

## The *Drosophila polychaeta* and the *D. quadrisetata* Species-Groups (Diptera: Drosophilidae) from Yunnan Province, Southern China

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**ABSTRACT**—Three new and four known species of the *Drosophila polychaeta* and the *D. quadrisetata* species-groups are reported from Yunnan Province, southern China. An evolutionary process of the *virilis-repleta* Radiation is discussed on the basis of the recent information from southern China.

### INTRODUCTION

The present paper deals with three new and four known species of the *Drosophila polychaeta* and the *D. quadrisetata* species-groups from Yunnan Province, southern China, both of which belong to the *virilis* section of the subgenus *Drosophila*.

Most of specimens described here were collected at watersides, by using traps baited with fermenting bananas. All the holotypes and a part of paratypes are deposited in the Kunming Institute of Zoology, Academia Sinica, Kunming, China, and the remaining paratypes in the Biological Laboratory, Hokkaido University of Education, Sapporo, Japan.

### *DROSOPHILA POLYCHAETA* SPECIES-GROUP

*D. polychaeta* species-group, Sturtevant, 1942, Univ. of Texas Publ., 4213: 31.

#### *Drosophila (Drosophila) daruma* Okada

*Drosophila (Drosophila) daruma* Okada, 1956, Syst. Study, 155.

*Specimens examined.* China: 1 ♂, 1 ♀, Kunming, 11. X. 1988 (Collector: H. Watabe); 3 ♂, 1 ♀, Simao, 4. XI. 1987 (X. C. Liang); 2 ♂, Jinhong, Xishuang-banna district, 13. IX. 1985 (W. X. Zhang); 1 ♂, Menghan, Xishuang-banna district, 21. IX. 1985 (W. X. Zhang).

*Distribution.* Korea, Japan, Malaya, Borneo, India; China: Taiwan, Guangdong, Yunnan (n. loc.).

*Remarks.* This species is relatively common in southern and middle parts of Yunnan Province, but has not been collected in its northern districts.

#### *Drosophila (Drosophila) latifshahi* Gupta et Ray-Chaudhuri

*Drosophila (Scaptodrosophila) latifshahi* Gupta et Ray-Chaudhuri, 1970 [1]: 67

*Drosophila (Drosophila) latifshahi*; Toda and Peng, 1989 [2]: 155.

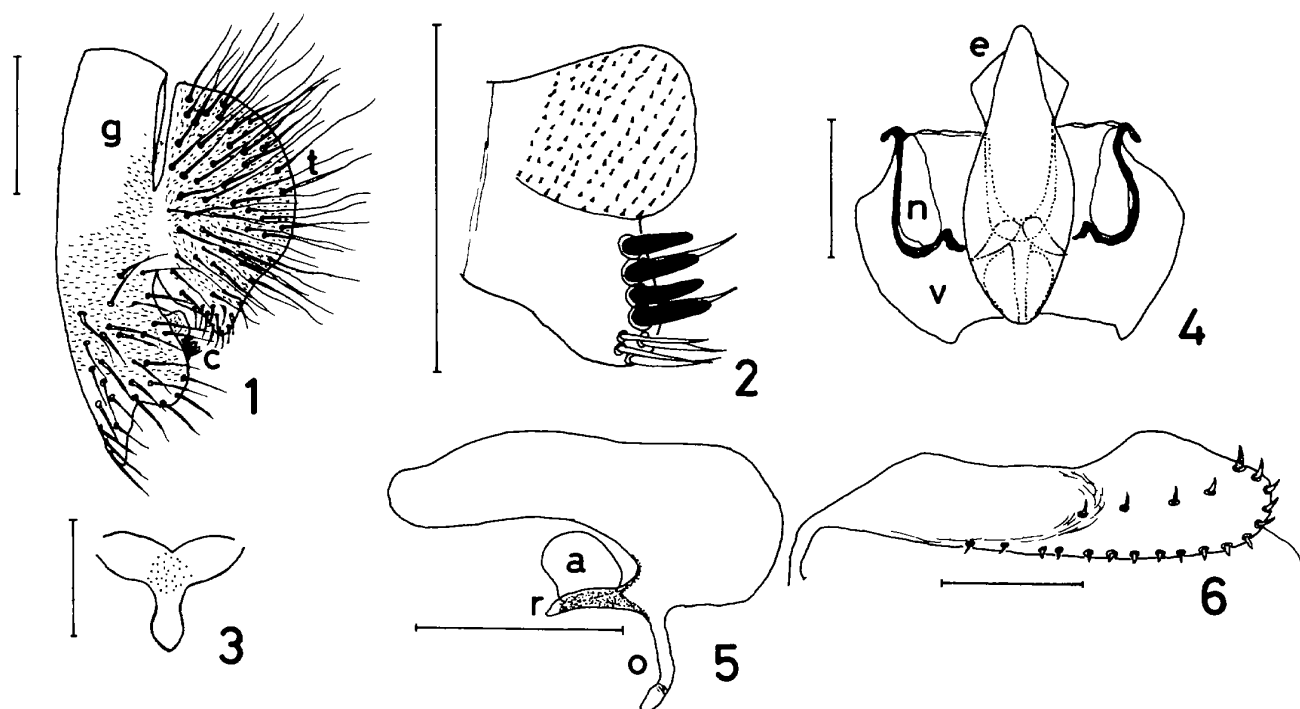
*Specimens examined.* China: 31 ♂, 14 ♀, Simao, 4. XI. 1987 (X. C. Liang); 1 ♂, Menghan, 3. X. 1985 (W. X. Zhang).

*Distribution.* India, Bangladesh; China: Guangdong, Yunnan (n. loc.).

*Remarks.* *D. latifshahi* is a dominant species of waterside drosophilids, in Simao and Xishuang-banna districts.

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FIGS. 1–6. *Drosophila (Drosophila) polychaeta* Patterson et Wheeler, 1942. 1: Periphallallic organs. 2: Surstylus. 3: Decasternum. 4: Phallic organs. 5: Aedeagus (lateral view). 6: Ovipositor. Signs: a, anterior paramere; c, surstylus; e, aedeagus; n, novasternum; o, aedeagal apodeme; r, vertical rod; t, cercus; v, ventral fragma. Scale-line=0.1 mm.

***Drosophila (Drosophila) polychaeta***  
Patterson et Wheeler  
(Figs. 1–6)

*Drosophila (Drosophila) polychaeta* Patterson et Wheeler, 1942 [3]: 102.

Patterson and Wheeler [3] described this species based on the laboratory strain from Texas, but did not refer to its genitalia. The present specimens are supposed to belong to a native population of *D. polychaeta*, and the description of the male and female genitalia is made below, together with its diagnostic characters.

**Diagnosis.** Brown species with 3 pairs of post-sutural dorsocentral bristles. Palpus with *ca.* 2 moderate and *ca.* 18 short bristles. C-index *ca.* 1.96, C3-fringe *ca.* 0.93. Epandrium fused to cercus at middle; anteroventral corner sharply pointed; caudoventral corner rounded (Fig. 1). Spermatheca unsclerotized.

**Periphallallic organs (Figs. 1–3):** Epandrium brown, darker on lower margin, pubescent except in upper portion and ventral margin, with *ca.* 30 bristles on lower half. Surstylus distally constricted into two parts; upper part flap-shaped, with tiny

thorn-like spines in somewhat regular rows; lower part nearly quadrate, with *ca.* 4 primary teeth and *ca.* 2 bristles on distal margin, and with *ca.* 5 bristles at caudoventral corner. Cercus oval, ventrally narrowing, entirely pubescent with *ca.* 53 long bristles and tuft of *ca.* 11 short bristles at lower apex. Decasternum pale brown, Y-shaped in ventral view, medially with small dark patches.

**Phallic organs (Figs. 4, 5):** Aedeagus T-shaped in lateral view, proximally broadened; aedeagal apodeme short, *ca.* 1/4 as long as aedeagus. Anterior paramere oval, without sensilla; posterior paramere absent. Vertical rod dark brown. Novasternum nearly triangular, without submedian spines. Ventral fragma laterally flattened, distally concaved in middle.

**♀ reproductive organs (Fig. 6):** Lobe of ovipositor pale orange, dorso-submedially expanded, with *ca.* 4 discal teeth, *ca.* 24 spine-like marginal teeth and 1 subterminal hair; ultimate marginal tooth darker than penultimate. Spermatheca very small, embedded in adipose tissue.

**Specimens examined.** China: 12 ♂, 13 ♀, Simao, 4. XI. 1987 (X. C. Liang).

**Distribution.** Neotropics, Micronesia, Hawaii,

North America, Europe; China (n. loc.): Yunnan.

*Origin.* *D. polychaeta* is cosmopolitan, but its extremely wide range of distribution is probably due to the propagation with man [4]. Fonseca [5] states that *D. polychaeta* is frequently collected on ships in British ports but does not establish its permanent population there. The origin of this species was unknown. The present collection was made in a natural subtropical forest remote from a human residence. This suggests that southern China might be the original distribution range of *D. polychaeta*.

### DROSOPHILA QUADRISSETATA SPECIES-GROUP

*D. quadrisetata* species-group: Toda and Peng, 1989 [2]: 158.

This group is very small, and consisted of only three species: *D. potamophila* Toda et Peng and *D. beppui* Toda et Peng from southern China, and *D. quadrisetata* Takada, Beppu et Toda from northern Japan. The last species was previously included in the *polychaeta* species-group [6]. Three new species are added in this article.

*Drosophila (Drosophila) potamophila* Toda et Peng  
*Drosophila (Drosophila) potamophila* Toda et Peng, 1989 [2]: 159.

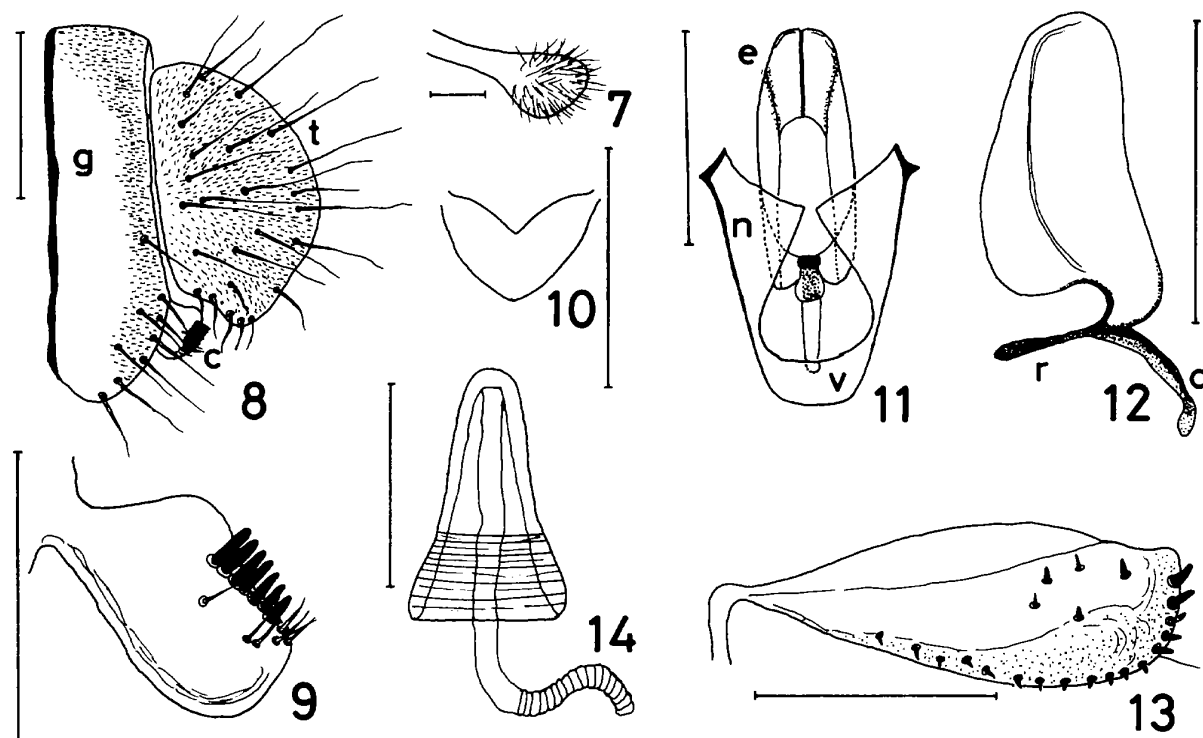
*Specimens examined.* China: 1 ♂, 1 ♀, Simao, Yunnan Province, 4. XI. 1987 (X. C. Liang).

*Distribution.* China: Guangdong, Yunnan (n. loc.).

*Remarks.* This species is abundant in subtropical districts of Yunnan, but has not been collected in Kunming (center of Yunnan) and Dali (northern Yunnan) districts.

### Drosophila (Drosophila) karakasa Watabe et Liang, sp. nov. (Figs. 7-14)

*Diagnosis.* Small and yellowish brown species with cercus separated from epandrium. Palpus short, with short hairs but without stout bristles (Fig. 7). 4C-index *ca.* 7/9 and C3-fringe *ca.* 3/5. Surstylus rectangular, distally with *ca.* 7 primary teeth and *ca.* 7 short bristles (Fig. 9). Lobe of ovipositor brown, much darker on ventral margin, roundish at tip (Fig. 13). Spermatheca cone-



FIGS. 7-14. *Drosophila (Drosophila) karakasa* Watabe et Liang, sp. nov. 7: Palpus. 8: Periphallallic organs. 9: Surstylus. 10: Decasternum. 11: Phallic organs. 12: Aedeagus (lateral view). 13: Ovipositor. 14: Spermatheca. Signs and scales as in figs. 1-6.

shaped, with sparse horizontal stripes on basal half of outer capsule (Fig. 14).

♂, ♀. Body length, ♂ *ca.* 2.33 mm (range: 2.1–2.5), ♀ *ca.* 2.31 mm (2.1–2.5). Wing length, ♂ *ca.* 2.83 mm (2.6–3.0), ♀ *ca.* 2.73 mm (2.6–2.8).

Head: Eye red with thick piles. Second joint of antenna reddish brown; 3rd grayish brown. Arista with *ca.* 4 (4–6) upper and *ca.* 2 (2–3) lower short branches in addition to terminal fork. Frons dark brown, *ca.* 0.54 (0.43–0.65) as broad as head, anteriorly with a few frontal hairs. Anterior reclinate orbital (Orb 2) *ca.* 0.44 (0.33–0.56) length of posterior reclinate orbital (Orb 1); proclinate orbital (Orb 3) *ca.* 0.63 (0.56–0.78) length of Orb 1. Face brown; carina somewhat low, narrow. Clypeus reddish brown. Cheek tannish brown, *ca.* 0.25 (0.20–0.31) as broad as maximum diameter of eye, with *ca.* 3 long bristles along lower margin. Second oral (Or 2) minute, *ca.* 0.29 (0.23–0.36) length of vibrissa (Or 1). Palpus brown, club-shaped, basally baring (Fig. 7).

Thorax: Mesoscutum yellowish brown, medially with a darker longitudinal stripe running to scutellum. Scutellum brown, paler on lateral sides. Lower humeral *ca.* 0.70 (0.55–0.86) length of upper one. Two extra pairs of dorsocentrals present in front of usual ones. Anterior acrostichal bristles present between 1st (anteriormost) dorsocentrals; posterior ones between 2nds; length and location of acrostichal bristles more or less variable. Relative lengths of dorsocentrals and acrostichal bristles to 4th (posteriormost) dorsocentral: 1st dorsocentral *ca.* 0.57 (0.51–0.62), 2nd *ca.* 0.57 (0.49–0.62), 3rd *ca.* 0.71 (0.65–0.79), anterior acrostichal bristle *ca.* 0.35 (0.29–0.43), posterior one *ca.* 0.53 (0.46–0.68). Length distance from 1st dorsocentral to 2nd *ca.* 0.57 (0.52–0.68), distance from 2nd to 3rd *ca.* 0.48 (0.44–0.55), distance from 3rd to 4th *ca.* 0.56 (0.52–0.64) cross distance between 3rds. Acrostichal hairs (Ac) sparse, in 4 irregular rows. Anterior scutellars (SctA) nearly parallel and posterior ones (Sctp) convergent; SctA *ca.* 1.07 (0.88–1.17) length of SctP. Sterno-index *ca.* 0.72 (0.64–0.76).

Legs light brown; preapicals on all three tibiae; apicals on fore and mid tibiae.

Wing hyaline, slightly fuscous. Veins dark brown; crossveins clear.  $R_{2+3}$  straight;  $R_{4+5}$  and

M parallel.  $C_1$  bristles 2, subequal. Number of small stout bristles on 3rd costa (3CFr) *ca.* 28 (24–33). Wing indices: C in ♂ *ca.* 3.10 (2.96–3.34) and in ♀ *ca.* 2.77 (2.50–3.11), 4V *ca.* 1.64 (1.54–1.87), 4C *ca.* 0.77 (0.70–0.86), 5X *ca.* 1.57 (1.33–1.73), Ac in ♂ *ca.* 2.26 (2.17–2.36) and in ♀ *ca.* 2.64 (2.14–3.00), C3-fringe *ca.* 0.61 (0.52–0.67). Haltere white, basally brown.

Abdomens: Tergites brown, darker on middle and paler on lateral margin. Sternites brown, darker on posterior margin, nearly quadrate.

Periphallallic organs (Figs. 8–10): Epandrium yellowish brown, darker on anterior margin, pubescent on posterior half, with *ca.* 9 bristles on lower half. Surstylus pale brown, marginally darker, somewhat swollen at caudodorsal corner. Decasternum translucent, heart-shaped. Cercus brown, slightly projecting at ventral apex, entirely pubescent, with *ca.* 17 long bristles and tuft of *ca.* 5 short bristles along lower margin.

Phallic organs (Figs. 11, 12): Aedeagus yellow, bilobed, ventrally broadened; apodeme dark brown, *ca.* 3/8 as long as aedeagus. Anterior paramere small. Vertical rod black, plate-shaped in ventral view. Novasternum pale brown, without submedian spines; ventral fragma narrow.

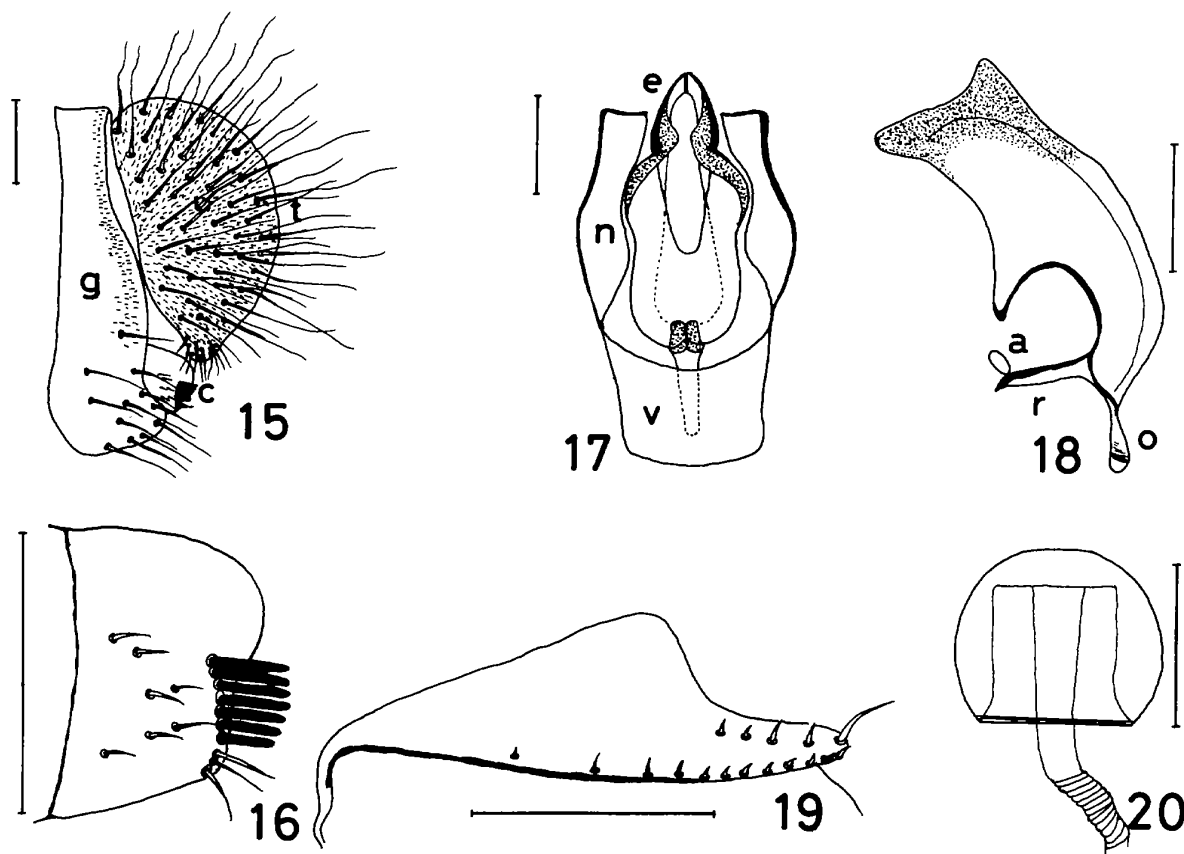
♀ reproductive organs (Figs. 13, 14): Lobe of ovipositor with *ca.* 3–5 discal teeth and *ca.* 17 short marginal teeth: first 2 marginal teeth darker and larger than others. Spermatheca grayish brown, slightly constricted in middle; introvert deep.

Holotype ♂, China: Xianguan, Dali district, Yunnan Province, 19. IX. 1988 (X. C. Liang).

Paratypes, China: 1 ♂, same data as holotype, 2 ♀, Dabochin, Dali district, Yunnan Province, 21. IX. 1988 (X.C. Liang).

*Distribution.* China: Yunnan; Dabochin, Xianguan.

*Relationships.* *D. karakasa* somewhat resembles the foregoing species, *D. potamophila*, in the general morphology and chaetotaxy, but clearly distinguishable from the latter by the diagnostic characters. The aedeagus of this species is very similar to that of four species of the *D. robusta* species-group: *D. okadai* Takada, *D. neokadai* Kaneko et Takada, *D. gani* Liang et Zhang and *D. unimaculata* Strobl [7].



Figs. 15–20. *Drosophila (Drosophila) barutani* Watabe et Liang, sp. nov. 15: Periphallallic organs. 16: Surstylus. 17: Phallic organs. 18: Aedeagus (lateral view). 19: Ovipositor. 20: Spermatheca. Signs and scales as in figs. 1–6.

***Drosophila (Drosophila) barutani***

Watabe et Liang, sp. nov.

(Figs. 15–20)

**Diagnosis.** Dull brown species with cercus close to epandrium at middle (Fig. 15). Third oral subequal to vibrissa. Palpus with *ca.* 3 moderate bristles. 4C-index *ca.* 5/9 and C3-fringe *ca.* 9/10. Surstylus arc-shaped, broadened at caudodorsal corner (Fig. 16). Lobe of ovipositor sharply pointed at tip; ultimate marginal tooth large, bristle-like (Fig. 19). Spermatheca hemispherical (Fig. 20).

♂, ♀. Body length, *ca.* 3.60 mm (3.4–3.8). Wing length, *ca.* 4.03 mm (3.9–4.1).

**Head:** Eye brownish red with thick piles. Second joint of antenna reddish brown; 3rd blackish brown. Arista *ca.* 4 (4–6) upper and *ca.* 2 (1–2) lower short branches in addition to terminal fork. Frons reddish brown, *ca.* 0.47 (0.46–0.48) as broad as head, anteriorly with a few frontal hairs. Orb 2 *ca.* 0.32 (0.31–0.34) length of Orb 1; Orb 3 *ca.* 0.40 (0.33–0.47) length of Orb 1. Face brown; carina

broad. Clypeus dark red. Cheek reddish brown, *ca.* 0.28 (0.24–0.33) as broad as maximum diameter of eye, with *ca.* 3 long bristles along lower margin. Or 2 thin, *ca.* 0.16 (0.14–0.17) length of Or 1; Or 3 *ca.* 0.99 (0.92–1.11) length of Or 1. Palpus grayish brown, laterally flattened.

**Thorax:** Mesoscutum brown, with 4 darker longitudinal stripes. Scutellum brown, lateral sides black. Lower humeral *ca.* 0.58 (0.55–0.59) length of upper one. Two extra pairs of dorsocentrals present. Anterior acrostichal bristles present between 1st dorsocentrals; posterior slightly below cross line between 2nds. Relative lengths of dorsocentrals and acrostichal bristles to 4th dorsocentral: 1st (anteriormost) dorsocentral *ca.* 0.66 (0.65–0.67), 2nd *ca.* 0.68 (0.62–0.74), 3rd *ca.* 0.86 (0.79–0.98), anterior acrostichal bristle *ca.* 0.58 (0.48–0.70), posterior one *ca.* 0.54 (0.52–0.57). Length distance from 1st dorsocentral to 2nd *ca.* 0.64 (0.60–0.71), distance from 2nd to 3rd *ca.* 0.55 (0.50–0.61), distance from 3rd to 4th *ca.* 0.58 (0.55–0.61) cross distance between 3rds. Ac

sparse, in 6 irregular rows. SctAs parallel and Sctps convergent; SctA *ca.* 0.97 (0.93–1.03) length of SctP. Sterno-index *ca.* 0.72 (0.52–0.84).

Legs dark brown; coxae and trochanters paler. Fore femur posteriorly with *ca.* 5 bristles. Preapicals on all three tibiae; apicals on fore and mid tibiae.

Wing hyaline, slightly fuscous. Veins dark brown; crossveins clear.  $R_{2+3}$  nearly straight;  $R_{4+5}$  and M parallel.  $C_1$  bristles 2, inner bristle *ca.* 5/9 length of outer one. Number of 3CFr *ca.* 38 (35–40). Wing indices: C *ca.* 3.46 (3.04–3.70), 4V *ca.* 1.61 (1.56–1.70), 4C *ca.* 0.57 (0.53–0.62), 5X *ca.* 1.06 (1.00–1.17), Ac *ca.* 2.01 (1.82–2.20), C3-fringe *ca.* 0.90 (0.87–0.94). Haltere pale yellow; stalk anteriorly darker.

Abdomens: Tergites entirely dark brown. Sternites pale grayish brown, nearly quadrate; ♂ 5th slightly convexed posteriorly.

Periphallial organs (Figs. 15, 16): Epandrium brown, dorsally narrowing and ventrally broadened, posteriorly pubescent except lower portion, with *ca.* 12 bristles. Surstylus dark brown, distally with *ca.* 7 primary teeth on margin and *ca.* 3 bristles at caudoventral corner, medially with *ca.* 7 spine-like bristles on outer surface. Cercus dark brown, somewhat projecting ventrally, entirely pubescent, with *ca.* 38 long bristles and tuft of *ca.* 12 short bristles at lower apex.

Phallic organs (Figs. 17, 18): Aedeagus yellowish brown, much darker at distal portion, bilobed, concaved on distal margin; apodeme short, *ca.* 2/7 as long as aedeagus. Anterior paramere rudiment. Vertical rod brown, ventrally black. Novasternum narrow; ventral fragma handmill-shaped.

♀ reproductive organs (Figs. 19, 20): Lobe of ovipositor brown, marginally black, dorso-subapically swollen, with *ca.* 4 discal teeth and *ca.* 13 marginal teeth in regular row; ultimate marginal tooth prominent, *ca.* 3 times as long as penultimate. Spermatheca pale yellow, apically somewhat flattened, wrinkled on basal margin, without apical indentation; introvert deep, *ca.* 5/8 height of outer capsule.

Holotype ♂, China: Dabochin, Dali district, Yunnan Province, 21. IX. 1988 (X. C. Liang).

Paratypes, China: 1 ♂, Xianguan, Dali district, Yunnan Province, 21. IX. 1988, (X. C. Liang);

1 ♀, same data as holotype.

*Distribution.* China: Yunnan; Dabochin, Xianguan.

*Relationships.* *D. barutani* is somewhat similar to *D. potamophila* in the abdominal coloration and large value of C3-fringe, but easily distinguishable from the latter by the shapes of its aedeagus and ovipositor.

### *Drosophila (Drosophila) multidentata*

Watabe et Zhang, sp. nov.

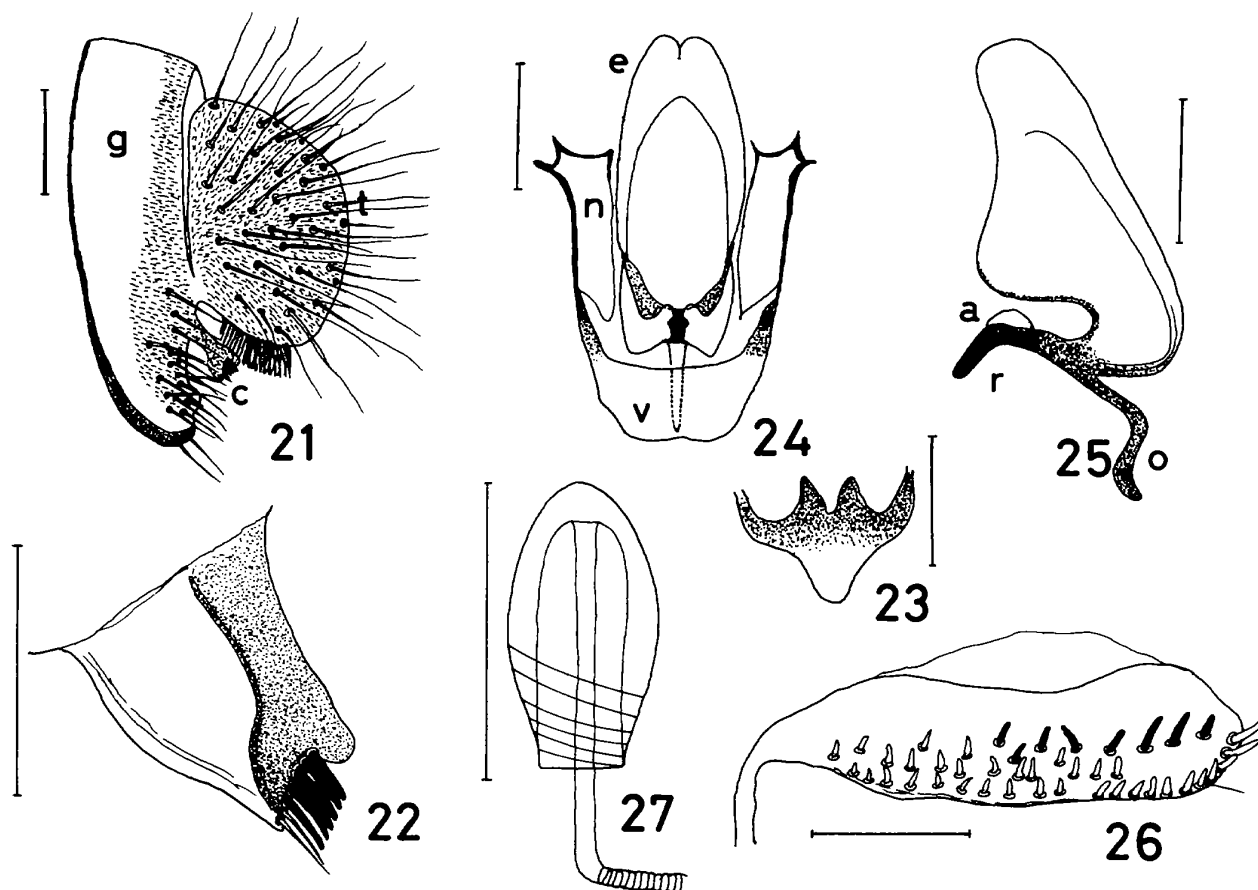
(Figs. 21–27)

*Diagnosis.* Dull brown species, with cercus fused to epandrium at submedian portion (Fig. 21). Or 2 *ca.* 4/9 length of Or 1. C3-fringe *ca.* 5/9. Lobe of ovipositor with many irregular teeth (Fig. 26). Spermatheca slender, with sparse oblique lines on basal 1/3 of outer capsule (Fig. 27).

♂, ♀. Body length, ♂ *ca.* 2.55 mm (2.4–2.8), ♀ *ca.* 2.85 mm (2.6–3.1). Wing length, ♂ *ca.* 3.18 mm (3.0–3.5), ♀ *ca.* 3.48 mm (3.2–3.8).

Head: Eye dark red with thick piles. Second joint of antenna dark brown; 3rd grayish brown. Arista with *ca.* 4 (3–4) upper and *ca.* 1 lower branches in addition to short terminal fork. Frons dark brown, *ca.* 0.46 (0.42–0.49) as broad as head, medially with black cuneiform line. Orb 2 *ca.* 0.36 (0.25–0.46) length of Orb 1; Orb 3 *ca.* 0.52 (0.42–0.79) length of Orb 1. Face reddish brown; carina very high, wider below. Clypeus blackish brown. Cheek brown, *ca.* 0.26 (0.23–0.31) as broad as maximum diameter of eye, with *ca.* 3 long and *ca.* 11 short bristles along lower margin. Or 2 thin, *ca.* 0.44 (0.23–0.61) length of Or 1; Or 3 minute. Palpus brown, small, club-shaped, with 1 somewhat long bristle at tip.

Thorax: Mesoscutum brown, medially darker; scutellum dark brown. Lower humeral *ca.* 0.61 (0.44–0.69) length of upper one. Anterior acrostichal bristles present below cross line between 1st dorsocentrals; posterior below cross line between 2nds. Relative lengths of dorsocentrals and acrostichal bristles to 4th dorsocentral: 1st dorsocentral (anteriormost) *ca.* 0.46 (0.39–0.52), 2nd *ca.* 0.51 (0.39–0.58), 3rd *ca.* 0.68 (0.60–0.79), anterior acrostichal bristle *ca.* 0.33 (0.24–0.44), posterior one *ca.* 0.42 (0.37–0.44). Length distance from 1st



FIGS. 21–27. *Drosophila (Drosophila) multidentata* Watabe et Zhang, sp. nov. 21: Periphallallic organs. 22: Surstylus. 23: Decasternum. 24: Phallic organs. 25: Aedeagus (lateral view). 26: Ovipositor. 27: Spermatheca. Signs and scales as in figs. 1–6.

dorsocentral to 2nd *ca.* 0.55 (0.44–0.74), distance from 2nd to 3rd *ca.* 0.45 (0.39–0.48), distance from 3rd to 4th *ca.* 0.51 (0.46–0.56) cross distance between 3rds. Ac in 6 irregular rows; a few acrostichal hairs in rows of dorsocentrals somewhat longer than other hairs. SctAs slightly and SctPs heavily convergent; SctA *ca.* 0.96 (0.86–1.05) length of SctP. Sterno-index *ca.* 0.73 (0.52–0.96).

Legs brown; fore tarsi darker. Fore femur posteriorly with *ca.* 2–3 long bristles. Preapicals on all three tibiae; apicals on fore and mid tibiae.

Wing hyaline, slightly fuscous. Veins dark brown; crossveins clear.  $R_{2+3}$  nearly straight;  $R_{4+5}$  and M parallel.  $C_1$  bristles 2, subequal. Number of 3CFr *ca.* 24 (17–28). Wing indices: C *ca.* 3.54 (3.12–4.20), 4V *ca.* 1.69 (1.52–1.78), 4C *ca.* 0.68 (0.60–0.77), 5X *ca.* 1.22 (1.00–1.50), Ac *ca.* 2.00 (1.67–2.13), C3-fringe *ca.* 0.56 (0.43–0.65). Haltere white; stalk grayish brown.

Abdomens: Tergites grayish brown, darker in middle; sternites brown, each with *ca.* 26–34 bristles.

Periphallallic organs (Figs. 21–23): Epandrium brown, darker on anterior margin, posteriorly pubescent, with *ca.* 15 bristles on lower half and *ca.* 2 bristles along ventral margin. Surstylus brown, darker on upper half, distally narrowing, slightly projecting at caudodorsal corner, with *ca.* 6 primary teeth and *ca.* 2 bristles. Decasternum dark brown, paler on lower portion. Cercus blackish brown, with *ca.* 34 long bristles and tuft of *ca.* 23 pale yellow bristles along ventral margin.

Phallic organs (Figs. 24, 25): Aedeagus yellow, bilobed, submedially broadened; apodeme dark brown, *ca.* 1/3 as long as aedeagus. Anterior paramere pale yellow, hemispherical. Vertical rod black, recurved dorsally. Novasternum pale yellow, darker on lateral margin, without submedian spines; ventral fragma slightly concaved at middle.

♀ reproductive organs (Figs. 26, 27): Lobe of ovipositor dark brown, with *ca.* 45 stout teeth in irregular rows and 1 long subterminal hair; *ca.* 8 upper teeth much darker than others. Spermatheca grayish brown, slightly wrinkled basally; introvert deep; inner duct narrow.

Holotype ♂, China: Xianguan, Dali district, Yunnan Province, 19. IX. 1988 (X. C. Liang).

Paratypes, China: 2♂, 2♀, Dabochin, Dali district, Yunnan Province, 21. IX. 1988 (H. Watabe & X. C. Liang).

*Distribution.* Yunnan; Dabochin, Xianguan, Kunming.

*Relationships.* One of the diagnostic characters for the *D. quadrisetata* species-group described by Toda and Peng [2] is "cercus separated from epandrium". The cercus of *D. multidentata* fuses to epandrium at its lower portion. However, *D. multidentata* should be involved in the *quadrisetata* species-group by the following characters: 1) two extra pairs of dorsocentrals and prominent acrostichal bristles present, 2) C-index *ca.* 3.54, 3) 4V-index *ca.* 1.69, and 4) aedeagus large and curved ventrally.

Since the cercus in the *robusta* species-group fuses to epandrium, the same type cercus found in *D. multidentata*, as well as the large value of C-index and the shape of aedeagus, implies the phylogenetic relationship between this species and the *robusta* group [2, 7].

#### THE VIRILIS-REPLETA RADIATION IN THE OLD WORLD

The *virilis-repleta* Radiation, which might have occurred during the Oligocene to early Miocene, is one of main lineages in the evolution of the genus *Drosophila*. Throckmorton [4] considers that first the *polychaeta* group might have emerged in the Old World tropics and then several groups, e.g., the *robusta*, the *virilis* and the *melanica* species-groups, might have diverged adaptively in its temperate forest. However, the phylogenetic relationship among these species-groups, especially between the *polychaeta* group and other groups, was still open to question, mainly due to the insufficient information from China.

The recent *Drosophila*-survey in southern China

has resulted in the establishment of a new species-group, the *quadrisetata* group. This group is closely related to the *polychaeta* group in the external morphology and to the *robusta* group in the male genitalia. Toda and Peng [2] consider that the *quadrisetata* group occupies a systematic position between these two species-groups. Similarly, a geographical information on the distribution of these three groups has made it possible to trace the evolutionary process. Most of the *polychaeta* group flies are distributed from the tropics to the subtropics of the East Asia, whereas the *robusta* group flies in its temperate zone [1, 2, 4, 8]. The distribution range of the *quadrisetata* group overlaps with that of the *polychaeta* group and that of the *robusta* group. Of six *quadrisetata* group species, *D. potamophila* and *D. beppui* are distributed in the subtropics and the remaining four species in the temperate forest [2, 6, 8]. In particular, in northern Yunnan, the present three new species are sympatric to *D. neokadai* and *D. gani* of the *robusta* species-group [9].

These information from southern China, including the discovery of *D. polychaeta* in a natural forest of Simao, strongly supports the Throckmorton's hypothesis: the *polychaeta* group first emerged in the Old World tropics and then the *robusta* group in the temperate forest of the East Asia probably through the emergence of the *quadrisetata* group in its subtropics.

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