

Jpn. J. Ent., **61** (2): 313–322. June 25, 1993

The *Drosophila virilis* Section (Diptera, Drosophilidae) from Eastern China, with Descriptions of Two New Species

Hua-zhong CHEN

Institute of Genetics, Fudan University, Shanghai, China

and

Hide-aki WATABE

Biological Laboratory, Hokkaido University of Education,
Ainosato 5–3–1, Sapporo, 002 Japan

Abstract Two new and thirteen unrecorded species of the *Drosophila virilis* section are reported from eastern China. *Drosophila* (*D.*) *wakahamai* TODA et PENG, 1989 is newly synonymized with *D.* (*D.*) *angor* LIN et TSENG, 1971.

Key words: Drosophilidae; *virilis* section; new species; distribution; China.

Recent faunal surveys have demonstrated that the *Drosophila virilis* section is very abundant in southern China, where an early adaptive radiation of the section might have occurred (TODA & PENG, 1989; WATABE *et al.*, 1990 a, b; WATABE & PENG, 1991). In other districts of the mainland China, however, our knowledge on the section is still scanty. Only two species, domestic *Drosophila virilis* STURTEVANT, 1916 and *D. cheda* TAN, HSU et SHENG, 1949, were known in eastern China (PENG, 1937; TAN *et al.*, 1949).

Since 1989 we have made faunal surveys of the *virilis* section flies in four provinces of eastern China (Fig. 1), and collected two new and thirteen unrecorded species enumerated below. Of these, the *robusta* species-group is richest in eastern China, which implies that it is the center of the geographic distribution of this group.

Most of the specimens were collected at watersides by using traps baited with fermenting bananas. All the holotypes and part of the paratypes are deposited in Institute of Genetics, Fudan University, Shanghai, China, and the remaining paratypes in Biological Laboratory, Hokkaido University of Education, Sapporo, Japan.

1. The *polychaeta* species-group

Drosophila (*Drosophila*) *daruma* OKADA, 1956

Drosophila daruma OKADA 1956, Syst. Stud. Drosophilid. all. Fam. Japan, 155; TODA & PENG, 1989, Zool. Sci., **6**: 157.

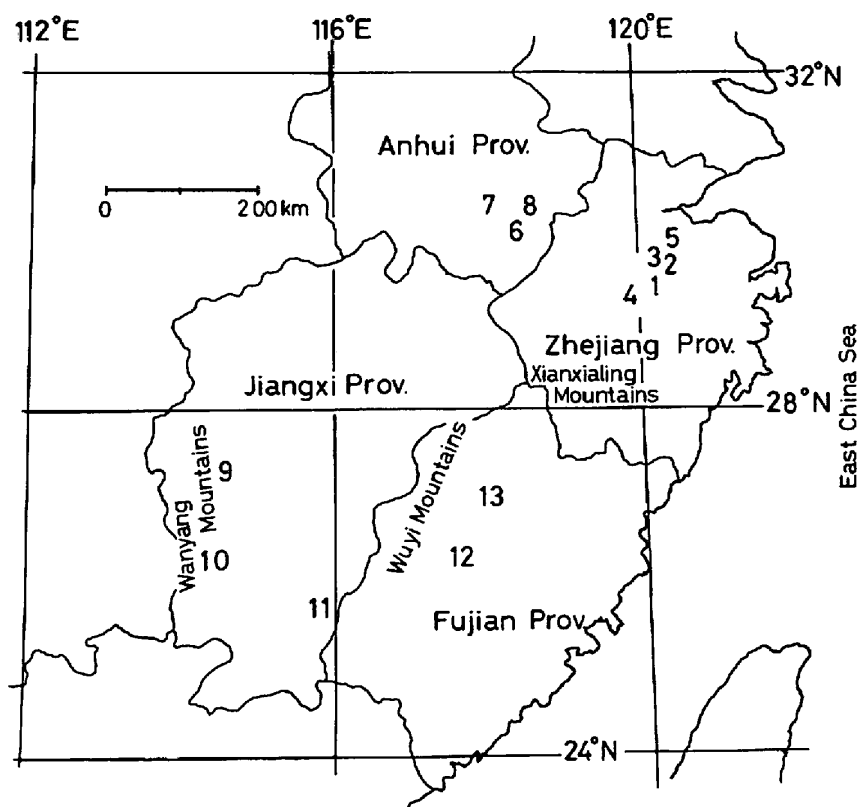


Fig. 1. Map of eastern China, showing the collection sites of drosophilid flies. Zhejiang Province: 1, Liden; 2, Zuxiba; 3, Taoga; 4, Wushi; 5, Xiaoshan. Anhui Province: 6, Huangshan; 7, Jiuhuashan; 8, Jingxian. Jiangxi Province: 9, Anfuqiao; 10, Gingangshan; 11, Raigian. Fujian Province: 12, Wuyishan; 13, Wanmulin.

Specimens examined. 1 ♂, Wushi, Zhejiang (ZH) Prov., 24. VI. 1991; 4 ♂, 5 ♀, Huangshan, Anhui (AN) Prov., 28–31. VIII. 1991; 18 ♂, 27 ♀, Jiuhuashan, AN, 1–2. IX. 1991; 2 ♀, 20–24. VII. 1990, Jingxian, AN; 1 ♂, 1 ♀, Anfuqiao, Jiangxi (JI) Prov., 21. IX. 1992; 7 ♂, 3 ♀, Gingangshan, JI, 25. IX.–12. X. 1992; 1 ♂, Raigian, JI, 25. X. 1992; 1 ♀, Wuyishan, Fujian (FU) Prov., 24–26. VII. 1991.

Distribution. Japan, Korea, Malaya, Borneo, India, China: Taiwan Prov., Guangdong Prov., Yunnan Prov., Zhejiang Prov. (n. loc.), Anhui Prov. (n. loc.), Jiangxi Prov. (n. loc.), Fujian Prov. (n. loc.).

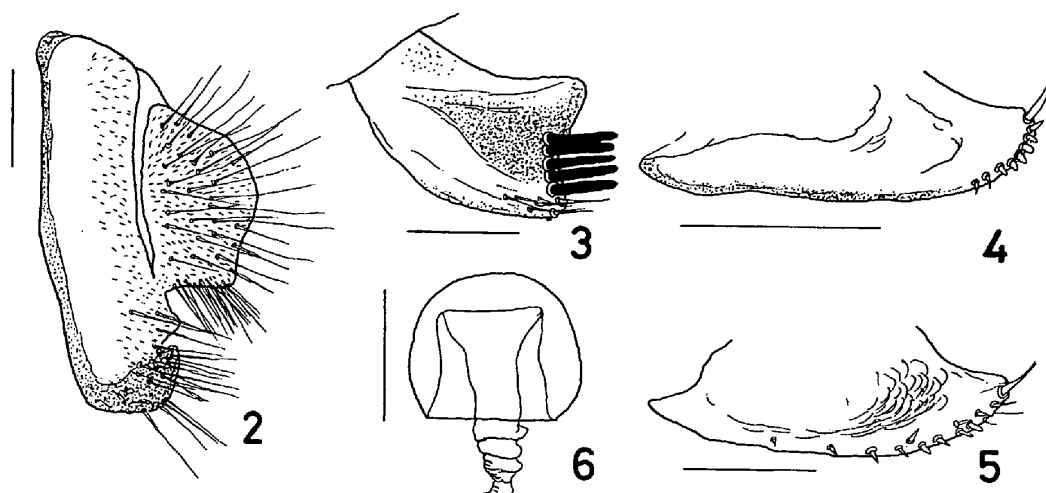
***Drosophila (Drosophila) latifshahi* GUPTA et RAY-CHAUDHURI, 1970**

Drosophila (Scaptodrosophila) latifshahi GUPTA et RAY-CHAUDHURI, 1970, Proc. R. ent. Soc. Lond., (B), 39: 67.

Drosophila (Drosophila) latifshahi: TODA & PENG, 1989, Zool. Sci., 6: 155.

Specimens examined. 4 ♂, 7 ♀, Wuyishan, FU, 2. XI. 1992.

Distribution. India, Bangladesh, China: Guangdong Prov., Yunnan Prov., Fujian Prov. (n. loc.).



Figs. 2–6. *Drosophila (Drosophila) pilosa* (2–4) and *Drosophila (Drosophila) flumenicola* (5–6). — 2, Male terminalia; 3, surstylus; 4–5, oviscapt; 6, spermatheca. Scale lines: 0.1 mm, except for Fig. 3 (0.05 mm).

2. The *quadrisetata* species-group

The following two species, *Drosophila pilosa* and *D. flumenicola*, were described from the male specimens only (WATABE & PENG, 1991), and their female terminalia are described below by using the revised terminology (MCALPINE, 1981; ZHANG & TODA, 1992).

Drosophila (Drosophila) pilosa WATABE et PENG, 1991

(Figs. 2–4)

Drosophila (Drosophila) pilosa WATABE et PENG, 1991, Zool. Sci., 8: 151.

Female terminalia (Fig. 4): Oviscapt brown, darker on ventral margins, lacking lateral ovisensillum, with ca. 9 marginal ovisensilla; ultimate one prominent. Spermatheca less sclerotized.

Specimens examined. 1 ♂, 2 ♀, Gingangshan, JI, 10. X. 1992.

Distribution. China: Guangdong Prov., Jiangxi Prov. (n. loc).

Geographic variation. Some quantitative, but slight, differences in the wing-index and male genitalia were seen between the type (T) from Guangdong Province and the present samples (P); C3-fringe ratio is ca. 0.69, the number of long setae on epandrium ca. 11 and the number of setae on surstylus ca. 7 in T, while for P they are ca. 0.75–0.87, ca. 20 (Fig. 2) and ca. 5 (Fig. 3), respectively.

Drosophila (Drosophila) flumenicola WATABE et PENG, 1991

(Figs. 5–6)

Drosophila flumenicola WATABE et PENG, 1991, Zool. Sci., 8: 152.

Female terminalia (Figs. 5–6): Oviscapt yellowish brown, somewhat pointed apically, with ca. 14 marginal ovisensilla. Spermatheca light brown, large, flattened apically; introversion deep, laterally wide.

Specimens examined. 1 ♂, Taoga, ZH, 17. VI. 1991; 1 ♂, Wushi, ZH, 25. VI. 1991; 5 ♂, 4 ♀, Huangshan, AN, 28–31. VIII. 1991; 14 ♂, 10 ♀, Jiuhuashan, AN, 1–2. IX. 1991.

Distribution. China: Guangdong Prov., Zhejiang Prov. (n. loc.), Anhui Prov. (n. loc.).

3. The *robusta* species-group

Drosophila (Drosophila) nigrescens sp. nov.

(Figs. 7–12)

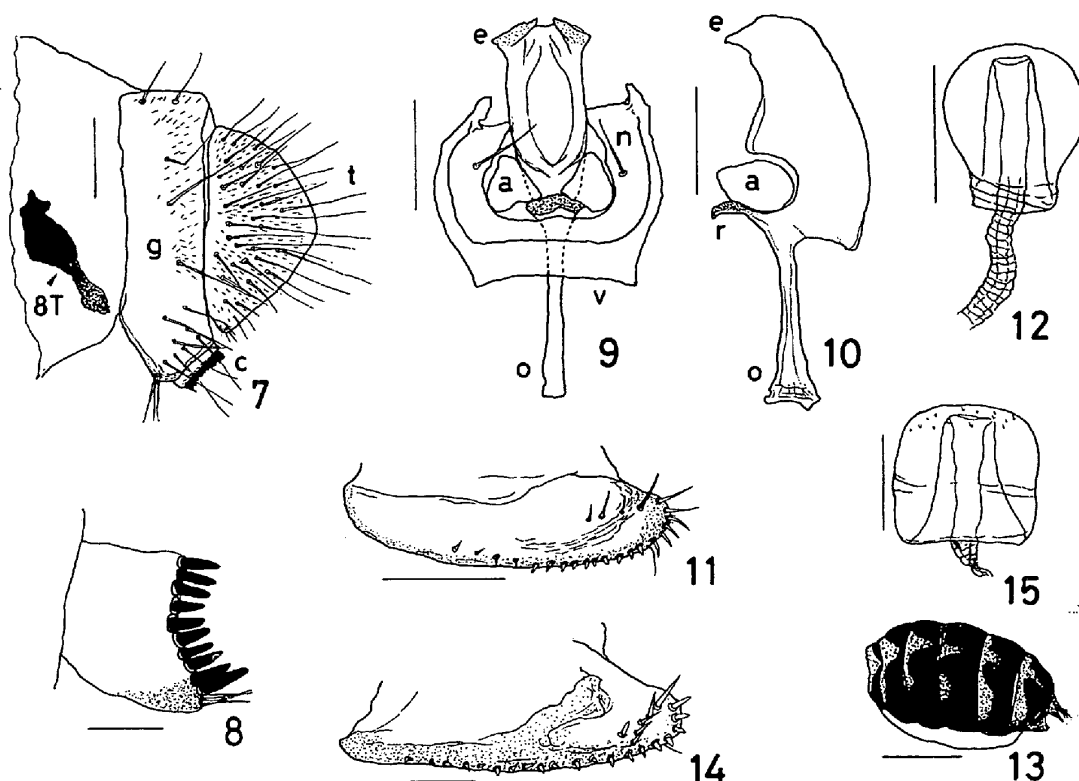
Diagnosis. C3-fringe ratio ca. 3/5. Cercus separated from epandrium, and ♂ 8th abdominal tergite pestle-shaped (Fig. 7). Aedeagus with lateral flaps at tip (Fig. 9).

Measurements. Body length (BL) ca. 3.47 mm (range: 3.20–3.72), thorax length (TL) including scutellum ca. 1.49 mm (1.32–1.68). Wing length (WL) from base to tip ca. 3.50 mm (3.16–3.82), wing width (WW) in maximum ca. 1.32 mm (1.12–1.48).

Head: Eye dark red with thick piles. Pedicel grayish brown, with 2 stout setae; 1st flagellomere dark brown. Arista with ca. 4 (3–4) dorsal and ca. 2 (1–2) ventral branches, besides terminal bifurcation. Frons dark brown, medially paler, ca. 0.48 (0.44–0.51) as broad as head. Anterior reclinate orbital seta (Orb 2) ca. 0.36 (0.26–0.50) length of posterior reclinate orbital seta (Orb 1); proclinate orbital seta (Orb 3) ca. 0.59 (0.42–0.70) length of Orb 1. Distance between Orb 3 and Orb 1 ca. 0.68 (0.55–0.83) of distance between Orb 1 and inner vertical seta (Vi). Face reddish brown; facial carina low. Clypeus blackish brown. Gena tannish brown, ca. 0.18 (0.13–0.30) as broad as maximum diameter of eye. Subvibrissal seta (Or 2) ca. 0.40 (0.20–0.67) length of vibrissa (Or 1). Palpus dark brown, club-shaped, with several setae.

Thorax: Scutum brown, medially with obscure darker longitudinal stripe; scutellum dark brown. Postpronotal lobes dark brown, with 2 stout setae; lower one ca. 0.76 (0.62–1.00) length of upper one. Length distance of dorsocentral setae ca. 0.52 (0.43–0.65) cross distance; anterior dorsocentral seta (DcA) ca. 0.66 (0.36–0.86) length of posterior one (DcP). Acrostichal setulae (Ac) in 6 regular rows. Basal scutellar setae (SctBs) nearly parallel and apical ones (SctAs) heavily convergent; SctB ca. 0.91 (0.77–1.00) length of SctA; distance from SctB to SctA ca. 0.68 (0.57–0.80) cross distance between SctAs. Anterior/posterior katapisternal seta length (Sterno-index) ca. 0.68 (0.57–0.80).

Legs dark brown; joints pale. All 1st tarsomere longer than 3 succeeding tar-



Figs. 7-15. *Drosophila (Drosophila) nigrescens* (7-12) and *Drosophila (Drosophila) zonata* (13-15). — 7, Male terminalia; 8, surstylus; 9, aedeagus and hypandrium in ventral view; 10, aedeagus in lateral view; 11, 14, oviscapt; 12, 15, spermatheca; 13, abdominal tergites. Signs: a, paramere; c, surstylus; e, aedeagus; g, epandrium; n, hypandrium; o, aedeagal apodeme; r, aedeagal guide; t, cercus; v, hypandrial apodeme. Scale lines: 0.1 mm, except for Fig. 13 (1.0 mm).

someres together.

Wing brownish fuscous. Veins dark brown; r-m and dm-cu crossveins brown. Wing indices: C ca. 3.07 (2.87-4.25) in ♂ and ca. 3.52 (3.00-4.08) in ♀, 4V ca. 1.59 (1.36-1.84), 4C ca. 0.70 (0.54-0.89), 5x ca. 1.16 (1.00-1.36), Ac ca. 1.98 (1.60-2.27), M ca. 0.44 (0.39-0.53), C3-fringe ca. 0.58 (0.35-0.79). Haltere brownish white, darker on lateral sides and bases.

Abdomen: Tergites black, slightly paler at middle of 2nd to 4th; sternites dark brown, rectangular in ♂ and quadrate in ♀.

Male terminalia (Figs. 7-10): Epandrium black, posteriorly pubescent on upper half, with ca. 15 long setae. Surstylus brown, darker on caudoventral corner, distally with ca. 10 prenisetae and ca. 3 bristle-like setae, medially with a few spines on inner sides. Cercus dark brown, nearly transparent on caudal margin, with ca. 40 long setae and with several short ones on ventral apex. Aedeagus bilobed anteriorly, ventrally curved gently; apodeme slender. Paramere pale brown, oval. Aedeagal guide relatively developed. Hypandrium light brown, with 1 pair

of paramedian spines. Hypandrial apodeme rectangular, slightly concaved at middle.

Female terminalia (Figs. 11–12): Oviscapt dark brown, slender, roundish at caudal tip, with ca. 4 lateral and ca. 15 marginal ovisensilla.

Holotype: ♂, China: Huangshan, Anhui Prov., 30. VIII. 1991 (ex. trap, H. WATABE).

Paratypes: 3 ♂, 1 ♀, same data as for the holotype; 1 ♂, 3 ♀, Zuxiba, Zhejiang Prov., 4–5. VI. 1991 (ex. trap, H. CHEN).

Distribution. China: Zhejiang Prov., Anhui Prov., Jiangxi Prov.

Relationships. *D. nigrescens* characteristically has the cercus separated from epandrium (WATABE & PENG, 1991), but it surely belongs to the *lacertosa* subgroup of the *robusta* species-group in having hypandrium with 1 pair of paramedian spines and anteriorly bilobed aedeagus. Further, the present species is somewhat related to the *robusta* subgroup in having ventrally concaved hypandrial apodeme (WATABE & NAKATA, 1989).

***Drosophila (Drosophila) zonata* sp. nov.**

(Figs. 13–15)

Diagnosis. C-index ca. 2.33, C3-fringe ratio ca. 4/5. Abdominal tergites with undulate caudal bands (Fig. 13). Spermatheca nearly quadrate (Fig. 15).

Characters that are the same as those in the foregoing species are excluded from the following description.

Measurements. ♀. BL ca. 4.20 mm, TL ca. 1.76 mm. WL ca. 4.00 mm, WW ca. 1.48 mm.

Head: Arista with ca. 4 (3–4) dorsal and ca. 1 ventral branches. Frons ca. ca. 0.49 as broad as head. Orb 2 short; Orb 3 ca. 0.63 length of Orb 1. Gena 0.17 as broad as maximum diameter of eye. Or 2 minute, ca. 0.23 length of Or 1.

Thorax: Scutum dark brown, medially with longitudinal stripe running to black scutellum. Length distance of dorsocentrals ca. 0.47 cross distance; DcA ca. 0.73 length of DcP. SctB subequal to SctA in length; distance from SctB to SctA ca. 0.76 cross distance between SctAs. Sterno-index ca. 0.53.

Wing indices: 4V ca. 1.47, 4C ca. 0.89, 5x ca. 1.20, Ac ca. 2.47, M ca. 0.38, C3-fringe ca. 0.81.

Female terminalia (Figs. 14–15): Oviscapt blackish brown, paler at caudal tip, with ca. 6 lateral and ca. 18 marginal ovisensilla. Spermatheca pale brown, flattened apically, slightly wrinkled in middle, apically with tiny warts on outer surface.

Holotype: ♀, China: Huangshan, Anhui Prov., 30. VIII. 1991 (ex. trap, H. WATABE).

Distribution. China: Anhui Province.

Relationships. *Drosophila zonata* is related to the following species of the

lacertosa subgroup, *D. medioconstricta*, in having a small value of C-index, but can be distinguished from the latter by the diagnostic characters.

***Drosophila (Drosophila) medioconstricta* WATABE, ZHANG et GAN, 1990**

Drosophila medioconstricta WATABE, ZHANG et GAN, in WATABE, LIANG & ZHANG, 1990, Zool. Sci., 7: 138.

Specimen examined. 1 ♂, Huangshan, AH, 31. VIII. 1991.

Distribution. China: Yunnan Prov., Guangdong Prov., Anhui Prov. (n. loc.).

***Drosophila (Drosophila) lacertosa* OKADA, 1956**

Drosophila lacertosa OKADA, 1956, Syst. Stud. Drosophilid. all. Fam. Japan, 158.

Specimens examined. 2 ♂, 3 ♀, Zuxipa, ZH, 4–9. VI. 1991; 7 ♂, 13 ♀, Wushi, ZH, 24–26. VI. 1991; 33 ♂, 20 ♀, Huangshan, AN, 28–31. VIII. 1991; 11 ♂, 12 ♀, Jiuhuashan, AN, 1–2. IX. 1991; 1 ♂, 1 ♀, Jingxian, AN, 20–25. VII. 1990; 537 ♂, 673 ♀, Gingangshan, JI, 25. IX.–12. X. 1992; 10 ♂, 13 ♀, Wuyishan, FU, 30. X.–3. XI. 1992; 96 ♂, 102 ♀, Wanmulin, FU, 23–30. V. 1988.

Distribution. Japan, Korea, India, Nepal, Myanmar, China: Taiwan Prov., Guangdong Prov., Yunnan Prov., Zhejiang Prov. (n. loc.), Anhui Prov. (n. loc.), Jiangxi Prov. (n. loc.), Fujian Prov. (n. loc.).

***Drosophila (Drosophila) cheda* TAN, HSU et SHENG, 1949**

Drosophila cheda TAN, HSU et SHENG, 1949, Univ. Texas Publs., (4920): 199.

Specimens examined. 35 ♂, 26 ♀, Liden, ZH, 14–20. V. 1991; 3 ♂, Zuxipa, ZH, 4–9. VI. 1991; 41 ♂, 49 ♀, Taoga, ZH, 14–18. VI. 1991; 11 ♂, 11 ♀, Wushi, ZH, 24–26. VI. 1991; 2 ♂, Huangshan, AN, 28–31. VIII. 1991; 1 ♂, 4 ♀, Jingxian, AN, 20–24. VII. 1990; 4 ♂, 3 ♀, Anfuqiao, JI, 21. IX. 1992; 22 ♂, 24 ♀, Ginganshan, JI, 1–12. X. 1992; 1 ♀, Wuyishan, FU, 3. XI. 1992.

Distribution. China: Guangdong Prov., Zhejiang Prov., Fujian Prov., Anhui Prov. (n. loc.), Jiangxi Prov. (n. loc.).

***Drosophila (Drosophila) neokadai* KANEKO et TAKADA, 1966**

Drosophila neokadai KANEKO et TAKADA 1966, Annotnes. zool. jap., 39: 55.

Specimens examined. 5 ♂, 1 ♀, Huangshan, AN, 28–31. VIII. 1991; 1 ♂, 1 ♀, Jiuhuashan, AN, 1–2. IX. 1991.

Distribution. Japan, China: Yunnan Prov., Guangdong Prov., Anhui Prov. (n. loc.).

***Drosophila (Drosophila) gani* LIANG et ZHANG, 1990**

Drosophila gani LIANG et ZHANG, in WATABE, LIANG & ZHANG, 1990, Zool. Sci., 7: 134.

Specimens examined. 11 ♂, 5 ♀, Zuxiba, ZH, 4–9. VI. 1991; 2 ♀, Taoga, ZH, 17. VI. 1991; 4 ♂, 2 ♀, Wushi, ZH, 24–26. VI. 1991; 12 ♂, 8 ♀, Huangshan, AN, 28–31. VIII. 1991; 1 ♂, 9 ♀, Jiuhuashan, AN, 1–2. IX. 1991; 6 ♂, 2 ♀, Gingangshan, JI, 25. IX.–12. X. 1992; 1 ♂, Wanmulin, FU, 23–30. V. 1988.

Distribution. Japan, China: Yunnan Prov., Guizho Prov., Guangdong Prov., Zhejiang Prov. (n. loc.), Anhui Prov. (n. loc.), Jiangxi Prov. (n. loc.), Fujian Prov. (n. loc.).

4. The *virilis* species-group***Drosophila (Drosophila) virilis* STURTEVANT, 1916**

Drosophila virilis STURTEVANT, 1916, Ann. ent. Soc. Am., 9: 330.

Specimens examined. 2 ♂, 1 ♀, Liden, ZH, 20. V. 1991; 1 ♂, Wushi, ZH, 24–26. VI. 1991; 1 ♂, 2 ♀, Xiaoshan, ZH, 5–12. VIII. 1991.

Distribution. *D. virilis* presently shows a world-wide distribution as a domestic species, but it inhabits both natural and artificial environments in southern and eastern China (TAN *et al.*, 1949; WATABE & PENG, 1991).

***Drosophila (Drosophila) kanekoi* WATABE et HIGUCHI, 1979**

Drosophila kanekoi WATABE et HIGUCHI, 1979, Annotnes. zool. jap., 52: 203.

Specimens examined. 1 ♂, Liden, ZH, 20. V. 1991; 2 ♂, Jingxian, AN, 20–24. VII. 1990.

Distribution. Japan, China: Guangdong Prov., Zhejiang Prov. (n. loc.), Anhui Prov. (n. loc.).

5. The *angor* species-group

Drosophila angor was described by LIN and TING (1971), as a member of the *robusta* species-group, while *D. wakahamai* was described by TODA and PENG (1989) as an ungrouped species of the subgenus *Drosophila*. For the latter species, WATABE and PENG (1991) established a new group of the *virilis* section, the *wakahamai* species-group. The junior author (H.W.) and Prof. M. J. TODA have recently had a chance to examine paratypes of *D. angor* deposited in Institute of Zoology, Academia Sinica, Taiwan, and they have concluded that these two species are conspecific. Thus, *D. wakahamai* is a junior synonym of *D. angor*, and a new name of the group, the *angor* species-group, is adopted accordingly.

***Drosophila (Drosophila) angor* LIN et TING, 1971**

Drosophila (Drosophila) sp. *a*, collected from Okinawa Main Island: TAKADA & WAKAHAMA, 1967, *Annotnes. zool. jap.*, **40**: 59.

Drosophila (Drosophila) angor LIN et TING, 1971, *Bull. Inst. Zool., Acad. sin.*, **10**: 31.

Drosophila (Drosophila) wakahamai TODA et PENG, 1989, *Zool. Sci.*, **6**: 163. N. syn.

Specimens examined. 26 ♂, 53 ♀, Wuyishan, FU, 30. X.–3. XI. 1992.

Distribution. Japan, China: Taiwan Prov., Guangdong Prov. Fujian Prov. (n. loc.).

***Drosophila (Drosophila) hei* WATABE et PENG, 1991**

Drosophila hei WATABE et PENG, 1991, *Zool. Sci.*, **8**: 150.

Specimen examined. 1 ♀, Gingangshan, JI, 30. IX. 1992.

Distribution. China: Guangdong Prov., Jiangxi Prov. (n. loc.).

Acknowledgments

We wish to express our sincere thanks to Prof. Masanori J. TODA (Hokkaido University) for his kind advice in identification and help in collections. This work was supported by Grants-in-Aid for Overseas Scientific Study from the Ministry of Education, Science and Culture, Japan (Nos. 01041078, 0304168) to Prof. Osamu KITAGAWA (Tokyo Metropolitan University).

References

- LIN, F. J., & J. I. TING, 1971. Several additions to the fauna of Taiwan Drosophilidae (Diptera). *Bull. Inst. Zool., Acad. sin.*, **10**: 17–35.
- MCALPINE, J. F., 1981. Morphology and terminology — adults. In MCALPINE, J. F., et al. (eds.), *Manual of Nearctic Diptera*, **1**: 9–63. Agriculture Canada Monograph No. 27, Biosystematics Research Institute, Ottawa, Ontario.
- PENG, F. T., 1937. On some species of *Drosophila* from China. *Annotnes. zool. jap.*, **16**: 20–27.
- TAN, C. C., T. C. HSU & T. C. SHENG, 1949. Known *Drosophila* species in China with descriptions of twelve new species. *Univ. Texas Publs.*, (4920): 196–206.
- TODA, M. J., & T. X. PENG, 1989. Eight species of the subgenus *Drosophila* (Diptera: Drosophilidae) from Guangdong Province, southern China. *Zool. Sci.*, **6**: 155–166.
- WATABE, H., X. LIANG & W. ZHANG, 1990 a. The *Drosophila robusta* species-group (Diptera: Drosophilidae) from Yunnan Province, southern China, with the revision of its geographic distribution. *Zool. Sci.*, **7**: 133–140.
- , ———, ——— 1990 b. The *Drosophila polychaeta* and the *D. quadrisetata* species-groups (Diptera: Drosophilidae) from Yunnan Province, southern China. *Ibid.*, **7**: 459–467.
- & S. NAKATA, 1989. A comparative study of genitalia of the *Drosophila robusta* and *D. melanica* species-groups. *J. Hokkaido Univ. Education*, (IIB), **40**: 1–18.
- & T. X. PENG, 1991. The *Drosophila virilis* Section (Diptera: Drosophilidae) from Guangdong Province, southern China. *Zool. Sci.*, **8**: 147–156.

- ZHANG, W., & M. J. TODA, 1992. A new species-subgroup of the *Drosophila immigrans* species-group (Diptera, Drosophilidae), with description of two new species from China and revision of taxonomic terminology. *Jpn. J. Ent.*, **60**: 839–850.

(Received January 21, 1993; Accepted March 5, 1993)
