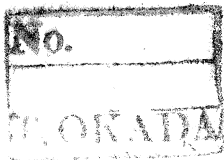


To Prof. Dr. Okada  
with compliments  
of authors.  
Fei-jann Lin



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THE *DROSOPHILA IMMIGRANS* SPECIES GROUP  
IN TAIWAN WITH DESCRIPTIONS  
OF FIVE NEW SPECIES\* \*\*

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ABSTRACT

F. J. Lin and H. C. Tseng (1973). *The Drosophila immigrans species group in Taiwan with descriptions of five new species*. Bull. Inst. Zool., Academia Sinica, 12(1): 13-26. A total of twenty-one species of *Drosophila immigrans* species group of flies have been found from Taiwan. Five of them are new species and four of them are new record in Taiwan. Of the twenty-one species identified in Taiwan, nine of them seem to be endemic species.

The *Drosophila immigrans* species group (superspecies) was first established by Sturtevant in 1942<sup>(20)</sup>, further it was divided into six species sub-groups, *immigrans*, *nasuta*, *quadrilineata*, *lineosa*, *hypocausta*, and an artificial, by Wheeler in 1969<sup>(32)</sup>. A Total of seventy species have been nominated at the present. The historical review of the species group has been reported elsewhere<sup>(32)</sup>. Most of the species are distributed from off eastern African coast, through Asia, Indonesia to Pacific islands, except *D. immigrans* which is a cosmopolitan species. Taiwan is an island which lies between Okinawa Islands and Philippines in oriental region. The landscapes and climates on this island has been described by Lin & Wheeler<sup>(14)</sup>. The species group of subgenus *Drosophila* is said to have originated

in the area of Southeast Asia and speciated widely within this region<sup>(2)</sup>. Amongst drosophilid fauna, *immigrans* species group of flies is one of the most abundant species in Taiwan. A Total of 18 nominated species of the group of flies have been reported, *Drosophila tripunctata* Duda, 1924; *D. t. formosana* Duda, 1926; *D. immigrans formosana* Sturtevant, 1927; *D. signata* Duda, 1923; *D. albomicans* Duda, 1924; *D. komaii* Kikkawa & Peng, 1938; *D. nasuta* Lamb, Sturtevant, 1927; *D. annulipes* Duda, 1924; *D. quadrilineata* de Meijere, 1911; *Zaprionus albicornis* (Enderlein), 1922; *D. bistriata* de Meijere, 1911; *Phorticella fenestrata* (Duda), 1923; *Stegana lineata* (de Meijere), 1911; *D. multistriata* Duda, 1923; *Z. multistriata* (Sturtevant), 1927; *D. xanthogaster* Duda, 1924; *D. bellus* Lin & Ting, 1971; and *Z. nigrodigitus* Lin & Ting, 1971<sup>(3,4,5,6,12,13,16,25)</sup>.

\* The article has been presented before the Sixth Annual Meeting of Chinese Biological Association, January 21st, 1973.

\*\* The Taiwan *Drosophila* Research Program was supported by Biology Center, Academia Sinica and National Science Council, Republic of China.

The present paper is dealing with the new species, *D. quinquestriata* and *D. neohypocausta*, originally described by Lin & Wheeler; and three new species, *D. tongpua*, *D. taipinsanensis* and *D. sui*, described here by Lin & Tseng.

TABLE 1.  
List of Taiwan *Drosophila immigrans* species group, with references of original description, type locality, distribution in Taiwan and cultural condition

Species name	Original description	Type locality	Distribution in Taiwan	Culture
<i>immigrans</i> sub-group:				
<i>bellus</i> *	Lin & Ting, 1971	Chi-tou, Nan-Tou, Taiwan	Chi-tou, Nan-Tou	-
<i>formosana</i>	Duda, 1926	Taipei, Taiwan	every parts of mountain area	+
<i>immigrans</i>	Sturtevant, 1921	cosmopolitan	every parts of mountain area	+
<i>ruberrima</i>	de Meijere, 1911	Java	every parts of mountain area	+
<i>signata</i> *	Duda, 1924	Chi-chi, Nan-Tou, Taiwan	Chi-tou, Nan-Tou	-
<i>taipinsanensis</i> *	Lin & Tseng, 1973	Tu-chang, I-Lan, Taiwan	Tu-chang, I-Lan; Chung-tou, I-Lan	+
<i>tongpua</i> *	Lin & Tseng, 1973	Tong-pu, Nan-Tou, Taiwan	Tong-pu, Nan-Tou; Chi-tou, Nan-Tou	+
<i>nasuta</i> sub-group:				
<i>albolicans</i>	Duda, 1924	Ma-chia, Pingtung, Taiwan	every parts of mountain area below 1,500 m altitude	+
<i>sui</i> *	Lin & Tseng, 1973	Fong-lin, Hwalien, Taiwan	Fong-lin, Hwalien	+
<i>quadrilineata</i> sub-group:				
<i>amulipes</i>	Duda, 1924	Taiwan	every parts with bamboo forest sites	+
<i>quadrilineata</i>	de Meijere, 1911	Java	Ken-ting, Pingtung	+
<i>quinquestriata</i> *	Lin & Wheeler, 1973	Alishan, Chia-I, Taiwan	Alishan, Chia-I; Ken-ting, Pingtung	-
<i>lineosa</i> sub-group:				
<i>albicornis</i> *	Enderlein, 1922	Tainan, Taiwan	Yun-shui, Chia-I	-
<i>bakeri</i>	Sturtevant, 1927	Philippines	Yun-shui, Chia-I; Ta-keng, Chia-I; Chu-shui-po, Ta-wu, Taitung	-
<i>bistriata</i>	de Meijere, 1911	Java	Tainan City	-
<i>fenestrata</i>	Duda, 1923	Java	Chi-chi, Nan-Tou; Chi-tou, Nan-Tou; Puli, Nan-Tou; Fu-shan, Taipei	-
<i>lineosa</i>	Walker, 1860	Java	Yun-shui, Chia-I	-

TABLE 1.

List of Taiwan *Drosophila immigrans* species group, with references of original description, type locality, distribution in Taiwan and cultural condition (*Continued*)

Species name	Original description	Type locality	Distribution in Taiwan	Culture
<i>multistriata</i>	Duda, 1923	New Guinea	Chi-chi, Nan-Tou; Chi-tou, Nan-Tou	—
<i>hypocausta</i> sub-group:				
<i>neohypocausta</i> *	Lin & Wheeler, 1973	Chung-tou, I-Lan, Taiwan	Chung-tou, I-Lan	+
<i>xanthogaster</i>	Duda, 1924	Toa Tsui Kutsu (Chi-tou), Taiwan	Chi-tou, Nan-Tou	+
ungrouped species:				
<i>nigrodigitus</i> *	Lin & Ting, 1971	Chi-tou, Nan-Tou, Taiwan	Chi-tou, Nan-Tou; Puli, Nan-Tou	—

\* only reported from Taiwan at present.

The *immigrans* species group in Taiwan

Group I *immigrans* sub-group:

1. *Drosophila immigrans* Sturtevant, 1921

*Drosophila immigrans* Sturtevant, 1921. Carn. Inst. Publ. Wash., 301: 83<sup>(24)</sup>.

*Drosophila (Spinulophila) immigrans* Sturtevant, 1927. Phil. J. Sci., 32: 367<sup>(25)</sup>; Kikkawa & Peng, 1938. Japan. J. Zool., 7: 524<sup>(12)</sup>; Hennig, 1941. Ent. Beihefte, 8: 152<sup>(10)</sup>.

*Drosophila (Acanthophila) immigrans* Duda, 1924. Ann. Mus. Nat. Hung., 22: 200<sup>(4)</sup>.

*Drosophila (Drosophila) immigrans* Sturtevant, 1942. Univ. Texas Publ., 4213: 32<sup>(26)</sup>; Hsu, 1949. Univ. Texas Publ., 4920: 111<sup>(11)</sup>; Tan, Hsu & Sheng, 1949. Univ. Texas Publ., 4920: 201<sup>(27)</sup>.

*Drosophila tripunctata* Sturtevant, 1918. Bull. Am. Mus. Nat. Hist., 38: 445 (nec *tripunctata* Loew)<sup>(27)</sup>.

*Drosophila (Spinulophila) tripunctata* Duda, 1923. Arch. Naturg., 90(A) 3: 210, 246<sup>(8)</sup>.

*Drosophila brouni* Hutton, 1901 (*teste* Basden, Bull. Zool. Nomencl., 9: 343<sup>(1)</sup>).

*Drosophila cilifemur* Villeneuve, 1913 (*teste* Sturtevant, 1927. Phil. J. Sci., 32: 367)<sup>(25)</sup>.

♂ and ♀: General features as described by Patterson<sup>(21)</sup> and Kikkawa & Peng<sup>(12)</sup>. Phallic

organs as described and figured by Malogolowkin<sup>(16)</sup> and Okada<sup>(17,18)</sup>. Periphallic organ figured by Hsu<sup>(11)</sup>. Egg guides described and figured by Okada<sup>(18)</sup>. Internal structures described and figured by Okada<sup>(18)</sup> and Throckmorton<sup>(28)</sup>.

Specimens examined: A large amount of specimens were collected from Alishan (Lin), (Throckmorton, Takada, Lin & Kan), (Lin & Wu), (Throckmorton & Lin); Chi-tou (Lin), (Throckmorton, Takada, Lin, Ting & Kan), (Ting), (Lin & Tseng), (Lin & Wu), (Throckmorton & Lin); Chi-tu (Lin); Chia-I (Lin), (Lin & Ting); Fong-lin (Lin & Tseng); I-Lan (Lin), (Lin, Ting & Sheng), (Throckmorton & Lin); Jui-fang (Ting); Kuang-hsing (Lin & Ting); Ku-kuan (Lin); Kuan-tzu-ling (Lin); Mei-shan (Lin); Nankang (Lin & Du), (Ting), (Lin); Puli (Lin), (Ting); Shih-lin (Du); Taroko (Lin); Wulai (Throckmorton & Lin), (Throckmorton, Lin & Ting), (Throckmorton & Ting), (Lin, Ting, Wang & Hsu), (Lin); Yun-shui (Lin & Tseng), (Lin), (Throckmorton & Lin).

2. *Drosophila formosana* Duda, 1926

*Acanthophila (Spinulophila) tripunctata* var. *formosana* Duda, 1926a. Ann. Mus. Nat. Hung., 23: 250<sup>(6)</sup>.

*Drosophila (Acanthophila) formosana* Duda, 1926b. Suppl. Ent., 14: 83, 86<sup>(7)</sup>.

*Drosophila immigrans* var. *formosana* Sturtevant, 1927. Phil. J. Sci., 32: 368<sup>(25)</sup>; Hennig, 1941. Ent. Beihefte, 8: 152<sup>(10)</sup>.

*Drosophila (Drosophila) formosana* Duda, Wheeler, 1969. Univ. Texas Publ., 6918: 211<sup>(32)</sup>.

♂ and ♀: Differences in genital apparatus of males of *D. formosana* and *D. immigrans* were described and figured by Duda<sup>(6)</sup>. Abdominal patterns of male and female were described by Duda also<sup>(6)</sup>. Fore tarsi of the male leg were figured and described by Duda<sup>(6)</sup>. Key to the *Acanthophila* was furnished by Duda<sup>(7)</sup> and Sturtevant (as var. of *immigrans*)<sup>(25)</sup>. Immunochemical, cytological and morphological distinctions and cross abilities between *immigrans* and *formosana* will be published by Zia *et al.* (in preparation).

Specimens examined: A large amount of specimens were collected from Alishan (Lin), (Throckmorton & Lin); Chi-tou (Ting), (Lin & Wu), (Lin & Tseng); Chia-I (Throckmorton & Lin); Kuan-si (Lin); Mei-shan (Lin), (Throckmorton & Lin); Nankang (Lin); Puli (Lin, Kitagawa & Wakahama); Shih-meng Dam (Lin); Tu-cheng (Lin); Wulai (Throckmorton & Lin), (Throckmorton, Lin & Ting); Yang-ming-shan (Lin).

✓ 3. *Drosophila ruberrima* de Meijere, 1911

*Drosophila ruberrima* de Meijere, 1911. Tijds. Ent., 54: 403 (Java)<sup>(16)</sup>; Duda, 1924a. Arch. Naturg., 90(A) 3: 210, 231 (Java)<sup>(4)</sup>; Duda, 1926b. Suppl. Ent., 14: 82, 86 (Java)<sup>(7)</sup>.

*Drosophila (Drosophila) ruberrima* de Meijere, Sturtevant, 1942. Univ. Texas Publ., 4213: 32<sup>(26)</sup>; Wheeler, 1949. Univ. Texas Publ., 4920: 187<sup>(20)</sup>; Patterson & Stone, 1952. Evol. Gen. Dros.,: 73<sup>(22)</sup>.

♂ and ♀: Originally described by de Meijere<sup>(16)</sup> and Duda<sup>(7)</sup>.

Type locality: Java.

New record in Taiwan.

Specimens examined: A large amount of specimens were collected from Chi-tou (Lin), (Lin

& Wu), (Lin & Tseng); Fong-lin (Lin & Tseng); Jui-suei (Lin & Tseng); Mei-shan (Lin); Nankang (Lin & Du); Taroko (Lin, Ting & Sheng), Lin & Tseng), (Lin, Wakahama & Kitagawa), (Lin); Ta-wu (Lin & Tseng); Wulai (Throckmorton & Lin), (Throckmorton & Ting), (Du & Chen), (Lin, Tseng & Wang); Yun-shui (Lin), (Lin & Tseng), (Lin & Wu).

4. *Drosophila bellus* Lin & Ting, 1971

*Drosophila (Drosophila) bellus* Lin & Ting, 1971. Bull. Inst. Zool., Academia Sinica, 10 (1): 29-31<sup>(13)</sup>; Wheeler & Hamilton, 1972. Univ. Texas Publ., 7213: 258<sup>(31)</sup>.

♂ and ♀: All features were described and figured by Lin & Ting (1971).

Type locality: Chi-tou, Nan-Tou, Taiwan.

Specimens examined: Many flies were only collected from type locality, Chi-tou (Lin & Ting), (Lin), (Lin & Wu), (Lin & Tseng).

5. *Drosophila signata* Duda, 1924

*Spinulophila signata* Duda, 1923. *nom. nud.*, Ann. Mus. Nat. Hung., 20: 48<sup>(8)</sup>.

*Drosophila (Spinulophila) signata* Duda, 1924a. Arch. Naturg., 90(A) 3: 209<sup>(4)</sup>; Sturtevant, 1927. Phil. J. Sci., 32: 366<sup>(25)</sup>.

*Drosophila (Acanthophila) signata*, Duda, 1926b. Suppl. Ent., 14: 48<sup>(7)</sup>.

*Drosophila (Drosophila) signata*, Okada, 1964. Nature & Life in Southeast Asia, 3: 457-460 (Borneo) (?)<sup>(19)</sup>; Lin & Ting, 1971. Bull. Inst. Zool., Academia Sinica, 10 (1): 33-35<sup>(13)</sup>.

♂ and ♀: Originally described by Duda according to 2 female specimens<sup>(8)</sup>, redescribed and figured by Lin & Ting<sup>(13)</sup>.

Type locality: Chip Chip (now been destroyed by buildings new name for the locality been changed as Chi-chi).

Specimens examined: Several specimens were collected from Chi-tou (Lin), (Ting), (Lin & Wu), (Throckmorton & Lin).

✓ 6. *Drosophila taipinsanensis*  
Lin & Tseng, n.sp.

♂ and ♀: Antennae dark brown, second

segment with 2 short setae; third segment darker, pollinose. Arista branches short, 4 above and 2 below in addition to a terminal fork. Front dark brown, anterior margin with a broad orange band and narrower anteriorly, sharply wider posteriorly. Periorbits dark brown, narrow, reach anterior 2/3 of front. Orbitals, *orb-2* 1/2 length of *orb-1* and *orb-3*, *orb-1* situated a little nearer to inner vertical bristles than to *orb-3*. Oral only one, very prominent. Carina low, brown. Face narrow, brown. Clypeus reddish brown. Palpi reddish brown, with 2 apical bristles and several hairs. Proboscis reddish brown. Ocellar triangle not separated from frons, brown, sub-shining. Ocellars divergent. Eyes red, with black thin piles. Cheek dirty brown, relatively wide, width about 1/5 of eye greatest diameter. Postvertical bristles strong, length equal to ocellars.

Mesonotum and scutellum dirty dark brown, sub-shining. Acrostichal hairs in 6 rows. Anterior dorsocentral bristles 3/5 length of posterior ones. Cross distance between anterior dorsocentrals about 1.6 times of the distance from anterior to posterior ones. No prescutellars. Pleurae reddish brown, with 3 black stripes. Humeral bristles 3, all strong, middle one 9/10 length of upper one and lower 4/5 of upper. Sternopleural bristles 3, posterior one very strong. Sterno-index about 0.47. Anterior scutellar bristles in equal length to posterior ones, parallel to convergent. Posterior ones convergent. Halteres brown, stalk black on outer side.

Legs yellowish brown. Last segments of all legs blackish. Inner side of fore femur with a row of about 7 stout bristles. Apical bristles on middle and hind tibiae. Preapical bristles on all three tibiae.

Male abdominal tergites yellow, 2T with black <sup>ventral</sup> middle interrupted caudal bands, 6T black shining, genital arch and anal plates black. Female, all segments with black bands all interrupted at middle, anal plates black. Sternites pale white. Male and female genitalia as shown in Figs. 1a-1i.

Wings a little brownish diffused. Veins

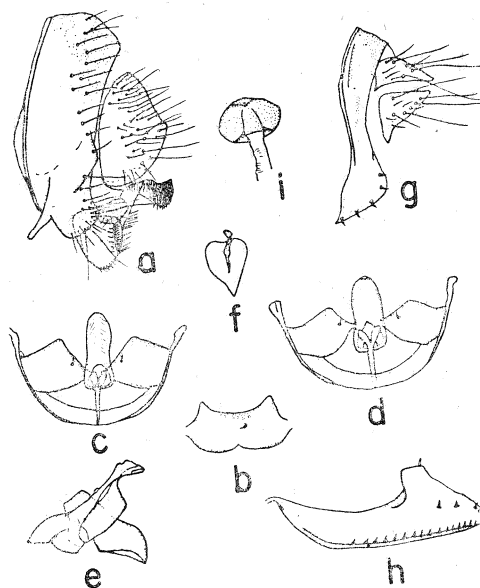


Fig. 1. *Drosophila taipinsanensis*— a, male periphallallic organ with an extra bridge connected with anal plates. b, decasternum. c-e, male copulatory apparatus (dorsal, ventral and lateral views). f, upper view of ejaculatory apodeme. g, female periphallallic organ. h, egg guide. i, spermatheca.

brown. Subcosta black. Anal vein prominent. Posterior cross vein clouded. C-1 bristles 2, upper one stronger, in equal length. C-3 fringe on its basal 1/3 only. C index about 3.72. 4V index about 1.56. 5x index about 1.00. 4c index about 0.68. Ac index about 2.20.

Body length: 3.00mm. Wing length: 3.00mm. Type locality: Tu-chang, I-Lan, Taiwan. Holotype: ♂, collected from Tu-chang, I-Lan, Taiwan; I 23, 1973 (Lin & Tseng). Allotype: ♀, same data as holotype. Paratypes: 5 males and 5 females, same data as holotype.

(All types deposit in Institute of Zoology, Academia Sinica).

Specimens examined: Academia Sinica Stock nos. 0112.1, 0113.1, 0113.2, 0113.3 and 0113.4 were collected from Chung-tou, I-Lan (Lin & Tseng); Tu-chang, I-Lan (Lin & Tseng).

TABLE 1.

List of Taiwan *Drosophila immigrans* species group, with references of original description, type locality, distribution in Taiwan and cultural condition (*Continued*)

Species name	Original description	Type locality	Distribution in Taiwan	Culture
<i>multistriata</i>	Duda, 1923	New Guinea	Chi-chi, Nan-Tou; Chi-tou, Nan-Tou	—
<i>hypocausta</i> sub-group:				
<i>neohypocausta</i> *	Lin & Wheeler, 1973	Chung-tou, I-Lan, Taiwan	Chung-tou, I-Lan	+
<i>xanthogaster</i>	Duda, 1924	Toa Tsui Kutsu (Chi-tou), Taiwan	Chi-tou, Nan-Tou	+
ungrouped species:				
<i>nigrodigitus</i> *	Lin & Ting, 1971	Chi-tou, Nan-Tou, Taiwan	Chi-tou, Nan-Tou; Puli, Nan-Tou	—

\* only reported from Taiwan at present.

The *immigrans* species group in Taiwan

Group I *immigrans* sub-group:

1. *Drosophila immigrans* Sturtevant, 1921  
*Drosophila immigrans* Sturtevant, 1921. *Carn. Inst. Publ. Wash.*, 301: 83<sup>(24)</sup>.  
*Drosophila (Spinulophila) immigrans* Sturtevant, 1927. *Phil. J. Sci.*, 32: 367<sup>(25)</sup>; Kikkawa & Peng, 1938. *Japan. J. Zool.*, 7: 524<sup>(12)</sup>; Hennig, 1941. *Ent. Beihefte*, 8: 152<sup>(10)</sup>.  
*Drosophila (Acanthophila) immigrans* Duda, 1924. *Ann. Mus. Nat. Hung.*, 22: 200<sup>(4)</sup>.  
*Drosophila (Drosophila) immigrans* Sturtevant, 1942. *Univ. Texas Publ.*, 4213: 32<sup>(26)</sup>; Hsu, 1949. *Univ. Texas Publ.*, 4920: 111<sup>(11)</sup>; Tan, Hsu & Sheng, 1949. *Univ. Texas Publ.*, 4920: 201<sup>(27)</sup>.  
*Drosophila tripunctata* Sturtevant, 1918. *Bull. Am. Mus. Nat. Hist.*, 38: 445 (nec *tripunctata* Loew)<sup>(27)</sup>.  
*Drosophila (Spinulophila) tripunctata* Duda, 1923. *Arch. Naturg.*, 90(A) 3: 210, 246<sup>(3)</sup>.  
*Drosophila browni* Hutton, 1901 (*teste* Basden, *Bull. Zool. Nomencl.*, 9: 343<sup>(1)</sup>).  
*Drosophila cilifemur* Villeneuve, 1913 (*teste* Sturtevant, 1927. *Phil. J. Sci.*, 32: 367<sup>(25)</sup>).  
♂ and ♀: General features as described by Patterson<sup>(21)</sup> and Kikkawa & Peng<sup>(12)</sup>. Phallic

organs as described and figured by Malogolowkin<sup>(16)</sup> and Okada<sup>(17,18)</sup>. Periphallitic organ figured by Hsu<sup>(11)</sup>. Egg guides described and figured by Okada<sup>(18)</sup>. Internal structures described and figured by Okada<sup>(18)</sup> and Throckmorton<sup>(28)</sup>.

Specimens examined: A large amount of specimens were collected from Alishan (Lin), (Throckmorton, Takada, Lin & Kan), (Lin & Wu), (Throckmorton & Lin); Chi-tou (Lin), (Throckmorton, Takada, Lin, Ting & Kan), (Ting), (Lin & Tseng), (Lin & Wu), (Throckmorton & Lin); Chi-tu (Lin); Chia-I (Lin), (Lin & Ting); Fong-lin (Lin & Tseng); I-Lan (Lin), (Lin, Ting & Sheng), (Throckmorton & Lin); Jui-fang (Ting); Kuang-hsing (Lin & Ting); Ku-kuan (Lin); Kuan-tzu-ling (Lin); Mei-shan (Lin); Nankang (Lin & Du), (Ting), (Lin); Puli (Lin), (Ting); Shih-lin (Du); Taroko (Lin); Wulai (Throckmorton & Lin), (Throckmorton, Lin & Ting), (Throckmorton & Ting), (Lin, Ting, Wang & Hsu), (Lin); Yun-shui (Lin & Tseng), (Lin), (Throckmorton & Lin).

2. *Drosophila formosana* Duda, 1926  
*Acanthophila (Spinulophila) tripunctata* var. *formosana* Duda, 1926a. *Ann. Mus. Nat. Hung.*, 23: 250<sup>(6)</sup>.

Holotype: ♂, collected from Tong-pu, Nan-Tou, Taiwan; V 15, 1972 (Lin).

Allotype: ♀, same data as holotype.

Paratypes: 7 males and 6 females, same data as holotype.

(All of the types are deposited in Institute of Zoology, Academia Sinica).

Specimens examined: Academia Sinica Stock nos. 0099.1, 0099.3, 0099.4, 0100.1 and 0100.2 were collected from Tong-pu, Nan-Tou (Lin); Chi-tou, Nan-Tou (Lin & Tseng).

#### Group II *nasuta* sub-group:

##### 8. *Drosophila albomicans* Duda, 1924

*Drosophila (Spinulophila) albomicans* Duda. 1923. *nom. nud.*, Ann. Mus. Nat. Hist. Hung., 20: 47<sup>(8)</sup>; Duda, 1924a, b. Arch. Naturg., 90(A)3: 209, 245<sup>(4,5)</sup>; Hennig, 1941. Ent. Beihefte, 8: 153<sup>(10)</sup>.

*Drosophila (Spinulophila) komaii* Kikkawa & Peng, 1938. Jap. J. Zool., 7: 525-526<sup>(12)</sup>; Hennig, 1941. Ent. Beihefte, 8: 152<sup>(10)</sup>.

*Drosophila (Drosophila) albomicans*, Wheeler, 1969. Univ. Texas Publ., 6918: 213<sup>(32)</sup>.

♂ and ♀: Originally described by Duda<sup>(3,4,5)</sup>, figured and described by Okada<sup>(18)</sup> and described by Kikkawa and Peng<sup>(12)</sup>. Chromosome configuration described by Kikkawa & Peng<sup>(12)</sup> and Wilson *et al.*<sup>(32)</sup>. Male genitalia was described by Okada<sup>(18)</sup> and Wilson *et al.*<sup>(32)</sup>.

Type locality: Paroe, Paiwan Distr., (now been changed as Ma-chia Hsiang, Ping-tung Hsien, Taiwan).

Specimens examined: A large amount of specimens were collected from Chi-peng (Lin & Wang); Chi-tou (Lin), (Ting), (Throckmorton, Takada, Lin, Ting & Kan), (Lin & Tseng), (Lin & Wu), (Throckmorton & Lin); Chi-tu (Lin), (Throckmorton & Lin); Chia-I (Lin), (Lin & Ting), (Lin & Wu), (Lin & Tseng); Chu-kou (Lin); Fong-lin (Lin & Tseng); Fushan (Lin); Hsin-Chu (Lin); I-Lan (Ting), (Lin), (Throckmorton & Lin), (Lin & Tseng); Jui-fang (Ting); Jui-suei (Lin & Wang), (Lin

& Tseng); Ken-ting (Ting), (Throckmorton & Lin), (Lin), (Lin & Tseng); Kuan-tzu-ling (Lin); Mei-shan (Lin), (Ting); Mu-kua-hsi (Lin); Nankang (Lin & Duda), (Lin, Tseng & Wang), (Lin), (Throckmorton & Lin); Peng-Hu Is. (Lin); Puli (Ting), (Lin); San-hu-tang (Ting); San-ti-meng (Ting); Seng-ken (Lin); Shih-tou-shan (Tseng & Wang); Szu-chung-hsi (Throckmorton & Lin); Tai-pa-liu-chiu (Lin & Wang); Taroko (Lin, Ting & Sheng), (Ting), (Lin), (Lin, Wakahama & Kitagawa); Ta-wu (Lin & Tseng); Wu-fong Fall (Ting); Wulai (Lin), (Throckmorton & Lin), (Ting), (Lin, Ting, Wang & Hsu), (Lin, Tseng & Wang); Yun-shui (Lin), (Lin & Wu), (Lin & Tseng), (Throckmorton & Lin); Tu-chang (Lin & Tseng).

##### 9. *Drosophila sui* Lin & Tseng, n.sp.

♂ and ♀: Antennae, second segment blackish dark brown with 2 prominent setae; third segment darker, pollinose. Arista branches 6 above and 3 below in addition to a terminal fork. Front dark brown covered with silvery on entire frons and orbits from lower angular view in male. Female no such silvery shining. Periorbits unclear, not separate from front. Orbitals, *orb-1* nearer to inner vertical bristles than to *orb-3*; *orb-2* situated between *orb-1* and *orb-3* in equal distance, thin, 1/3 length of other two. Orals 2, second one 2/3 length of first one. Carina blackish dark brown, carinated but not reach anterior margin of face. Face dark brown, lower margin of face especially on lower carina black. Clypeus blackish dark brown, broad. Palpi dark brown, with one long apical and one median subapical bristles and one median hair on lower middle portion, club-like. Proboscis brown entirely. Ocellar triangle blackish brown. Ocellars normal. Eyes red, with white piles. Eyes a little oblique to body axis. Cheek brown, black on base of vibrissae, width about 1/8 of eye greatest diameter. Postvertical bristles slightly convergent, length equal to *orb-1*.

Mesonotum and scutellum dark brown with faint blackish markings. Acrostichal hairs in 10

rows. Anterior dorsocentral bristles about 3/5 length of posterior ones. Cross distance between anterior dorsocentrals about twice as the distance from anterior to posterior. No prescutellars. Pleurae dark reddish brown. Humeral bristles 2, long, in equal length. Sternopleural bristles 3, all strong. Sterno-index about 0.61. Anterior scutellars parallel, posterior pair convergent. Halteres reddish brown.

Legs reddish brown. Inner side of fore femur with a row of about 14 stout spine-like bristles. Fore metatarsus of male short, with fine hairs on inner side which forming a sex comb-like, similar fine hairs on inner side of following tarsal segment (Fig. 3f). Apical bristles on fore and middle legs. Preapical bristles on all three tibiae. Two long spines on inner side of hind-tibia distally.

Abdominal tergites reddish brown, each segment with black narrow band which a little interrupted at middle or rather complete. Sternites yellowish brown. Male genitalia as shown in Figs. 3a-3e.

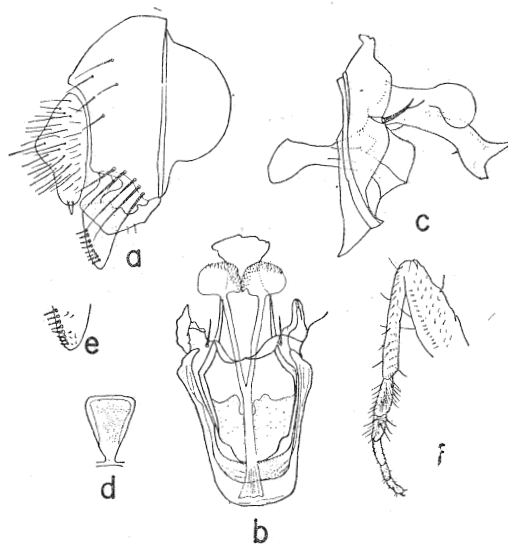


Fig. 3. *Drosophila sui* — a, male periphallallic organ. b-c, male copulatory apparatus. d, decasternum. e, inner side of clasper. f, male fore leg.

Wings light brown diffused. Veins brown. Posterior cross vein clouded. C-1 bristles 2, one strong upper and one inconspicuous lower. C-3 fringe on its basal less than half. C index about 4.00. 4V index about 1.21. 5x index about 1.18. 4c index about 0.52. Ac index about 2.00.

Body length: 4.50-5.50 mm. Wing length: 5.50-6.50 mm.

Type locality: Fong-lin, Hwalien, Taiwan.

Holotype: ♂, Fong-lin, Hwalien, Taiwan; XII 20, 1972 (Lin & Tseng).

Allotype: ♀, collected together with holotype.

Paratypes: 5 males and 5 females same data as holotype. (All of the types deposit in Institute of Zoology, Academia Sinica).

The name *sui* is in honor of Dr. J. C. Su, Director, Institute of Zoology, Academia Sinica for his encouraging and promoting the *Drosophila* program here in Taiwan.

Group III *quadrilineata* sub-group:

✓ 10. *Drosophila annulipes* Duda, 1924

*Drosophila (Spinulophila) annulipes* Duda, 1923. *nom. nud.*, Ann. Mus. Nat. Hung., 20: 58<sup>(3)</sup>; Duda, 1924a, b. Arch. Naturg., 90(A) 3: 209, 221, 250<sup>(4,5)</sup>; Duda, 1962b. Suppl. Ent., 14: 84<sup>(7)</sup>.

*Drosophila (Drosophila) annulipes*, Wheeler, 1949. Univ. Texas Publ., 4920: 187<sup>(20)</sup>; Patterson & Stone, 1952. Evol. Gen. Dros.,: 39<sup>(22)</sup>. Wheeler & Takada, 1964. Insect Micronesia, 14(6): 183<sup>(30)</sup>. Okada, 1966. Bull. Brit. Mus. (Nat. Hist.) Suppl., 6: 110<sup>(20)</sup>.

*Drosophila virgata* Tan, Hsu & Sheng, 1949. Univ. Texas Publ., 4920: 203<sup>(27)</sup>; Okada, 1955. Kontyû, 25: 98<sup>(17)</sup>; Okada, 1956. Syst. Study Dros. Japan.,: 149<sup>(18)</sup>.

♂ and ♀: Described and figured by Duda<sup>(3-5)</sup>, Tan, Hsu & Sheng<sup>(27)</sup> and Okada<sup>(18)</sup>. Bamboo habitats.

Type locality: Taiwan (Taihoku, now been changed as Taipei; Toa Tsui Kutsu, now as Chi-tou; and Macuyama).

Specimens examined: A lot of specimens were collected from Alishan (Throckmorton & Lin);



Chi-tou (Lin), (Ting), (Lin & Wu), (Lin & Tseng); Chi-tu (Lin); Nankang (Lin), (Throckmorton & Lin); Puli (Lin); Yun-shui (Lin), (Lin & Tseng), (Lin & Wu).

11. *Drosophila quadrilineata*  
de Meijere, 1911

*Drosophila quadrilineata* de Meijere, 1911. Tijds. Ent., 54: 396 (Java)<sup>(16)</sup>.

*Chaetodrosophilella quadrilineata*, Duda, 1923. Ann. Mus. Nat. Hung., 20: 40<sup>(3)</sup>; Wheeler & Takada, 1964. Insect Micronesia, 14(6): 198<sup>(30)</sup>.

*Chaetodrosophila quadrilineata*, Duda, 1924a. Arch. Naturg., 90 (A) 3: 180, 230<sup>(4)</sup>; Duda, 1926b. Suppl. Ent., 14: 85<sup>(7)</sup>.

*Drosophila (Chaetodrosophilella) quadrilineata*, Sturtevant, 1927. Phil. J. Sci., 32: 367<sup>(25)</sup>.

*Drosophila (Drosophila) quadrilineata*, Wheeler, 1969. Univ. Texas Publ., 6918: 214<sup>(32)</sup>.

♂ and ♀: Originally described by de Meijere<sup>(16)</sup>, described and figured by Duda<sup>(3-5)</sup>, Wheeler & Takada<sup>(30)</sup>, and Sturtevant<sup>(25)</sup>.

Type locality: Java.

Specimens examined: Academia Sinica Stock no. 0101.1 and several specimens were collected from Ken-ting, Pingtung (Lin), (Throckmorton & Lin), (Lin & Tseng), (Ting); Lan-yu (Lin & Tseng).

12. *Drosophila quinquestriata* Lin & Wheeler, n. sp.

♂ and ♀: Antennae, second segment yellowish orange, anteriorly blackish with two prominent setae; third segment blackish light brown, pollinose. Arista branches 4 to 5 above and 3 below in addition to a terminal fork. Front yellowish orange, lateral margins with black stripes which reach anterior margin. Frontal hairs present. Periorbits yellowish orange, rather wide, reach anterior 3/4 of front. Orbitals, *orb-2* 2/5 length of *orb-3* and 1/4 of *orb-1*, *orb-1* situated at equal distance between *orb-3* and inner vertical bristles. Oral only one. Carina yellow, nose-like carinated, reach anterior 3/4 of face. Face yellow. Clypeus reddish yellow. Palpi yellow with

one apical and one sub-apical bristles. Proboscis yellow. Labrum blackish. Ocellar triangle black. Ocelli yellowish orange. Ocellars normal. Eyes bright red. Cheek light brown, width about 1/7 of eye greatest diameter. Postvertical bristles parallel to convergent.

Mesonotum orange brown with 5 black stripes, one on the middle, 2 on dorsocentral lines which extended to scutellum and 2 on laterals. Scutellum orange brown. Acrostichal hairs in 8 rows orderly. Anterior dorsocentral bristles 2/3 length of posterior ones. Cross distance between anterior dorsocentrals about twice as the distance from anterior to posterior ones. No prescutellar bristles. Pleurae orange with 3 black stripes. Humerals 2, upper one longer than lower one. Sternopleural bristles 3. Sterno-index about 0.64. Anterior scutellar bristles divergent, length equal to posterior ones. Posterior scutellar bristles convergent. Halteres orange brown.

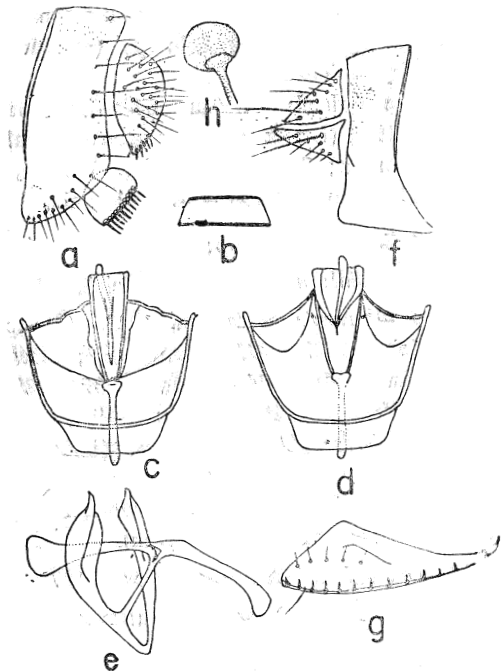


Fig. 4. *Drosophila quinquestriata* — a, male periphallallic organ. b, decasternum. c-e, male copulatory apparatus. f, female periphallallic organ. g, egg guide. h, spermatheca.

Legs orange. Inner side of fore femur with a row of 8 to 10 stout bristles. Male fore tarsi bristly. Apical bristle on middle tibia. Preapical bristles on all three tibiae. Legs not annulated.

Abdominal tergites orange with black caudal band on each segment which are interrupted at middle. Genitalia shown in Figs. 4a-4h.

Wings hyaline, a little brown diffused, with higher costal index. Veins light brown. Costa reaches apical 4th vein. Third and 4th veins parallel. Posterior cross vein clouded. C-1 bristles 2, long, in equal length. C-3 fringe on its basal 1/3. C index about 3.90. 4V index about 1.54. 5x index about 0.61.

Body length: 3.10mm. Wing length: 3.40mm. Holotype: ♂, collected from Alishan, Taiwan (Throckmorton & Lin), VII 29, 1968. (deposits in University of Texas).

Allotype: ♀, collected together with holotype (deposits in University of Texas).

Paratypes: 11 paratypes (6 males and 5 females) collected together with holotype (deposit in University of Texas).

Specimens examined: Alishan, Chia-I, Taiwan. VII 29, 1968 (Lin & Throckmorton), 7 males and 6 females; Ken-ting, Pintung, Taiwan, V 18, 1968 (Throckmorton & Lin), 1 male.

Group IV *lineosa* sub-group:

*Phorticella* 13. *Drosophila albicornis* (Enderlein), 1922

*Zapionus albicornis* Enderlein, 1922. Deutsch. Ent. Zeit., 1922: 295 (Formosa)<sup>(92)</sup>; Duda, 1939. Ann. Mus. Nat. Hung., 32: 18<sup>(93)</sup>; Hennig, 1941. Ent. Beihefte, 8: 155<sup>(10)</sup>.

*Drosophila (Drosophila) albicornis* (Enderlein), Wheeler, 1969. Univ. Texas Publ., 6918: 212<sup>(32)</sup>.

Specimens examined: Yun-shui, Chia-I, 2 males (Lin), 1 male and 2 females (Lin).

*Phorticella* 14. *Drosophila bakeri* (Sturtevant), 1927

*Zapionus (Phorticella) bakeri* Sturtevant, 1927. Phil. J. Sci., 32: 366<sup>(25)</sup>.

*Drosophila (Drosophila) bakeri* (Sturtevant), Wheeler, 1969. Univ. Texas Publ., 6918: 212<sup>(32)</sup>.

♂ and ♀: Originally described by Sturtevant<sup>(25)</sup> from Philippines.

Type locality: Philippines.

Specimens examined: Yun-shui, Chia-I, 1 male and 1 female (Ting); Ta-keng, Chia-I, 2 females (Ting); Chu-shui-po, Ta-wu, Taitung, 2 males and 1 female (Lin & Tseng).

*Phorticella* 15. *Drosophila bistriata* de Meijere, 1911

*Drosophila bistriata* de Meijere, 1911. Tijd. Ent., 54: 397<sup>(10)</sup>.

*Phorticella bistriata* (de Meijere), Duda, 1923. Ann. Mus. Nat. Hung., 20: 36<sup>(93)</sup>; Hennig, 1941. Ent. Beihefte, 8: 147<sup>(10)</sup>.

*Drosophila (Drosophila) bistriata* de Meijere, Wheeler, 1969. Univ. Texas Publ., 6918: 212<sup>(32)</sup>.

♂ and ♀: Originally described by de Meijere<sup>(10)</sup>, specimens from Java and Sumatra. Duda<sup>(93)</sup> has Sauter's Formosan collection in Budapest Museum, Hungary, classified them and discussed the differences between *fenestrata* and *bistriata*.

Type locality: Srondol, Java (Semarang).

Previous record in Taiwan: Toyenmongai bei Tainan (Sauter), (in Budapest Museum). Never collected by the authors.

*Phorticella* 16. *Drosophila fenestrata* (Duda), 1923

*Phorticella fenestrata* Duda, 1923. Ann. Mus. Hung., 20: 36<sup>(93)</sup>; Hennig, 1941. Ent. Beihefte, 8: 147<sup>(10)</sup>.

*Drosophila (Drosophila) fenestrata* (Duda), Wheeler, 1969. Univ. Texas Publ., 6918: 212<sup>(32)</sup>.

♂ and ♀: Originally described and compared with *bistriata* by Duda in Budapest Museum collections<sup>(93)</sup>.

Type locality: Java.

Previous record from Taiwan: Chip Chip (been changed as Chi-chi), collected by H. Sauter (Duda leg.).

Specimens examined: Several specimens were collected from Fu-shan, Wulai (Lin); Ta-shui-ku, Chi-tou (Lin); Puli (Ting); Chi-tou (Lin), (Throckmorton & Lin).

17. *Drosophila lineosa* (Walker), 1860

*Notiphila lineosa* Walker, 1860. Proc. Linn. Soc. London 4 (*taste*, Wheeler<sup>(32)</sup>).

*Drosophila (Drosophila) lineosa* (Walker),  
Wheeler, 1969. Univ. Texas Publ., 6918:  
212<sup>(32)</sup>.

Type locality: Java. Celebes

New record in Taiwan.

Specimen examined: Yun-shui, Chia-I (Lin, 1 ♂).

18. *Drosophila multistriata* Duda, 1923

*Stegana lineata* de Meijere, 1911. Tijds. Ent., 54:  
420<sup>(16)</sup>.

*Drosophila multistriata* Duda, 1923. Ann. Mus.  
Nat. Hung., 20: 57<sup>(9)</sup>.

*Zaprionus multistriata* Sturtevant, 1927. Phil. J.  
Sci. 32: 367<sup>(25)</sup>.

*Drosophila (Drosophila) multistriata* Duda,  
Wheeler, 1969. Univ. Texas Publ., 6918:  
212<sup>(32)</sup>.

♂ and ♀: Originally described as *Stegana*  
by de Meijere<sup>(16)</sup>. Duda<sup>(9)</sup> described as new  
species of *Drosophila* and figured its wing, and  
Sturtevant<sup>(25)</sup> recognized it as *Zaprionus*.

Type locality: New Guinea.

Previous record in Taiwan: Chip Chip (been  
changed as Chi-chi) (specimens deposit in  
Budapest Museum).

Specimen examined: Chi-tou, Nan-Tou, Taiwan,  
(Lin, 1 ♀).

Group V *hypocausta* sub-group:

19. *Drosophila neohypocausta* Lin &  
Wheeler, n. sp.

♂ and ♀: Antennae dark brown, second  
segment with 3 prominent setae; third segment  
twice longer than second one, pollinose. Arista  
branches long, 5 above and 3 below in addition  
to a fork. Front reddish brown, anterior margin  
with a broad orange brown band, width about  
3/5 of its middle length. Frontal hairs present.  
Periorbits reddish brown. Orbitals, *orb-2* 1/2  
length of *orb-3* and 1/3 length of *orb-1*, *orb-1*  
situated at the middle between *orb-3* and inner  
vertical bristles. Orals 2, second one 2/3 length  
of 1st one. Carina light brown, nose-like, lower  
portion wider, almost reach anterior margin of  
face. Face brown, flat. Clypeus reddish brown  
with a thin black line. Palpus brown, with 3

setae downward. Proboscis dark brown. Labrum  
black. Ocellar triangle blackish brown, narrow.  
Ocelli brown. Ocellar bristles normal. Eyes  
dark red, with thick piloses. Cheek blackish  
light brown, width about 1/5 of eye greatest  
diameter. Postvertical bristles strong, convergent.

Mesonotum and scutellum dark brown.  
Acrostichal hairs in 8 rows. Anterior dorso-  
central bristles nearly equal length to posterior  
ones. Cross distance between anterior dorso-  
central bristles about twice as the distance from  
anterior to posterior ones. No prescutellar bristles.  
Pleurae male black, female dark brown.  
Humeral 2, lower one thinner. Sternopleural  
bristles 2. Anterior scutellar bristles parallel to  
convergent. Posterior ones convergent. Halteres  
dark brown.

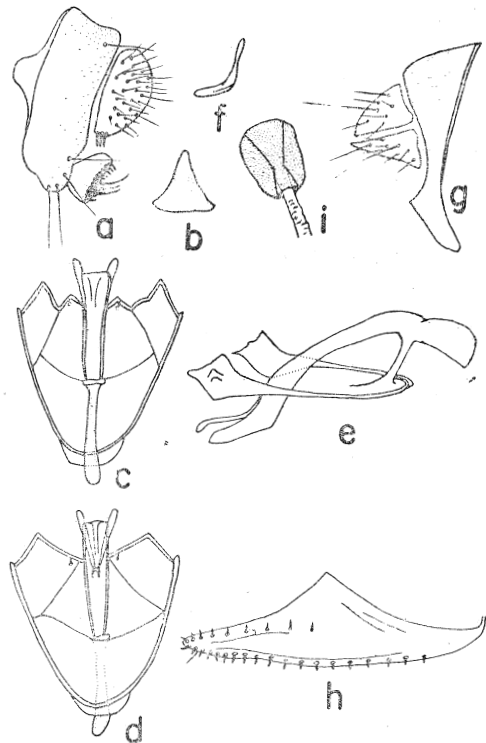


Fig. 5. *Drosophila neohypocausta*—a, male periphallid organ. b, decasternum. c-e, male copulatory apparatus (dorsal, ventral and lateral views.) f, ejaculatory apodeme. g, female periphallid organ. h, egg guide. i, spermatheca.

Legs dark brown. Inner side of fore femur with a row of about 10 to 12 stout bristles. Apical bristles on middle tibia. Preapical bristles on all three tibiae. Distal metatarsus of hind leg with 2 spines.

Abdominal tergites, male black, only anteriorly dark brown, female dull light brown entirely. Genitalia shown in Figs. 5a-5i.

Wing a little brownish diffused, wide. Veins light brown. Third and 4th veins parallel. Costa reach apical 4th vein. Posterior cross vein clouded. C-1 bristles 2, in equal length. C-3 fringe on its basal 1/2. C index about 3.40. 4V index about 1.21. 5x index about 0.73. 4c index about 0.62. Ac index about 1.52.

Body length: 2.80 mm. Wing length: 2.80 mm.

Type locality: Chung-tou, I-Lan, Taiwan.

Holotype: ♂, collected from Chung-tou, I-Lan; I 19, 1968 (Lin).

Allotype: ♀, same data as holotype.

Paratypes: 15 paratypes, same data as holotype.

(All of the types are deposited in University of Texas).

✓ 20. *Drosophila xanthogaster* Duda, 1924

*Drosophila xanthogaster* Duda, 1924b. Arch. Naturg., 90(A) 3: 248<sup>(52)</sup>; Hennig, 1941. Ent. Bethefte, 8: 154<sup>(10)</sup>; Wheeler, 1969. Univ. Texas Publ., 6918: 212<sup>(32)</sup>.

♂ and ♀: Originally described and figured by Duda<sup>(52)</sup>.

Type locality: Toa Tsui Kutsu (now been changed as Chi-tou), Nan-Tou, Taiwan.

Specimens examined: Academia Sinica Stock nos. 0107.17, 0107.18 and 0107.19 were collected from Chi-tou, Nan-Tou (Lin & Tseng).

Group VI ungrouped species:

✓ 21. *Drosophila nigrodigitus*  
(Lin & Ting), 1971

*Zaprionus nigrodigitus* Lin & Ting, 1971. Bull. Inst. Zool., Academia Sinica, 10: 20-22<sup>(13)</sup>.

♂ and ♀: Originally described and figured by Lin & Ting<sup>(13)</sup> as *Zaprionus*.

Type locality: Chi-tou, Nan-Tou, Taiwan.

(Holotype and allotype are deposited in University of Texas, paratypes are deposited in Institute of Zoology, Academia Sinica).

Specimens examined: Several specimens were collected from Chi-tou, Nan-Tou (Lin & Ting); Puli, Nan-Tou (Ting).

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## 臺灣之大果蠅 (*Drosophila immigrans*) 種群

林 飛 棧 曾 和 枝

本文討論在臺灣之二十一種大果蠅種群之果蠅的分類類目，並描述五個新種及兩個在臺灣的新紀錄。二十一種果蠅當中，可能有九種是臺灣的土產種。