangoon Arts and Science University, for their help in field collections in Burma. This work was supported by a Grant-in-Aid for Overseas Scientific Survey from the Ministry of Education, Science and Culture, Japan (Nos. 56041049 and 57043044).

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