Eight Species of the Subgenus Drosophila (Diptera: Drosophilidae) from Guangdong Province, Southern China

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ABSTRACT—Six new and two known species of the subgenus Drosophila are reported from Guangdong, China. A new species-group, the Drosophila quadrirsetata species-group, is established by one known and two new species.

INTRODUCTION
Up to the present, no drosophilid species has been reported from Guangdong Province, China. In order to fill the lack of knowledge on its drosophilid fauna, we have been making a faunal survey since 1985. As the first report this paper deals with six new and two known species of the subgenus Drosophila. The information on other known species will be reported elsewhere.

All the holotypes and a part of paratypes are deposited in the Guangdong Institute of Entomology, Guangzhou, China, and the remaining paratypes in the Entomological Institute, Hokkaido University, Sapporo, Japan.

D. polychaeta Species-group

Diagnosis. Reddish brown species (D. asper Lin et Tseng, 1971 blackish brown) with 3 pairs of poststural dorsocentral bristles and without prominent acrostical bristles between dorsocentral lines. C-index ca. 1.8 to 2.1 (ca. 3.1 in D. kashimirensis Kumar et Gupta, 1985) and 4V-index ca. 2.0 to 2.3. Aedeagus usually T-shaped in lateral view. Surstylus dorsally with more or less pubescent flap. The last two characters were confirmed in D. polychaeta Patterson et Wheeler, 1942, D. daruma Okada, 1956, D. bivibrissae Toda, 1988 and D. latifshahi Gupta et Ray-Chaudhuri, 1970.

Drosophila (Drosophila) latifshahi Gupta et Ray-Chaudhuri (Figs. 1–4)


Diagnosis. ♂ fore tarsus anteriorly with long recurved hairs. Epandrium caudo-subapically with acute projection (Fig. 1). Surstylus with small, slightly pubescent flap on dorsal margin (Fig. 1). Ovipositor with ca. 3 long bristle-like discal teeth and longest ultimate marginal tooth (Fig. 4).

♂, ♀. Body length, ♀ ca. 2.3 mm (range: 2.17–2.52), ♂ ca. 3.0 mm (2.89–3.29). Thorax length (including scutellum), ♀ ca. 1.0 mm (0.96–1.12), ♂ ca. 1.2 mm (1.12–1.28).

Head: Eye brownish red with thick pile. Antenna dark brown. Arista with ca. 5 (5–6) upper and ca. 2 (2–3) lower long branches in addition to large terminal fork. Frons slightly narrower than 1/2 of head width (mean = 0.48, 0.46–0.49, measured at level of anterior ocellus), dark brown, anteriorly with frunal hairs; inside margins of ocelli darker; periorbit paler. Anterior reclinate orbital ca. 3/7 (0.43, 0.36–0.53) length of
posterior reclinate, proclinate ca. 2/3 (0.67, 0.62–0.75) length of posterior reclinate. Face dark brown; carina broad. Clypeus dark brown. Cheek dark brown, ca. 1/5 (0.21, 0.17–0.23) as broad as maximum diameter of eye. Second oral ca. 7/10 (0.70, 0.53–0.80) length of vibrissa. Palpus dark brown, club-shaped, with several long setae.

**Thorax** **brown, episternum dark.** **Humerals 2, subequal.** One extra pair of dorsocentrals present in front of usual anteriors. Several bristles in row of dorsocentrals and in 1st row lateral to dorsocentrals somewhat longer than other acrostichal hairs. First dorsocentral ca. 2/5 (0.40, 0.32–0.49), 2nd ca. 7/10 (0.69, 0.61–0.77) length of 3rd; length distance from 1st to 2nd ca. 1/3 (0.32, 0.23–0.41), distance from 2nd to 3rd ca. 1/2 (0.48, 0.41–0.54) cross distance between 2nds. Prescutellars absent. Acrostichal hairs in 6 rows. Anterior scutellar ca. 9/10 (0.91, 0.80–0.99) length of posterior; posteriors nearer to each other than to anterior. Sterno-index ca. 0.8 (0.68–0.95).

**Legs** **brown.** **Precapicals on all tibiae; apicals on fore and mid tibiae.** Fore metatarsus as long as 3 succeeding tarsal joints together; mid and hind metatarsi as long as rest together.

**Wing** hyaline, somewhat fuscous. Veins dark brown; cross veins clear. R2+3 slightly curved to costa at tip; R4+5 and M nearly parallel. C1-bristles 2, subequal. Wing indices: C ca. 1.9 (1.79–2.06), 4V ca. 2.3 (2.03–2.45), 4C ca. 1.4 (1.30–1.50), 5x ca. 1.6 (1.23–2.00), Ac ca. 2.7 (2.46–2.87). C3-fringe ca. 0.9 (0.79–0.90). Haltere dark grayish brown.

**Abdomen:** Tergites dark brown; 1st and anteromedian part of 2nd and 3rd yellowish. Sternites pale brown, quadrate, broader than long; 3rd to 5th large.

**Periphallic organs** (Fig. 1): Epandrium pubescent except ventral and anterior portions, with ca. 34 bristles in lower part and several small setae on lower margin. Sustylus narrow, triangular, with ca. 6 long, slightly curved primary teeth on distal

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**Figs. 1–4.** *Drosophila* (*Drosophila*) *latifshahi* Gupta et Ray-Chaudhuri, 1970. 1: Periphallic organs. 2: Phallic organs. 3: Aedeagus (lateral view). 4: Ovipositor. (Scale-line=0.1 mm.)

**Figs. 5–8.** *Drosophila* (*Drosophila*) *daruma* Okada, 1956. 5: Periphallic organs. 6: Lower part of epandrium (caudal view). 7: Phallic organs. 8: Aedeagus (lateral view). (Scale-line=0.1 mm.)
Drosophila from Guangdong

Drosophila (Drosophila) daruma Okada
(Figs. 5–8)


Diagnosis. Caudal margin of lower epandrium part expanding triangularly; toe not pointed, but with acute corner on inner side (Figs. 5, 6). Surstylus triangular, dorsally with large, quadrate, pubescent flap, and with 5 primary teeth in straight row on lower distal margin (Fig. 5). Cercus narrowly fused to epandrium at middle (Fig. 5).

§. Body length ca. 2.8 mm. Thorax length ca. 1.2 mm (1.20–1.23).

Head: Arista with 5 upper and 2 lower long branches in addition to large terminal fork. Frons slightly narrower than 1/2 of head width (0.47, 0.45–0.48), dark brown; inside margins of ocelli darker; periorbit paler. Anterior reclinete orbital ca. 4/9 (0.44, 0.43–0.45) length of posterior reclinete; proclinete ca. 5/7 (0.72, 0.71–0.72) length of posterior reclinete. Face dark brown; carina broad. Cheek dark brown, ca. 1/5 (0.21, 0.20–0.21) as broad as maximum diameter of eye. Second oral ca. 5/6 (0.82, 0.81–0.83) length of vibrissa.

Thorax: Humeral 2, subequal. One extra pair of dorsocenters present in front of usual anteriors. Several bristles in row of dorsocenters and in 1st row lateral to dorsocenters somewhat longer than other acrostichal hairs. First dorsocentral ca. 2/5 (0.40, 0.38–0.41), 2nd ca. 5/7 (0.73) length of 3rd; length distance from 1st to 2nd ca. 1/4 (0.25), distance from 2nd to 3rd ca. 3/7 (0.43, 0.42–0.43) across distance between 2nds. Acrostichal hairs in 8 rows. Anterior scutellar ca. 9/10 (0.90, 0.88–0.92) length of posterior; posteriors nearer to each other than to anterior. Serrino-index ca. 0.8 (0.77–0.83).

Leg: Fore metatarsus as long as 3 succeeding tarsal joints together; mid and hind metatarsi as long as rest together.

Wing: Veins brown. R2+3 nearly straight; R4+5 and M nearly parallel. Cl-bristles 2, subequal. Wing indices: C ca. 2.1 (2.05–2.12), 4V ca. 2.0 (1.97–2.01), 4C ca. 1.7 (1.71–1.76), 5V ca. 1.4 (1.30–1.52), Ac ca. 2.7 (2.58–2.85), C3-fringe ca. 0.8 (0.82–0.86). Haltere dark grayish brown.

Abdomen: Sternites quadrate, broader than long.

Periphalic organs (Figs. 5, 6): Epandrium pubescent except ventral and anterior portions, with ca. 23 bristles in lower part, narrow in submedian to upper part. Surstylus with several recurved setae at caudoventral corner. Cercus oval, pubescent except ventral portion.

Phallic organs (Figs. 7, 8): Aedeagus T-shaped in lateral view, dorsally broad, ventrally somewhat flat; apodeme ca. 1/3 as long as aedeagus. Nova- sternum somewhat quadrate; hypandrium slightly serrate on inner margin.


Distribution. Korea, Japan, Bonin Is., Ryukyu Is., Malaya, Borneo, India; China: Taiwan,
Guangdong (n. loc. rec.).

Relationship. This species is somewhat related to D. bivibrissae in having surstylus dorsally with large, quadrate, pubescent flap, but clearly distinguishable from the latter by the other diagnostic characters.

D. quadrisetata Species-group

Diagnosis. Dull brown species with 4 pairs of dorsocentral bristles and prominent acrostichal bristles between dorsocentral lines. C-index ca. 2.4 to 3.6 and 4V-index ca. 1.7 to 1.8. Cercus separate from epandrium. Aedeagus large, curved ventrad.

This newly established species-group consists of D. quadrisetata Takada, Beppu et Toda, 1979 and the following two new species. D. quadrisetata was previously included in the polychaeta species-group [2], because of having extra pairs of dorsocephalums. However, this species and the following two new species resemble the D. robusta species-group, especially D. neokadai Kaneko et Takada, 1966 and D. okadai Takada, 1959, rather than the polychaeta species-group in the body color, the morphology of aedeagus and the larger values of C-index, although clearly distinguished from the robusta species-group by the presence of extra dorsocephalums and cercus separate from epandrium. Therefore, these three species are considered to form a separate species-group probably intermediate between the polychaeta and the robusta species-group.

♀ Drosophila (Drosophila) beppui sp. nov.
(Figs. 9–14)

Diagnosis. ♀ palpus modified, apically much broadened and with flat undersurface (Fig. 9). Epandrium moderate in width, slightly broader below; toe round (Fig. 10). Ovipositor subapically much broad, with ca. 22 black, stout teeth in irregular rows and 1 short subterminal hair (Fig. 13).

♂. Body length, ♀ ca. 2.4 mm (2.19–2.70), ♂ ca. 2.6 mm (2.38–2.98). Thorax length, ♀ ca. 0.9 mm (0.88–1.07), ♂ ca. 1.0 mm (0.84–1.07).

Head: Eye brownish red, with thick pile. Antenna dark grayish brown. Arista with ca. 4 (2–5) upper and ca. 1 (1–2) lower small branches in addition to terminal fork. Frons ca. 1/2 (0.51, 0.49–0.54) as wide as head, grayish brown, anteriorly with a few frontal hairs; ocellar triangle and its surrounding area darker. Anterior reclinate orbital ca. 2/5 (0.39, 0.31–0.52) length of posterior reclinate; proclinate ca. 3/5 (0.61, 0.49–0.85) length of posterior reclinate. Face pale brown; carina broad. Clypeus dark brown. Cheek pale brown, ca. 1/4 (0.28, 0.21–0.77) as broad as maximum diameter of eye. Second oral minute. Palpus pale brown, with numerous setae.

Thorax pale brown; median line and posteromedian portion of mesoscutum and scutellum darker. Humerals 2; upper one longer. Two extra pairs of dorsocephalums present in front of usual ones; 1st pair located before transverse suture, 2nd slightly posterior to suture. Two pairs of acrostichal bristles present between dorsocephalums, arranged somewhat irregularly. Relative lengths of dorsocephalums and acrostichal bristles to 4th dorsocephalum: 1st dorsocephalum ca. 3/5 (0.59, 0.53–0.65), 2nd ca. 1/2 (0.50, 0.33–0.64), 3rd ca. 7/10 (0.69, 0.61–0.76), anterior acrostichal bristle ca. 2/5 (0.41, 0.33–0.48), posterior ca. 4/9 (0.45, 0.38–0.57). Length distance from 1st dorsocephalum to 2nd ca. 4/7 (0.57, 0.43–0.64), distance from 2nd to 3rd ca. 4/9 (0.47, 0.34–0.67), distance from 3rd to 4th ca. 1/2 (0.50, 0.44–0.57) cross distance between 3rds. Acrostichal hairs sparse, in ca. 4 irregular rows. Anterior scutellar ca. 9/10 (0.90, 0.82–0.97) length of posterior; posteriors nearer to each other than to anterior. Sterno-index ca. 0.6 (0.45–0.75).

Legs pale brown. Preapicals on all tibiae; apicals on fore and mid tibiae. Fore metatarsus as long as rest of tarsal joints together; mid and hind metatarsi longer than rest together.

Wing hyaline, slightly fuscous. Veins grayish brown; cross veins clear. R<sub>2,3</sub> nearly straight; R<sub>4+5</sub> and M nearly parallel. C1-bristles 2, subequal. Wing indices: C ca. 2.7 (2.38–2.92), 4V ca. 1.8 (1.69–2.05), 4C ca. 0.9 (0.88–1.01), 5x ca. 1.3 (1.05–1.62), Ac ca. 2.4 (2.12–2.79), C3-fringe ca. 0.8 (0.71 0.81). Haltere pale brown; stalk anteriorly darker.

Abdomen: Tergites nearly entirely dark
brown. Sternites pale gray, quadrate, broader than long; ♂ 3rd to 5th large.

Phallic organs (Figs. 10): Epandrium pubescent on middle to upper caudal half, with ca. 1 bristle in middle part and ca. 6 in lower part. Surstylus quadrate, broad, distally narrowing, with ca. 9 primary teeth in straight row on distal margin, ca. 3 spines on lower outer surface and several small bristles at caudoventral corner. Cercus oval, entirely pubescent, with ca. 32 long bristles and tuft of several short bristles on caudoventral apex.

Phallic organs (Figs. 11, 12): Aedeagus basally bilobed and expanded anteriorly, with 1 pair of dark-colored dorsal ridges and vertical rod; apodeme short, ca. 1/3 as long as aedeagus. Anterior and posterior parameres absent. Novasternum without submedian spines; ventral fragma arc-shaped; hypandrium large, quadrate, with sharp ridge starting from lateral corner.

♀ reproductive organs: Basal lumen of ovipositor narrow, sinuate, ca. 1/2 as long as ovipositor (Fig. 13). Spermatheca (Fig. 14) elongate, conical, apically slightly indented, basally horizontally wrinkled; introvert deep.

Holotype ♂, China: Nankunshan, Guangdong Province, 28. VIII. 1987, ex trap (K. Beppu).
Paratypes, China: 1 ♂, 2 ♀, same data as holotype; 4 ♂, 4 ♀, same data except 27. VIII. 1987.


Relationship. This species is somewhat close to D. quadrisetata, but easily distinguishable from the latter by the diagnostic characters.

Remarks. This species is named in honor of our colleague, Dr. K. Beppu, Shinshu University, who provided us with the material.

*Drosophila (Drosophila) potamophila* sp. nov.

(Figs. 15–18)

Diagnosis. Epandrium narrow in submedian to upper part, broad below; caudal margin of lower part sigmoidal, toe pointed (Fig. 15). Ovipositor slender, apically somewhat truncate, with 1 stout apical tooth, ca. 12 minute marginal teeth in somewhat irregular rows and ca. 2 small discal teeth (Fig. 18). Spermatheca unscerotized.

The characters such as eye, antenna, frons, clypeus, acrostichal hairs and so on are same as in
the foregoing species, *D. beppui*, and not referred to in the following description.

♀, ♂. Body length, ♀ ca. 2.4 mm (2.22–2.49), ♂ ca. 2.5 mm (2.21–2.94). Thorax length, ♀ ca. 1.0 mm (0.89–1.08), ♂ ca. 1.0 mm (0.90–1.10).

Head: Arista with ca. 4 (3–5) upper and 2 lower small branches. Periorbit darker than frons. Anterior reclinate orbital ca. 4/9 (0.46, 0.39–0.53) length of posterior reclinate; proclinate ca. 5/9 (0.53, 0.47–0.57) length of posterior reclinate. Face grayish brown. Cheek grayish brown, ca. 2/7 (0.27, 0.23–0.32) as broad as maximum diameter of eye. Palpus dark gray, club-shaped, with several long and numerous small setae.

Thorax grayish brown. Numerals 2, subequal. Second pair of dorsocentraals located beside suture. One or 2 pairs of acrostichal bristles present; anterior pair between 1st dorsocentraals, posterior pair (if present) between 2nd dorsocentraals. Relative lengths of dorsocentraals and acrostichal bristles to 4th dorsocentral: 1st dorsocentral ca. 5/8 (0.62, 0.57–0.68), 2nd ca. 5/8 (0.63, 0.49–0.68), 3rd ca. 3/4 (0.74, 0.67–0.81), anterior acrostichal bristle ca. 1/2 (0.51, 0.43–0.60), posterior (if present) ca. 1/2 (0.50, 0.38–0.64). Length distance from 1st dorsocentral to 2nd ca. 1/2 (0.52, 0.48–0.61), distance from 2nd to 3rd ca. 3/5 (0.59, 0.52–0.65), distance from 3rd to 4th ca. 1/2 (0.52, 0.46–0.58) cross distance between 3rd. Anterior scutellar ca. 9/10 (0.92, 0.74–1.06) length of posterior. Sterno-index ca. 0.7 (0.56–0.91).

Legs grayish brown.

Wing fuscous. Veins dark brown. R<sub>5+3</sub> slightly curved to costa at tip. Wing indices: C ca. 2.4 (2.14–2.77), 4V ca. 1.8 (1.59–2.05), 4C ca. 1.0 (0.88–1.16), 5x ca. 1.4 (1.26–1.60), Ac ca. 2.2 (1.96–2.45), C3-fringe ca. 0.9 (0.82–0.95). Haltere grayish brown.

Abdomen. Tergites nearly entirely dark grayish brown. Sternites grayish brown.

Periphalic organs (Fig. 15): Epandrium pubescent except anterior margin, with ca. 12 bristles in lower part. Surstylus quadrate, distally narrowing, with ca. 8 primary teeth in straight row on distal margin and several small bristles at caudalventral corner. Cercus with ca. 42 bristles.

Phallic organs (Figs. 16, 17): Aedeagus broad in both ventral and lateral views. Ventral fragma quadrate; hypandrium large, triangular.

♀ reproductive organs: Basal linthmus of ovipositor ca. 1/4 as long as ovipositor (Fig. 18).

Holotype ♀, China: Dinghushan, Guangdong Province, 3. IX. 1987, ex trap (K. Beppu).

Paratypes, China: 1 ♀, 1 ♂, same data as holotype; 1 ♀, 2 ♀, same data except 21. VIII. 1987, 2 ♀, 6 ♂, Nankunshan, Guangdong Province, 21/ 28. VIII. 1987, ex trap (K. Beppu).


Relationship. This species is somewhat similar to the foregoing species, *D. beppui*, but clearly distinguishable from the latter by the diagnostic characters.

**D. histrio** Species-group


† *Drosophila* († *Drosophila*) lute sp. nov.

(Figs. 19–24)

Diagnosis. Thoracic pleura dark brown; episternum paler below. Aedeagus apically with 1 pair of small, acute, thorn-like projections (Figs. 20, 21). Anterior paramere absent (Fig. 20). Hypantral process elongate, distally expanded triangularly, somewhat irregularly serrate on margin (Fig. 22).

♀, ♂. Body length, ♀ ca. 2.2 mm. Thorax length ca. 1.0 mm.

Head: Eye orange red, with pile. Antenna with 2nd joint dark brown and 3rd grayish. Arista with 6 or 7 upper and 3 lower branches in addition to terminal fork. Frons ca. 4/9 (0.45, 0.43–0.46) as wide as head, orange brown, anteriorly with a few frontal hairs; periorbit and ocellar triangle darker, especially on inside margins of ocelli. Anterior reclinate orbital ca. 3/8 (0.39, 0.36–0.41) length of posterior reclinate; proclinate ca. 4/7 (0.57, 0.52–0.62) length of posterior reclinate. Face brown; carina high, narrow. Clypeus dark brown. Cheek yellowish brown, narrower than 1/10 of maximum diameter of eye (0.09, 0.08–0.09). Second oral ca. 5/6 (0.83, 0.67–0.98) length of vibrissa. Palpus pale brown, club-shaped, with several prominent setae on apical to lateral margin, in ♀ with numer-
ous small setae on ventral surface.

Thorax: Mesocutum orange brown; scutellum yellowish brown. Humeral 2, subequal. Acrostichal hairs in 6 rows. Anterior dorsocentral ca. 5 (0.55) length of posterior; length distance of dorsocentra ca. 1/2 (0.50, 0.46-0.53) cross distance. Rostro scutellaris equidistant to each other and to anterior. Sterno-index ca. 0.5 (0.52-0.55); mid sternopleural ca. 1.3 (1.31-1.32) times longer than anterior.

Legs pale brown. Preapicals on all tibiae; apicals on fore and mid tibiae. Fore metatarsus slightly longer than 2 succeeding tarsal joints together; mid and hind metatarsi slightly longer than 3 succeeding together.

Wing hyaline, slightly fuscous. Veins brown; anterior cross vein clear; posterior clouded. C1 slightly curved to costa at tip; C4-5 and M nearly parallel. C1-bristles 2; ventral one somewhat weak. Wing indices: C ca. 3.3 (3.22-3.31), 4V ca. 1.6 (1.51-1.68), 4C ca. 0.7 (0.67-0.73), 5x ca. 1.3 (1.31-1.35), Ac ca. 2.4 (2.37-2.44), C3-fringe ca. 0.5 (0.51-0.57). Haltere white; stalk anteriorly dark gray.

Abdomen: Tergites yellow; 2nd to 5th each with medially interrupted, laterally forward extending, dark brown, caudal band. Sternites pale yellow.

Periphallic organs (Fig. 19): Epandrium pubescent mediocaudally to dorsally, constricted deeply at base of surstylius, with 1 bristle in midpart and 5 in lower part; heel present; toe somewhat pointed. Surstylius quadrate, broad, medially slightly pubescent, with 11 primary teeth in slightly concave row on distal margin, 4 spines on outer surface and many curved setae on inner surface. Cercus oval, pubescent except ventral portion, separate from epandrium, with ca. 28 bristles and tuft of a few short bristles at caudoventral, somewhat pointed corner.


**Figs. 25-30. Drosophila (Drosophila) fluviatilis sp. nov.** 25: ♂ abdomen. 26: Periphallic organs. 27: Phallic organs. 28: Aedeagus (lateral view). 29: Ovipositor. 30: Spermatheca. (Scale-line = 1 mm in 25, 0.1 mm in 26-30.)
Phallic organs (Figs. 20–22): Aedeagus slender, basally with vertical rod; apodeme short, ca. 1/3 as long as aedeagus. Posterior paramere absent. Novasternum narrow, long, with 1 pair of submedian spines at bases of hypandrial processes; median notch deep, wide.

♀ reproductive organs: Ovispositor (Fig. 23) dorso-submedially expanded, apically round, with 3 bristle-like discal, ca. 14 apically round, marginal teeth, 3 short terminal and 1 subterminal hairs; basal ilium narrow, short. Spina inae (Fig. 24) ellipsoidal; introvert shallow, ca. 1/5 height of outer capsule; duct distally expanded.

Holotype ♀, China: Conghua, Guangdong Province, 27. I. 1987, by sweeping on forest floor (M. J. Toda).

Paratype, China: 1 ♀, Dindingshan, Guangdong Province, 24. I. 1987, by sweeping on forest floor (M. J. Toda).


Relationship. This species is closely related to D. trisetosa Okada, 1966, but readily distinguishable from the latter by the diagnostic characters.

Remarks. This species is named in honor of Dr. Li Ying Li, the director of the Guangdong Institute of Entomology, who understood and promoted this study.

Ungrouped Species

♀ Drosophila (Drosophila) flavialis sp. nov.

(Figs. 25–30)

Diagnosis. Third to 6th abdominal tergites each with medially uninterrupted and broad, laterally narrowing blackish brown, caudal band (Fig. 25). Cercus fused broadly to epandrium (Fig. 26). Aedeagus large, curved ventrad, with vertical rod (Fig. 28). Anterior paramere narrowly separate from novasternum, triangular, apically with ca. 3 sensilla (Fig. 27). Finely pubescent, oval hypandrial plate present posteriorly to anterior paramere, separate from novasternum (Fig. 27).

♀, ♀. Body length, ♀ ca. 3.1 mm (2.70–3.36), ♀ ca. 3.2 mm (3.01–3.36). Thorax length, ♀ ca. 1.4 mm (1.27–1.57), ♀ ca. 1.5 mm (1.34–1.55).

Head: Eye brownish red, with thick pile. Second joint of antenna dark grayish brown; 3rd dark gray. Arista with 3 upper and 1 or 2 lower branches in addition to terminal fork. Frons ca. 1/2 (0.49, 0.47–0.51) as wide as head, brown, anteriorly with frontal hairs, occipital triangle darker. Anterior reclinate orbita ca. 1/3 (0.35, 0.25–0.46) length of posterior reclinate; procline ca. 6/7 (0.86, 0.75–0.94) length of posterior reclinate. Face brownish yellow, mediadly whitish; carina high, broad. Clypeus brown. Check brownish yellow, dark gray below eye and on anteroventral margin, ca. 1/4 (0.23, 0.21–0.20) as broad as maximum diameter of eye. Second oral ca. 2/5 (0.40, 0.29–0.52) length of vibrissa. Palpus grayish yellow, with several long setae.

Thorax: Mesoscutum grayish brown, mediadly darker; scutellum dark grayish brown; thoracic pleura grayish yellow. Hemeral 2; upper one longer. Acroschial hairs in 6 somewhat irregular rows. Anterior dorsocentral ca. 2/3 (0.65, 0.59–0.67) length of posterior; length distance of dorsocentrals ca. 3/8 (0.38, 0.34–0.42) cross distance. Anterior scutellar ca. 8/9 (0.89, 0.83–0.95) length of posterior; posteriors nearer to each other than to anterior. Sterno-index ca. 0.7 (0.63–0.77).

Legs grayish yellow; fore tibia and tarsus blackish. Preapicals on all tibiae; apicals on fore and mid tibiae. All metatarsi much longer than rest of tarsal joints together. ♀ fore tarsus anteriorly with many erected hairs.

Wing hyaline. Veins dark brown; cross veins clear. R2+3 slightly curved to costa at tip; R4+5 and M nearly parallel. C1-bristle 1. Wing indices: C ca. 3.0 (2.74–3.62), 4V ca. 1.9 (1.77–2.06), 4C ca. 0.9 (0.71–0.94), 5x ca. 1.3 (1.06–1.35), Ac ca. 2.1 (1.97–2.35). C3-fringe ca. 0.9 (0.82–0.93). Haltere pale grayish brown; anterior side of stalk darker.

Abdomen (Fig. 25): Tergites yellow; 2nd with 1 pair of large, triangular, blackish brown patches. Stermites pale yellow, quadrates; ♀ 5th longer than broad, concave on caudal margin.

Peripheral organs (Fig. 26): Epandrium yellow, broad, pubescent caudally and dorsally, with ca. 5 bristles in middle to upper part; lower blackish, narrow, apically pointed, with ca. 6 bristles. Surstylus quadrates, pubescent on medial to ventral outer surface, with 7 primary teeth in straight row on distal margin, 2 straight spines on
outer surface and numerous recurved spines at caudoventral corner and on inner surface. Cercus large, oval, pubescent medially to dorsally, with ca. 40 bristles; ventral part bare except for tuft of short bristles on caudoventral apex.

Phallic organs (Figs. 27, 28): Aedeagal apodeme ca. 1/4 as long as aedeagus. Posterior paramere absent. Novasternum quadrate, longer than broad, without submedian spines.

♀ reproductive organs: Ovipositor (Fig. 29) subapically broad, with ca. 6 discal, ca. 36 marginal teeth and subterminal hair; ultimate marginal tooth long, bristle-like; basal iihmus narrow, ca. 1/5 as long as ovipositor. Spermatheca (Fig. 30) small, less sclerotized, irregularly wrinkled and shaped; introvert very shallow.

Holotype ♀, China: Nankunshan, Guangdong Province, 28. VIII. 1987, ex trap (K. Beppu).

Paratypes, China: 9 ♀, 25 ♂, same data as holotype; 1 ♀, 1 ♂, same data except 27. VIII. 1987.


Relationship. The large, ventrad curved aedeagus and the cercus fused to epandrium suggest the relationship to the robusta species-group. However, the abdominal color pattern, the morphology of anterior paramere, the presence of characteristic hypandrial plate and the small, less sclerotized spermatheca are inconsistent with the characters of the latter group.

Drosophila (Drosophila) wakahamai sp. nov.
(Figs. 31–36)

Diagnosis. Arista with 3 upper and 1 lower long branches in addition to large terminal fork. Longest axis of eye oblique to body axis. Wing entirely brownish fuscous. Epandrial toe truncate, with ca. 6 short bristles (Fig. 31). Decasternum triangular and with lateral short arms (Fig. 32). Aedeagus bilobed but with apical fusion (Fig. 33). Ventral fragma triangular, basally tapering and with narrow elongation, distally overlapping with hypandrium (Fig. 33).

♀, ♂. Body length, ♀ ca. 2.9 mm (2.43–3.50), ♂ ca. 3.0 mm (2.84–3.24). Thorax length, ♀ ca. 1.2 mm (1.00–1.34), ♂ ca. 1.2 mm (1.16–1.33).

Head: Eye dark brownish red, with thick pile. Second joint of antenna dark brown; 3rd gray. Frons slightly wider than 1/2 of head width (0.51, 0.50–0.51), dark brown, anterory with frontal hairs; ocellar triangle and periortbit darker. Anterior reclinato orbital ca. 3/10 (0.31, 0.25–0.35) length of posterior reclinato; proximate ca. 2/3 (0.68, 0.62–0.72) length of posterior reclinato. Face dark brown, paler below; carina high, broad. Clypeus dark brown. Check dark brown, ca. 1/4 (0.27, 0.23–0.30) as broad as maximum diameter of eye. Second oral small. Palpus grayish brown, with a few prominent setae.

Thorax: Mesoscutum dark brown, with 1 pair of broad, darker bands between dorsocentrals; scutellum blackish brown, anteromedially paler; thoracic pleura dark brown, with diffuse, darker patch on epistemum. Humerals 2, subequal. Acróstichal hairs in 6 rows. Anterior dorsocentral ca. 2/3 (0.65, 0.59–0.72) length of posterior; length distance of dorsocentrals ca. 1/2 (0.48, 0.40–0.56) cross distance. Anterior scutellar as long as posterior (1.00, 0.93–1.06); posteriors nearer to each other than to anterior. Stero-index ca. 0.7 (0.60–0.85).

Legs brown. Preapicals on all tibiae; apicals on fore and mid tibiae. Fore metatarsus as long as rest of tarsal joints together; mid and hind metaatarsi slightly longer than rest together.

Wing apically somewhat pointed. Veins dark brown; cross veins clear. R3, 4 slightly curved to costa at tip; R5, 6 and M nearly parallel. C1-bristles 2; lower one thin. Wing indices: C ca. 3.7 (3.53–3.79), 4V ca. 1.5 (1.41–1.56), 4C ca. 0.7 (0.64–0.71), 5x ca. 1.3 (1.05–1.50), Ac ca. 1.7 (1.59–1.91), C3-fringe ca. 0.4 (0.32–0.45). Haltere dark grayish brown.

Abdomen: Tergites nearly entirely blackish brown, each anterolaterally somewhat paler. Stermites pale grayish brown, longer than broad.

Periphalic organs (Figs. 31, 32): Epandrium pubescent caudally and dorsally, broad mediadally, narrow below, with ca. 1 (0–2) bristle in upper part and ca. 2 in middle part; heel prominent. Systylus blackish brown, narrow proximally, broad distally, with ca. 8 primary teeth in concave row on distal margin and several setae at caudoventral corner and on inner surface. Cercus oval, fused to
epandrium, pubescent medially to dorsally, with ca. 42 (33-47) bristles.

Phallic organs (Figs. 33, 34): Aedeagal apodemne as long as aedeagus. Anterior paramere attached to aedeagus, ventrally pubescent, with a few small warts on apical inner surface. Posterior paramere absent. Novasternum without submedian spines; hypandrium somewhat quadrate.

♀ reproductive organs: Ovipositor (Fig. 35) narrow, dorso-subapically expanded triangularly, with ca. 3 apically pointed discal, ca. 17 marginal teeth and subterminal hair; ultimate marginal tooth only apically pointed, other marginals apically round; basal thimus narrow, ca. 1/5 as long as ovipositor. Spermatheca (Fig. 36) large, long, sinuate on basal margin, with numerous small warts on upper 3/4 outer capsule; introvert wide and deep.

Holotype ♀, China: Nankunshan, Guangdong Province, 28. VIII. 1987, ex trap (K. Beppu).

Paratypes, China: 1 ♀, same data as holotype; 3 ♀, 3 ♂, Dinghushan, Guangdong Province, 22. VIII, 3. IX. 1987, ex traps (K. Beppu).


Relationship. This species is conspecific or very close to Drosophila (Drosophila) sp. a reported by Takada and Wakahama [3]. According to their description, though not referring to the phallic organs, there are slight differences only in the number of bristles on epandrium and the morphology of decasternum between the two forms. Although Takada and Wakahama [3] thought that their form "probably belongs to the robusta group", the present species is quite unique in the subgenus Drosophila, having the diagnostic characters different from any species-groups of this

Figs. 31-36. Drosophila (Drosophila) wakahamai sp. nov. 31: Phallic organs. 32: Decasternum. 33: Phallic organs. 34: Aedeagus and anterior paramere (lateral view). 35: Ovipositor. 36: Spermatheca. (Scale-line=0.1 mm.)

Figs. 37-42. Drosophila (Drosophila) guangdongensis sp. nov. 37: Phallic organs. 38: Surstylius and decasternum. 39: Phallic organs. 40: Aedeagus and anterior paramere (lateral view). 41: Ovipositor. 42: Spermatheca. (Scale-line=0.1 mm.)
subgenus. However, the cercus fused to epandrium and the absence of submedian spines on novasternum indicate at least the relationship to the *virilio-repleta* Radiation [4].

Remarks. This species is named in honor of Dr. K. Wakahama, Shimane University.

*Drosophila* (Drosophila) guangdongensis sp. nov. (Figs. 37–42).

**Diagnosis.** Eye bare. Cross veins clear. ♀ abdominal tergites entirely black except for 1st and anterior part of 2nd. ♀ tergites yellow; 2nd with medially interrupted, narrow, dark brown, caudal band; 3rd to 6th each with medially uninterrupted, narrow, caudal band. Surstylus with ca. 8 moderate teeth in straight row on upper half distal margin, ca. 15 larger teeth in irregular rows on lower half (Fig. 37). Aedeagus long, distally bilobed and swollen (Figs. 39, 40). Anterior paramere long, slender, apically with 3 long bristles, basally attached to aedeagus (Fig. 40).

♂, ♀. Body length, ♀ ca. 3.0 mm (2.63–3.19), ♀ ca. 3.2 mm (3.01–3.33). Thorax length, ♀ ca. 1.4 mm (1.25–1.46), ♀ ca. 1.6 mm (1.5–1.9).

Head: Eye orange red. Antenna grayish yellow. Atrita with ca. 5 (4–6) upper and 3 lower branches in addition to terminal fork. Frons slightly narrower than 1/2 of head width (0.48, 0.47–0.50), orange yellow, anteriorly with frontal hairs; inside margins of ocelli darker; periorbit paler. Anterior reclinata orbital ca. 5/7 (0.43, 0.34–0.55) length of posterior reclinata; proclinate ca. 7/9 (0.77, 0.72–0.87) length of posterior reclinata. Face orange yellow; carina pale, high, narrow. Clypeus brownish yellow. Check orange yellow, ca. 1/5 (0.19, 0.16–0.21) as broad as maximum diameter of eye. Second oral small. Palpus grayish yellow, with a few prominent setae.

Thorax brownish yellow. Humerals 2, subequal. Acrostichal hairs in ca. 10 irregular rows. Anterior dorsocentral ca. 5/5 (0.54, 0.50–0.65) length of posterior; length distance of dorsocentra ca. 3/10 (0.30, 0.24–0.37) cross distance. Anterior scutellar ca. 8/9 (0.89, 0.81–0.93) length of posterior; posteriors nearer to each other than to anterior. Sterno-index ca. 0.7 (0.63–0.76).

Legs yellow. Preapicals small, but present on all tibiae; apicals on fore and mid tibiae. Fore metatarsus as long as 2 succeeding tarsal joints together; mid as long as 3 succeeding together; hind as long as rest together.

Wing hyaline. Veins yellow. R2+3 slightly curved to costa at tip; R4+5 and M slightly convergent distally. C1-bristle 1. Wing indices: C ca. 3/1 (2.96–3.35), 4V ca. 1.7 (1.56–1.73), 4C ca. 0.8 (0.73–0.82), 5x ca. 1.4 (1.21–1.65), Ac ca. 2.4 (2.13–2.59), C3-fringe ca. 0.7 (0.62–0.73). Haltere grayish pale yellow.

Abdomen: Sternites grayish pale yellow; ♂ 5th broader than long.

Periphalic organs (Figs. 37, 38): Epandrium broad, with ca. 8 bristles in upper to middle part and ca. 23 in lower part; lower part triangular, curved inward, apically pointed, with rectangular corner on caudal margin; heel prominent, pointed. Surstylus broad, with several curved spines on ventral inner surface; upper part fused basally to epandrium, distally to decasternum. Decasternum composed of dark median plate and lateral broad arms. Cercus somewhat narrow, with ca. 26 bristles; caudoventral corner somewhat pointed, with 3 stout short spines and several small spines.

Phallic organs (Figs. 39, 40): Aedeagus with numerous spinules on submedian ventral to lateral surface; spicule short, ca. 3/10 as long as aedeagus. Posterior paramere absent. Novasternum long, basally narrowing, with 1 pair of submedian spikes at apices of U-shaped hypandrial plates; median notch deep, narrow.

♀ reproductive organs: Ovipositor (Fig. 41) apically quadrate, dorso-subapically expanded triangularly, with ca. 5 discal, ca. 21 marginal teeth and subterminal hair; basal thimbus narrow, somewhat sinuate, ca. 1/4 as long as ovipositor. Spermaphæca (Fig. 42) spherical, apically shallowly indented, basally slightly wrinkled; introvert deep, distally narrowing, basally wrinkled; duct expanded medially and distally in introvert.


Paratypes, China: 38 ♂, 39 ♀, same data as holotype.

**Distribution.** China: Guangdong.

**Relationship.** This species seems to have some affinities to the *D. quinaria* species-group in the
arrangement of teeth on surstylus and the morphology of phallic organs, but clearly differs from the latter group in having the clear cross veins, the bare eye and the neither spotted nor medially interrupted caudal bands on 3rd to 6th abdominal tergites.

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REFERENCES


