

## I. Introduction

A quarter of a century has elapsed since the appearance of an epoch-making contribution by Kikkawa & Peng (1938), in which they described 27 species, including 11 new, of the genus *Drosophila* from Japan, and adjacent countries. They referred not only to the adult but the earlier stages, and the chromosomal configurations of each species as well; they made, moreover, extensive researches in the fauna of the flies inhabiting dwelling houses and neighborhood, for the purpose of providing with materials favorable for the investigations of the drosophilists in genetics and other fields. Recently, however, it has become increasingly necessary particularly for the population geneticists to get further taxonomic and faunistic informations about Japanese drosophilid flies of the so-called "wild" species, that haunt mountains or woody lands considerably remote from the human habitations.

Prof. Dr. D. Moriwaki of the Tokyo Metropolitan University, who has been most anxious to solve the urgent problem of filling the gaps in our knowledge on the drosophilid fauna of Japan, especially since the day, in 1950, he visited Prof. Th. Dobzhansky at his institute of the Columbia University to discuss about the problem, urged on the present author to carry out the work, which involves the systematic accounts of the family Drosophilidae of Japan. Several survey trips in various parts of Japan have up to present been carried out by the members of the Institute of Genetics directed by Prof. Moriwaki, so as to obtain as many materials for research as possible, applying not only the fruit-traps but also sweeping, light-traps, collection at tree-bloods and fungi, as well as any other means available. A vast number of materials has been presented to our laboratory for study, by many investigators in Japan and abroad. Brief synopses of the geographical distribution and feeding habits of adult flies are given (Chapter V), although the materials are still unsatisfactory in some respects.

The descriptions of species are in most cases based on the adult stages. The early stages will be studied elsewhere. The redescrptions of known species are as a rule avoided, unless either the species have not been scientifically studied in Japan or have characters that have either been overlooked, or considered different from the corresponding characters of the original forms. Special care has been paid to describe male and female genitalia, as has widely been done by the majority of taxonomic entomologists, and also to investigate internal structures, such as digestive organs including Malpighian tubes, and male and female internal reproductive organs, as they have generally been applied by the recent taxonomic drosophilists. Interrelation between systematic groups higher than species-groups has been discussed, with respect to the periphallidic organs (Chapter IV). The systematic arrangement of species or groups higher than species has been discussed with special reference to the hitherto overlooked minute characters such as decasternum of male abdomen and ejaculatory apodeme, particularly for the *obscura* group in the present paper; the general treatment of the whole drosophilid flies will be carried out in future. The present author has not taken up chromosomal study, because it has been carried on by several authorities in Japan. Cytogenetic analysis of the various categories of systematic groups may be possible only after the accumulation of the results of their investigations. It will, however, be accepted that the "morphological species" (Dobzhansky, 1937, 1951) so far treated in this work are undoubtedly valid entities also as "biological species" (Dobzhansky, 1941, 1951).

In describing species are adopted mainly the methods of Sturtevant (1921, 1942) for external and internal structures, of Hsu (1949) for periphallidic organs, of Okada (1954, 1955) for phallic organs and digestive system. A number of terms have newly been coined for describing egg-guides, male decasternum, and other minute structures. Typical decasternum (bridge, Malogolowkin, 1948) of male abdomen is composed of a median piece and a pair of lateral pieces; the latter are connected to the bases of the paired primary claspers respectively. Typical egg-guide is a pair of lobes, which are connected with each other basally by means of a basal isthmus, and provided with a number of marginal and discal bristles or teeth, a subterminal hair, and a few sensilla.

The phallic formula (p. f., Okada, 1945), which is a series of alphabetical signs, representing features of the phallic organs of different species, arranged according to the following rules, has been applied only for the sake of convenience of comparative study, despite the author is aware

that it is desirable to avoid to introduce such signs into the description (Esaki, 1939).

1. Aedeagus apparently bifid (A), or fused (a).
2. Aedeagus non-pectinated (B), or pectinated (b).
3. Aedeagus bare (C), or pubescent (c).
4. Anterior parameres large (D), or minute (d).
5. Anterior parameres articulated to the aedeagus (E), or non-articulated (e).
6. Anterior parameres with sensilla mesad to, or scattered evenly on the parameres (F), distad (f), or absent ( $f_0$ ).
7. Posterior parameres non-contiguous (G), or contiguous (g) to each other.
8. Posterior parameres non-branched (H), or branched (h).
9. Novasternum with a pair of submedian spines on its caudal margin (I), or without such spines (i).
10. Novasternum without (K), or with (k) a median notch on its caudal margin.
11. Aedeagus vertically (L), or horizontally (l) flattened.
12. Aedeagus without (M), or with (m) prominent basal vertical rod on its ventral surface.
13. Basal apodeme as long as, or longer than, the aedeagus (N), or less than half the length of the aedeagus (n).

Synonymic tables accompanying each species and genus are by no means perfect, and as a rule do not indicate earlier literature which are seen in the monographs of outstanding authors, e. g. Sturtevant (1921), Duda (1924, 1935), Kikkawa & Peng (1938), and the reports appeared in the Drosophila Information Services (DIS) also are excluded.

Abbreviations used in the text are as explained below.

1) For morphological descriptions: *fr*, frontal hair; *vti*, inner vertical bristle; *pvt*, postvertical bristle; *oc*, ocellar bristle; *or*, oral bristle; *or<sub>1</sub>*, first oral bristle or vibrissa; *or<sub>2</sub>*, second oral bristle; *orb*, orbital bristle; *orb<sub>1</sub>*, first or upper reclinate orbital bristle; *orb<sub>2</sub>*, second or lower reclinate orbital bristle; *orb<sub>3</sub>*, third or proclinate orbital bristle; *scut*, scutellar bristle; *hu*, humeral bristle; *prsc*, prescutellar bristle; *dc*, dorsocentral bristle; *ac*, acrostichal hair.

For wing-veins and wing-indices, see Fig. 1B. Sterno-index (Kikkawa & Peng, 1938), a ratio in length between anterior and posterior sternopleural bristles; C1-bristles, long bristles at the end of the 1st costal section. C3-bristles, heavy bristles inserted on the proximal portion of the 3rd costal section; the range of C3-bristles means a ratio between the length of the 3rd costal section with heavy bristles and the total length of the same section; T, abdominal tergite; 1T, first abdominal tergite; S, abdominal sternite; 1S, first abdominal sternite.

Coiling index (C), number of coilings of the proximal intestine; rectal index (R), a ratio between length and the largest diameter of the rectal papillae; phallosomal index (PI), a ratio between length of aedeagus and its basal apodeme.

2) For collection data of adult flies: F, collected in fruit-trap; T, collected on tree-blood or timber-pile; M, collected on fungi; G, collected in garbage; L, collected at light-trap; E, collected about human eyes; S, collected by sweeping bushes. Arranging these letters in a declining order of frequencies met with in collecting a certain species, the author devised a sign to indicate the feeding habits of the respective species.

### Abbreviations used in figures

For wings:

a	analis	(a)/(b)	costal-index or C-index
c	costa	(d)/(c)	4th-vein-index or 4V-index
cu	cubitus	(b)/(c)	4C-index
m	media	(f)/(e)	5X-index
r	radius		
sc	subcosta		

For male and female genitalia:

a	anterior paramere (phallic organs)
b	decasternum or bridge connecting claspers (periphallic organs)
c	clasper (periphallic organs)
d	discal teeth (egg-guides)
e	aedeagus (phallic organs)

- g genital arch (periphallic organs)
- h subterminal hair (egg-guides)
- i basal isthmus (egg-guides)
- l lobe (egg-guides)
- m marginal teeth (egg-guides)
- n novasternum or hypandrial plates (phallic organs)
- o basal apodeme of aedeagus (phallic organs)
- p posterior paramere (phallic organs)
- r anal plate (periphallic organs)
- s submedian spines (phallic organs)
- t anal plate (periphallic organs)
- u pregenital plate (egg-guides)
- v ventral fragma (phallic organs)

### Deposition of the type-specimens

Holo- and allotypes of the newly described species are deposited in the National Science Museum, Tokyo, paratypes in the Department of Biology, Tokyo Metropolitan University.

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## II. Historicals

There is a historical review of the taxonomic and faunistic studies of the Japanese drosophilid flies, published by Kikkawa & Peng (1938). In this paper the author desires to revise it in adding informations about the further contributions so far accomplished. In citing the earlier contributions the author owes very much to the late Mr. S. Mitsuhashi's unpublished life-work, "Bibliographic list of Japanese insects", in the cabinet of the Division of Insect Identification, National Institute of Agricultural Sciences.

Matsumura (1906) seems to be the first Japanese entomologist that used the scientific name "*Drosophila*" in Japanese literature. He listed *Drosophila obscura* Fallén as an injurious insect of Japan, and he (1915) gave a short remark with figure of the same species. The same name was cited by Shiraki (1911), Suzuki (1915) and other investigators. Kurisaki (1925, 1926) made detailed observations and precise experiments on the life history of this species, and criticising Matsumura's work insisted that Matsumura's *D. obscura* should be identified with *D. melanogaster* Meigen.

Chino (1927) recorded from Japan 6 species of *Drosophila*: *D. melanogaster* Meigen, *D. takahashii* Sturtevant, *D. montium* de Meijère, *D. busckii* Coquillett, *D. virilis* Sturtevant, and *D. immigrans* Sturtevant, as well as several other unnamed species. Matsumura (1931) illustrated 3 Japanese species: *D. histrio* forma *jezonica* Matsumura (synonymous with *D. nigromaculata* Kikkawa & Peng), *D. funebris* Fabricius, and *Leucophenga suzukii* Matsumura (syn. with *D. suzukii* (Matsumura) Kanzawa). Esaki (1932) illustrated *D. melanogaster* and *D. virilis* from Japan. He (1950) added *D. suzukii* in the Iconographia. Chino and Kikkawa (1934) reported the occurrence of *D. hydei* Sturtevant from Rhukyu, and enlisted *D. melanogaster*, *D. virilis*, *D. immigrans*, and *D. busckii* Coquillett as the most common species in Japan. Chino (1936) redescribed *D. virilis* with Japanese specimens as the material, and summed up in detail the records of distribution of the same species. Moriwaki (1937) recorded in DIS the occurrence of *D. repleta* Wollaston in the center of Tokyo. He (1934, 1935) also reported finding of *D. ananassae* Doleschall in a green market of Kanda, Tokyo.

Kanzawa (1934) published results of his extensive investigation on taxonomy, morphology, ecology and economy of *D. suzukii* (Matsumura), further detailed results (1936, 1939) having been published in succession. Kikkawa & Peng's monograph appeared then in 1938. They described from Japan 11 new species of the genus *Drosophila*: *D. coracina*, *D. komaii*, *D. rufa*, *D. nipponica*, *D. ficusphila*, *D. bizonata*, *D. lutea*, *D. nigromaculata*, *D. sordidula*, *D. subtilis*, *D. grandis*, and newly recorded 6 species which were unknown from Japan and adjacent localities: *D. bipectinata* Duda, *D. auraria* Peng, *D. simulans* Sturtevant, *D. transversa* Fallén, *D. histrio* Meigen, *D. melanissima* Sturtevant. They also redescribed *D. immigrans*, *D. ananassae*, *D. montium* de Meijère (2 types), *D. takahashii* Sturtevant, *D. melanogaster*, *D. suzukii*, *D. virilis*, *D. busckii*, *D. funebris* and *D. repleta*, and recorded *Amiota variegata* (Fallén), *Apsinota obscuripes* de Meijère, and *Chymomyza obscura* de Meijère, from Japan and the adjacent countries.

Tokunaga (1943) listed 27 Japanese species of the genus *Drosophila*, all cited from Kikkawa & Peng (1938). Makino (1949) reported on the geographical variation of *D. melanogaster*, *D. virilis*, *D. immigrans* and *D. nigromaculata* in Hokkaido, with assistance of T. Mizuno. Makino & Momma (1950) recorded in DIS 5 species, including *D. coliforae* (nom. nud.), from various localities of Hokkaido. The present author (1950) published a pictorial key for hitherto known Japanese species of *Drosophila*.

Since 1951 a series of papers have appeared with informations on taxonomy, morphology, distribution, synecology, population genetics, and cytology of various domestic as well as wild species, inhabiting Japan. Makino & Kanehisa (1951) recorded in DIS 25 species belonging to 4 genera (*Amiota*, *Scaptomyza*, *Mycodrosopila*, *Drosophila*), from various parts of Hokkaido, and 13 species of *Drosophila*, and a species of *Scaptomyza* from Sapporo alone. Makino & Takada (1951) recorded in DIS a species of *Amiota* and 14 species of *Drosophila*, from Otaru, Hokkaido. Moriwaki, Okada, Ohba & Kurokawa (1951) recorded in DIS a species of the *obscura* group, conferrable to *D. bifasciata* Pomini, from Hokkaido and Aomori Prefecture.

Kato & Hori (1952, 1954) tried synecological analysis of *Drosophila*-association in Sendai, the



species involved being *D. lutea*, *D. immigrans*, *D. transversa*, *D. sordidula*, *D. busckii* *D. sp.* and *D. montium* (see under *D. auraria* in this paper). Koizumi (1952, 1954) reported from Okayama and other localities *Cryptochaetum grandicorne* Rondai? and *Amiota variegata* (Fallén), and the former was placed in the family of its own. Komai (1952) edited a book, "Shōjōbae no Iden to Zikken," in which Shōgaki took part in writing the ecological and morphological notes regarding *D. melanogaster*, *D. lutea*, *D. virilis*, and *D. immigrans*, and Okada prepared keys to the genera and subgenera of the genus *Drosophila*, as well as to the 30 species of *Drosophila*, occurring in Japan, including *D. bifasciata*?, *D. hydei*, *D. testacea* van Roser and *D. hayashii* (MS). Mori-waki, Okada & Kurokawa (1952), and Takada & Makino (1952) at the same time reported in DIS on the presence of two different types in *D. auraria*. Kurokawa (1952) reported on the experimental studies about the sexual isolation between these types. Makino, Momma & Takada (1952) recorded in DIS 13 species belonging to 4 genera: *Acletoxenus*, *Amiota*, *Chymomyza*, and *Drosophila*, in reference to altitudes in Mt. Asahidake, Hokkaido. Makino, Momma, Takada & Ishihara (1952) listed in DIS 25 species belonging to 6 genera: *Acletoxenus*, *Amiota*, *Mycodrosophila*, *Leucophenga*, *Scaptomyza*, and *Drosophila*, collected in various localities of Hokkaido. Mizuno (1952) recorded 14 species from Hokkaido: *D. virilis*, *D. nigromaculata*, *D. funebris*, *D. sordidula*, *D. coriferae* (sic, nom. nud.), *D. transversa*, *D. suzukii*, *D. auraria*, *D. testacea*, *D. sp.* of *obscura* group, *D. coracina*, 2 spp. of *Hirtodrosophila*, and *Amiota sp.* Mori-waki, Okada, Ohba & Kurokawa (1952) reported on the occurrence of a species of the *obscura* group, probably *D. bifasciata* Pomini, and they (1952, 1953) also reported in DIS about the species in question, and with an additional species, also of the *obscura* group, closely similar with *D. alpina* Burla, found in Nagano Pref. Takada (1952) reported on the geographical variations of the wing-indices of *D. auraria*, *D. melanogaster*, and *D. virilis* in Hokkaido.

Okada (1953) computed the phallosomal indices (ratio in length between aedeagus and its apodeme) of 76 species belonging to 12 genera of the family Drosophilidae, including 12 exotic species of *Drosophila*. It is ascertained that these indices hold good, in the main, with the current systematics. Ōshima (1953) investigated genetically the two types of *D. rufa* in Kōchi Pref. Okada (1953) published an abstract of the comparative study of the egg-guide bristles of 62 species, mostly of Japan. Takada, Momma, & Nakahara (1953) recorded in an abstract form *D. melanogaster*, *D. auraria* Type B, *D. rufa*, *D. lutea*, *D. hydei*, *D. histrio* Type B, *D. sp.* resembling *D. busckii*, and 2 types of *D. transversa*. Takada, Makino, Momma & Suzuki (1953) recorded in DIS *D. megaloplectinata* (nom. nud.) and *D. sp.* cf. *helvetica* Burla from Hokkaido.

Momma & Takada (1954) described a new species, *D. (Hirodrosophila) alboralis* from Hokkaido, a species already noted in DIS by Takada & Makino (1953). Ohba (1954) treated 15 species .....*D. testacea*, *D. bifasciata*, *D. nigromaculata*, *D. auraria*, *D. sp.* (*immigrans* group I), *D. sp.* (*robusta* group II), *D. alpina*?, *D. immigrans*, *D. lutea*, *D. rufa*, *D. coracina*, *D. histrio*, *D. suzukii*, *D. bizonata* and *D. transversa*, as the material of his work on population ecology. Iwamura & Nobuchi (1953, 1954) found *D. bizonata* to be a serious pest of the pine-mushrooms in Kyoto Prefecture. Takada (1954) investigated vertical distribution of the two types of *D. auraria* at Otaru, Makino, Momma & Wakahama (1954) reported in DIS on the diurnal activity of the same species in Sapporo. Takada (1954) also recorded in DIS *D. sp.* closely related to *D. pallida* Zetterstedt, and another species closely similar to *D. kuntzei* Duda from Hokkaido. Okada (1954) studied the phallic organs of 16 species of the *melanogaster* group, and distinguished 8 subgroups in that group. He also (1954, 1955) studied comparatively the rectal papillae and proximal intestine of 84 species mostly Japanese, belonging to 14 genera of the family. He (1954) enumerated 34 species belonging to 4 genera as the fungus-feeders in Japan, and analysed their morphological characteristics.

Suzuki (1955) obtained 26 species belonging to 4 genera from various kinds of weeds and fungi in Sapporo; the preliminary contribution was given in DIS by Suzuki, Momma & Makino (1953) and Momma, Suzuki & Makino (1953). Ishihara (1953) made observation on the diurnal activity of 17 species of *Drosophila* in Hokkaido (15 species in Sapporo, and 7 species at Daise-tsuzan); the results were partly reported in DIS by Ishihara, Momma & Makino (1953). Okada (1953) made comparison of the adult Malpighian tubes of 75 species of the family. He (1955) published the results of investigation on the phallic organs of 20 species of the subgenus *Drosophila*. In 1955 (DIS 29): 53 species were found to occur in Hokkaido by Makino, Momma, Takada & Wakahama, 24 species in Sapporo by Momma & Wakahama; 5 species were reported to be predominant in Hokkaido; variations of wing patterns in *D. nigromaculata* were reported by Toyofu-

ku & Momma; intergeneric and intersubgeneric relations in Drosophilidae were discussed by Okada with respect to phallic organs.

### III. Systematic accounts

#### 1. Extents and subdivision of the families

The extents and subdivision of the family Drosophilidae are variable according to different authors, and it is difficult, as stated by Sturtevant (1921), to get "a classification into sub-families that will be generally satisfactory". Oldenberg (1914) enumerated 16 genera in the family: *Mycodrosophila*, *Drosophila*, *Scaptomyza*, *Chymomyza*, *Paraleucophenga*, *Leucophenga*, *Phortica*, *Stegana*, *Camilla*, *Gitona*, *Acletoxenus*, *Aulacogaster* (sic), *Cyrtonotum* (sic), *Astia*, *Liomyza* and *Periscelis*. Sturtevant (1921) placed Drosophilidae under the family Muscidae, and involved in which 22 genera: *Curtonotum*, *Apsinota*, *Aulacigaster*, *Titanochaeta*, *Cladochaeta*, *Acletoxenus*, *Blaesochaetophora*, *Sinophthalmus*, *Gitona*, *Pseudiasata*, *Idiomysia*, *Zygothrica*, *Dettopsomyia*, *Camilla*, *Stegana*, *Zaprionus*, *Pseudophortica*, *Leucophenga*, *Chymomyza*, *Mycodrosophila*, *Scaptomyza*, and *Drosophila*, and excluded the genera *Paratissa*, *Stenomicro*, *Periscelis*, *Amphoroneura*, *Asteia*, *Hyphselothylea*, *Crepidohamma*, *Echidonocephala*, *Liomyza* and *Uranucha*. He made a comprehensive review for each of these genera. Hendel (1922) put Drosophilidae, Astiidae, Periscelidae, etc. in the superfamily Drosophiloidea and tentatively placed Camillinae and Diastatinae in the last-mentioned family. Handlirsch (1925) treated Drosophilinae as a subfamily of Borboridae, which includes the genera *Periscelis*, *Stegana*, *Drosophila*, *Scaptomyza*, *Astia*, *Camilla*, *Diastata* etc. Hendel (1928) divided Drosophilidae into 3 subfamilies: Cyrtonotinae, Diastatinae and Drosophilinae. Brues & Melander (1932) placed *Cryptochaetum*, *Diastata*, *Aulacogaster* etc., in their own families respectively, and recognized 4 subfamilies in Drosophilidae: Camillinae, Steganinae, Amiotinae and Drosophilinae. Séguy (1934) is of the same view, dividing the family into Cyrtonotinae, Diastatinae and Drosophilinae. He, however, put *Cryptochaetum* in Drosophilinae. Enderlein (1936) placed in the family Drosophilidae 2 subfamilies: Steganinae and Drosophilinae. Sturtevant (1942) made comparison of 40 genera of Acalyptrae in regard of 29 characters, in order to determine the position of Drosophilidae, and enumerated *Periscelis*, *Trioxscelis*, *Diastata*, *Aulacigaster* and *Leiomysia* as genera which have "at various times been referred to the family". Wheeler (1952) recognized the validity of placing Amiotinae and Drosophilinae in Drosophilidae, but he excluded *Camilla* from the family and placed *Stegana* in Amiotinae. Shiraki (1954) divided the family into 3 subfamilies: Drosophilinae, Steganinae and Amiotinae, but referred *Diastata* and *Cryptochaetum* to their own families. The present author (1952) has tentatively distinguished *Cryptochaetinae*, *Aulacigasterinae*, *Amiotinae* and *Drosophilinae* in the family Drosophilidae, and referred *Leucophenga*, *Stegana*, and *Amiota* to the subfamily Amiotinae. Borror & Delong (1954) mentioned Aulacogastridae and Diastatidae as to belong to Drosophilidae.

These are various opinions or attitudes as regards of the family hitherto taken in various investigations chronologically arranged. In the present work, the author, compromising these interpretations, intends to refer *Cryptochaetum*, *Aulacigaster* and *Diastata* to their own families, as done by Brues & Melander (1932) and others, and to divide Drosophilidae into 3 subfamilies: Camillinae, Steganinae and Drosophilinae. The Camillinae will be excluded from the present study, owing to the lack of any reliable information on the occurrence of its members from Japan. The Steganinae of the author coincides with the Amiotinae of Wheeler (1952) and of the present author in the sense as defined before (Okada, 1952), containing *Stegana*, *Amiota*, *Leucophenga*, etc. The situation of *Leucophenga* will be discussed later under the description for Steganinae (Chapter III, 2).

#### Key to families, subfamilies and genera of Drosophilidae and allied families found in Japan

1. Arista seemingly absent. Body without prominent bristles, but with the mesopleural bristles. Discal and 2nd basal cells confluent. Subcosta incomplete, not reaching the costa. .... *Cryptochaetidae: Cryptochaetum* Rondani.

- Arista distinct. Body with prominent bristles. .... 2.
2. Mesopleura bristly. *orb*<sub>3</sub> situated outside to *orb*<sub>2</sub>. .... 3.
- Mesopleura bare. *orb*<sub>3</sub> situated inside to *orb*<sub>2</sub>. *sc* incomplete. .... Drosophilidae. .... 4.
3. Postverticals absent. Only 2 orbital bristles. Discal and 2nd basal cells confluent. *sc* complete and fused to *r*<sub>1</sub> for a short distance. .... Aulacigastridae: *Aulacigaster* Macquart.
- Postverticals present. 3 orbital bristles present: *orb*<sub>3</sub> inserted outward to *orb*<sub>1</sub>. Discal and 2nd basal cells incompletely separated. Subcosta not reaching the costa. .... Diastatidae: *Diastata* Meigen.
4. *orb*<sub>1</sub> nearer to *vti* than to *orb*<sub>3</sub>. *orb*<sub>2</sub> nearly as long as *orb*<sub>3</sub>. Discal and 2nd basal cells usually separated. Costa with several thorn-like warts on the lower side of the 3rd section. Middle tarsus with a pair of rows of minute cuneiform bristles. Prescutellar bristles developed. 9 *T* of female divided into 2 lateral lobes. .... Steganinae. .... 5.
- orb*<sub>1</sub> nearer to *orb*<sub>3</sub> than to *vti*. *orb*<sub>2</sub> much shorter than *orb*<sub>3</sub>, or sometimes absent. Costa without thorn-like warts on the 3rd section. Middle tarsus without paired rows of minute cuneiform bristles. Prescutellar bristles usually undeveloped. 9 *T* of female not divided into 2 lateral lobes. .... Drosophilinae. .... 9.
5. Costa with several thorn-like warts on the 3rd section. .... 6.
- Costa without thorn-like warts on the 3rd section. .... *Amiota* (*Phortica*) Schiner.
6. Discal and 2nd basal cells confluent. .... *Leucophenga* Mik.
- Discal and 2nd basal cells separated. .... 7.
7. Middle tibia with a row of long stout bristles on the outer margin. Arista with long branches both above and below fork. *r*<sub>4+5</sub> and *m* apically strongly convergent. .... 8.
- Middle tibia without a row of long bristles on the outer margin. Arista usually with branches only above fork. *r*<sub>4+5</sub> and *m* not strongly convergent. .... *Amiota* (*Amiota*) Loew.
8. Long axis of the head nearly vertical to the body axis. .... *Protostegana* Hendel.
- Long axis of the head highly oblique to the body axis. .... *Stegana* Meigen.
9. *orb*<sub>2</sub> absent or microtrichia-like. .... 10.
- orb*<sub>2</sub> distinct, not microtrichia-like. .... 14.
10. Body slender. Wing narrow and short; anal cell absent. *pvt* absent. .... *Hypselothylea* de Meijere.
- Body thicker. Wing normal; anal cell present. *pvt* present. .... 11.
11. Costa swollen at the end of the 1st section. .... 12.
- Costa not swollen at the end of the 1st section. .... 13.
12. Mesonotum strongly convex. *dc* 1 pair. *ac* irregularly arranged in more than 6 rows. .... *Mycodrosophila* Oldenberg.
- Mesonotum not strongly convex. *dc* 2 or more pairs. *ac* in 2 or 4 rows. .... *Dettoptomyia* Lamb.
13. Mesonotum strongly convex. Fore femora with a row of short stout teeth. 3rd costal section with heavy bristles on the basal 1/2. .... *Liodrosophila* Duda.
- Mesonotum not strongly convex. Fore femora without a row of short stout teeth. 3rd costal section with heavy bristles on the entire or nearly entire length. .... *Microdrosophila* Malloch.
14. *orb*<sub>2</sub> as long as *orb*<sub>1</sub>, and situated anterior to *orb*<sub>3</sub>. .... *Chymomyza* Czerny.
- orb*<sub>2</sub> much shorter than *orb*<sub>1</sub>, and situated posterior to *orb*<sub>3</sub>. .... 15.
15. *ac* in 2 or 4 rows. Body somewhat slender. .... *Scaptomyza* Hardy.
- ac* in 6 or 8 rows, if 4 rows the body is not much slender. .... *Drosophila* Fallén.

#### Key to families, subfamilies, and genera of Drosophilidae and allied families found in Japan, with regard to the periphallallic organs

1. Clasper absent. .... 2.
- Clasper usually present. .... 4.
2. Genital arch exceedingly broaden below, narrowing above. .... 3.
- Genital arch exceedingly narrowing below. .... Drosophilinae: *Microdrosophila* Malloch.
3. Anal plate tapering above and dorsally fused to genital arch. .... Cryptochaetidae: *Cryptochaetum* Rondani.
- Anal plate tapering below and separated from genital arch. .... Aulacigastridae: *Aulacigaster* Macquart.
4. Claspers two, both without teeth. .... Diastatidae: *Diastata* Meigen, and Steganinae: *Protostegana* Hendel.
- Clasper one; if two, at least one of which has teeth. .... Drosophilidae. .... 5.
5. Clasper attached to the ventral side of genital arch. .... Steganinae (excl. *Protostegana*). .... 6.
- Clasper attached to the caudal side of genital arch. .... Drosophilinae (excl. *Microdrosophila*). .... 7.
6. Clasper teeth absent. .... *Stegana* Meigen, *Amiota* (*Phortica*) Schiner, and *Leucophenga* (*Leucophenga*) Mik.
- Clasper teeth present. .... *Leucophenga* (*Trichiaspiphenga*) Duda, and *Amiota* (*Amiota*) Loew.
7. Clasper teeth absent. .... *Drosophila* (*Sophophora*) *alpina* Burla.
- Clasper teeth present. .... Most of the genera of Drosophilinae (generic differentiation being obscure).

#### Key to families, subfamilies and genera of Drosophilidae and allied families found in Japan, with regard to the phallic organs

1. Aedeagus long filamentous and strongly curved. .... Cryptochaetidae: *Cryptochaetum* Rondani.
- Aedeagus not long filamentous and usually nearly straight. .... 2.

2. Aedeagus minute, bifid and inbedded in a cup-like dilatation of the apodeme. .... Aulacigastridae: *Aulacigaster* Macquart.  
Aedeagus larger, not inbedded in the apodeme. .... 3.
3. Anterior parameres distally bilobed, both lobes being setigerous. Ventral fragma with a deep notch. .... Diastatidae: *Diastata* Meigen.  
Anterior parameres distally not bilobed; if bilobed, the both lobes are not setigerous and ventral fragma without notch. .... Drosophilidae. .... 4.
4. Aedeagus strongly curved ventrally in U-shape. .... Steganinae: *Amiota* Loew.  
Aedeagus not curved in U-shape. .... 5.
5. Aedeagus very thick and distally enlarged. .... Steganinae (part). .... 6.  
Aedeagus not quite thick and distally not enlarged. .... 7.
6. Aedeagus spiny at lateral sides. .... *Stegana* Meigen and *Protostegana* Hendel.  
Aedeagus smooth at lateral sides. .... *Leucophenga* (*Trichiaspihenga*) Duda.
7. Aedeagus usually without apodeme. Posterior parameres slender and at least apically fused to each other. .... *Leucophenga* (*Leucophenga*) Mik.  
Aedeagus usually with apodeme. Posterior parameres not as above. .... 8.
8. Aedeagus widely bifid apically. .... *Protostegana* Hendel.  
Aedeagus usually fused to be a compact body, or shortly bifid apically. .... Drosophilinae. .... 9.
9. Aedeagus laterally asymmetrical. .... *Chymomyza* Czerny.  
Aedeagus laterally symmetrical. ....  
..... Most of the genera of Drosophilinae (generic characters not clearcut).

### Key to subfamilies and genera of the family Drosophilidae, with regard to the egg-guides

1. Lobes weakly sclerotized, often fused to each other. Basal isthmus not sharply defined. Marginal and discal hairs never peg-like. .... Steganinae. .... 2.  
Lobes more or less well sclerotized and separated from each other. Ventral isthmus usually developed. Marginal hairs (and discal hairs if present) at least partially peg-like, rarely entirely hair-like. .... Drosophilinae. .... 3.
2. Lobes nearly entirely setigerous. .... *Protostegana* Hendel, *Amiota* Loew, and *Leucophenga* Mik.  
Lobes only apically setigerous. .... *Stegana* Meigen, and *Leucophenga* Mik (part).
3. Ventral isthmus not sharply defined. Bristles mostly setigerous, except a few ones which are peg-like. ....  
..... *Microdrosophila* Malloch.  
Ventral isthmus sharply defined. Bristles various. .... 4.
4. Bristles entirely setigerous. .... *Chymomyza* Czerny.  
Bristles not entirely setigerous, at least a few ones being peg-like. .... 5.
5. Bristles mostly setigerous, only a few being peg-like. .... 6.  
Bristles mostly or entirely peg-like. .... 7.
6. Lobes slender, about four times as long as broad. .... *Mycodrosophila* Oldenberg.  
Lobes broader and elliptical, about three times as long as broad. .... *Scaptomyza* Hardy (part).
7. Bristles mostly peg-like, some are setigerous. .... *Liodrosophila* Duda.  
Bristles entirely peg-like. .... 8.
8. Lobes slender, about four times as long as broad. .... *Dettopsomyia* Lamb.  
Lobes broader, about three times as long as broad. .... 9.
9. Lobes with numerous discal peg-like bristles. .... *Scaptomyza* Hardy (part).  
Lobes with a few or no discal peg-like bristles. .... *Drosophila* Fallén.

The chief characteristics common to the four families treated in the present work, i.e. Cryptochaetidae, Aulacigastridae, Diastatidae and Drosophilidae, are as below: *Costa* twice broken (or becoming thin at the humeral break, in Aulacigastridae), *orb* 3 or less, reclinate or proclinate (never inclinate as in Milichiidae or Carnidae, nor exclinate as in Leptoceridae). *pvt* convergent, parallel, or absent, never divergent. Sternopleurals present (except in Cryptochaetidae).

## 2. Description

### Family Cryptochaetidae

Japanese name: Higebuto-kobae-ka (Siraki, 1954); Kaigarayadori-kobae-ka (Koizumi, 1952).

### Genus *Cryptochaetum* Rondani, 1875

Japanese name: Higebuto-Kobae-zoku (Siraki, 1954).

*Cryptochaetum* Rondani, 1875. Boll. Soc. Ent. Ital., 8:168; Knab, 1914. Ins. Inscit. Menstr., 2:33; de Meijère, 1916. Tijd. Entom., 59:193; Malloch, 1927. Proc. Linn. Soc. N.S.W., 52:421; Thorpe, 1930. Proc. Zool. Soc. Lond. :138; Séguy, 1951. Trait. Zool., 10 (1); Wheeler, 1952. Univ. Texas Publ., 5204:164; Koizumi, 1952. Kurashiki konchû Dôkoku Kai-ho, 1:2; Siraki 1954. Class. Ins. :748.

*Lestophonus* Williston (teste de Meijère, 1916).

Haplotype: *Cryptochaetum grandicorne* Ronani, 1875.

Fig. 1

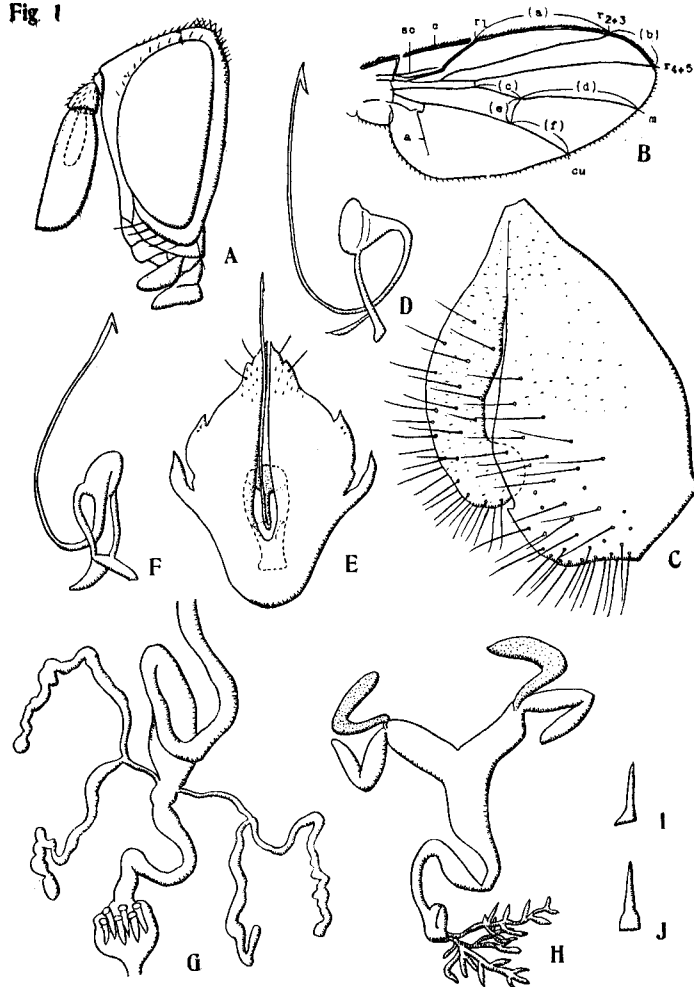


Fig. 1. *Cryptochaetum grandicorne* Rondani.

A. Head; B. Wing; C. Periphalllic organs (lateral aspect); D. Aedeagus (lateral aspect); E. Phallic organs (ventral aspect); F. Aedeagus (ventral aspect); G. Digestive system (ventral aspect); H. Male reproductive organs (ventral aspect); I. Ejaculatory apodeme (lateral aspect); J. do. (ventral aspect).

***Cryptochaetum grandicorne* Rondani, 1875 Fig. 1.**

Japanese name: Kuro-mematoi (Tokunaga, 1943); Higebuto-kobae (Shiraki, 1954); Me-seseribae (Nawa, 1920).  
*Cryptochaetum grandicorne* Rondani, 1875. Boll. Soc. Ent. Ital., 8:168; Coquillett, 1898. Proc. U. S. Nat. Mus., 21:340; Kuwana, 1922. Dept. Agric. Comm. Imp. Plant Quar. St., Bul. 1: 28; 2: 37; Thorpe, 1930. Proc. Zool. Soc. Lond., 1930: 395; Séguy, 1933. Encycl. Entom. B II (7):181; ?, Koizumi, 1952. Kurashiki Konchū Dōkōkai Kaihō, 1:2; Okada, 1953. Zool. Mag., 62:280; Okada, 1954. ibid., 63:262; Koizumi, 1954. Kontyū, 20:25; Shiraki, 1954. Class. Ins.:748.  
*Hippelates nipponensis* Tokunaga, 1943. Iyō-Konchūgaku:1075 (teste Koizumi, 1952. loc. cit.).

♂: Body shining black, somewhat bluish, and with numerous short setae; about 2.5-3.5 mm in length. Head (Fig. 1 A): Frontal triangle small. Eyes dark red, with short grey piles. Palpus with a short seta. A few short orals. Wings (Fig. 1 B) hyaline;  $r_{4+5}$  and  $m$  strongly divergent; posterior crossvein straight or arcuated. C-index about 2.3; 4 V-index about 2.7; 4 C-index about 1.3; 5 X-index about 2.4.

Periphalllic organs (Fig. 1 C): Black, pubescent. Genital arch narrow above, broadly truncate below, with about 30 hairs on the lower half. Anal plate narrow and contiguous to genital arch above, rounded below and with about 30 hairs. Clasper entirely absent.

Phallic organs (Fig. 1 D-F): Aedeagus extremely slender and arcuated upward, dark orange, basally swollen and contiguous to a paired black arms, which surround the base of aedeagus. Ventral fragma with very deep median notch, basally and apically narrowing, and apically pubescent. 2 pairs of submedian spines near apex. A flap with a few sensilla on each side of the fragma looks like an anterior paramere. p.f. = a'BCd<sub>0</sub>Ef<sub>0</sub>g<sub>0</sub>HIkLmn. PI=18.0.

Internal structures (Fig. 1 G-J): Proximal intestine simply once folded, C=1. Rectal papillae

4, 5, or 6 in number, arranged in rosette at the proximal end of the rectal pouch. Papillae slender, R=about 3.5. Malpighian tubes rather short, with common stalks fairly long, and branches thicken distally, posterior branches ending free. Testis dark reddish brown, once folded. Paragonia hyaline, also once folded. Vas deferens exceedingly enlarged and bifid at the junction with paragonia. Ejaculatory bulb with multiply divided branches. Ejaculatory apodeme dark brownish black, with plate minute and quadrate.

Specimens examined: In Tokyo: Meguro, a few ♂♂, IV '51 E (Hasegawa); Fukazawa, 1 ♂, 1 VI '53 L; Takamizuyama, 1 ♂, 29 IV '53 E; Kumotoriyama, 1 ♂, 14 VII '53 E. Hatano, Kanagawa Pref., 3 ♂♂, 2 V '55 E; Kanazawa, Ishikawa Pref., 1 ♂, 10 VI '52 E (Hori); Ichinose, Ishikawa Pref., 2 ♂♂, 3 V '51 E (Hori).

Previous records from Japan: (Koizumi, 1952, 1954) Kanazawa, Kyoto, Hyōgo, Okayama, Fukuoka.

Distribution: Honshu (Kanto, Chubu, Kinki, Chugoku), Kyushu, Europe, Africa.

Feeding habits: EL.

Remarks: All the specimens examined are males, collected mainly in the spring, while the flies were hovering about eyes of people. Only one male shows an exceptional case of being collected at light-trap. The larvae of this species are known as a parasite of *Icerya seychellarum* Westwood, *Drosicha corpulenta* Kuwana, etc. Kuwana (1922) described and illustrated the adult, larva and puparium and referred to the life-history. Taxonomic synopsis was carried out in detail by Koizumi (1952), who thinks it doubtful to apply the name *grandicorne* for the Japanese *Cryptochaetum*, because of the fact that Clausen (1940) obtained from Japanese *Icerya* a kind of *Cryptochaetum*, which slightly differs from *C. grandicorne*. Thus the species name applied here is a tentative one, and the real name will be published by Mr. Koizumi.

The swollen large 3rd antennal segment is either apically pointed or rounded in this species, and it seems to be difficult to apply Knab's (1914) diagnosis of species, referring to the character of antenna, for this species.

Sturtevant (1926) mentioned that the true 3rd antennal segment is hidden under coverage of arista, which is extraordinarily enlarged to take appearance of the 3rd antennal segment. Thorpe (1930) observed by dissection such hidden structure in *Cryptochaetum iceryae* (Williston), and insisted that the structure could not be the true 3rd segment.

The author (1953) reported the presence of 6 rectal papillae in this species, as a unique case in the Acalyptrata. After that he found specimens with 5, or ordinary 4, papillae also. The absence of claspers and the dorsal narrowing of genital arches of this species are the features occurring also in *Aulacigaster leucopeza* (see below).

#### Family Aulacigastridae

Japanese name: Naga-shōjōbae-ka.

#### Genus *Aulacigaster* Macquart, 1835

Japanese name: Naga-shōjōbae-zoku.

*Aulacigaster* Macquart, 1835. Suit. Buff., 2: 579; Sturtevant, 1921. Carn. Inst. Publ., 301: 51; Sturtevant, 1926. Journ. N. Y. Ent. Soc., 34: 18; Duda, 1934. Die Fliegen, 58c: 3; Shiraki, 1954. Class. Ins.: 726.

*Aulacogaster* Oldenberg, 1914. Arch. Naturg., 80 A (2): 30; Duda, 1924. Arch. Naturg., 90 A (3): 176; Enderlein, 1936. Tierwelt Mitteleur., 16: 178.

Haplotype: *Diastata leucopeza* Meigen.

Oldenberg (1914) proposed usage of "*Aulacogaster*" instead of "*Aulacigaster*" from grammatical point of view, but according to the rule of the Zoological Nomenclature, "*Aulacigaster*" should be retained.

#### *Aulacigaster leucopeza* (Meigen, 1830) Fig. 2 A-H.

Japanese name: Nijime-naga-shōjōbae.

*Diastata leucopeza* Meigen, 1830. Syst. Besch., 6: 100.

*Aulacigaster leucopeza* Williston, 1908. Manual N. Amer. Dipt., 293; Sturtevant, 1921. Carn. Inst. Publ., 301: 51; Duda, 1934. Die Fliegen, 58c: 3.

*Aulacogaster leucopeza* Oldenberg, 1914. Arch. Naturg., 80A (2): 30; Duda, 1924. Arch. Naturg., 90A (3): 176.

*Aulacigaster* sp. Okada, 1953. Zool. Mag., 62: 280.

*Aulacigaster rufitarsis* Macquart, 1835. Suit. Buff., 2: 580 (teste Sturtevant, 1921).

♂: Head (Fig. 2A): Eyes red, with 3 transverse stripes of bluish white illusion. Carina not developed. Cheek about 2/9 as broad as the greatest diameter of eye. Wing (Fig. 2B) with

C1-bristles not prominent; C3-bristles at basal 1/6, composed of only 2 bristles.

Periphallic organs (Fig. 2 C): Genital arch black, entirely setigerous on the surface, much narrow above, and broad below. Heel low and pointed forward. Toe rounded. Anal plate tapering below, with about 40 setae.

Phallic organs (Fig. 2 D, E): Mostly black. Aedeagus minute, bifid, half inbedded on the concaved apex of the apodeme, which is narrowing toward its free end. Ventral fragma broader than long, anterior margin broadly concaved and laterally pointed out. Posterior paramere rod-like, contiguous to each other and to the aedeagus. Anterior parameres minute, articulated to the aedeagus, pubescent on the apical half. p. f. = ABCdEf<sub>0</sub>gHiKIMN. PI=0.7.

Internal structures (Fig. 2 F-H): Testis orange red, oval, with narrowing tip, and basally contiguous to short narrow seminal vesicle. Paragonia yellowish white, twice folded. Ejaculatory apodeme elongate, plate small and elliptical. Rectal papillae 4, R=about 2.0. Spermathecae 3, according to Sturtevant (1921).

Specimen examined: Akkeshi, Hokkaido, 1 ♂, 15 Aug. '51 S.

Distribution: Hokkaido (new record), Europe, N. America, Asia.

Feeding habits: S. Sturtevant (1921) obtained it frequently on bleeding tree and rarely in garbages (TG).

Remarks: A single male has been examined, which, however, has features strictly coincident

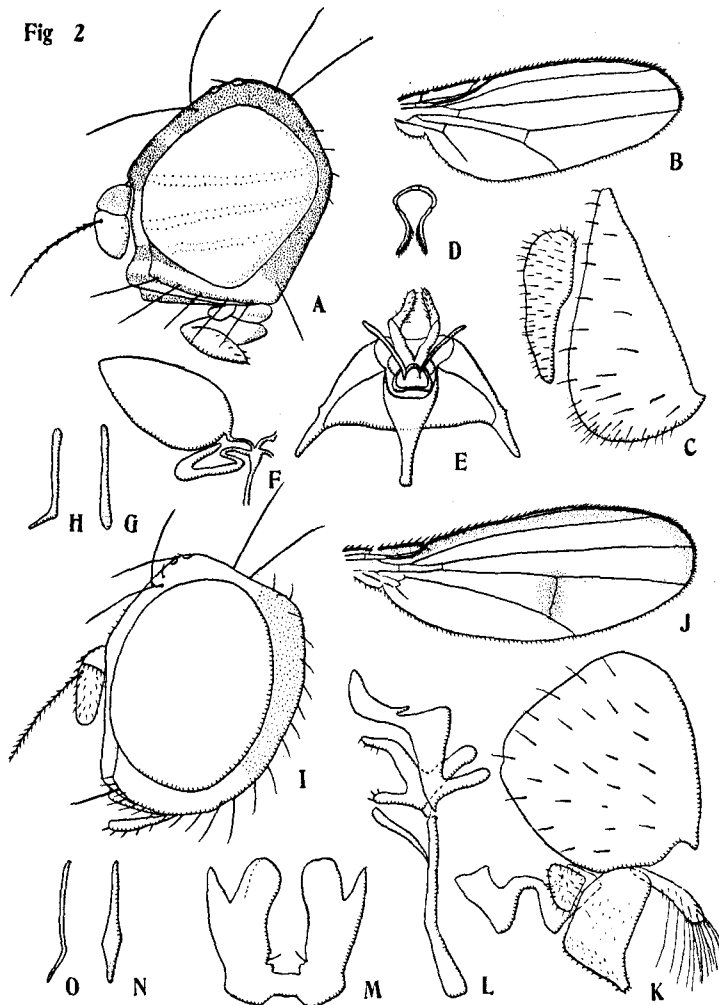


Fig. 2. *Aulacigaster leucopseza* (Meigen).

A. Head; B. Wing; C. Periphallic organs (lateral aspect); D. Anterior parameres (ventral aspect); E. Phallic organs (dorsal aspect); F. Male reproductive organs (part); G. Ejaculatory apodeme (ventral aspect); H. do. (lateral aspect).

*Diastata vagans* Loew.

I. Head; J. Wing; K. Periphallic organs (lateral aspect); L. phallic organs, exclusive of ventral fragma (lateral aspect); M. Ventral fragma (ventral aspect); N. Ejaculatory apodeme (ventral aspect); O. do. (lateral aspect).

with Duda's redescrptions of the species (1924, 1934).

### Family Diastatidae

Japanese name: Hosō-shōjōbae-ka (Shiraki, 1954).

### Genus *Diastata* Meigen, 1830

Japanese name: Hosō-shōjōbae-zoku.

*Diastata* Meigen, 1910. Syst. Besch., 6:94, 211; Duda, 1934. Die Fliegen, 58e:4; Shiraki, 1954. Class. Ins.: 746.

*Calopterella* Coquillett, 1910. Proc. U.S. Nat. Mus., 37:517 (teste Duda, 1934).

Logotype: *Diastata vagans* Loew, 1864.

### Key to Japanese species of the genus *Diastata*

1. Wing with small transverse black band upon the posterior crossvein alone. .... *D. vagans* Loew.  
Wing with large transverse black bands upon and also before the posterior crossvein. .... *D. ussurica* Duda.

### *Diastata vagans* Loew, 1864 Fig. 2 I-O.

Japanese name: Hosō-shōjōbae (Shiraki, 1954).

*Diastata vagans* Loew, 1864. Berl. entom. Zeitschr., 8:362,9; Sturtevant, 1923. Amer. Mus. Novit., 76:25; Duda, 1934. Die Fliegen, 58e:8; Shiraki, 1954. Class. Ins.: 747.

♂: Body black, about 3.5 mm. Head (Fig. 2 I): Front orange, about 1/2 as broad as head. Cheek yellowish orange, about 1/6 as broad as the greatest diameter of eye. Sterno-index about 0.2. Wing (Fig. 2 J) brownish, with black markings. C-index about 4.7; 4V-index about 1.1; 4C-index about 2.2; 5X-index about 0.8. C1-bristles 2, long, subequal in size. C3-bristles on basal half.

Periphallic organs (Fig. 2 K): Genital arch black, rounded, heel angulated, with macrotrichia sparsely distributed all over the surface. Anal plate minute, triangular, and hairy. Claspers 2; lower one quadrate and finely setigerous below; upper one club-shaped, and distally with long hairs.

Phallic organs (Fig. 2 L, M): Aedeagus laterally broaden, medially convex dorsally. Anterior paramere distally bifurcated, and each fork distally hairy. Posterior paramere membranous. Ventral fragma quadrate, as long as broad, with deep median notch, and a pair of small submedian spines inserted at the bottom of the notch. p.f.=aBCDEfghIKLmN. PI=1.0.

Internal structures: Ejaculatory apodeme (Fig. 2 N, O) narrow, with plate black and narrower than the apodeme.

Specimen examined: Nishikomagatake, Nagano Pref., 1 ♂, 22 VII '52 F.

Previous records from Japan: (Shiraki, 1954) Amamiōshima, South-West parts of Honshu.

Distribution: Honshu (Chubu, South-West parts), Amamiōshima, Europe, N. America.

Feeding habits: F.

### *Diastata ussurica* Duda, 1934 Fig. 3.

Japanese name: Mon-hosō-shōjōbae.

*Diastata ussurica* Duda, 1934 Die Fliegen, 58e:8.

♂: Body mainly black, about 3 mm in length. Head (Fig. 3 A): Eye dark red and bare. Antenna yellowish orange, 3rd joint large. Arista with about 17 short branches including a fine fork, about 7 below it. Palpi narrow and orange, with a few short setae. Front orange, about half as broad as the head-width. *pvt* long. Face orange yellow. Carina not developed, represented by a fine median ridge. Cheek orange, very narrow, about 1/10 the greatest diameter of eye. *orb*<sub>1</sub> minute. *orb*<sub>3</sub> about 2/3 as long as *orb*<sub>2</sub>. *or*<sub>2</sub> weak, about 1/2 as long as vibrissa.

Mesonotum and scutellum black, with greyish blue pollinosity. *prsc* rather short. *ac* in about 10 rows. Posterior *scut* short and upright. Cross distance of *dc* about 1.2 times as long as the length distance. Legs brownish yellow. Preapicals on all three tibiae; apicals on middle and hind. Wing fuscous, with black patch below the 1st costal section, a broad black cross band covering posterior crossvein, and a narrower cross band between anterior and posterior crossveins; these 2 bands are extending between *r*<sub>3+4</sub> and *cu*, and demarcated apically and basally with white cross bands. Anterior crossvein distinctly clouded. C-index about 3.2; 4V-index about 1.0; 4C-index about 0.5; 5X-index about 0.5. C1-bristles 2, upper one larger. C3-bristles covering entire length. Halteres white. Abdominal tergites black.

Periphallic organs: Genital arch black, broad and rounded below, with scattered fine discal hairs. Anal plate minute, oval, hairy, and separated from genital arch. Clasper brown, conical, tapering and hairy, without teeth. Secondary clasper rod-shaped, pale white, and with a few



long and several minute hairs. Decasternum pale grey, nearly hexagonal, and apically acutely incised.

Fig 3

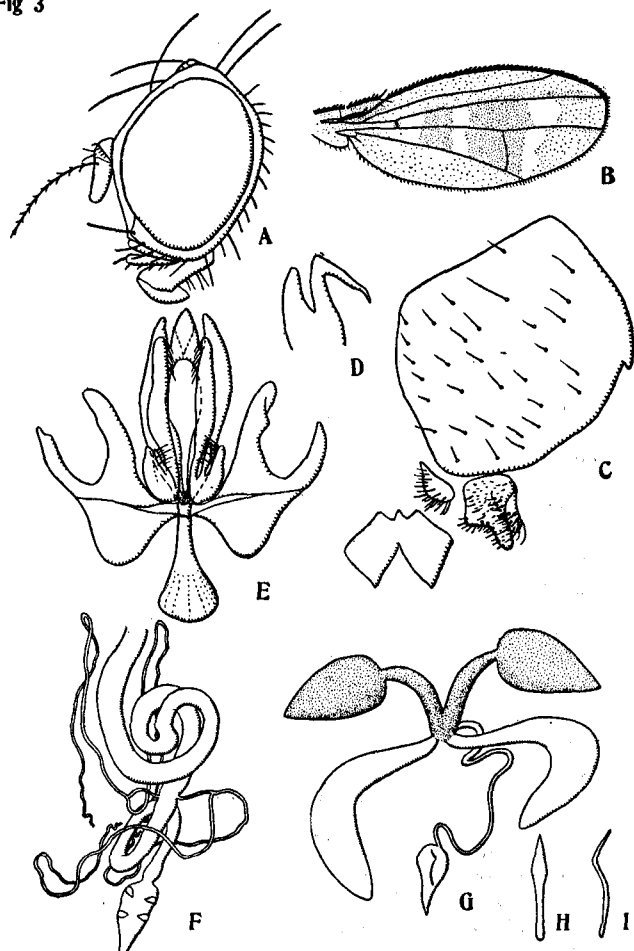


Fig. 3. *Diastata ussurica* Duda.

A. Head; B. Wing; C. Periphallallic organs (lateral aspect); D. Tip of aedeagus (lateral aspect); E. Phallic organs (ventral aspect); F. Digestive systems; G. Male reproductive organs; H. Ejaculatory apodeme (ventral aspect); I. do. (lateral aspect).

Phallic organs (Fig. 3 D, E): Aedeagus dark brown, apically trilobed; apodeme basally much dilated; vertical rod well developed. Median lobes of aedeagus rectangularly curved and pointed at tip. Anterior paramere large, dark brown, elongate, with several recurved setae near the apex of the inner surface, and basally curved back and bilobed, each lobe being hairy apically. Ventral fragma brownish black, deeply concaved at base. Novasternum with long black sublateral processes and shorter lateral processes.  $PI = a'BCDEfg, Hiklmn$ .

Internal structures: Proximal intestine:  $C=2.5$ . Rectal papillae small, oval,  $R=1.4$ . Testis brownish black, large, oval, distally tapering but not coiled at all. Seminal vesicle banana-shaped, similar to testis in coloration, and arcuated at middle. Paragonia hyaline, thick, and weakly folded at middle. Malpighian tubes hyaline, with common stalks short and branches long, posterior branches ending free.

Specimens examined: Asakawa, Tokyo, 1 ♂, 12 IV '56 S; Tojō, Hiroshima Pref., 1 ♂, 26 X '55 S.

Distribution: Honshu (Kanto, Chugoku), Ussuri.

Feeding habits: S.

Remarks: The present specimens show slight difference from the original form from Ussuri, in having the black band covering the posterior crossvein nearly in equal breadth, not narrowing below, while in the original form, the band is abruptly narrowing at the posterior half.

#### Family Drosophilidae

Japanese name: Shōjōbae-ka.

### Subfamily Steganinae

Japanese name: Kabuto-shōjōbae-aka.

*Stegana*, *Amiota* and *Leucophenga* are the genera closely related to each other. Sturtevant (1921) and Patterson (1943) regarded *Amiota* to be included in *Stegana*, while Malloch (1921) thought it valid to separate these two genera, and he (1923) mentioned that "*Stegana* is more closely related to *Leucophenga* than to *Amiota*". Sturtevant (1942) proved also an intimate relationship between *Stegana* and *Leucophenga*. The present author is inclined to recognize validity of Wheeler's concept (1952) of the subfamily Steganinae (his Amiotinae) in which the genus *Leucophenga*, which has ordinarily been referred to the subfamily Drosophilinae, is included together with *Stegana*, *Amiota*, etc., because of the facts that these genera are remarkable in having in common certain special characters, as explained below. These features (no. 1-9) do not or only very seldom occur in the ordinary members of Drosophilinae.

Genera	<i>Protostegana</i> & <i>Stegana</i>	<i>Amiota</i> ( <i>Amiota</i> )	<i>Amiota</i> ( <i>Phor-</i> <i>tica</i> )	<i>Leucophen-</i> <i>ga</i> ( <i>Leuco.</i> )	<i>Leuco.</i> ( <i>Trichias-</i> <i>piphenga</i> )	<i>Drosophi-</i> <i>linae</i>
Number of species examined	2	1	1	10	1	82
1. Discal and 2nd basal cells closed	+	+	+	—	—	—
2. 3rd costal section with thorn-like warts	+	+	—	+	+	—
3. Middle tibia with minute cuneiform bristles	+	+	+	+	+	—
4. <i>orb</i> <sub>1</sub> not nearer to <i>orb</i> <sub>3</sub> than to <i>vti</i>	+	+	+	+	+	—
5. Prescutellars present	+	+	+	+	+	—(+ <sup>1</sup> )
6. 9th abdominal tergite of female bifid laterally	+	+	+	+	+	—
7. Clasper teeth of male absent	+	+	+	+	—	—(+ <sup>2</sup> )
8. Egg-guide with lobes fused to each other, without forming basal isthmus	+	+	+	+	+	—
9. Egg-guide without teeth	+	+	+	+	+	—(+ <sup>3</sup> )

1) *D. (Paradrosophila)*, *D. (Siphlodora)*. 2) *D. (Sophophora) alpina* Burla.

3) *Microdrosophila* and a certain species of *Mycodrosophila*.

The "thorn-like bristles", "thorns", "tubercles" (Sturtevant, 1927), or "thorn-like warts" (Wheeler, 1952) have been found to occur in *Stegana*, *Protostegana*, *Amiota* (*Amiota*) and *Leucophenga*, and the minute cuneiform bristles or "cerdas cuneiformes das filas, tipo 4" (de Castro, 1953) in *Stegana*, *Protostegana*, *Amiota*, *Leucophenga*, as well as in *Sinophthalmus* and *Orthostegana* according to de Castro.

### Genus *Protostegana* Hendel, 1920

Japanese name: Kamenoko-shōjōbae-zoku.

*Protostegana* Hendel, 1920. Wien. ent. Zeit., 38:53; Duda, 1924. Arch. Naturg., 90A (3):182; Duda, 1935. Die Fliegen, 58g:19.

Orthotype: *Drosophila curvipennis* Fallén, 1823.

### *Protostegana kanoi* sp. nov. Fig. 4.

Japanese name: Kano-Kamenoko-shōjōbae.

♂: Large splendid species, with body about 6 mm, dark yellow, with black stripes. Head (Fig. 4 C) yellow; eye dark red and bare. Antenna yellow, 3rd joint apically black. Arista with about 20 long branches including fine fork, about 6 below it. Palpus orange yellow, with short setae. Ocellar triangle black, with minute hairs. Periorbits yellow. Front yellow, widely black around ocelli, longer than broad and about 5/12 as broad as headwidth. *fr* fine and numerous, scattered all over the lower half of front. Face yellow, with lower margin convex and black. Carina low. Cheek yellow and narrow, about 1/7 as broad as the greatest diameter of eye. Occiput black, yellow above. *orb*<sub>2</sub> as long as *orb*<sub>3</sub>. *or*<sub>2</sub> short and weak. Frontal suture black.

Mesonotum yellow, with a pair of broad black longitudinal stripes (on both sides of the median line, inside *dc*), which are narrowing anteriorly, and also with a narrow longitudinal black line at the caudal half of the mesonotum, outside each *dc*-line. Scutellum black, laterally yellow. Thoracic pleura yellow, with a prominent black longitudinal band on each side. *prsc* long. *ac* in numerous irregular rows. Anterior *dc* about half the posterior *dc* in length; cross distance of *dc* about 5 times the length distance. Anterior *scut* divergent; posterior one upright and shorter than the anterior one. Sterno-index about 0.8; the 3rd or median sternopleural bristle about 2/3 as long as the posterior one.

Legs yellowish grey; hind femur with a black stripe on the external surface of the proximal half; middle tibia with 2 stout spines on the upper margin near the proximal end, the upper one being longer than the lower one. Middle tarsus with 2 rows of short black cuneiform bristles. Preapicals on hind tibia; apicals on hind. Wings (Fig. 4 A) largely black, pale at the base and along posterior margin, the boundaries between the black and pale areas much undulated. A pale spot at the middle of the cell  $R_{2+3}$ . The 3rd costal section with about 6 wart-like bristles. C-index about 2.5; 4V-index about 1.3; 4C-index about 0.9; 5X-index about 0.6. C1-bristles 2; C3-bristles on the entire length. Halteres yellow.

Abdomen dark brown, posterior margin and lateral sides of each T black. Caudal segment darker. 9T prominently orange.

Periphallic organs (Fig. 4 B): Genital arch yellow, broad, dorsally convexed and caudally concaved; heel high and rectangular; toe moderately rounded; upper margin of the arch with about a dozen long black setae; lower margin bare. Primary clasper orange, small, oval, and distally with a row of about 10 fine setae. Secondary clasper situated just above the primary clasper, yellow, rod-shaped, and laterally with a few long setae. Anal plate fine, separated from genital arch, yellowish grey, crescent, and with about 50 hairs. Decasternum yellowish grey, elongate, gently curved, and bar-like, from which projected a pair of vertical arms. The arms pointed apically and attached to the lateral arms of novasternum.

Phallic organs (Fig. 4 D, E, H): Aedeagus dark brown, deeply bifid, proximally curved dorsad rectangularly and projected beyond articulation with apodeme. Apodeme much longer than aedeagus, with distal end much swollen. PI=2.2. Anterior parameres black, large and long, apically pointed, medially with numerous sensilla (about 40), and basally attached to the short median

Fig 4

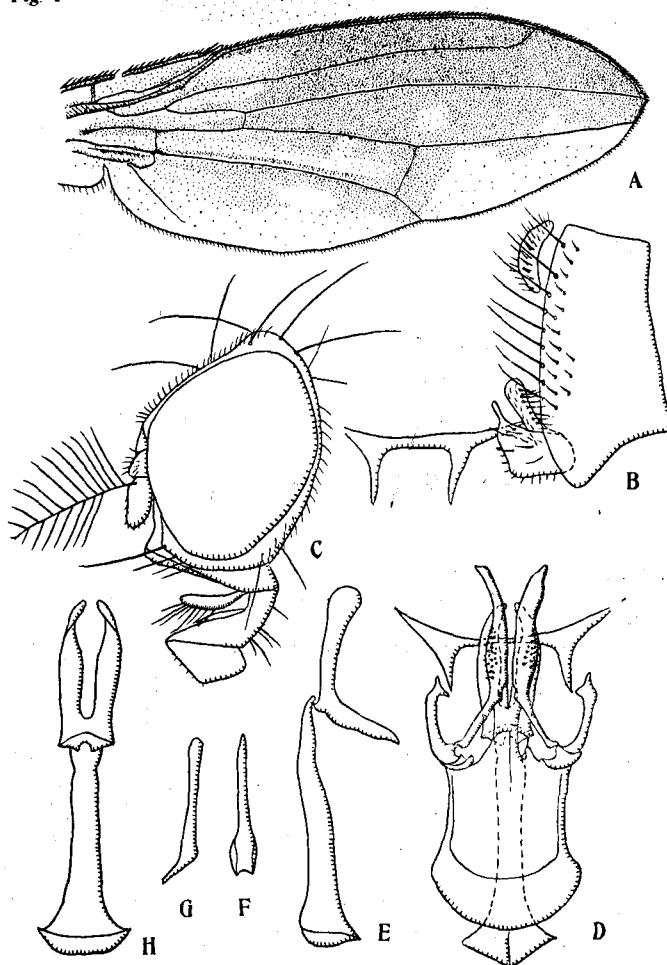


Fig. 4. *Protostegana kanoi* sp. nov.

A. Wing; B. Periphallic organs (lateral aspect); C. Aedeagus; D. Phallic organs (ventral aspect); E. Aedeagus (lateral aspect); F. Ejaculatory apodeme (ventral aspect); G. do. (lateral aspect); H. Aedeagus (dorsal aspect).

process of novasternum. Posterior parameres seem to be represented by the 2 arms of decasternum (see above). Ventral fragma well-developed, quadrate, and pale brownish yellow. Novasternum without submedian spines and median notch. p. f. = ABCDeFGHikLMN.

Internal structures: Ejaculatory apodeme (Fig. 4 F. G) dark brown, with stem long and straight; plate short, quadrate and distally concaved.

Distribution: Ishigakijima.

Holotype: ♂, Ishigakijima, 19 IX '55 S (Kano).

Feeding habits: S.

Relationships: The presence of 2 tibial spines in this species recalls *Oxyphortica* Duda, but differs from it in having costa not becoming weak beyond  $r_{4+5}$ , and in having  $r_{2+3}$  strongly curved to reach costa at tip, as seen in the general species of *Protostegana*. It will also easily be distinguished from any other known member of *Protostegana* by the characteristic wing-patterns.

*Protostegana* sp. from Taba Fig. 5.

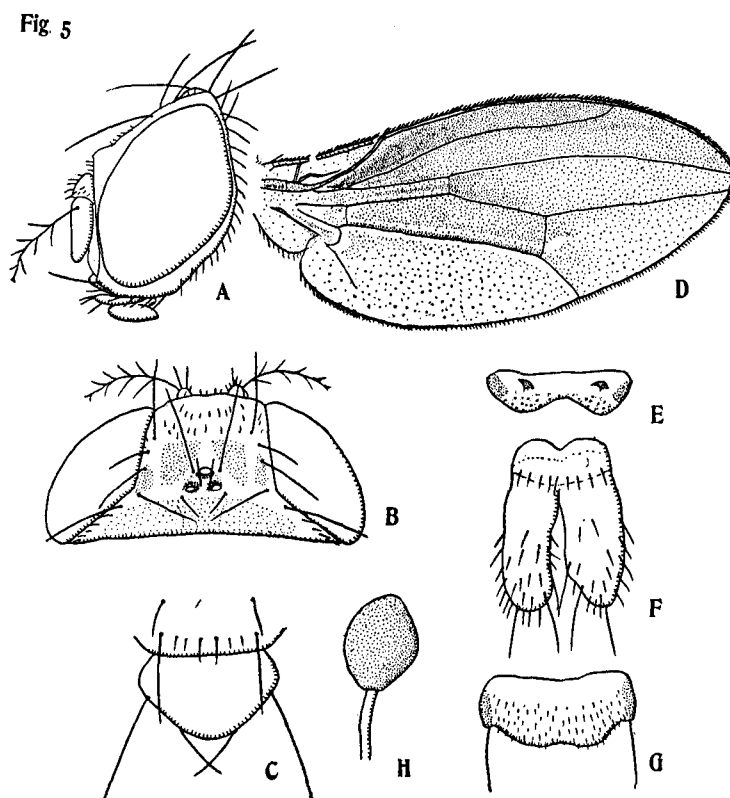


Fig. 5. *Protostegana* sp. from Taba

A. Head; B. do. (dorsal aspect); C. Scutellum and prescutellar region of the mesoscutum; D. Wing; E. Pregenital plate; F. Egg-guides. (ventral aspect); G. Novasternum of female; H. Spermatheca.

♀: Body about 4.3 mm, brownish black, with legs and venter of the body whitish. Wings black. Head (Fig. 5 A, B): Eyes bare. Arista with about 10 rather short branches including minute fork, about 3 below it. Front about 1/3 as broad as head, with numerous *fr.* Carina minute. Cheek about 1/4 as broad as the greatest diameter of eye.  $orb_2$  about 1/3 length of  $orb_1$ . Only one prominent *or.* Mesonotum with pale obscure longitudinal stripes. *ac* in about 12 irregular rows. Anterior *scut* strongly divergent. Mesopleura with black longitudinal stripe. Stern-index about 0.9. 5-6 long spines on middle tibia. Preapicals on all tibiae; apicals on middle. Wings (Fig. 5 D) black, broad.  $r_{2+3}$  convex at middle, ending to costa at an acute angle.  $r_{4+5}$  and *m* strongly convergent. C-index about 1.7; 4V-index about 1.9; 4C-index about 1.4; 5X-index about 1.5. C1-bristle may be single; C3-bristles on basal 1/2.

Egg-guides (Fig. 5 F) with lobes fused to each other at base, hairy, and with a few bristles. A pair of small pregenital plates (Fig. 5 E) anterior to egg-guides.

Spermatheca oval, black, and basally narrowing. Eggs without filaments.

Specimen examined: Taba, Yamanashi Pref., 1 ♀, 16 VII '53 S.

Distribution : Honshu (Chubu).

Feeding habits : S.

Relationships : Near *P. sibirica* Duda, and also *P. curvipennis* (Fallén) from Europe, but distinguished from the former in weak carina, blackish mesonotum, etc., and from the latter in the paler ventral side of mesopleura.

Genus *Stegana* Meigen, 1830

Japanese name: Kabuto-shōjōbae.

*Stegana* Meigen, 1830. Syst. Besch., 6:79; Oldenberg, 1914. Arch. Naturg., 80A (2):27; Sturtevant, 1921. Carn. Inst. Publ., 301:56 (s. lat.); Duda, 1924. Arch. Naturg., 90A (3):178; Malloch, 1921. Ent. News. 32:311; Sturtevant, 1927. Phil. Journ. Sci., 32:363; Duda, 1935. Die Fliegen, 58g:16; Patterson, 1943. Univ. Texas Publ., 4313:86(s. lat.).

*Eostegana* Hendel, 1913. Deutsch. ent. Zeit.:390 (teste Sturtevant, 1921).

*Orthostegana* Hendel, 1913. ibid. (ibid.); Duda, 1924. Arch. Naturg., 90 A (3):182.

Logotype : *Musca coleoptrata* Scopoli, 1762.

*Stegana coleoptrata* (Scopoli, 1763) Fig. 6.

Japanese name: Tsuya-Kabuto-shōjōbae.

*Musca coleoptrata* Scopoli, 1763. Entom. carn., 338, 907.

*Stegana coleoptrata* Oldenberg, 1914. Arch. Naturg., 80A (2):26, 181; Malloch, 1921. Ent. News, 32:311; Sturtevant, 1921. Carn. Inst. Publ., 301:57; Malloch, 1924. Proc. U. S. Nat. Mus., 66 (3), 2540:6; Duda, 1924. Arch. Naturg., 90A (3):181; Séguy, 1932. Encycl. Ent., B II, (6) :181; Duda, 1935. Die Fliegen, 58g:17; Wheeler, 1954. Univ. Texas publ., 5422:63.

*Stegana hypoleuca* Meigen, 1830. Syst. Besch., 6:80.

*Phortica vittata* Coquillett, 1901. Proc. U. S. Nat. Mus.:23.

*Stegana* sp. A. Wheeler, 1952. Univ. Texas Publ., 5204:212 (teste Wheeler, 1954).

*Stegana* sp. Okada, 1953. Zool. Mag., 62:280.

Fig 6

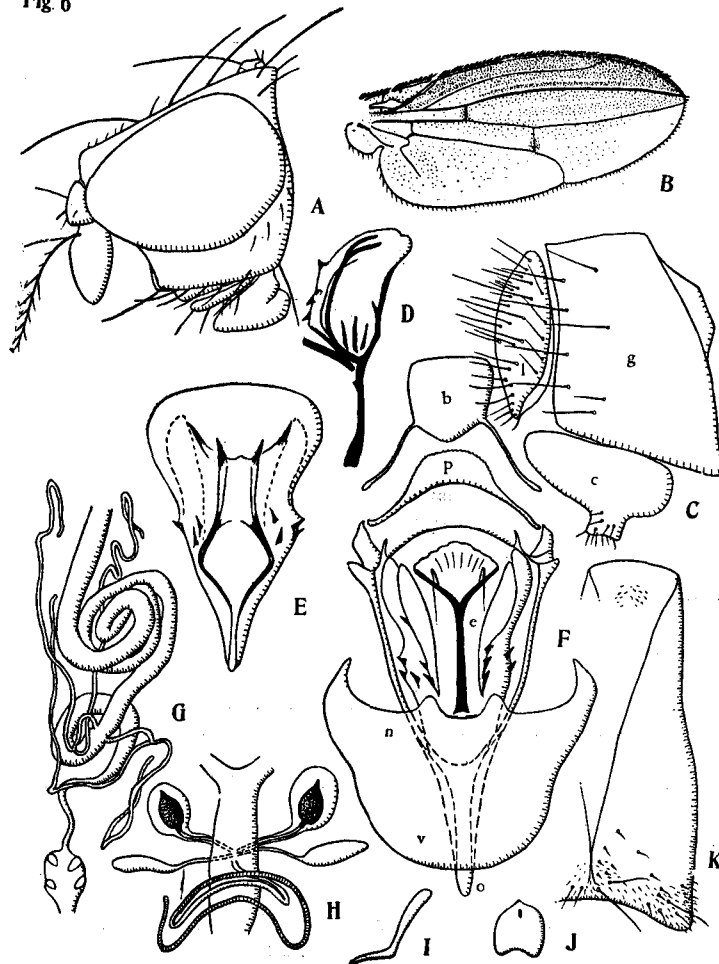


Fig. 6. *Stegana coleoptrata* (Scopoli).

A. Head; B. Wing; C. Periphallalic organs (lateral aspect); D. Aedeagus: (lateral aspect); E. do. (ventral aspect); F. Phallic organs (ventral aspect); G. Digestive system (ventral aspect); H. Female reproductive organs; I. Ejaculatory apodeme (lateral aspect); J. do. (ventral aspect).

♂ and ♀: Body glossy black, about 3 mm in length. Head (Fig. 6 A) flat, occiput black. Eyes dark reddish brown, roughly pilose. Antenna dark brown, 3rd segment darker. Arista black, basal 1/4 yellow, with black pubescence. Palpi yellow, with a few prominent setae.  $or_2$  less than half vibrissa. Ocellar triangle small and black. Periorbits orange brown. Front glossy black, with a few grey  $fr$ . Face black, perioral region white. Carina narrow above, yellow at middle. Cheek about 3/5 as broad as the greatest diameter of eye and white below.

Mesonotum glossy black, somewhat pruinose. Scutellum black, with transverse wrinkles at centre. Thoracic pleura yellowish white, with broad black longitudinal band.  $hu$  2, lower longer.  $ac$  in about 3 irregular rows. Cross distance of  $dc$  about 4 times the length distance. Prescutellars long. Anterior  $scut$  divergent. Sterno-index about 1.1.

Legs white, black at knee-joints, ultimate tarsi also black. Preapicals on all tibiae; apicals on middle. Wings (Fig. 6 B) black, especially at the anterior half.  $r_{4+5}$  and  $m$  apically strongly convergent. 3rd costal section with several thorn-like warts. C-index about 1.9; 4V-index about 2.4; 4C-index about 1.4; 5X-index about 2.0. C1-bristles 2; C3-bristles on basal 3/4. Halteres yellowish white. Abdomen entirely black and bristly.

Periphallic organs (Fig. 6 C): Genital arch black, broaden below, with about 8 upper marginal setae; lower margin bare; heel lower than toe. Clasper black, much broader than long, and apically with a small quadrate process, on which about 18 minute setae are inserted. Anal lobe black, elliptical, with about 45 setae. Decasternum brown and pentagonal.

Phallic organs (Fig. 6 D-F): Mainly dark brown. Aedeagus large and thick, with several strong black thorn-like projections on the ventral side. Apodeme long and tapering. Ventral fragma quadrate, with median notch shallow, and caudally with 2 submedian conical processes. Posterior parameres fused to each other, and contiguous to aedeagus at its apex. Anterior parameres seem to be absent. Vertical rod rather long. p. f. =  $ab'Cd_0Ef_0gHiKlm'N$ . PI=0.8.

Egg-guides (Fig. 6 K): Lobes entirely fused to each other, pale brown, distally broaden, and dark brown; each lobe with 2 long and about 20 minute setae.

There are a pair of minute, comma-shaped, pregenital plates just before and inside the egg-guides, and also a pair of triangular sclerotized pieces between the comma-shaped platlets and the egg-guides.

Internal structures (Fig. 6 G-J): Proximal intestine thrice coiled. Rectal papillae oval, R=2.0. Malpighian tubes with common stalks comparatively short, posterior branches closely apposed to each other at tips. Spermatheca black, pear-shaped, apically pointed. Parovaria hyaline, with elongate heads. Ventral receptacle with about 150 kinky coils and about 1 1/2 proximal folds. Ejaculatory bulb oblong; apodeme black, with quadrate plate and long straight stem. Testis and paragonia unobservable.

Specimens examined: Sōunkyo, Hokkaido, 3 ♂♂ and 5 ♀♀, 12 VIII '53 T; Asakawa, Tokyo, 1 ♂ and 1 ♀, 2 V '52 S.

Feeding habits: TS.

Distribution: Hokkaido, Honshu (Kanto), Europe, N. America.

Remarks: The present species has the mesonotal coloration resembling that of *S. coleoptrata* var. *mehadiae* Duda, 1924, from Europe, but has gena without black line, different from the latter species. The flies were found resting on the timber piles at Sōunkyo, with wings folded upon abdomen, like a beetle.

#### Genus *Amiota* Loew, 1862

Japanese name: Takame-Shōjōbae-azoku.

*Amiota* Loew, 1862. Berl. ent. Zeit., 6:299, 93; Coquillett, 1910. Proc. U. S. Nat. Mus., 37:505; Hendel, 1910. Wien. ent. Zeitg., 29:312; Sturtevant, 1927. Phil. Journ. Sci., 32:361; Duda, 1935. Die Fliegen, 58g:30, 31; Wheeler, 1949. Univ. Texas Publ., 4920:159; Wheeler, 1952. *ibid.*, 5204:166.

*Phortica* Schiner, 1862. Wien. ent. Monat., 6:433; Malloch, 1921. Ent. News, 32:1; Duda, 1924. Arch. Naturg., 90A (3): 178, 183.

*Stegana* pro parte, Sturtevant, 1921. Carn. Inst. Publ., 301:56.

Logotype: *Amiota humeralis* Loew, 1862.

#### Key to subgenera of the genus *Amiota*, after wheeler (1952).

1. Mesonotum without spots; legs not banded;  $orb_2$  at least 2/3 as long as  $orb_3$ ; humeral and subalar regions usually white..... Subgenus *Amiota* Loew.
- Mesonotum with dark spots;  $orb_2$  less than 1/3 the length of  $orb_3$ ; humeral and subalar regions not white..... Subgenus *Phortica* Schiner.

Further diagnoses are shown in the key to genera.

Subgenus *Amiota* Loew, 1862

Japanese name: Chibi-mematai-azoku.

*Amiota* Loew, 1862. Berl. ent. Zeit., 6:297.

Logotype: *Amiota humeralis* Loew, 1862.

*Amiota (Amiota) alboguttata* (Wahlberg, 1838) Fig. 7.

Japanese name: Chibi-mematai.

*Drosophila alboguttata* Wahlberg, 1838. Acta Acad. Sci. Holm., 22:11.

*Amiota alboguttata* Duda, 1935. Die Fliegen, 58g:31; Basden, 1952. Ent. Month. Mag., 88:201; Basden, 1954. Trans. Roy. Soc. Edinburgh, 72:651.

*Phortica alboguttata* Oldenberg, 1914. Arch. Naturg., 80A (2):22; Duda, 1923. Annal. Mus. Nat. Hung., 20:36; Duda, 1924. Arch. Naturg., 90A (3):184.

*Leucophenga leucostoma* Becker, 1908. Annal. Mus. Nat. Hung., 6:320.

*Amiota leucostoma* Loew, 1862. Berl. ent. Zeit., 6:330.

*Phortica leucostoma* Oldenberg, 1922. Deut. ent. Zeit.:214; Malloch, 1921. Ent. News, 32:312.

*Stegana alboguttata* Sturtevant, 1921. Carn. Inst. Publ., 301:133

*Paraphortica* sp. Okada, 1953. Zool. Mag., 62:280; Okada, 1954. *ibid.*, 63:262.

Fig 7

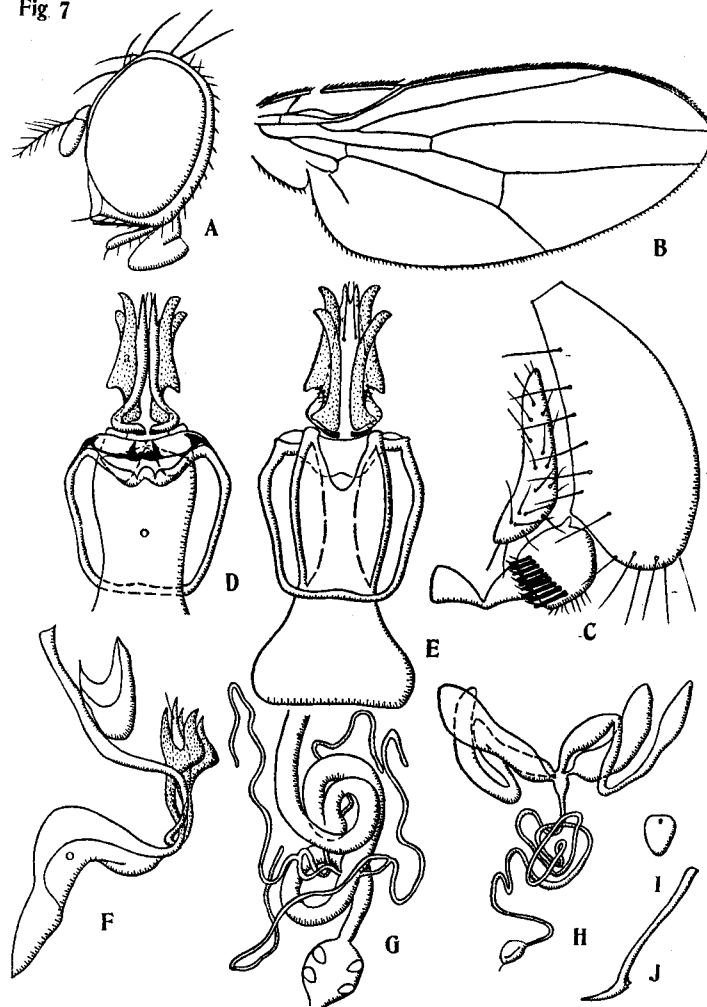


Fig. 7. *Amiota (Amiota) alboguttata* (Wahlberg).

A. Head; B. Wing; C. Peripheral phallic organs (lateral aspect); D. Phallic organs (dorsal aspect, part); E. do. (ventral aspect); F. do. (lateral aspect); G. Digestive system (ventral aspect); H. Male reproductive organs; I. Ejaculatory apodeme (ventral aspect); J. do. (lateral aspect).

♂: Body about 2.7 mm, black with distinct white spots on each humerus, below wing-bases, and on the face. Head (Fig. 7 A) black, as broad as or broader than thorax. Antenna greyish brown, 3rd joint broad. Arista with about 11 rather short branches including small fork, 2 below it. Palpus broad, yellow, fusiform, with a few strong setae. Eyes red and bare. Ocellar triangle black; periorbits reddish brown. Carina brown and flat. Front black, about 2/5 as broad as head-width, and with fr. Cheek reddish brown, about 1/15 the greatest diameter of eye in width.

Mesonotum black, humerus white. Scutellum black. Thoracic pleura black, white below wing.

*hu* 1. *prsc* 2. *ac* in 10 rows. Cross distance of *dc* about thrice the length distance. Anterior *scut* divergent. Sterno-index about 0.8.

Legs yellowish white; tarsi short. Metatarsus longer than the 3 succeeding tarsal joints taken together. Preapicals on all three tibiae; apical on fore and middle. Wings (Fig. 7 B) hyaline, veins yellow; costa with about 20 minute thorn-like warts on the underside of the 3rd section;  $r_{4+5}$  and *m* apically convergent. C-index about 1.8; 4V-index about 2.7; 4C-index about 1.7; 5X-index about 1.3. C1-bristles 2; C3-bristles on basal 2/3. Halteres white.

Abdominal tergites brownish black, white at posterior margins; 2T yellowish at middle. Sternites white. 6S bare, yellowish orange, and with a crescent patch on each side.

Periphallic organs (Fig. 7 C): Primary clasper greyish brown, hemispherical, and with about 9 long black primary teeth, lower ones being longer; no secondary teeth, no secondary clasper. Genital arch broadly rounded below, toe slightly projected; upper marginal hairs about 6, lower about 7. Anal plate crescent, with about 20 short hairs. Decasternum medially narrow.

Phallic organs (Fig. 7 D-F): Aedeagus small, broad at base, with a pair of long setae on venter about at middle, and tip bifid. Basal apodeme of aedeagus very large, dorsally convex at middle, and apically broaden. Anterior paramere black, apically with 2 strong claws, and basally with a few sensilla. Posterior parameres fused with each other, separated from aedeagus, and connected to the lateral arms of novasternum. p. f. = ABCDEfgHikLMN. PI=0.4.

Internal structures (Fig. 7 G-J): Proximal intestine twice coiled (C=2). Rectal papillae oval, R=0.8. Malpighian tubes with common stalks short, posterior branches ending free. Testis elliptical, cream-colored. Paragonia elongate, twice folded. Ejaculatory duct complicatedly entangled. Ejaculatory bulb small, oval; apodeme with plate oval and stem elongate, 3 times as long as plate.

Specimens examined: Daisetsuzan, Hokkaido, 1 ♂, 12 VIII '53 E; Sapporo, Hokkaido, 1 ♂, 19 VIII '53 E; Kumotoriyama, Tokyo, 7 ♂♂, 15 VII '52 E; 3 ♂♂, 21 VII '54 S (Moriwaki); Takaozan, Tokyo, 3 ♂♂, 23 VIII '55 E; Yatsugatake, 1 ♂, 26 VII '52 E; Kisofukushima, Nagano Pref., 4 ♂♂, 21 VII '53 E; Tadashina, Nagano Pref., 1 ♂, 18 VII '54 E; Ichinose, Ishikawa Pref., 1 ♂, 14 VIII '52 E (Hori).

Distribution: Hokkaido, Honshu (Kanto, Chubu), Europe, N. America, New Guinea, South Asia.

Feeding habits: ES.

Remarks: All the specimens examined were males, most of them have been collected while they were hovering about eyes of people. The present form is strictly similar to the Siberian form, which was reported by Duda (1935), as shown by Mr. K. Koizumi of Okayama University in his private letter (1954), especially in the feature of arista, which has both upper and lower branches.

#### Subgenus *Phortica* Schiner, 1862

Japanese name: Takame-shōjōbae-azoku.

*Phortica* Schiner, 1862. Wien. ent. Monat., 6:433.

Haplotype: *Drosophila variegata* Fallén, 1823.

#### *Amiota (Phortica) variegata* (Fallén, 1823) Fig. 8.

Japanese name: Madara-mematoi (Tokunaga, 1943); Takame-Shōjōbae (Siraki, 1954)

*Drosophila variegata* Fallén, 1823. Dipt. Suec. Geomys., 5:2.

*Amiota variegata* Kikkawa and Peng, 1938. Japan. Journ. Zool., 7:547; Koizumi, 1952. Kurashiki Konchū Dōkōkai, 1:2;

Okada, 1953. Zool. Mag., 62:280; Okada, 1954. Zool. Mag., 63:262; Koizumi, 1954. Kontyū, 20:25; Shiraki, 1954. Class.

Ins.:748.

*Phortica variegata* Oldenberg, 1914. Arch. Naturg., 80A(2):23; Duda, 1923. Annal. Mus. Nat. Hung., 20:35; Duda, 1924.

Arch. Naturg., 90A(3):183, 240; Duda, 1935. Die Fliegen, 58g:35.

*Stegana variegata* Sturtevant, 1921. Carn. Inst. Wash., 301:57.

*Amiota* sp. I, Mizuno, 1952. Papers for Res. Gen., 3:51.

♂ and ♀: Body about 4.5 mm in length, yellowish grey, with dark brown markings. Head (Fig. 8 A): Arista with about 6-8 branches including small fork, 0-2 below it. Palpus basally black, with only one prominent apical seta. Front about half the head-width.  $orb_2$  about 1/3  $orb_1$ ;  $or_2$  about 1/3 vibrissa. *hu* 1, *ac* in 8 rows. Sterno-index about 0.8. Preapicals on all tibiae; apicals on middle. Wings (Fig. 8 B): Costa without thorn-like warts. C-index about 2.4; 4V-index about 3.0; 4C-index about 1.4; 5X-index about 0.8. C1-bristle 1; C3-bristles on basal 3/4.

Periphallic organs (Fig. 8 C): Genital arch yellowish brown, darker below; heel high and curved upward; upper margin with about 5 hairs, lower margin bare. Clasper oblong, yellow,



submedially curved caudad, and with about 15 short setae and 15 hairs. Anal plate yellow, oval, with about 60 long black hairs on the outer surface. Decasternum pale, quadrate and trilobed proximally.

Phallic organs (Fig. 8 D-F): Aedeagus orange yellow, strongly arcuated dorsally, apically with a horizontally flattened quadrate flap which has a recurved spur on each side, and sub-basally with a pair of short branches to which connected the posterior parameres. The posterior parameres are contiguous to each other and deeply arcuated. Apodeme of aedeagus short, black, and contiguous to aedeagus by mean of a very short black rod. Vertical rod also black and short, apically bifid and contiguous to the bases of anterior parameres. Ventral fragma is represented by a narrow black arch. p.f.=aBCDEfgHiklMn. PI=about 1.5.

Egg-guides: Lobes thin, membranous, and basally contiguous to each other, distally yellowish grey, and each with about 20 hairs. A pair of minute comma-shaped pregenital plates (Fig. 8 G) are seen just in front of egg-guides.

Internal structures (Fig. 8 H-J): Proximal intestine coiled 3 times or less. Rectal papillae oval,  $R=1.6-2.0$ . Malpighian tubes with common stalks short, and posterior branches ending free. Testis once or twice folded, opaque white, and basally black. Paragonia also twice folded and basally black. Ejaculatory bulb oval, plate black and elongate oval. Spermatheca hemispherical, black, and with long stems. Parovaria globular, medially darker, and with long stems. Ventral receptacle very short, about twice folded.

Specimens examined: In Hokkaido: Akkeshi, 2 ♀♀, 12-18 VIII '51; Nakashibetsu, 1 ♀, 16 VIII '51; Tōbetsu, 2 ♂♂, 17 VIII '51 TE; Shioya, 10 VII '52 (Takada). Towada, Aomori Pref., 1 ♀, 23 VIII '52 F (Yoshida); Hakkōda, Aomori Pref., 2 ♂♂, 23 VIII '51 E; Morioka, Iwate Pref.,

Fig 8

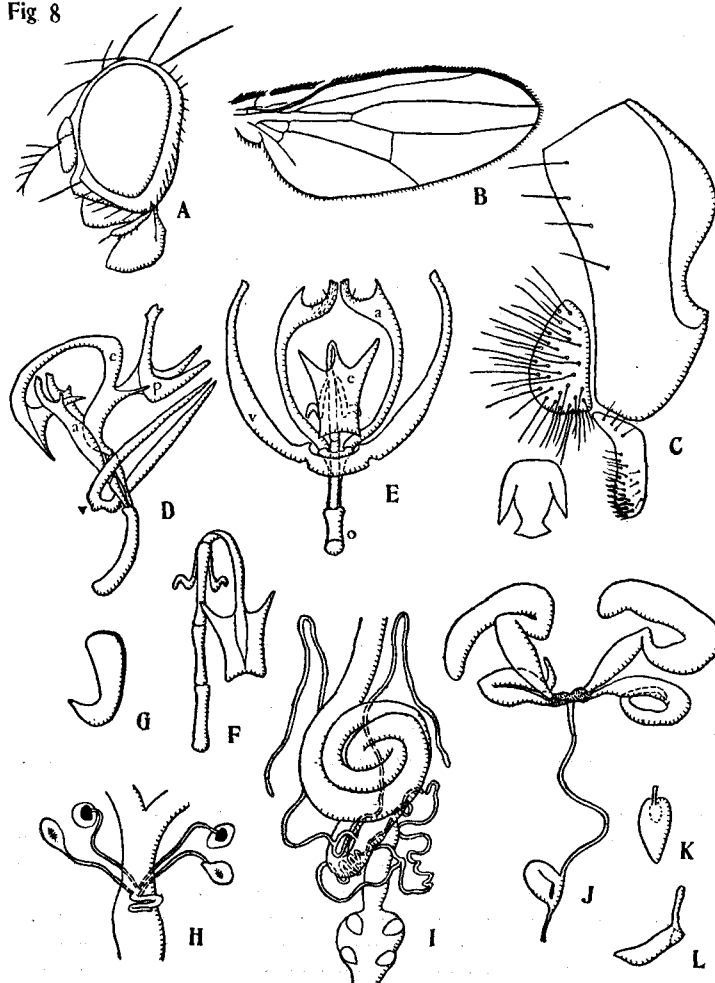


Fig. 8. *Amiota (Phortica) variegata* (Fallén).

A. Head; B. Wing; C. Periphallallic organs (lateral aspect); D. Phallic organs (lateral aspect); E. do. (ventral aspect); F. Aedeagus (ventral aspect); G. Pregenital plate; H. Female reproductive organs (ventral aspect); I. Digestive organs; J. Male reproductive organs; K. Ejaculatory apodeme (ventral aspect); L. do. (lateral aspect).

7-11 X '52 T; Fukushima, 1 ♂ and 1 ♀, 26-27 VII '54 (Kotake). In Tokyo: Asakawa, a few ♂♂ and ♀♀, 28 II '53 F (Ohba); Setagaya, 1 female, 24 III '53 F; 1 ♂ and 1 ♀, 18 IV '52 F (Toda); Suginami, 10 ♂♂ and 4 ♀♀, 9, 15 VI '51 T; 6 ♂♂ and 1 ♀, 25, 28 VII '51 T; 1 ♂ and 11 ♀♀, 18, 22 V '51 T; 3 ♂♂ and 4 ♀♀, 27 VI '52 T; 1 ♂, 25 XI '51 T (all by Ohnishi); Kunitachi, 1 ♂ and 2 ♀♀, 18 IX '52 T; Kumotoriyama, 1 ♂, 16 VII '52 S; 3 ♂♂, 15 VII '53 F. Ikuta, Kanagawa Pref., 1 ♂ and 2 ♀♀, 25 XI '52 TS; Yatsugatake, Nagano Pref., 1 ♀, 27 VII '52; Kisofukushima, 5 ♂♂, 21-25 VII '52 E; Nanokawa, Kōchi Pref., 1 ♂, 6 XI '53 S; Asozan, Kumamoto Pref., 1 ♂ and 1 ♀♀, 28 IX '54 E; Kujūzan, Ōita Pref., 1 ♂, 27 IX '54 E; Kirishimayama, Kagoshima Pref., 2 ♀♀, 22 IX '54 E; Kaimondake, Kagoshima Pref., 2 ♂♂, 20 IX '54 E.

Previous records from Japan: (Kikkawa & Peng, 1938) Kōfu, Gotenba; (Koizumi 1952, 1954) Okayama, Kyoto, Yamagata; (Mizuno, 1952) Ohyachi, Hokkaido; (Hori, 1952, read in the 12th annual meeting of the Entomological Society of Japan) Kanazawa.

Distribution: Hokkaido, Honshu (Tohoku, Kanto, Chubu, Kinki, Chugoku), Shikoku, Kyushu, China, Europe, Formosa, Sumatra.

Feeding habits: ETFS.

Remarks: The males have often been found flying about eyes of people, but females are less often attracted there.

A pair of minute comma-shaped well sclerotized pregenital plates, located anteriad to egg-guide and hidden under 7 T, found in the present species, as well as three preceding ones and *Leucophenga* (*Trichiaspiphenga*) *argentosa* sp. nov., seem to be a characteristics common to the subfamily steganinae. There is, however, an exceptional case in the subfamily Drosophilinae, which shows similar structures: i.e. *Microdrosophila* (*Microdrosophila*) *purpurata* sp. nov. (see under the species).

As shown in the key to genera of the family Drosophilidae, the present species is quite different from the remaining members of the subfamily Steganinae in the lack of the thorn-like warts on the 3rd costal section of wing. Laboratory culture is only occasionally possible. Eggs without filaments.

#### Genus *Leucophenga* Mik, 1886

Japanese name: Kogane-shōjōbae-zoku.

*Leucophenga* Mik, 1886. Wien. ent. Zeitg., 1886:317; Strutevant, 1921. Carn. Inst. Wash., 301:59; Malloch, 1923. Proc.

Linn. Soc. N.S. Wales, 48:601; Duda, 1924. Arch. Naturg., 90A (3): 179, 185; Duda, 1935. Die Fliegen, 58g:37;

Patterson, 1943. Univ. Texas Publ., 4313:36; Wheeler, 1952. Univ. Texas Publ., 5204:184.

*Oxyleucophenga* Hendel, 1913. Ent. Mitt., 2:386.

*Drosomyella* Hendel, 1914. Suppl. Ent., 3:113.

*Paraleucophenga* Hendel, 1914. Suppl. Ent., 3:114.

*Neoleucophenga* Oldenberg, 1914. Arch. Naturg., 80A (2):93.

Haplotype: *Drosophila maculata* Dufour, 1839.

This genus is the second largest genus of the family, especially rich in the Tropical areas. Matsumura (1931) described *Leucophenga suzukii*, but it has been referred by Kanzawa (1934) to the genus *Drosophila*. Duda (1924) divided the genus into 3 subgenera: *Pararhinoleucophenga* Duda, *Trichiaspiphenga* Duda, and *Leucophenga* Mik, s. str. The author has obtained several species of the genus from Japan, some of them are identical or closely related to the European ones, others to the South Asiatic representatives. They belong to the last 2 subgenera of Duda.

#### Key to Japanese subgenera and species of the genus *Leucophenga*.

1. Carina flat. Arista only pubescent below. Scutellum with microtrichia on the lateral margins..... *L. (Trichiaspiphenga)* Duda: *L. (T.) argentosa* sp. nov.  
Carina developed. Arista with long branches below. Scutellum without microtrichia on the lateral margins..... *L. (Leucophenga)* Mik. ... 2.
2. Palpi very large..... 3.  
Palpi moderate in size ..... 4.
3. Palpi black..... *L. (L.) magnipalpis* (de Meijère), (female).  
Palpi yellowish grey..... *L. (L.) guttiventris* (de Meijère), (female).
4. Wings without distinct black markings..... 5.  
Wings with distinct black markings..... 9.
5. Palpi black or dark brown..... 6.  
Palpi yellowish..... 8.
6. Crossveins clouded; abdominal spots confluent with the black bands on 3-5T..... *L. (L.) concilia* sp. nov. (part)  
Crossveins non-clouded..... 7.

7. Abdomen almost entirely black. .... *L. (L.) angusta* sp. nov. (male)  
Abdominal spots separated from each other. .... *L. (L.) magnipalpis* Duda (male).
8. Knee-joints of the middle and hind legs not black. .... *L. (L.) maculata* (Dufour).  
Knee-joints of the middle and hind legs black. 3-5T with distal black bands laterally broaden to reach the anterior margins. .... *L. (L.) concilia* sp. nov. (part).
9. Costa evidently black. .... *L. (L.) subpollinosa* de Meijère.  
Costa not black. .... 10.
10. Crossveins clear; costal black spot at the end of  $r_{2+3}$  elongated both distally and proximally. .... *L. (L.) interrupta* Duda.  
Crossveins distinctly clouded; costal black spot at the end of  $r_{2+3}$  circular. .... 11.
11. Wings with black spots at the tip of  $r_{4+5}$ . .... *L. (L.) quinque maculipennis* sp. nov.  
Wings without black spots at the tip of  $r_{4+5}$ . .... 12.
12. The black spot at the tip of  $r_{2+3}$  extending below to reach  $r_{4+5}$ . .... *L. (L.) quadripunctata* (de Meijère).

#### Key to Japanese species of the genus *Leucophenga*, with regard to the periphallid organs

1. Clasper quadrate, with primary teeth and without discal hairs. .... *L. (Trichiasiphenga)* Duda; *L. (T.) argentosa* sp. nov.  
Clasper more or less semicircular, without primary teeth and with discal hairs. .... *L. (Leucophenga)* Mik. ... 2.
2. Anal plate with less than 10 macrotrichia. .... 3.  
Anal plate with more than 15 macrotrichia. .... 4.
3. Genital arch with lower marginal hairs. Decasternum bar-like, not broaden at middle. Clasper with stout setae. .... *L. (L.) magnipalpis* Duda.  
Genital arch without lower marginal hairs. Decasternum triangular, broaden at middle. Clasper with fine setae. .... *L. (L.) angusta* sp. nov.
4. Clasper with strong setae. .... *L. (L.) guttiventris* (de Meijère).  
Clasper with fine setae. .... 5.
5. Genital arch with a few lower marginal hairs, which are distributed evenly on the lower margin. .... 6.  
Genital arch with lower marginal hairs almost entirely restricted at the heel, or absent. .... 7.
6. Clasper much broader than long. .... *L. (L.) concilia* sp. nov.  
Clasper as long as broad. .... *L. (L.) maculata* (Dufour).
7. Genital arch without lower marginal hairs. .... *L. (L.) quadripunctata* (de Meijère).  
Genital arch with at least one lower marginal hair. .... 8.
8. Heel bare. Only one lower marginal hair on the genital arch. .... *L. (L.) interrupta* Duda.  
Heel hairy. At least a few lower marginal hairs on genital arch. .... 9.
9. About 8 hairs at heel. .... *L. (L.) quinque maculipennis* sp. nov.  
About 4 hairs at heel. .... *L. (L.) ornatipennis* (de Meijère).

#### Key to Japanese species of the genus *Leucophenga*, with regard to the phallic organs

1. Aedeagus very thick and short. Anterior paramere without sensilla. .... *L. (Trichiasiphenga)* Duda; *L. (T.) argentosa* sp. nov.  
Aedeagus and posterior paramere very slender. Anterior paramere with sensilla. .... *L. (Leucophenga)* Mik.
2. Posterior paramere with stem very slender, and only basally bifid. Novasternum slender. .... 3.  
Posterior paramere with stem thicker, and bifid for almost entire length. .... 4.
3. Aedeagus with apical half pubescent. .... *L. (L.) magnipalpis* Duda.  
Aedeagus pubescent only at apex. .... *L. (L.) angusta* sp. nov.  
Aedeagus pubescent at almost entire length. .... *L. (L.) guttiventris* (de Meijère).
4. Basal apodeme of aedeagus distinct. Aedeagus scaly. Ventral fragma basally broad and truncate. .... *L. (L.) ornatipennis* (de Meijère).  
Basal apodeme of aedeagus indistinct. Aedeagus not scaly, but usually pubescent. Ventral fragma basally narrow. .... 5.
5. Aedeagus not pubescent, and subbasally with heavy serrations. .... *L. (L.) interrupta* Duda.  
Aedeagus at least apically pubescent, and subbasally without heavy serrations. .... 6.
6. Bifid stems of posterior parameres very slender, much longer than aedeagus. .... *L. (L.) concilia* sp. nov.  
Bifid stems of posterior parameres as long as or shorter than aedeagus. .... 7.
7. Anterior paramere with sensilla apical. .... *L. (L.) quadripunctata* (de Meijère).  
Anterior paramere with sensilla mesal. .... 8.
8. Ventral fragma proximally pointed. .... *L. (L.) quinque maculipennis* sp. nov.  
Ventral fragma proximally rounded. .... *L. (L.) maculata* (Dufour).

#### Key to Japanese species of the genus *Leucophenga*, with regard of the egg-guides

1. Lobes broader than long, perfectly fused to each other, and setigerous on entire surface. .... *L. (Trichiasiphenga)* Duda; *L. (T.) argentosa* sp. nov.  
Lobes not broader than long, usually imperfectly fused to each other, and entirely or partially setigerous. .... *L. (Leucophenga)* Mik. ... 2.

2. Lobes as long as broad, almost entirely fused to each other. .... 3.
- Lobes longer than broad, imperfectly fused to each other. .... 4.
3. Lobes minute, and only apically setigerous. .... *L. (L.) guttiventris* (de Meijère).
- Lobes not minute, and with both apical and discal setae. .... *L. (L.) subpollinosa* de Meijère.
4. Lobes only apically setigerous. .... 5.
- Lobes entirely setigerous. .... 6.
5. Lobes closely apposed to each other. .... *L. (L.) magnipalpis* Duda.
- Lobes separated from each other to some extents. .... *L. (L.) concilia* sp. nov.
6. Lobes truncate at tips, and without microtrichia. .... *L. (L.) ornatipennis* (de Meijère).
- Lobes obtusely pointed at tips, and with microtrichia on outer surface. .... *L. (L.) maculata* (Dufour).

Subgenus *Trichiaspiphenga* Duda, 1924

Japanese name: Shirogane-shōjōbae-azoku.

*Trichiaspiphenga* Duda, 1924. Arch. Naturg., 90 A (3): 185.

Haplotype: *Helomyza invicta* Walker, 1857.

*Leucophenga (Trichiaspiphenga) argentosa* sp. nov. Fig. 9.

Japanese name: Shirogane-shōjōbae.

Fig 9

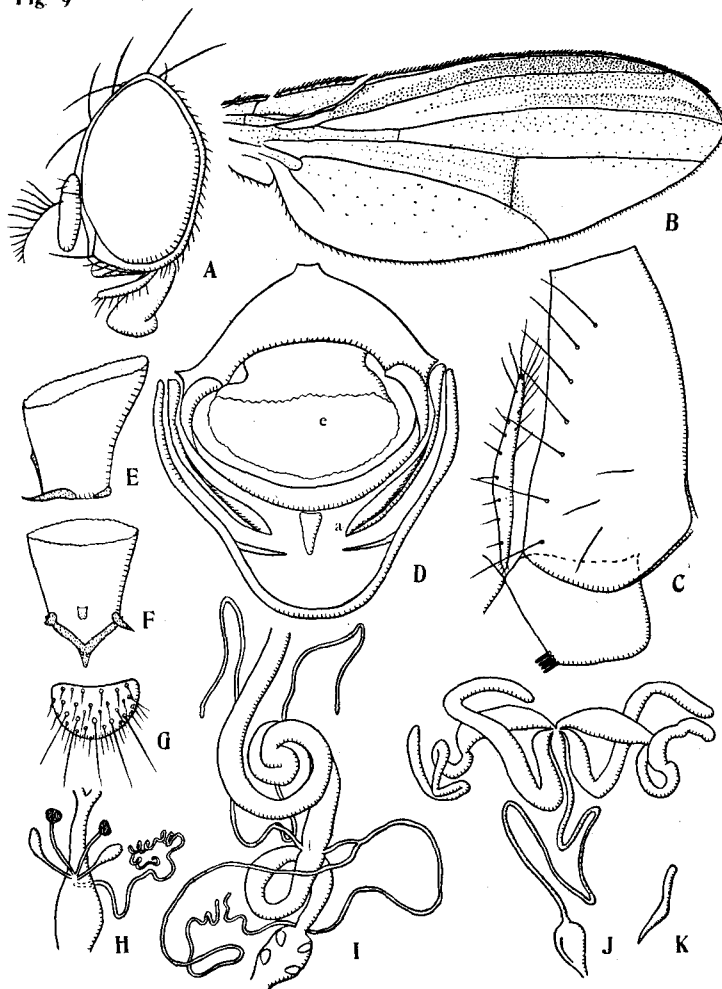


Fig. 9. *Leucophenga (Trichiaspiphenga) argentosa* sp. nov.

A. Head; B. Wing; C. Peripheral phallic organs (lateral aspect); D. Phallic organs (ventral aspect); E. Aedeagus (lateral aspect); F. do. (ventral aspect); G. Egg-guides; H. Female reproductive organs (dorsal aspect); I. Digestive system (ventral aspect); J. Male reproductive organs; K. Ejaculatory apodeme (lateral aspect).

♂ and ♀: Large silvery shining species, with body-length about 5.4 mm. Head (Fig. 9 A): Largely greyish. Eyes bare, dark red. Antenna brown. Arista with about 10 long branches above, bare below. Palpus slender, yellowish grey, and with one long apical and several shorter marginal setae. Only one prominent *or*. Ocellar white. Front yellowish white, with a paired rows of small *fr*, and about 1/3 as broad as headwidth. Face yellowish white. Carina broad, broaden below.

Cheek yellowish and very narrow, about 1/18 as broad as the greatest diameter of eye.

Mesonotum and scutellum dark brown, with silvery pollinosity, which is evident in cephallic view. Scutellum with a few marginal setae of the subgeneric character besides ordinary *scut*. Pleura dark brown, with silvery pollinosity. Sterno-index about 0.8. Humerus yellowish white. *ac* in about 10 irregular rows. Cross distance of *dc* about 3.5 times the length distance. Anterior *scut* divergent, somewhat longer than the posterior ones. Halteres white.

Legs yellowish white. Preapicals on all three tibiae, inserted near the tip of tibiae. Apicals on all three tibiae, apparently 2 apicals on fore and hind, 3 on middle. Wings (Fig. 9 B) dark, especially along costa. Crossveins clouded. C-index about 5.1; 4V-index about 1.9; 4C-index about 1.5; 5X-index about 1.1. C1-bristles only one; C3-bristles on basal 1/2.

Abdomen with tergites flat, silvery white, and with black longitudinal band on each lateral side. 6T apically black in male. In female each T with caudal black band, which projects forward at middle and at each lateral side. Pleura white; sternum yellow.

Periphallic organs (Fig. 9 C): Genital arch broad, black, yellow below; heel low, pointed in dull triangle; upper portion of arch with about 7 marginal and 3 medioventral smaller hairs; lower portion bare. Anal plate vertically narrowing, yellow, with several long upper and short lower hairs. Clasper quadrate, yellow, and with 4 black tiny teeth. Decasternum not developed well, seemingly represented by the inner triangular dilatation of claspers.

Phallic organs (Fig. 9 D-F): Aedeagus broad cup-like, with rounded large apical border, which is serrate, and a pair of small black dorsobasal processes. Apodeme of aedeagus short, rectangular to the axis of aedeagus. Anterior paramere spoon-shaped, with fine marginal serrations on apical half. Posterior paramere large, triangular, fused to each other, and contiguous to aedeagus. Ventral fragma hemispherical. p.f.=aBCDEf<sub>g</sub>Hiklm'n. PI=12.0.

Egg-guides (Fig. 9 G): Lobes completely fused to each other, hemispherical, and setigerous on entire surface. There are a pair of fusiform yellowish pregenital plates, and a pair of smaller oblong sclerites, just before egg-guides, hidden under 7S (see the remark under *Amiota variegata* (Fallén)).

Internal structures (Fig. 9 H-K): Proximal intestine twice coiled. Rectal papillae: R=1.5-2. Malpighian tubes with rather short common stalks and long branches. Posterior branches ending free. Testis with about 3 irregular coils, seminal vesicle oblong. Paragonia about twice folded. Ejaculatory bulb distally narrowing, apodeme with plate narrow. Spermatheca black, subspherical, slightly broaden apically. Parovaria with large oblong knobs. Ventral receptacle with about 12 loose coils.

Holotype: ♂, Setagaya, Tokyo, 13 XI '51 L (Okada).

Allotype: ♀, Setagaya, Tokyo, 5 XI '51 L (Okada).

Paratypes: 1 ♀, collected together with allotype; 2 ♂♂, Setagaya, Tokyo, 2 IV '54 S (hovering about road-side) (Okada); 1 ♀, Sugunami, Tokyo, 8 VII '51 T (Ohnishi); 1 ♂, Aoyama, Tokyo, 18 X '52 F (Toda), 1 ♀, Kunitachi, Tokyo, 19 IX '52 T (Okada).

Distribution: Honshu (Kanto).

Feeding habits: SLTF.

Relationships: It differs from ordinary *Leucophenga* species in having *orb*<sub>1</sub> situated as far from *orb*<sub>3</sub> as from *vti* (nearer *vti* than to *orb*<sub>3</sub> in ordinary *Leucophenga* species). Whether this slight difference deserves subgeneric value or not is uncertain, however. It will be distinguishable from *L. (T.) invicta* (Walker, 1857) from South Asia, in having less prominent marginal hairs on scutellum, and darker wings.

#### Subgenus *Leucophenga* Mik, 1886

Japanese name: Kogane-Shōjōbae-azoku.

*Leucophenga* Mik, 1886. Wien. entom. Zeit., 1886:317.

Haplotype: *Drosophila maculata* Dufour, 1839.

#### *Leucophenga (Leucophenga) magnipalpis* Duda, 1924. Fig. 10.

Japanese name: Tsuno-Kogane-shōjōbae.

*Leucophenga magnipalpis* Duda, 1924. Arch. Naturg., 90A (3): 187; Wakahama, 1956. Annot. Zool. Japon., 29:119.

? *Leucophenga nigroscutellata* Duda, 1924. Arch. Naturg., 90A (3): 186.

♂ and ♀: Body organs yellow, about 3 mm in length. Head (Fig. 10 A): Arista with about 10 branches including small fork, about 2 below it. Palpus large, black, and with or without long setae in female; small, paler, and with a long subapical seta in male. *orb*<sub>2</sub> slightly shorter than

Fig 10

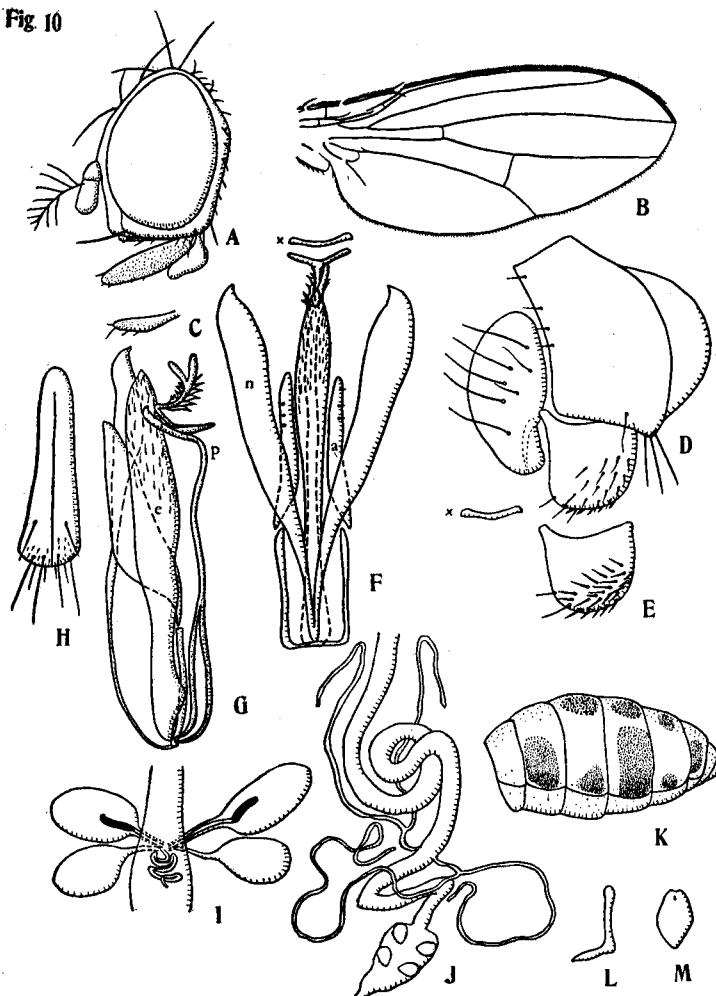


Fig. 10. *Leucophenga (Leucophenga) magnipalpis* Duda.

A. Head; B. wing; C. Palpus; D. Periphallic organs (lateral aspect); E. Clasper (inner aspect); F. Phallic organs (ventral aspect); G. do. (lateral aspect); H. Egg-guides; I. Female reproductive organs (lateral aspect); J. Digestive system; K. Male abdomen; L. Ejaculatory apodeme (lateral aspect); M. do. (ventral aspect).

*orb*<sub>1</sub>. Only one prominent *or*. Cheek yellow, about 1/7 as broad the greatest diameter of eye. Sterno-index about 0.9. Thoracic pleura with an interrupted longitudinal black band. *hu* 2, lower shorter. *ac* in 6 rows. Length distance of *dc* about 1/4 the cross distance. Anterior *scut* divergent.

Legs yellow, knee-joints of middle and hind legs black. Preapicals on middle and hind tibiae; apicals on all three. Wings (Fig. 10 B) clear, slightly fuscous along costa. Costa reaches the tip of *r*<sub>4+5</sub>. Veins yellow. C-index about 2.8; 4V-index about 2.0; 4C-index about 1.1; 5X-index about 1.5. C1-bristles 2; C3-bristles on basal about 3/4. Abdomen (Fig. 10 K) with black patches as below: one on each lateral side of 2-7 T and one median on 3-5 T, a lateral pair on 4 T being largest.

Periphallic organs (Fig. 10 D,E): Genital arch pubescent, pale brown, with 3-4 bristles at toe, and a few setae on the posterior margin. Clasper rounded, pale yellow, without teeth, but with about 20 macrotrichia and numerous microtrichia. Anal plate pubescent, with about 7 long setae, and posterior margin pale and membranous.

Phallic organs (Fig. 10 F,G): Aedeagus elongate, tapering both apically and basally, densely pubescent on apical 1/3, and yellowish orange. Posterior parameres slender, fused to each other side by side, bifid only at base and at apex. strongly curved near tips, and dorsally with a recurrent lobe. Anterior paramere large, yellowish grey, with about 3 sensilla near tip. Ventral fragma narrow basally, and deeply notched. p.f.=aBcDEFGHIKLMN. PI=seemingly infinite, owing to the lack of apodeme.

Egg-guides (Fig. 10 H): Small, oblong, and with about 3 setae near apex of each lobe. The

lobes are fused to each other and distally pubescent.

Internal structures (Fig. 10 I,J,L,M): C=2.5. R=2.2. Posterior Malpighian tubes ending free. Common stalks rather short. Testis bright yellow, with about 0.5 inner and 2.5 outer coils. Seminal vesicles banana-shaped, confluent at bases with each other. Ejaculatory bulb simple; ejaculatory apodeme with fusiform plate and straight stem, which is as long as plate. Spermatheca black, oblong, and with number of cross-stripes. Ventral receptacle folded about 3.5 times. Parovaria with short narrow stems and oval heads, which are sometimes very large.

Specimens examined: In Tokyo: Chiyoda-ku (Imperial garden), 8 ♀♀, 24-5 XI '55 F; Setagaya, 1 ♂, 13 III '51 S; 1 ♀, 14 XI '51 S; 1 ♂ 26 IX '52 L; 1 ♀, 8 IV '53 S; 1 ♂, 27 XI '52 S; Meguro, 3 ♂♂ and 1 ♀ 11 X '53 S; Asakawa, 3 ♂♂ and 5 ♀♀, 5 V '51 S; 5 ♂♂ and 1 ♀, 29 IV '52 S; 1 ♀, 1 V '52 S. Aburatsubo, Kanagawa Pref., 1 ♂, 7 V '51 S; Nanokawa, Kōchi Pref., 1 ♂, 6 XI '53 S; Dazaifu, Fukuoka Pref., 4 ♂♂ and 2 ♀♀, 24 X '53 S.

Previous record from Japan: (Wakahama, 1956) Sapporo.

Distribution: Hokkaido, Honshu (Kanto), Shikoku, Kyushu, Formosa.

Feeding habits: S.

Remarks: Well agrees with Duda's original description of this species from Formosa.

*Leucophenga guttiventris* (de Meijère, 1911) Fig. 12. A-E,H,J.

Japanese name: Haramon-kogane-shōjōbae.

*Drosophila guttiventris* de Meijère, 1911. Tijds. Ent., 54:414; de Meijère, 1918 Tijds. Ent., 60:542.

*Leucophenga guttiventris* Sturtevant, 1921. Carn. Inst. Publ., 301:131; Duda, 1923. Annal. Mus. Nat. Hung., 20:28; Duda, 1924. Arch. Naturg., 90A (3):188, 239; Kikkawa & Peng, 1938. Japan. Journ. Zool., 7:547; Duda, 1939. Annal. Mus. Nat. Hung., 32:32, 51.

*Drosophila maculiventris* de Meijère, 1908. Tijds. Ent., 51:155 (nec van der Wulp).

*Leucophenga fuscipennis* Duda, 1923. Annal. Mus. Nat. Hung., 20:28; Duda, 1924. Arch. Naturg., 90A (3):187.

*Leucophenga guttiventris* var. *curvipila* Duda, 1939. Annal. Mus. Nat. Hung., 32:32.

*Leucophenga guttiventris* var. *fuscipennis* Duda, 1939. Annal. Mus. Nat. Hung., 32:32.

♂ and ♀: Body about 3.5 mm, yellowish brown with abdomen spotted in black. Eye red, bare. Antenna yellowish grey. Arista with about 12 branches including small fork, 3 below it. Palpus yellowish grey, slender, with a prominent apical seta in male, while it is orange, very large and broadly flattened, apically rounded, and without prominent setae in female. Ocellar triangle black around ocellars. Periorbits yellowish brown or nearly black. Front orange, with a few minute *fr.* Face yellowish orange. Clypeus dark yellowish brown. Cheek brownish, narrow, about 1/13 as broad as the greatest diameter of eye. *orb*<sub>2</sub> slightly shorter than *orb*<sub>3</sub>, and situated just outside and posteriad to *orb*<sub>3</sub>. Only one prominent *or*.

Mesonotum and scutellum yellowish orange. Thoracic pleura yellowish orange, slightly clouded in male. Humerus yellowish. *prsc* as long as (male), or longer than (female), the anterior *dc. ac* in about 8 or more rows. *dc* situated close to scutellum; cross distance of *dc* about 4 times the length distance. Sterno-index about 0.8.

Legs yellow, with middle and hind femora sometimes slightly fuscous. Preapicals on middle and hind tibiae; apicals on middle. Wings (Fig. 12 A) hyaline, apically slightly pointed, and without pattern. Costa not black. *r*<sub>2+3</sub> convex forward before middle, subapically curved forward to reach costa. C-index about 2.5; 4V-index about 2.2; 4C-index about 1.3; 5X-index about 1.2. C1-bristles 2; C3-bristles on basal 2/3 or more. Halteres yellowish white.

Abdominal tergites pale yellow; 2T largely or laterally black; 3T with a small median black spots; 4T with a large (female) or 2 (male) lateral black spots on each side; 5T with a small black spot on each lateral side. Sternites pale grey. 7S of female ventroapically projected and with several stout black spinules on the processes (Fig. 12 E).

Periphallic organs (Fig. 12 C): Genital arch broad, brownish black, broadly truncate below; upper margin with about 4 hairs; lower margin with about one middle and several proximal hairs. Anal plate brownish black, fusiform, separated from genital arch, and with about 6 long and 7 shorter discal hairs. Clasper oval, brownish black, and with about 6 long hairs and 25 stout setae, covering outer margin and inner surface.

Phallic organs (Fig. 12 B): Pale brown and slender. Aedeagus slender, gently swollen subapically, and pubescent on almost entire length. Anterior paramere basally elongate, apically lobate, and with about 2 sensilla subapically. Posterior parameres brownish, slender, bifid at basal 1/3, and apically about T-shaped. Ventral fragma slender, Y-shaped. p.f.=aBcDEFghiklMn.

Egg-guides (Fig. 12 E): Minute, lobes fused and quadrate, pale grey, and apically with a

pair of short hairs.

Internal structures (Fig. 12 H,J): Proximal intestine:  $C=2.0$ . Rectal papillae oval:  $R=1.2$ . Malpighian tubes with common stalks short and posterior branches ending free. Testis pale yellow, with about 0.5 inner and 2 outer coils. Seminal vesicles thick and long. Paragonia slender and about once folded. Spermatheca black, oblong and minutely cross-striated. Parovaria short and slightly swollen at tip. Ventral receptacle with about 6 small semicircular transverse folds.

Specimens examined: Kamakura, Kanagawa Pref., 1 ♂, 7 XII '51; Chiyoda-ku, Tokyo (Imperial garden), 8 ♀♀. 25 XI '55 S.

Distribution: Honshu (Kanto), Java, Formosa, Africa.

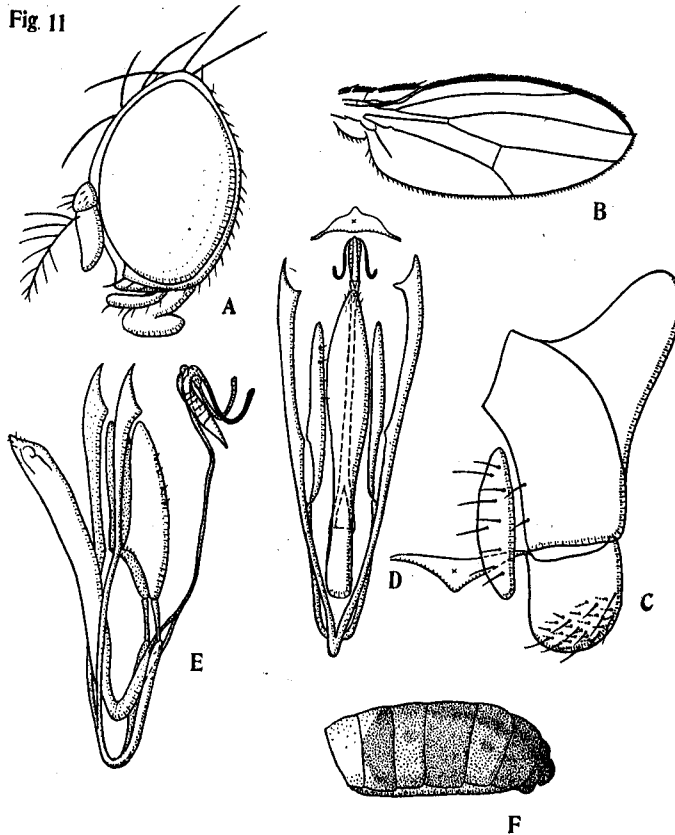
Feeding habits: S.

Remarks: The male specimen examined shows the abdominal patterns finely coincide with those described by Duda of *L. (L.) guttiventris* var. *curvipila* Duda, from Africa. This species is also closely allied to *L. (L.) magnipalpis* Duda, the foregoing species, especially in having large female palpi, but the palpus is not black, different from the latter. It is also distinguished from the latter in far less prominent egg-guides, more widely pubescent aedeagus, more stoutly setigerous claspers, and in the absence of a black spot on each lateral side of 3 T.

***Leucophenga (Leucophenga) angusta* sp. nov. Fig. 11.**

Japanese name: Kurogane-shōjōbae.

Fig 11



**Fig. 11. *Leucophenga (Leucophenga) angusta* sp. nov.**

A. Head; B. Wing; C. Periphallic organs (lateral aspect); D. Phallic organs (ventral aspect); E. Phallic organs (lateral aspect); F. Male abdomen.

♂: Body about 2-2.5 mm. Eye red, bare. Antenna with 2nd joint brown, 3rd yellowish grey. Arista with about 10 branches including small fork, 2 below it. Front  $1/3$  as broad as head. *fr* present. Face brown, carina not prominent. *orb*<sub>2</sub> slightly shorter than *orb*<sub>3</sub>. *orb*<sub>2</sub> minute. Cheek very narrow, about  $1/14$  as broad as the greatest diameter of eye. Palpus greyish brown, with a few short setae.

Mesontoum yellowish brown, pleura paler, and scutellum darker, apically paler. *ac* in about 10 irregular rows. Cross distance of *dc* about 3.5 times the length distance. *prsc* slightly longer than anterior *dc*. Anterior *scut* divergent. Sterno-index about 0.7. *2hu*, lower slightly longer.

Legs yellow, middle and hind knees slightly black. Halteres yellowish brown. Wings (Fig. 11



B) hyaline. C1-bristles 2; C3-bristles on basal  $\frac{4}{5}$ .  $r_{4+5}$  and  $m$  parallel. C-index about 2.0; 4V-index about 2.1; 4C-index about 1.4; 5X-index about 0.8.

Abdomen (Fig. 11 F) mostly black. 1T yellow; 2T medially yellow; 3T and 5T slightly paler and with median and lateral black spots.

Periphallic organs (Fig. 11 C): Genital arch broad, with elongate fragma proximally, and truncate below; upper margin with about 2 hairs; lower margin with also about 2 hairs. Claspers as broad as long, each with about 25 setae. Anal plate with about 10 hairs. Decasternum rod-shaped, medially broaden.

Phallic organs (Fig. 11 D,E): Aedeagus pale yellowish orange, cylindrical, apically pointed, and slightly pubescent. Anterior paramere oblong, pale yellowish grey, and with about 4 marginal sensilla near middle, arranged in a row. Posterior paramere very slender, basally bifid for a short distance. Ventral fragma narrow and pointed proximally. Novasternum slender and apically bifid.  $p.f. = aBc'/DEFgHiklMn$ .  $PI = \text{infinite}$ .

Holotype: ♂, Meguro, Tokyo, 11 X '53 S (Okada).

Paratopotypes: 2 ♂♂, collected together with holotype.

Other specimens examined: Chiyoda-ku, Tokyo (Imperial garden), 4 ♂♂, 24-25 XI '55 S plus 1 ♂ F.

Distribution: Honshu (Kanto).

Feeding habits: S.

Relationships: Somewhat resembles *L. (L.) basilaris* (Adams), from Rhodesia, in having black abdomen, but differs from it in the lack of black stripes on the thoracic pleura. Also allied to the

Fig 12

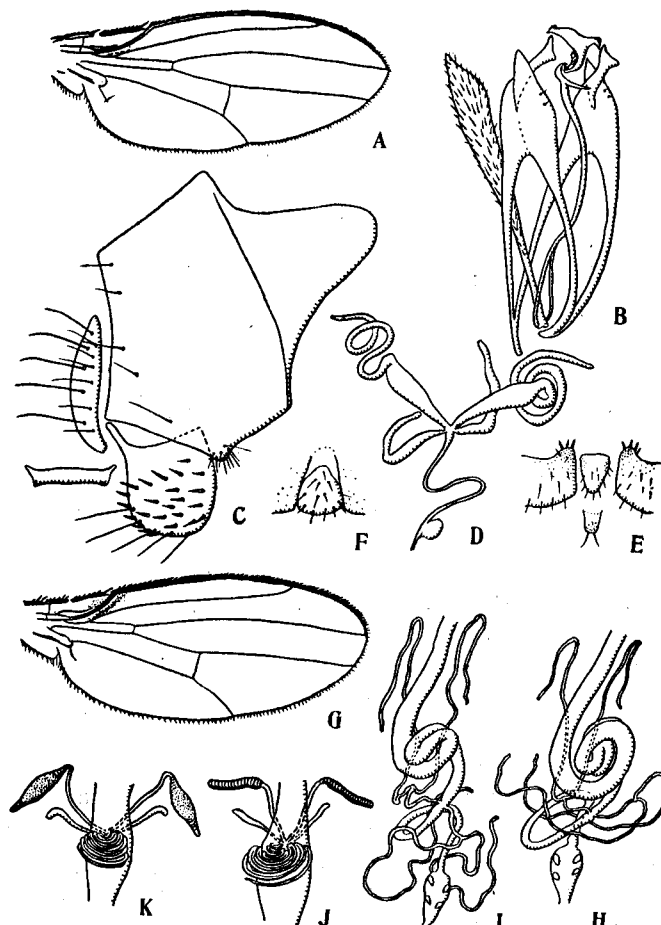


Fig. 12. *Leucophenga (Leucophenga) guttiventris* (de Meijère).

A. Wing; B. Phallic organs (lateral aspect); C. Periphallic organs (lateral aspect); D. Male reproductive organs; E. Female 7th abdominal segment and egg-guides (ventral aspect); H. Digestive system; J. Female reproductive organs.

*Leucophenga (Leucophenga) subpollinosa* (de Meijère).

F. Egg-guides (ventral aspect); G. Wing; I. Digestive organs; K. Female reproductive organs.

preceding two species, i.e. *L. (L.) magnipalpis* Duda and *L. (L.) guttiventris* (de Meijère), in having narrow and pointed ventral fragma, as well as slender and only basally bifid posterior paramere.

***Leucophenga (Leucophenga) subpollinosa* de Meijère, 1914 Fig. 12 F,G,I,K.**

Japanese name: Munaguro-kogane-Shōjōbae.

*Leucophenga subpollinosa* de Meijère, 1914. Tijd. Ent., 57:263; Sturtevant, 1921, Carn. Inst. Publ., 301:132; Duda, 1924. Arch. Naturg., 90A (3):186, 187; Duda, 1939. Annal. Mus. Nat. Hung., 32:27, 43.

♀: Body about 2 mm, orange brown, with costa and abdomen black. Eyes red, bare. Antenna with 2nd joint yellowish orange, 3rd proximally yellow, distally with long pubescence. Arista with about 10 branches including a fine fork, about 2 below it. Palpus yellowish orange, apically blackish, and with a prominent apical and a few shorter ventral setae. Ocellar triangle black. Periorbits orange yellow. Front yellowish orange, with fine *fr*, and about 1/3 as broad as the head width. Occiput largely black. Clypeus orange brown. Face yellowish orange. Cheek orange brown, about 1/10 as broad as the greatest diameter of eye. *orb*<sub>2</sub> as long as *orb*<sub>3</sub>, situated just outside and posteriad to *orb*<sub>3</sub>. *or*<sub>2</sub> about 2/3 as long as vibrissa.

Mesonotum orange brown, with a pair of narrow black longitudinal stripes along *dc*-lines, a pair of shorter black stripes on both sides behind humerus, and a black quadrate patch at middle behind posterior *dc*. Scutellum orange brown. Postscutellum and postnotum black. Thoracic pleura yellow, each with a broad black longitudinal stripe at middle, and a shorter and narrower patch below sternopleurals. *prsc* well developed, as long as anterior *dc*. *ac* in about 8 somewhat irregular rows. Posterior *dc* about 4 times as long as anterior *dc*; cross distance of *dc* about 3 times the length distance. Anterior *scut* divergent. Sterno-index about 1.0.

Legs yellow; middle and hind knees black. Preapicals on all three tibiae; apicals on middle. Wings (Fig. 12 G) hyaline; costa black; prominent black patch below *r*<sub>1</sub>. C-index about 2.2; 4V-index about 2.2; 4C-index about 1.2; 5X-index about 1.8. Halteres yellowish white, with black knobs.

Abdomen with 1T mainly yellow; 2T yellow, black below, and with a median black spot which is posteriorly narrowing, and a lateral oblique black patch on each side. The remaining tergites almost entirely black.

Egg-guides (Fig. 12 F): Lobes entirely fused to each other to become a oval sclerite, which is truncate caudad and with about 10 short discal hairs.

Internal structures (Fig. 12 I,K): Proximal intestine: C=about 2.0. Rectal papillae: R=about 2.3. Malpighian tubes with short common stalks and long branches; posterior branches end free. Spermatheca black, fusiform, cross-striated at both ends; stem apically strongly curved. Parovaria short and apically swollen. Ventral receptacle with about 5 transverse semicircular tight folds.

Specimens examined: Aburatsubo, Kanagawa Pref., 1 ♀, 3 XI '55 S (Mori); Chiyoda-ku, Tokyo (Imperial garden), 1 ♀, 25 XI '55 S.

Distribution: Honshu (Kanto), Formosa, Java, French Ind-China, Africa.

Feeding habits: S.

***Leucophenga (Leucophenga) concilia* sp. nov. Fig. 13.**

Japanese name: Yamagata-kogane-shōjōbae.

♂ and ♀: Body about 3-3.5 mm, yellowish brown, with black abdominal spots. Head (Fig. 13 A): Eye large, bright red, and bare. 3rd antennal joint yellowish grey. Arista with about 10 branches including a small fork, 2 below it. Ocellar triangle small and black. Front about 1/3 as broad as head-width, brown and somewhat whitish. *fr* present. Clypeus dark brown. Cheek narrow, about 1/20 as broad as the greatest diameter of eye. Carina low. Occiput black. *orb*<sub>2</sub> as long as *orb*<sub>3</sub>. Only one prominent *or*. Palpus yellowish brown, silvery pollinose, and with anteriorly narrowing obscure patch at middle. Scutellum medially dark, apically yellow. Thoracic pleura black below. 2 long *hu*. 2 long *prsc*. *ac* in about 12 irregular rows. Cross distance of *dc* about 3 times the length distance. Anterior *scut* divergent. Sterno-index about 0.8.

Legs yellow, fore and middle knee-joints blackish. Preapicals on middle and hind tibiae. Apicals on middle. Wings (Fig. 13 B) hyaline, *r*<sub>4+5</sub> and *m* parallel, costa ending at the tip of *r*<sub>4+5</sub>. C-index about 2.7; 4V-index about 1.5; 4C-index about 0.8; 5X-index about 1.3. Cl-bristles 2; C3-bristles on basal 4/5. Halteres white.

Abdomen (Fig. 13 G) yellow, with black patches as follows: 2T with one mediocandal and

one lateral small spots; 3-5 T with caudal band projected anteriorly at middle and each lateral side, showing a patch which looks like a Chinese character "yama" (mountain), thus is afforded the present specific name. 6 T black except anterior margin; 7 T with a median and a lateral spots. Abdominal sternites narrow, whitish yellow.

Fig 13

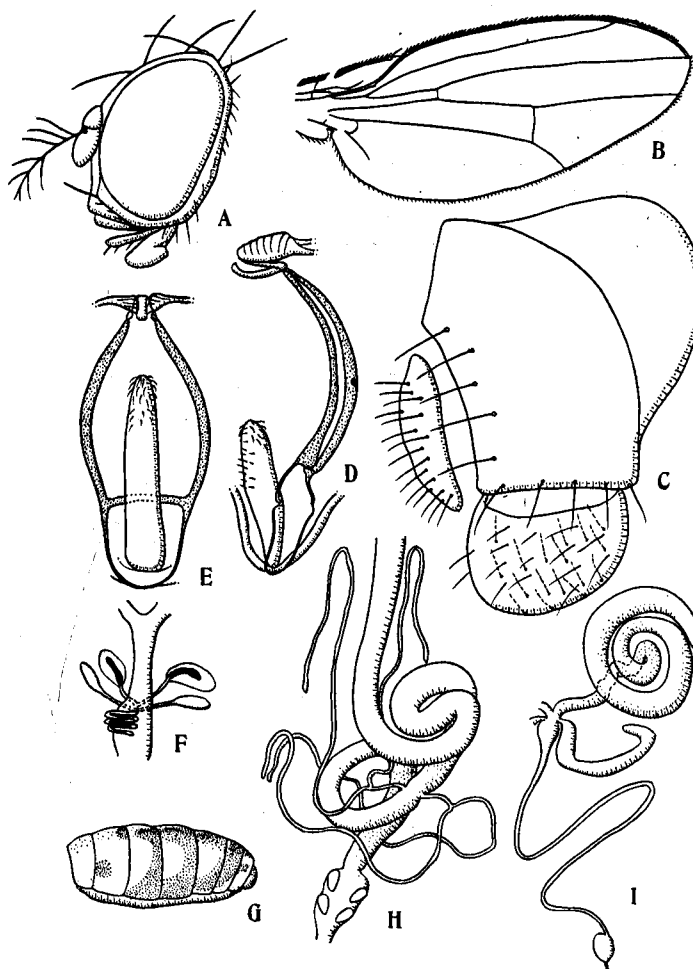


Fig. 13. *Leucophenga (Leucophenga) concilia* sp. nov.

A. Head; B. Wing; C. Periphallic organs (lateral aspect); D. Phallic organs, part (lateral aspect); E. do. (ventral aspect); F. Female reproductive organs (ventral aspect); G. Male abdomen; H. Digestive system (ventral aspect); I. Male reproductive organs, part.

Periphallic organs (Fig. 13 C): Mainly yellow. Genital arch broadly truncate at tip, with about 5 upper and 5 lower marginal hairs. Anal plate elongate, separated from genital arch, and with about 15 hairs. Clasper quadrate, somewhat broader than long, and with about 35 black hairs.

Phallic organs (Fig. 13 D, E): Aedeagus cylindrical, pubescent at tip. Posterior paramere with a pair of very long and arcuated median black arms. Anterior paramere missing unfortunately. p.f. = aBc???ghikLMn. PI = infinite.

Internal structures (Fig. 13 F, H, K): Proximal intestine folded about twice. Malpighian tubes with common stalks short, posterior branches ending free. Rectal papillae: R = about 1.5. Testis pale yellow, with about 0.5 inner and 2.5 outer coils. Seminal vesicle elongate banana-shaped. Paragonia about twice folded. Spermatheca black, elongate, and ringed as usual. Parovaria with large elliptical heads. Ventral receptacle with about 3 lateral folds.

Holotype: ♂, Kakinokizaka, Tokyo, 14 XI '51 S (Okada).

Allotype: ♀, Meguro-Shizenkyōikuen, Tokyo, 11 X '53 S (Okada).

Paratype: 1 ♂, Meguro-Shizenkyōikuen, 11 X '53 S (Okada).

Other specimens examined: Matsuyama, Ehime Pref., 16 III '56 (Morikawa).

Distribution: Honshu (Kanto).

Feeding habits: S.

Relationships: Near *L. magnipalpis* Duda, but female palpi not enlarged, abdominal black patterns different, clasper without stout setae, and the median black arms of male posterior parameres very long and arcuated (very short and straight in *L. magnipalpis*).

A female specimen collected at Asakawa, Tokyo, 5 V '51 S, seems to be a variety, and differs from the original type, in having dark grey palpi, slightly fuscous crossveins, mesopleural black band interrupted, and in having an isolated black lateral spot on each of 4-5 T.

***Leucophenga (Leucophenga) maculata* (Dufour, 1839) Fig. 14.**

Japanese name: Mon-kogane-shōjōbae.

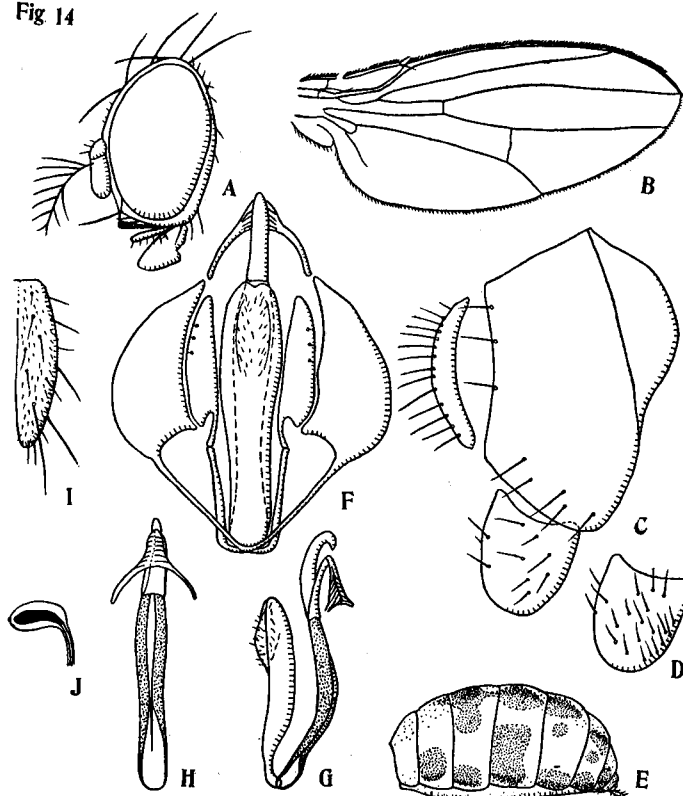
*Drosophila maculata* Dufour, 1839. Ann. Sci. Nat., 49: 14.

*Leucophenga maculata* Oldenberg, 1914. Arch. Naturg., 80 A (2): 20; Sturtevant, 1921. Carn. Inst. Publ., 301: 59, 131;

Duda, 1924. Arch. Naturg., 90 A (3): 190; Duda, 1935. Die Fliegen, 58 g: 38.

*Leucophenga* sp. from Hokkaido, Okada, 1954. Japan. Journ. Appl. Zool., 19: 79.

Fig 14



**Fig. 14. *Leucophenga (Leucophenga) maculata* (Dufour).**

A. Head; B. Wing; C. Periphallic organs (lateral aspect); D. Clasper (inner aspect); E. Female abdomen; F. Phallic organs (ventral aspect); G. do., part (lateral aspect); H. do. (dorsal aspect); I. Egg-guide; J. Spermatheca.

♂ and ♀: Slightly different from the European form, in having *ac* in 8-10 rows (6 in European), and the median 3 black spots of 3 T ordinarily confluent to each other separated in European). Further description: Body about 3.5-5.5 mm, yellowish brown to dark brown, with black spots on abdomen. Head (Fig. 14): Eyes dark purplish red and bare. palpus yellow, very slender and weakly curved upward, and with a few prominent setae. Antenna yellowish orange, 3rd joint with brown pubescence. Arista with about 11 long branches including a small fork, 2 below it. *orb*<sub>2</sub> as long as *orb*<sub>3</sub>, and slightly shorter than *orb*<sub>1</sub>. *or*<sub>2</sub> minute. Ocellar triangle small and black. Periorbits yellowish orange. Front reddish brown, about 1/3 as broad as the head-width. *fr* present. Clypeus black. Face yellow. Cheek yellowish brown, about 1/7 as broad as the greatest diameter of eye.

Mesonotum yellowish brown, silvery pollinose, and sometimes with a medially broaden longitudinal stripe. Scutellum dark or pale brown, silvery pollinose, apically pale and black at sides. Thoracic pleura largely dark brown, or yellowish brown with small dark brown spots. Sterno-index about 0.8. Legs yellowish whites knee-joints pale. Apicals on middle and hind

tibiae; preapicals on all three. *hu* 2, long, upper one slightly longer. *ac* in about 8-10 irregular rows. Cross distance of *dc* about 3.5 times the length distance. *prsc* 2, large; anterior *scut* divergent. Wings (Fig. 14B) hyaline, costal bristles short. Costa reaching tip of  $r_{4+5}$ . Crossveins clear. C-index about 2.8; 4V-index about 2.2; 4C-index about 1.1; 5X-index about 1.0. C1-bristles 2; C3-bristles on basal 3/4. Halteres white.

Abdomen (Fig. 14E): Tergites yellow, with black spots as follows: one on each side of 2T; 3 large median and one small lateral on 3T, median 3 often fused to each other; one median and one large lateral on 4T, lateral one being often divided into two spots; 3 median and 1 small each lateral on 5T and 6T respectively; one lateral on 7T. Sternum pale yellow and each sternite narrow. Cerci elongate.

Periphallic organs (Fig. 14C,D): Pale brownish black. Genital arch with fragma well developed, lower end broadly truncate; upper marginal hairs about 5, lower marginal ones about 10. Clasper ovoid, slightly longer than broad, with about 30 long setae inserted on both external and internal surfaces. Anal plate pale, crescent, and with about 20 long hairs.

Phallic organs (Fig. 14F-H): Aedeagus pubescent at tip. Anterior paramere with a few sensilla near middle. Posterior paramere elongate, apical half orange yellow, basal half being bifid and orange brown. Ventral fragma is a narrow arch, to which connected a large novasternal plate (hypandrium). p.f.=aBcDEFghikl'Mn. PI=infinite.

Egg-guides (Fig. 11I): Lobes greyish yellow, proximally fused to each other, and with several long and numerous fine hairs.

Internal structures: Proximal intestine: C=2.0; rectal papillae large, R=1.7. Posterior Malpighian tubes ending free. Testis bright yellow, with about 0.5 inner and 2 outer coils. Paragonia folded about 1.5 times. Spermatheca elongate, black, and with about 20 transverse striations.

Specimens examined: Sapporo, 1 ♀, 9 IX '53 M (Suzuki); 2 ♀♀, 25 IX '53 M (Suzuki); Chiyoda-ku, Tokyo (Imperial garden), 1 ♂, 25 XI '55 S; Meguro, Tokyo, 2 ♀♀, 16 XI '51 S; Kamakura, Kanagawa Pref., 4 ♀♀, 19 IV '51 (hidden in flower bracts of *Arisaema Thunbergii* Makino); Susaki, Kōchi Pref., 1 ♂, 5 XI '53 S.

Distribution: Hokkaido, Honshu (Kanto), Shikoku, Europe.

Feeding habits: MS, Flower.

### *Leucophenga (Leucophenga) quinquemaculipennis* sp. nov. Fig. 15.

Japanese name: Hamadara-kogane-shōjōbae.

*Leucophenga* sp. from Hokkaido, Okada, 1954. Japan. Journ. Appl. Zool., 19: 79.

*Leucophenga* sp., Suzuki, 1955. Zool. Mag., 64: 47.

♂: Body yellowish brown, about 5.3 mm. Eyes red, bare. Head (Fig. 15A): Antenna yellow. Arista with about 10 branches including a small fork, 3 below it. Postverticals comparatively long. Palpus slender, yellow, and with several prominent setae, apical one being longest. Ocellar triangle pale. Periorbits pale at the insertions of *orbs*. Front yellowish orange, parallel at lateral margins, about 2/5 as broad as head-width, and provided with rather numerous *fr*. Face yellow; carina flat. Cheek about 1/8 as broad as the greatest diameter of eye, and yellow. Clypeus blackish. Occiput black below. Only one prominent *or*.

Mesonotum pale yellowish orange, with 2 pairs of dark brown longitudinal stripes just inside and outside *dc* lines respectively, the inside ones shorter and confined at the anterior half of mesonotum. Scutellum pale yellow at tip, and at the insertions of anterior *scut*, and black at lateral sides. Pleura with obscure black spots at meson. Humerus yellow. *hu* 2, long, upper longer. *prsc* long. *ac* in about 12 rows. Cross distance of *dc* more than 3 times the length distance. Anterior *scut* convergent. Sterno-index about 0.8.

Legs yellow, preapicals on all three tibiae; apicals on 1st and 2nd. Wings (Fig. 15B) somewhat fuscous along costa. Costa weakly extending beyond tip of  $r_{4+5}$ .  $r_{2+3}$  and  $r_{4+5}$  slightly convergent. 5 black spots on the wing: one large at wing base, one on each crossvein, large elliptical one at the apex of  $r_{2+3}$ , and small somewhat quadrate one at the apex of  $r_{4+5}$ . C-index about 3.0; 4V-index about 2.0; 4C-index about 1.1; 5X-index about 1.0. C1-bristles 2, subequal. C3-bristles little over 4/5 in range. Halteres white.

Abdomen (Fig. 15F): 1T yellow; 2T with laterally broaden caudal band; 3-5T each with 5 black spots which are united together by a caudal black band. 6T black and medially yellow. Sternites narrow and pale grey; 6S broader than long and black.

Periphallic organs (Fig. 15C): Genital arch black, broad and truncate at tip; basal fragma

Fig 15

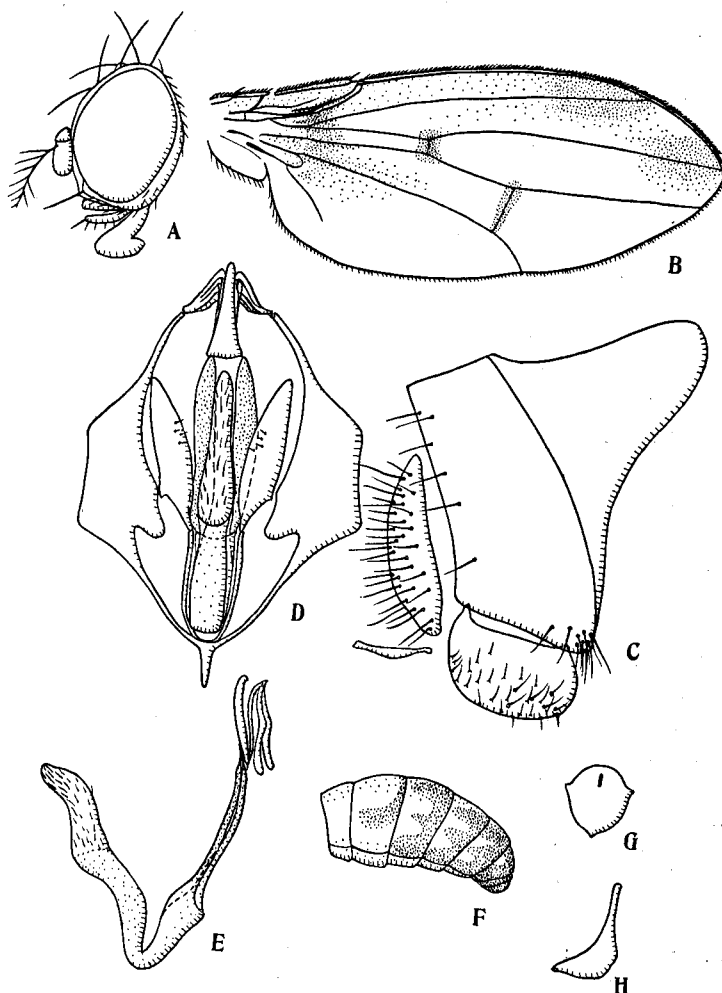


Fig. 15. *Leucophenga (Leucophenga) quinquemaculipennis* sp. nov.

A. Head; B. Wing; C. Periphallallic organs (lateral aspect); D. Phallic organs (ventral aspect); E. do., part (lateral aspect); F. Male abdomen; G. Ejaculatory apodeme (ventral aspect); H. do. (lateral aspect).

large. Anal plate dark brownish black, elongate, and with about 30 hairs. Clasper oval, little broader than long, dark brownish black, and with about 30 weak setae.

Phallic organs (Fig. 15 D,E): Aedeagus fusiform, pubescent on apical half, pale yellow and basally orange yellow. Anterior paramere with about 4 median sensilla. Posterior paramere basally grey, medially with black and thick straight arms, apically slender and dark brown. p.f.=aBcDE-FghikLMn. PI=infinite.

Internal structures (Fig. 15 G,H): Ejaculatory apodeme with pentagonal plate and short stem.

Holotype: ♂, Senjōdake, Nagano Pref., 19 VII '53 S (Kitagawa & Ono).

Other specimen examined: 1 specimen (sex obscure owing to the breaking off of genital apparatus), Sapporo, 13 VII '53 (Suzuki).

Distribution: Hokkaido, Honshu (Chubu).

Feeding habits: S.

Relationships: Closely resembles *L. quinquemaculata* Strobl, from Europe, but differs from the latter in having  $r_{4+5}$  and  $m$  less strongly convergent, and black spot at the end of  $r_{4+5}$  larger.

*Leucophenga (Leucophenga) quadripunctata* (de Meijère, 1908) Fig. 16.

Japanese name: Yotsumon-kogane-shōjōbae.

*Drosophila quadripunctata* de Meijère, 1908. Tijds. Ent.: 51; Sturtevant, 1921. Carn. Inst. Publ., 301: 59, 132; Duda, 1924. Arch. Naturg., 90 A (3): 186.

♂: Body yellow, with abdomen brownish yellow, about 4 mm in length. Head (Fig. 16 A) brown; eye large and bare. Antenna with 2nd joint yellowish brown, 3rd yellowish grey and

broad. Arista with about 9 branches including a small fork, 2 below it. Ocellar triangle black and small. Periorbits yellowish orange. Front less than  $1/3$  as broad as head-width. *fr* present. Carina flat. *orb*<sub>2</sub> subequal to *orb*<sub>3</sub> in length. Only one quite prominent *or*.

Mesonotum yellow, with a pair of indistinct brown longitudinal stripe along *dc*-lines, and a pair of brown patches behind humerus. Pleura yellow, with a small black spot. *hu* 2 large, and 2 smaller. *prsc* large. *ac* in about 12 irregular rows. Cross distance of *dc* about thrice the length distance. Anterior *scut* divergent. Sterno-index about 0.9.

Legs almost entirely yellow; tips of middle and hind femora slightly blackish. Preapicals on all three tibiae, tiny on the fore. Apicals on middle. Wings (Fig. 16H) hyaline, with 4 black spots, one on each crossvein, one at the tip of *r*<sub>2+3</sub>, large one at the wing-base. *r*<sub>4+5</sub> and *m* parallel. C-index about 1.9: 4 V-index about 2.2; 4 C-index about 1.6: 5 X-index about 0.8. Cl-bristles 2, subequal with each other; C3-bristles on basal  $1/5$  or more. Halteres yellow.

Abdominal tergites yellowish grey. 2T indistinctly black at anterolateral corners. Each T with narrow indistinct black caudal band.

Periphallic organs (Fig. 16F,G): Genital arch pale yellowish grey, broadly truncate at lower tip, and with about 4 upper marginal and no lower marginal hairs. Clasper brownish black, hemispherical, without teeth, but with about 30 hairs. Anal plate elliptical, brownish black, and with about 40 hairs. Decasternum like a cross bar, blackish, and medially awollen.

Phallic organs (Fig. 16B-E): Aedeagus apically pubescent, greyish white, and cylindrical. Anterior paramere greyish white, S-shaped, and apically with a few sensilla. Posterior paramere with basal bifurcated arms black especially at middle. Ventral frama narrow and arch-like. Novasternum greyish white, basally truncate and apically pointed. p.f.=aBcDEFghikLMn. PI=about 0.5.

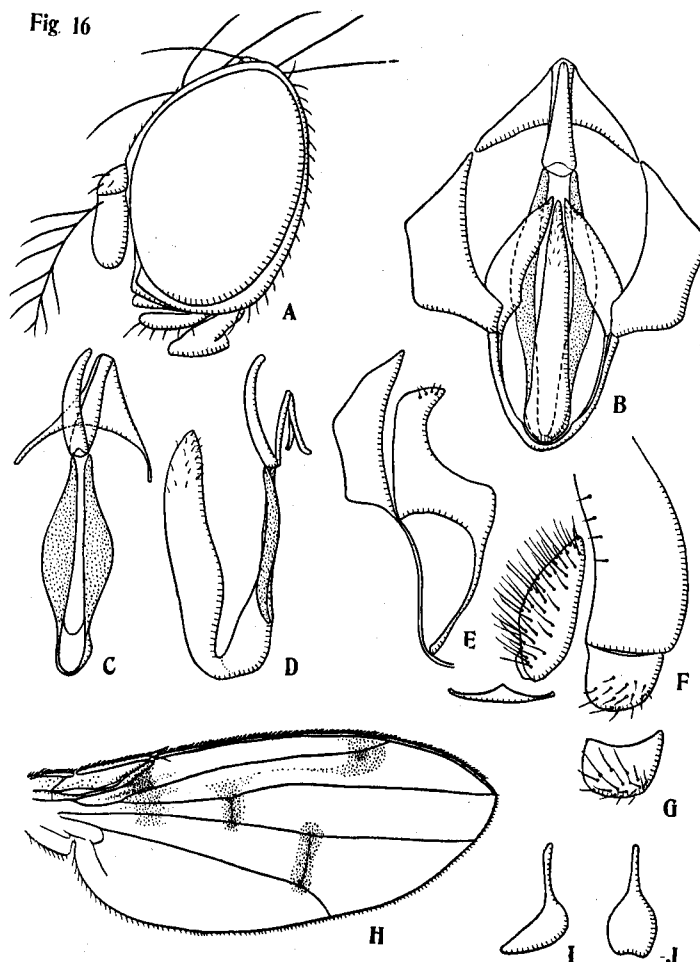


Fig. 16. *Leucophenga (Leucophenga) quadripunctata* (de Meijère).

A. Head; B. Phallic organs (ventral aspect); C. do., part (ventral aspect); D. do., part (lateral aspect); E. Anterior paramere with apical sensilla and novasternum (lateroventral aspect); F. Periphallic organs (lateral aspect); G. Clasper (inner aspect); H. Wing; I. Ejaculatory apodeme (lateral aspect); J. do. (dorsocaudal aspect).

Internal structures (Fig. 16 I,J): Ejaculatory apodeme with oval plate and short stem.

Specimens examined: Kinugawa, Tochigi pref., 1 ♂, 1 VIII '53 F (Moriwaki & Yoshida).

Distribution: Honshu (Kanto), Java.

Feeding habits: F.

Remarks: Slightly differs from the original form from Java in the less strongly convergent  $r_{4+5}$ , and in the larger black spot at the end of  $r_{4+5}$ .

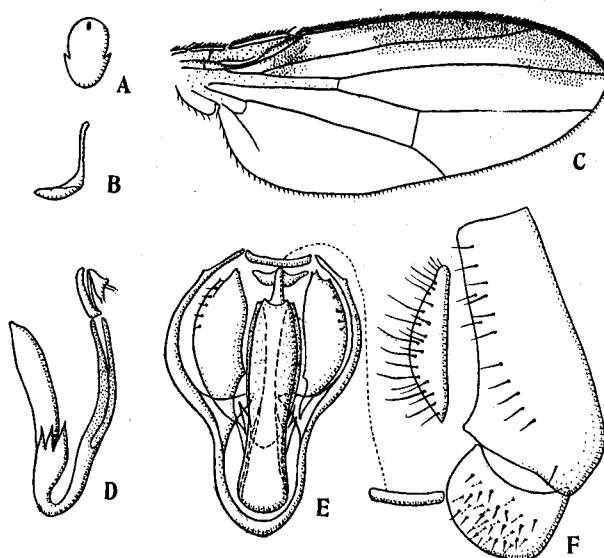
***Leucophenga (Leucophenga) interrupta* Duda, 1924 Fig. 17.**

Japanese name: Nakajiro-kogane-shōjōbae.

*Leucophenga interrupta* Duda, 1924. Arch. Naturg., 90 A (3): 237, 187; Kikkawa & Peng, 1938. Japan. Journ. Zool., 7: 547.

*Leucophenga* sp. from Shikoku, Okada, 1954. Japan. Journ. Appl. Zool., 19: 79 (Shikoku is misprint of Kyushu).

**Fig 17**



**Fig. 17. *Leucophenga (Leucophenga) interrupta* Duda.**

A. Ejaculatory apodeme (ventral aspect); B. do. (lateral aspect); C. Wing; D. Phallic organs, part (lateral aspect); E. do. (ventral aspect); F.Periphallic organs (lateral aspect).

♂: Wings (Fig. 17 C): with dark clouds below  $r_1$ , at the apical half of cell  $R_1$ , at the base and apical half along costa, and at the apex of  $r_{2+3}$ . C-index about 2.9; 4 V-index about 2.0; 4 C-index about 1.1; 5 X-index about 1.0. Cl-bristles 2; C 3-bristles on basal 6/7 or more.

Periphallic organs (Fig. 14 F): Genital arch yellowish white, with about 13 upper marginal and one lower marginal hairs, and the lower end obliquely truncate. Clasper pale brown, broader than long, with about 40 minute hairs, covering both surfaces. Anal plate yellowish grey, spindle-shaped, and with about 25 hairs.

Phallic organs (Fig. 17 D,E): Aedeagus apparently bare, pale yellow, cylindrical, and with several strong processes surrounding the base of aedeagus, just looking like a calyx of a flower. Anterior paramere distally black and triangular, with apical margin irregularly waved, with about 5 sensilla near apex, arranged in a row. Posterior paramere with black large and thick median paired arms. Ventral fragma rounded and broad, not bar-like, and with a deep and broad median notch. Novasternum slender. p.f.=aBCDEfghIklMn. PI=2.3.

Internal structures (Fig. 17 A,B): Ejaculatory apodeme with oval plate, which is incised at middle of lateral sides, and a stem as long as plate.

Specimens examined: Several ♂♂, Miyazaki Pref., 1952 M (Matsuzawa).

Distribution: Kyushu, Formosa.

Feeding habits: M.

Remarks: The larvae were found breeding on the pine-mushroom, *Cortunellus Shiitake* P. Henn, to give serious damages to it, according to a private information of Mr. Hiroshi Matsuzawa of Miyazaki University, 1952 (now at Kagawa University). The specimens sent by him to the present author had been broken into fragments, but they show wings strictly coincide with the redescrptions and figures of this species written by Duda.



*Leucophenga (Leucophenga) ornatipennis* (de Meijère, 1914) Fig. 18.

Japanese name: Kazari-kogane-shōjōbae.

*Drosophila ornatipennis* de Meijère, 1914. Tijds. Entom., 57: 256.

*Leucophenga ornatipennis* Duda, 1924. Arch. Naturg., 90 A (3): 186; Sturtevant, 1921. Carn. Inst. Publ., 301: 132.

*Leucophenga* sp. with PI 1.6, Okada, 1953. Zool. Mag., 62: 280.

Fig. 18

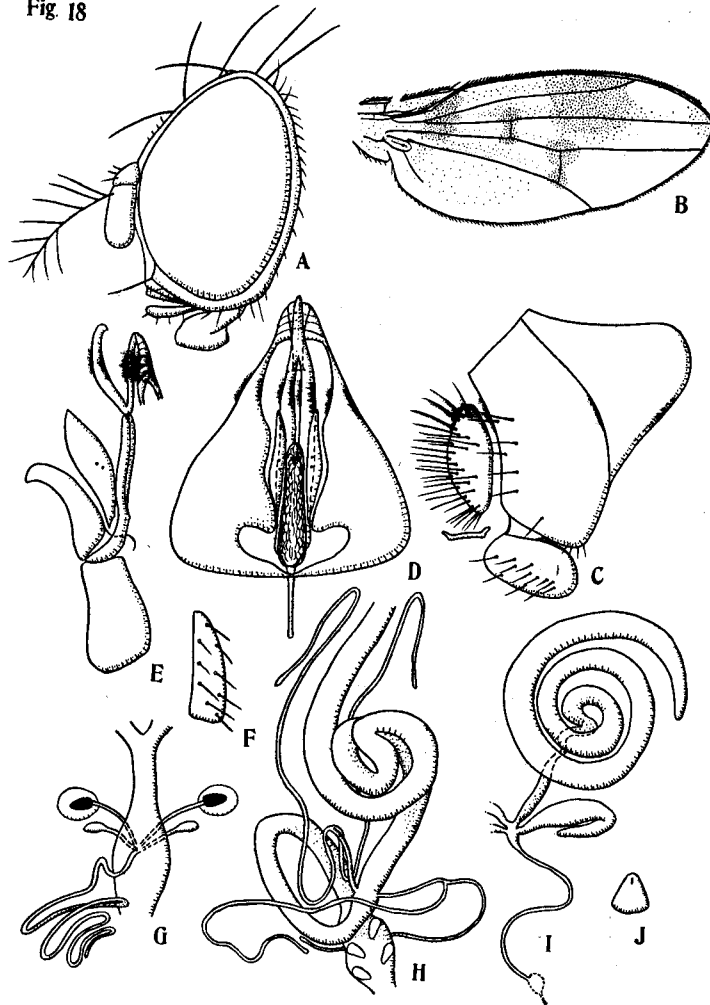


Fig. 18. *Leucophenga (Leucophenga) ornatipennis* de Meijère.

A. Head; B. Wing; C. Periphallallic organs (lateral aspect); D. Phallic organs (ventral aspect); E. do. part (lateral aspect); F. Egg-guide; G. Female reproductive organs (ventral aspect); H. Digestive system (ventral aspect); I. Male reproductive organs, part; J. Ejaculatory apodeme (ventral aspect).

♂ and ♀: Body about 3.4 mm, dark brown. Head (Fig. 18 A): Eyes bare, dark red. Palpus slender, black, basally with a few prominent setae. Antenna yellowish brown, 3rd joint dark brown to black, 4th yellow. Arista with about 11-13 branches including a small fork, 2 or 3 below it. *orb*<sub>2</sub> slightly shorter than *orb*<sub>1</sub>. Only one prominent *or*. Ocellar triangle small, black, and with long ocellars. Periorbits brown, with minute setae in front of *orb*<sub>3</sub>. Front dark brown, about 1/3 as broad as head-width, and paler around ocellar triangle. *fr* present. Face brown. Clypeus black, Carina obscure. Cheek pale, very narrow, about 1/3 the greatest diameter of eye.

Mesonotum dark yellowish brown. Scutellum dark yellowish brown, paler at tip. Thoracic pleura yellowish brown, and with black longitudinal band. Metapleura black. One prominent *hu. ac* in about 10 irregular rows. Cross distance of *dc* about 3.5 times the length distance. *prsc* distinct. Anterior *scut* divergent. Haltere white, with head slightly dark. Legs yellowish grey; pre-apicals on all three tibiae, apicals on fore and middle. Sterno-index about 0.7. Wings (Fig. 18 B) fuscous, with a black patch on each crossvein. Also a black patch on subbasal region and a large black cloud at the apex of *r*<sub>2+3</sub>. Costa ending at the tip of *r*<sub>4+5</sub>. C-index about 2.1; 4 V-index about 1.5; 5 X-index about 1.0. C-bristles 2; C 3-bristles on basal 7/8.

Abdomen black; 1 T yellow; 2-3 T sometimes yellow; 6 T sometimes apically yellow. 2-5 T

each with black posterior band, which usually projects forward at middle and at both lateral sides.

Periphallic organs (Fig. 18 C) : Genital arch yellowish brown, broadly truncate at lower end and with about 6 upper marginal and 5 lower marginal hairs. Anal plate quadrate, with about 30 hairs. Clasper ovoid, thicker than long, and with about 11 hairs.

Phallic organs (Fig. 18 D,E) : Aedeagus orange brown, very large, protruded downward, apically curved ventrad, and with scaly sculptures on entire surface. Apodeme of aedeagus developed well. Anterior paramere leaf-like, with about 2 sensilla at meson. Posterior paramere comparatively short, basally dark brown. Ventral fragma very broad and truncate at anterior end and narrowing posteriorly. Median notch deep. Novasternum broaden at base. p.f.=ab'cDEFghikLMN. PI=1.0.

Egg-guides (Fig. 18 F) : Lobes pale brown, nearly completely separated from each other; each lobe elliptical, apically truncate, and with about 7 setae on the surface.

Internal structures (Fig. 18 G-J) : C=2.5. Rectal papillae ovoid, R=1.6. Malpighian tubes with common stalks short, posterior branches ending free. Testis hyaline, basally yellow, and with about 1.5 inner and 3 outer coils. Paragonia slender, once or twice folded. Spermatheca elliptical and black. Parovaria short, heads slightly thicker than stems. Ventral receptacle loosely folded about 4 times.

Specimens examined : Asakawa, Tokyo, 4 ♂♂ and 3 ♀♀, 5 IV '51 S; 1 ♂, 24 IV '52 S; Meguro, Tokyo, 1 ♂ and 1 ♀, 1 IX '53 S.

Distribution : Honshu (Kanto), Java.

Feeding habits : S.

#### Subfamily *Drosophilinae*

Japanese name : Shōjōbae-aka.

The following 8 genera have been found in Japan : *Hypselothyrea* de Meijère, *Microdrosophila* Malloch, *Mycodrosophila* Oldenberg, *Dettopsomyia* Lamb, *Liodrosophila* Duda, *Chymomyza* Czerny, *Scaptomyza* Hardy, and *Drosophila* Fallén. The genus *Acletoxenus* Frauenfeld was reported to be found in Hokkaido by Makino, Momma, and Takada (1952 in DIS), and also by Makino, Momma, Takada, and Ishihara (1952 in DIS), but the present author is not aware of it.

#### Genus *Hypselothyrea* de Meijère, 1906

Japanese name : Arigata-shōjōbae-zoku.

*Hypselothyrea* de Meijère, 1906. Annal. Mus. Nat. Hung., 4: 193; Sturtevant, 1921. Carn. Inst. Publ., 301: 47, 109; Duda, 1928. Annal. Mus. Nat. Hung., 25: 81.

Logotype : *Hypselothyrea dimidiata* de Meijère, 1906.

Sturtevant (1921) excluded this genus from *Drosophilinae*, and thought it convenient to place it in a group of its own. According to Duda (1928) the present author placed it in the subfamily.

#### *Hypselothyrea breviscutellata* Duda, 1928 Fig. 19.

Japanese name : Arigata-shōjōbae.

*Hypselothyrea breviscutellata* Duda, 1928. Annal. Mus. Nat. Hung., 25: 82.

♀ : Body about 2.8 mm, yellowish brown. Head (Fig. 19 A) brown, broader than thorax. Eyes dark red, very sparsely pubescent. Antenna with 2nd joint reddish brown; 3rd black, and posteriorly paler. Ariata with about 12 long branches including a fork, 2 below it. Palpus brownish black, apically paler, and with a long apical and several shorter ventral bristles. 2 long orbitals subequal in length. Ocellar triangle yellowish brown, black at the inner margins of ocelli. Periorbits reddish brown, with a few minute hairs in front of *orb*<sub>3</sub>. Front dark reddish brown, without punctures, and about half as broad as head. Face dark brown, carina low. Clypeus very large, dark brown, and minutely pubescent. Cheek broad, paler, and about 1/3.5 the greatest diameter of eye in width.

Mesonotum reddish brown, somewhat glossy. Hind notopleurals small. Only one postalar. Pleura somewhat pollinose. One minute *hu. ac* in 2 rows. *dc* in one pair. Posterior *scut* upright. Legs reddish brown. Fore femur with a strong subapical black spine. Middle femora apically dark. Hind femora with black rings before middle and at apex. Fore metatarsus somewhat dark. Preapicals on 1st and 2nd tibiae. Apicals on 1st and 2nd. Haltere white, with elongate head. Wings (Fig. 19 B) about 1.6 mm in length, hyaline, and covered by microtrichia. Veins yellowish brown. C-index about 0.9; 4 V-index about 1.6; 4 C-index about 0.9; 5 X-index about 2.2. C1-bris-

cles 1; C3-bristles on basal 6/7.

Fig 19

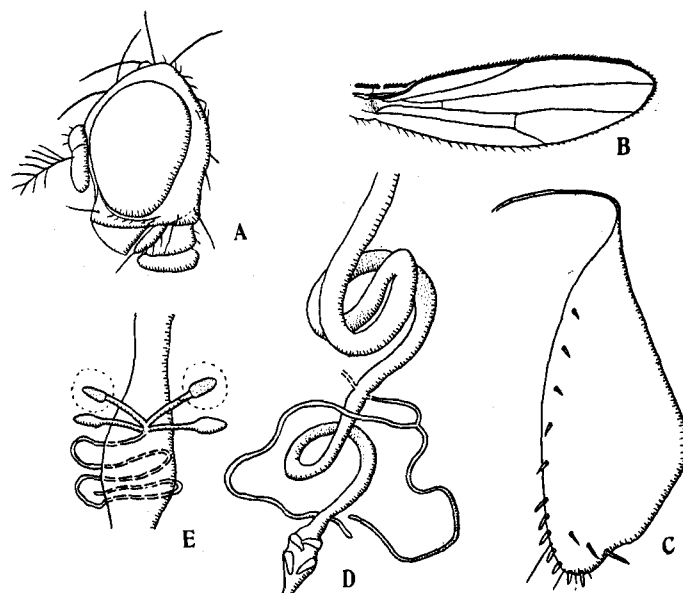


Fig. 19. *Hypselothyrea breviscutellata* Duda

A. Head; B. Wing; C. Egg-guide; D. Digestive system, anterior Malpighian tubes missing (ventral aspect); E. Female reproductive organs (dorsal aspect).

Abdomen glossy reddish brown, black at lateral margin of 5 T. 4-6 T largely dark reddish brown, except medioanteriorly. Sternites very narrow. Pleura white.

Egg-guides (Fig. 19 C): Lobes yellowish brown, well sclerotized, and separated from each other. Each lobe with tip rounded, broad, and with about 13 marginal and 2 discal brown teeth, uppermost marginal tooth elongate. Basal isthmus narrow and long.

Internal structures (Fig. 19 D,E): C=2.0. Rectal papillae oblong, R=2.4. Posterior Malpighian tubes ending free. Spermatheca small, brown, and somewhat longer than broad, only slightly broader than stems. Parovaria with small elliptical tips. Ventral receptacle short, folded about 3 times.

Specimens examined: Okurayama, Kanagawa Pref., 1 ♀, 7 XII '52 G (collected under a pile of rotten plants of sweetpotatoes).

Distribution: Honshu (Kanto), Formosa.

Feeding habits: G.

Remarks: Finely coincides with the description of Duda of this species from Formosa, differs only in having larger 5 X-index (about 1.0 in the original form). Teeth-bearing egg-guides in this species suggest validity of placing the genus *Hypselothyrea* in Drosophilinae.

#### Genus *Microdrosophila* Malloch, 1921

Japanese name: Otohime-shōjōbae-zoku.

*Microdrosophila* Malloch, 1921. Ent. News, 32: 312; Sturtevant, 1927. Phil. Journ. Sci., 32: 366; Wheeler, 1952. Univ. Texas Publ., 5204: 189.

*Incisurifrons* Duda, 1924. Arch. Naturg., 90 A (3): 202.

? *Hopkinsomyia* Malloch, 1934 (teste Wheeler, 1952), Insects of Samoa, VI (8): 289.

Orthotype: *Drosophila quadrata* Sturtevant, 1916.

Although only 2 Japanese species could have been examined, the genus seems to be divisible into two subgenera.

#### A preliminary key to subgenera of the genus *Microdrosophila*

1. *orb*<sub>2</sub> hair-like, not distinguishable from the neighbouring hairs. *orb*<sub>1</sub> situated slightly behind or just at the level of *orb*<sub>3</sub>; *orb*<sub>1</sub> about 1/5 as far from *orb*<sub>3</sub> as from *vti*. Mesopleuron with a distinct black longitudinal stripe. Female has a pair of minute sclerotized bodies (pregenital plates) just before and inside the egg-guides. Subgenus *Microdrosophila* Malloch, s. meo.
- orb*<sub>2</sub> minute, but distinguishable from the neighbouring hairs, *orb*<sub>1</sub> situated far behind *orb*<sub>3</sub>. *orb*<sub>1</sub> about 1/2 as far from *orb*<sub>3</sub> as from *vti*. Mesopleura without black longitudinal stripes. Female has no minute sclerotized bodies before and inside the egg-guides. Subgenus *Incisurifrons* Duda, s. meo.

Subgenus *Microdrosophila* Malloch, 1921

Japanese name: Otohime-shōjōbae-azoku.

*Microdrosophila* Malloch, 1921. Ent. News, 32: 312.

Orthotype: *Drosophila quadrata* Sturtevant, 1916.

*Microdrosophila* (*Microdrosophila*) *purpurata* sp. nov. Fig. 20.

Japanese name: Otohime-shōjōbae-azoku.

Fig. 20

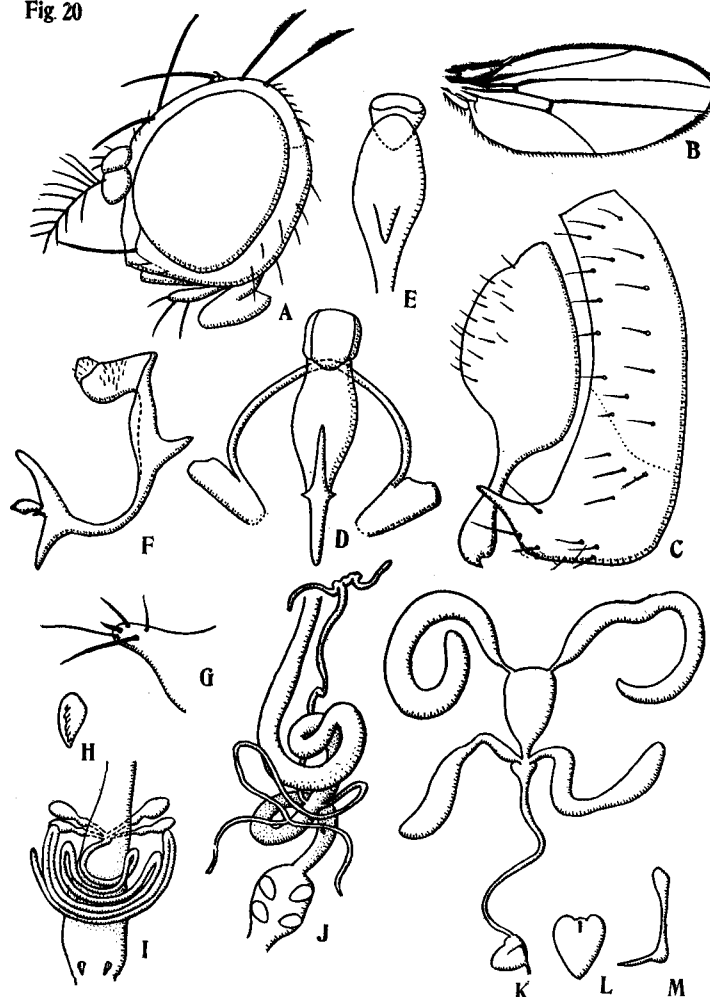


Fig. 20. *Microdrosophila* (*Microdrosophila*) *purpurata* sp. nov.

A. Head; B. Wing; C. Peripheral organs (lateral aspect); D. Phallic organs (ventral aspect); E. Aedeagus (dorsal aspect); F. Aedeagus (lateral aspect); G. Egg-guide; H. Pregenital plate; I. Female reproductive organs (ventral aspect); J. Digestive system (ventral aspect); K. Female reproductive organs (lateral aspect); L. Heart; M. Malpighian tubules.

♂ and ♀: Body about 2 mm, pale brown, with a broad, black, longitudinal stripe on each side of thoracic pleura. Head (Fig. 20 A) as long as wide in lateral aspect. Occiput black. Eyes purplish red, with thick reddish piles. Antenna with 2nd joint dark brown; 3rd yellow, slightly longer than broad. Arista with about 12 long branches, including large fork, 3 below it. palpus slender, yellowish white, apically slightly dark and with about 2 prominent black bristles. Vibrissa stout and long. *hu* minute. Ocellar triangle small and black, with long ocellars. Periorbits and front pale yellowish grey, somewhat glossy, and with a minute hair inside and close to *orb*<sub>3</sub>. Front about 5/9 as wide as head-width. Face yellow, anteriorly blackish in male. Carina low. Cheek whitish, about 1/5 the greatest diameter of eye in width.

Mesonotum pale yellowish brown, with 2 pairs of obscure longitudinal black stripes on caudal half. Scutellum pale yellowish brown. Pleural side with a longitudinal black stripe. *hu* 2. *ac* in 6 rows. Cross distance of *dc* as long as the length distance. Anterior *scut* short and parallel with each other; posterior ones longer and divergent. Sterno-index about 0.3.

Legs yellow, preapicals on all three tibiae; apicals on fore and middle, longest on middle.

Halteres yellow. Wings (Fig. 20 B) hyaline, veins yellow. C-index about 1.5; 4 V-index about 4.0; 4 C-index about 2.5; 5 X-index about 5.0. Cl-bristles 2; C 3-bristles on basal 7/8.

Abdomen with tergites brownish black, somewhat glossy; each T laterocaudally pale; 7-9 T yellow. Sternites quadrate and pale yellowish brown; pleura whitish yellow.

Periphallic organs (Fig. 20 C): Genital arch basally black, apically white, toe narrowly and acutely pointed caudad, upper portion with about 15 marginal hairs in about 2 rows, lower portion with about 7 marginal hairs. Anal plate narrowly prolonged downward and swollen apically, yellowish white and with about 20 fine hairs on the upper half. Claspers absent.

Phallic organs (Fig. 20 D-E): Aedeagus remarkably arcuated dorsally, with a strong, large dorsal thorn near middle, and apically pubescent. Anterior parameres minute. Posterior parameres seem to be represented by a narrow arch, connected to lateral corners of novastornum. Ventral fragma obscure. p.f.=aBcdEf<sub>0</sub>gHikl'mn. PI=4.0.

Egg-guides (Fig. 20 G): Lobes basally broaden and contiguous to 8 T, entirely separated from each other, and apically with a few setae. One or two of the setae stout and long, often one seta becoming a dark brown tooth. [There is a pair of minute yellowish orange pregenital plates (Fig. 20 H) near the end of uterus (a subgeneric character).]

Internal structures (Fig. 20 I-M): C=2.0. Malpighian tubes with common stalks very long, and with branches very short, posterior branches ending free. Rectal papillae ovoid or elliptical, R=2.0-3.0. Testis pale yellow, slender, and with about 1.5 coils. Seminal vesicles confluent with each other at bases, and enlarged elliptically. Paragonia transparent, basally narrowing, and about once folded. Ejaculatory bulb without caeca; apodeme with long stem and oval plate. Spermatheca with elliptical non-sclerotized knob, and a swollen neck region. Parovaria apparently similar with spermatheca in shape and coloration.

Holotype: ♂, Kikuna, Kanagawa Pref., 28 III '52 S (Okada).

Allotype: ♀, Setagaya, Tokyo, 3 III '52 S (Okada).

Paratypes: Setagaya, Tokyo, 1 ♀, 27 XI '52 S; 1 ♂, 14 X '53 G; 2 ♂♂ and 2 ♀♀, 25 IV '53 S (Okada).

Other specimens examined: Meguro, Tokyo, 1 ♂ and 3 ♀♀, 27 XI '52; 5 ♂♂ and 1 ♀, 11 V '53 S; Setagaya, Tokyo, 3 ♂♂, 9 IV '53 S; 1 ♂, 28 IV '53 S; Asakawa, Tokyo, 2 ♀♀, 29 IV '52; Mizonokuchi, Kanagawa Pref., 1 ♂, 22 VI '52 S; Aburatsubo, Kanagawa Pref., 2 ♀♀, 7 V '51 S; Higashimurayama, Tokyo, 1 ♂ and 1 ♀, 13 XII '53 S; Shichiseimura, Tokyo, 1 ♀, 18 XI '52; Tōjō, Hiroshima pref., 1 ♂ and 1 ♀, 26 X '55 S; Susaki, Kōchi Pref., 1 ♂, 5 XI '53 S; Tadotsu, Kagawa Pref., 4 ♂♂, 4 XI '53 S; Ochide, Kōchi Pref., 1 ♂, 6 XI '53 S; Dazaifu, Fukuoka pref., 1 ♂, 24 X '55 G.

Distribution: Honshu (Kanto, Chugoku), Shikoku, Kyushu.

Feeding habits: SG.

Relationships: Closely resembles *M. quadrata* (Sturtevant) from N. America, but differs therefrom in having 6 ac (8 in *quadrata*), preapicals on all three tibiae (only on hind), apicals on fore and middle (only on middle), 4 C-index about 2.5 (4.0).

Remarks: This species has never been collected at fruit traps, although it is abundant in the fields, especially in early spring and autumn.

#### Subgenus *Incisurifrons* Duda, 1924

Japanese name: Urashima-shōjōbae-azoku.

*Incisurifrons* Duda, 1924. Arch. Naturg., 90 A (3): 202.

Haplotype: *Drosophila congesta* Zetterstedt, 1847.

#### *Microdrosophila (Incisurifrons) congesta* (Zetterstedt, 1847) Fig. 21.

Japanese name: Urashima-shōjōbae.

*Drosophila congesta* Zetterstedt, 1847. Dipt. Scand., 6: 2558, 13.

*Drosophila (Incisurifrons) congesta* Duda, 1923. Annal. Mus. Nat. Hung., 20: 40; Duda, 1924. Arch. Naturg., 90 A (3): 242; Duda, 1924. Ent. Meddel., 13: 256; Duda, 1925. Annal. Mus. Nat. Hung., 22: 198; Duda, 1935. Die Fliegen, 58 g: 50.

*Drosophila frontata* de Meijère, 1916. Tijdschr. Ent., 59: 204.

♂ and ♀: Body about 2.5-2.8 mm, yellowish brown, abdomen black. General features as will be redescribed by Okada & Kurokawa (1956). Head (Fig. 21 A): Eyes deep red, with thick piles. Arista with about 9 branches including a small fork, 2 below it. Palpus with about 2 prominent apical setae. *fr* present. *or*<sub>2</sub> [minute. Front broad, over 1/2 as broad as the head-width. Carina

high and narrow. Sterno-index less than 0.5. *hu* 1. *ac* in 10-12 irregular rows. Anterior scut slightly divergent. Preapicals on all three tibiae; apicals on middle. Wings (Fig. 21 B) hyaline. C-index about 1.3; 4 V-index about 4.0; 4 C-index about 2.3; 5 X-index about 4.0. C1-bristles 2; C3-bristles on entire length.

Periphallic organs (Fig. 21 C): Genital arch narrow, pale yellow, and apically with a large process, which is curved forward. Clasper absent. Anal plate large, nearly quadrate.

Phallic organs (Fig. 21 D,E): Aedeagus very slender, yellow, and with a subapical black ring. Apodeme of aedeagus curved ventrad in U-shape. Parameres apparently absent. Ventral fragma narrow. p.f.=aBCdEf<sub>o</sub>g<sub>o</sub>Hikl'MN. PI=2.0.

Egg-guides (Fig. 21 F): Lobes pale, distally narrowing, and with a few setae. Basal isthmus absent.

Internal structures (Fig. 21 G,I,J): C=2.0. R=3. Malpighian tubes with common stalks comparatively short, posterior branches ending free. Testis fusiform, apically narrowing and curved back. Seminal vesicle simple and slender. Paragonia oblong. Spermatheca and parovaria similar in shape, hyaline and with small swollen tips and stems. Ventral receptacle with about 4 folds.

Specimens examined: Kunitachi and Meguro in Tokyo; Ōkurayama and Aburatsubo, Kanagawa Pref.; Futtsu, Chiba Pref.; Senjōdake, Nagano Pref.; Anjō, Aichi Pref.

Distribution: Honshu (Kanto, Chubu), Formosa, Java, Europe, New Guinea.

Feeding habits: GFS.

Remarks: Egg (Fig. 21 H) is characteristic in having a quite long filiform filament, about 6 times as long as the egg itself.

Fig. 21

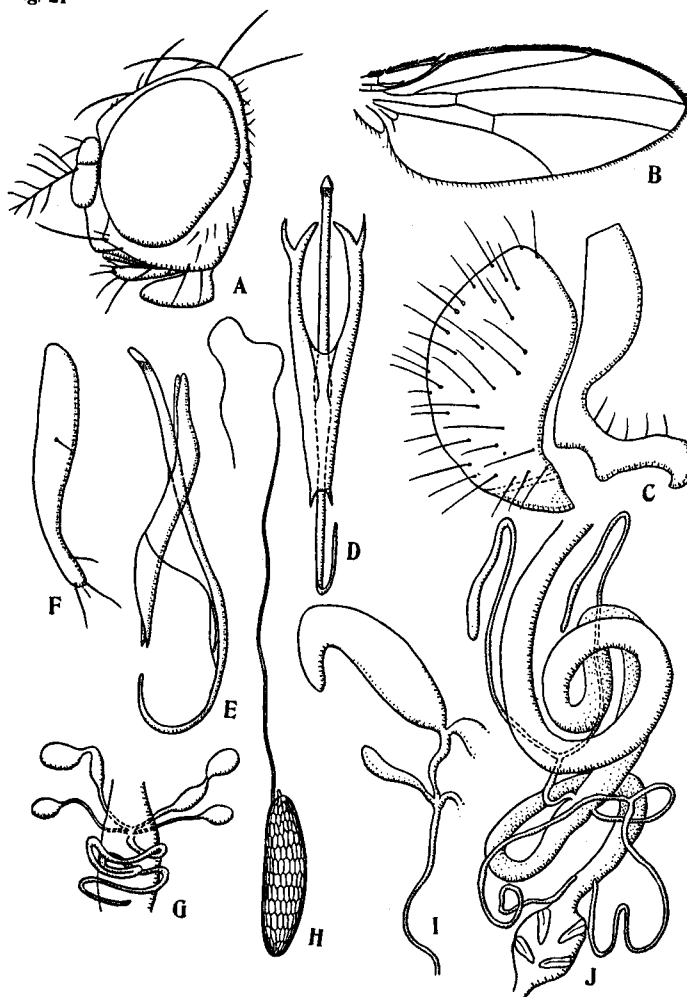


Fig. 21. *Microdrosophila (Incisurifrons) congesta* (Zetterstedt).

A. Head; B. Wing; C. Periphallic organs (lateral aspect); D. Phallic organs (ventral aspect); E. do. (lateral aspect); F. Egg-guide; G. Female reproductive organs (ventral aspect); H. Egg; I. Male reproductive organs; J. Digestive system (ventral aspect).

## Genus *Mycodrosophila* Oldenberg, 1914

Japanese name: Kinoko-shōjōbae-zoku.

*Mycodrosophila* Oldenberg, 1914. Arch. Naturg., 80 A (2): 4; Sturtevant, 1921. Carn. Inst. Publ., 301: 50, 62; Duda, 1924. Arch. Naturg., 90 A (3): 180, 191; Duda, 1935. Die Fliegen, 58 g: 46; Wheeler, 1952. Univ. Texas Publ., 5204: 190.

*Paramycodrosophila* Duda, 1924. Arch. Naturg., 90 A (3): 191; Duda, 1925. Annal. Mus. Nat. Hung., 22: 225 (teste Wheeler, 1952).

Haplotype: *Amiota poecilogastra* Loew, 1874.

Among 9 species reported here as Japanese representatives, 8 are thought to be endemic to Japan. All are found closely associated with fungi, and are showing their body markings usually variable to some extents.

### Key to Japanese species of the genus *Mycodrosophila*

1. Posterior crossveins clouded. ....2.  
Posterior crossveins clear. ....5.
2. Thoracic pleura without black longitudinal stripe. ....*M. setipalpis* sp. nov.  
Thoracic pleura with black longitudinal stripe. ....3.
3. Veins and cells of the distal half of wing not clouded. Black spot at the distal costal break not extending below  $r_1$ . ....*M. japonica* sp. nov.  
Veins and cells on the distal half of wing somewhat clouded. Black spot at the distal costal break expanding below  $r_1$ . ....4.
4. Black spot at the distal costal break extending below  $r_{2+3}$ . ....*M. takachihonis* sp. nov.  
Black spot at the distal costal break not extending below  $r_{2+3}$ . ....*M. shikokuana* sp. nov.
5. Thoracic pleura each with a black longitudinal band. ....6.  
Thoracic pleura without black longitudinal band. ....8.
6. Caudal black bands of proximal abdominal tergites interrupted at middle. ....*M. poecilogastra* (Loew).  
Caudal black bands of proximal abdominal tergites non-interrupted at middle. ....7.
7. Caudal black bands on 3-5 T projected forward at middle. ....*M. sp.* from Kirishimayama.  
3-5 T entirely black. ....*M. palmata* sp. nov.
8. Black spot below distal costal break large, reaching  $m$ . ....*M. basalis* sp. nov.  
Black spot below distal costal break small, not extending below  $r_{2+3}$ . ....*M. splendida* sp. nov.

### Key to Japanese species of the genus *Mycodrosophila*, with regard to the periphallic organs

1. Genital arch broadly truncate at lower tip. ....2.  
Genital arch more or less narrowing at lower tip. ....3.
2. Anal plate with strong teeth. ....*M. setipalpis* sp. nov.  
Anal plate without strong teeth. ....*M. takachihonis* sp. nov.
3. Genital arch narrowly pointed at lower tip. ....4.  
Genital arch bluntly projected at lower tip. ....5.
4. Lower portion of genital arch with about 2 hairs. ....*M. poecilogastra* (Loew).  
Lower portion of genital arch with about 10 hairs. ....*M. shikokuana* sp. nov.
5. Genital arch with lower projection short, not reaching apex of clasper. ....6.  
Genital arch with lower projection long, surpassing apex of clasper. ....*M. palmata* sp. nov.
6. Lower projection of genital arch club-shaped. ....*M. splendida* sp. nov.  
Lower projection of genital arch abruptly tapering. ....7.
7. Lower portion of genital arch with several hairs. ....*M. basalis* sp. nov.  
Lower portion of genital arch with about 10 hairs and a few stout spines. ....*M. japonica* sp. nov.

### Key to Japanese species of the genus *Mycodrosophila*, with regard to the phallic organs

1. Aedeagus non-serrated. ....2.  
Aedeagus at least partially serrated. ....4.
2. Aedeagus nearly straight, apically rounded, and not distinctly bilobed at tip. ....*M. splendida* sp. nov.  
Aedeagus rectangularly curved ventrad at middle, and apically bilobed. ....3.
3. Aedeagus subapically much swollen and finely pubescent. ....*M. japonica* sp. nov.  
Aedeagus subapically somewhat swollen and bare. ....*M. basalis* sp. nov.
4. Aedeagus dorsoventrally with numerous long serrations. ....*M. palmata* sp. nov.  
Aedeagus with only short serrations. ....5.
5. Aedeagus only apicodorsally serrated. ....*M. poecilogastra* (Loew).  
Aedeagus with serrations not confined to apex. ....6.
6. Aedeagus ventromedially serrated, and dorsally with 2 pairs of conical projections. ....*M. shikokuana* sp. nov.

- Aedeagus lateromarginally serrated with equal-sized minute teeth. ....7.  
 7. Aedeagus horizontally flatten. ....*M. setipalpis* sp. nov.  
 Aedeagus vertically flatten. ....*M. takachihonis* sp. nov.

**Key to Japanese species of the genus *Mycodrosophila*, with regard to the egg-guides**

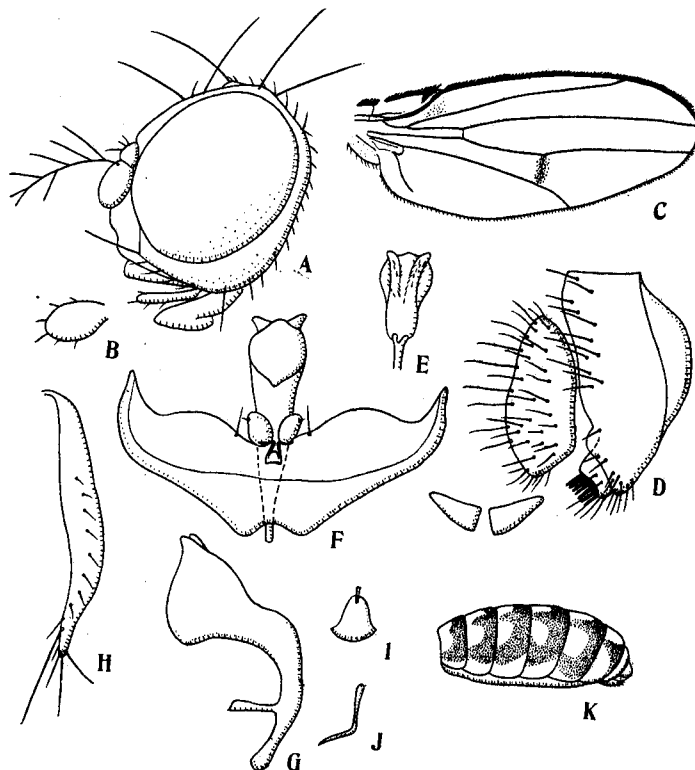
1. No marginal bristles teeth-like. ....2.  
 At least several marginal bristles teeth-like. ....4.
2. Lobes narrow, not exceedingly broaden at middle. ....3.  
 Lobes exceedingly broaden at middle, triangular in shape. ....*M. sp. from Kirishimayama.*
3. Lobes narrowly pointed at tips. ....*M. japonica* sp. nov.  
 Lobes rounded at tips. ....*M. sakakiana* sp. nov.
4. A part of marginal bristles teeth-like. ....5.  
 Almost all the marginal bristles teeth-like. ....6.
5. 2 long bristles on the upper margin of the lobe. ....*M. takachihonis* sp. nov.  
 1 long bristle on the upper margin of the lobe. ....*M. splendida* sp. nov.
6. Basal isthmus short, less than 1/5 the length of lobe. ....7.  
 Basal isthmus longer, more than 1/3 the length of lobe. ....*M. basalis* sp. nov.
7. Discal teeth absent, replaced by a long bristle. ....*M. palmata* sp. nov.  
 Discal teeth a few, not replaced by long bristles. ....*M. poecilogastra* (Loew).

***Mycodrosophila japonica* sp. nov. Fig. 22.**

Japanese name: Yamato-kinoko-shôjôbae.

*Mycodrosophila* sp. I, Suzuki, 1955. Zool. Mag., 64: 47.

**Fig 22**



**Fig. 22. *Mycodrosophila japonica* sp. nov.**

A. Head; B. Palpus; C. Wing; D. Periphallic organs (lateral aspect); E. Tip of aedeagus (dorsal aspect); F. Phallic organs (ventral aspect); G. Aedeagus (lateral aspect); H. Egg-guide; I. Ejaculatory apodeme (ventral aspect); J. do. (lateral aspect); K. Female abdomen.

♂ and ♀: Body about 3.0 mm, dark brown, with legs yellow. Head (Fig. 22 A) dark brownish black. Eye dark red and bare. Antenna with 2nd joint black; 3rd yellowish grey, and rounded at tip. Arista with 7 branches including a large fork, 1 below and close to it. Palpus dark yellowish brown; horizontally flatten, and with a few short bristles. Ocellar triangle and periorbit uniformly dark brown. Front about 1/2 as broad as the head-width, and without *fr*. Clypeus black. Carina high, long, and broader below. Cheek dark brown, broad, about 1/3 as broad as the greatest diameter of eye. Occiput black. *orb*<sub>2</sub> minute. Only one prominent *or*.



Mesonotum glossy black, somewhat bluish. Scutellum same as mesonotum in coloration. Thoracic pleura yellowish grey, with a longitudinal black stripe at middle. Notopleural region also black, *hu* 2, subequal in size. *ac* in about 12 rows. Anterior *dc* minute, just in front of posterior *dc*, which is larger. Anterior *scut* shorter than posterior, parallel or slightly convergent. Sterno-index about 0.4.

Legs yellow; fore tarsi and tibiae of male with a few short upright recurved hairs on anterior margin. Preapicals on all three tibiae, though obscure on 2nd. Apicals on fore and middle. Wings (Fig. 22 C) hyaline; posterior crossvein clouded. C-index about 2.0; 4 V-index about 1.8; 4 C-index about 1.1; 5 X-index about 1.3. C1-bristles 1; C3-bristles on basal 3/5 to 4/5. Halteres brown.

Abdomen (Fig. 22 K) yellowish brown with black bands. 1 T yellowish brown in male, with black caudal band in female. 2-5 T with caudal black bands; 3-5 T or even 6-7 T each with caudal band swollen at middle and lateral sides to reach anterior margin, leaving yellowish area on each lateral side. Abdominal sternites brownish grey.

Periphallic organs (Fig. 22 D): Anal plate truncate below, pale yellow, and with about 35 hairs. Genital arch also pale yellow, triangularly pointed at lower tip; upper margin with about 10 hairs; lower margin with about 10 hairs. Clasper with about 6-7 long black teeth and about 2 secondary teeth. Decasternum with lateral pieces triangular and pale yellow, median piece absent.

Phallic organs (Fig. 22 E-G): Novasternum pale yellowish grey, much broader than long, and concaved basally. Aedeagus pale yellow, broad, and slightly bilobed at tip. p.f.=aBcdEfg<sub>h</sub>HI-KLmn. PI=about 3.0.

Egg-guides (Fig. 22 H): Lobe narrow, pale yellowish orange, and with about 13 marginal bristles, which are not teeth-like and subapical three bristles are longest.

Internal structures: Ejaculatory apodeme (Fig. 22 I,J): Plate fan-shaped, pale brown, basolaterally darker; stem black, slightly longer than plate.

Holotype: ♂, Tōbetsu, Hokkaido, 17 VIII '51 M (Okada).

Allotopotype: ♀, collected together with holotype.

Paratopotypes: 3 ♂♂, collected together with holotype.

Other specimens examined: Imagane, Hokkaido, 4 ♂♂ and 2 ♀♀, 2 VI '53 M (Suzuki); Hakamoriyama, Iwate Pref., 1 ♂, 7 X '52; Asakawa, Tokyo, 1 ♂, 20 V '51; 1 ♀, 1 V '52 M (Okada).

Distribution: Hokkaido, Honshu (Tohoku, Kanto).

Feeding habits: M.

Relationships: Closely allied to *M. amabilis* (de Meijère) from Java, especially in abdominal patterns, but differs from it in having brownish halteres. It also resembles *M. ciliatipes* Duda from Singapore, in having upright hairs on fore legs, but differs from the latter in the abdominal coloration and smaller range of pleural black stripes.

### *Mycodrosophila shikokuana* sp. nov. Fig. 23.

Japanese name: Shikoku-kinoko-shōjōbae.

♂ and ♀: Body about 3.5 mm. Head (Fig. 23 A) yellowish orange, with periorbits, occiput, and gena blackish. Eye dark red and bare. Antenna yellowish orange. Arista with about 7 branches including fork, 1 below it. Ocellar triangle black. Front dark orange, about 1/2 as broad as head-width. Face yellowish orange. Clypeus black. Cheek yellowish orange, anteriorly black, and about 1/4.5 the greatest diameter of eye in breadth. Carina yellowish orange, broad, somewhat high and long, and broader below. *orb*<sub>2</sub> minute. Only one prominent *or*.

Mesonotum glossy black, humerus yellowish brown. Scutellum glossy black. Thoracic pleura yellowish white, with a black longitudinal stripe. *hu* 2, subequal. *ac* in about 12 rows. Anterior *dc* minute. Anterior *scut* short. Sterno-index about 0.6.

Legs yellow, without recurved upright hairs on fore legs of male. Preapical on hind tibia. Apicals on fore and middle. Wings (Fig. 23 B) slightly fuscous, obscurely clouded on outer margin; black cloud below *r*<sub>1</sub>; *r*<sub>2+3</sub>, *r*<sub>4+5</sub> and *m* apically black; posterior crossveins clouded. C-index about 1.9; 4 V-index about 1.5; 4 C-index about 1.1; 5 X-index about 1.0. C1-bristle one; C3-bristles on basal 3/4. Halteres white, outer tip of stem and the base of knob black.

Abdomen (Fig. 23 H) yellow, with black stripes on 2-6 T; black stripes on 3-6 T medially and laterally projected forward; 3-4 T with anterior black bands. 7 T, sometimes also 6 T, with triangular black spot at middle.

Periphallic organs (Fig. 23 C): Generally pale yellow. Anal plate broader below, and with about 30 hairs. Genital arch narrowly prolonged at lower end; upper margin with about 10 and lower margin about 15 hairs. Clasper quadrate, with about 8 long black primary teeth and 4 long secondary teeth.

Fig 23

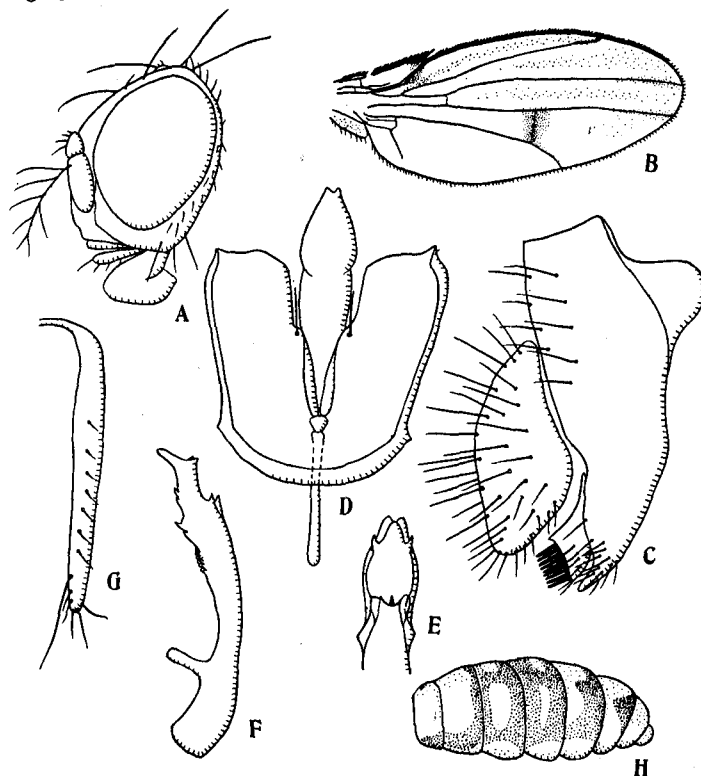


Fig. 23. *Mycodrosophila shikokuana* sp. nov.

A. Head; B. Wing; C. Periphallic organs (lateral aspect); D. Phallic organs (ventral aspect); E. Aedeagus, tip (dorsal aspect); F. Aedeagus (lateral aspect); G. Egg-guide; H. Male abdomen.

Phallic organs (Fig. 23 D-F): Aedeagus spinous on venter, serrate subapically, and scaly at middle; 2 subapical and 2 submedian conical processes on dorsum. Ventral fragma quadrate, and nearly as long as broad.  $p.f. = ab/CdE?f_0?g_0Hiklmn$ .

Egg-guides (Fig. 23 G): Lobe very slender, with hair-like bristles, about 14 in number, non of them teeth-like, apical ones longest. Subterminal hair stout and very long.

Holotype: ♂, Omogo, Ehime Pref., 9 XI '53 T (Okada).

Allotopotype: ♀, collected together with holotype.

Paratopotypes: 1 ♂ and 2 ♀♀, collected together with holotype.

Distribution: Shikoku.

Feeding habits: T.

Relationships: Somewhat resembles *M. amabilis* (de Meijère) from Java, but differs from it in entirely yellow 1 T, in having black spot on 6 T, and in much larger size of body.

*Mycodrosophila* sp. from Kirishimayama Fig. 24.

Japanese name: Kirishima-kinoko-shōjōbae.

♂ and ♀: Body about 3.0 mm. Head (Fig. 24 A): Antenna yellowish brown, 3rd joint thrice as long as broad. Arista with about 7 branches including large fork, 1 below it. Eye apparently bare. Palpus slender, yellowish orange, and with apical half black and dilated horizontally. Ocellar triangles and periorbits black. Front yellow, darker posteriorly, silvery shining, and less than half as broad as head-width. *fr* absent. Clypeus black. Face yellowish white, apically black. Carina high, black at middle. Cheek yellow, about  $2/7$  the greatest diameter of eye in breadth. *orb*<sub>2</sub> minute, hair-like. Only one prominent *or*.

Mesonotum black, somewhat shining, with a long narrow stripe at middle and yellow spot on each laterocaudal corner. Humerus grey. Scutellum black. Thoracic pleura yellow, with a long

Fig. 24

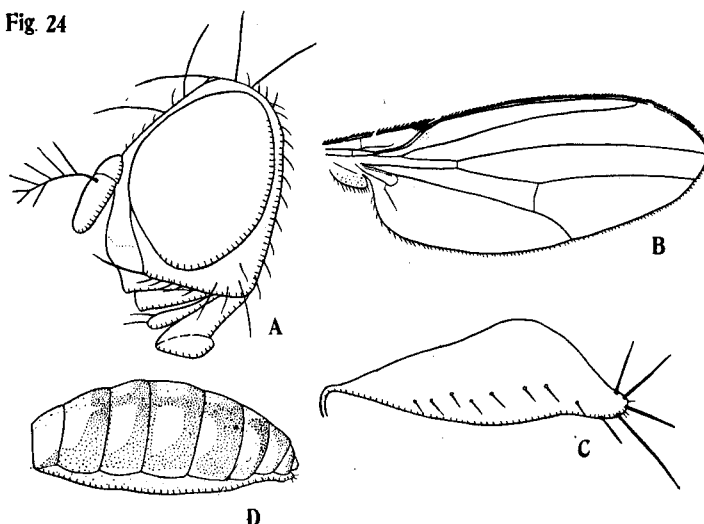


Fig. 24. *Mycodrosophila* sp. from Kirishimayama

A. Head; B. Wing; C. Egg-guide; D. Female abdomen.

brownish black longitudinal stripe on each lateral side. *hu* 2, long. *ac* in about 10 irregular rows. Anterior *scut* somewhat convergent. Sterno-index about 2.1.

Legs entirely pale yellow. Preapicals on middle and hind tibiae; apicals on middle. Wings (Fig. 24 B) without black markings. Crossveins pale. C-index about 2.2; 4V-index about 2.0; 4C-index about 1.2; 5X-index about 1.8. C1-bristle 1; C3-bristles on basal 2/3. Halteres yellowish white, with base of knob darker.

Abdominal tergites yellow; 1T black at sides; 2T with caudal black bands concaved at middle; 3-5T with caudal black bands projected anteriorly at middle and at lateral sides; 6-8T each with a triangular black spot at middle, which is sometimes broken into 2 spots. 9T yellow, with primary clasper having a row of black teeth.

Phallic organs: Generally yellow, aedeagus elongate; fragma rounded.

Egg-guides (Fig. 24 C) yellow, triangular at lateral aspect, pointed, and with about 14 marginal bristles, none of them being tooth-like, a few apical ones being long and stout.

Specimens examined: Kirishimayama, 1 ♂ and 1 ♀, 22 IX '54 M.

Distribution: Kyushu.

Feeding habits: M.

Remarks: Somewhat resembles preceding species, but differs from that in the broader egg-guides, pattern-less wings, etc.

***Mycodrosophila takachihonis* sp. nov. Fig. 25.**

Japanese name: Takachiho-kinoko-shōjōbae.

♂ and ♀: Body about 3-3.5 mm. Head (Fig. 25 A) black. Eyes dark red, and bare. Antenna yellowish brown. Arista with about 7 branches including a large fork, one below it. Palpus with a few prominent setae, apical one being longest. Ocellar triangle and periorbit mat black. Front broad, flat and black, about 1/2 as broad as the head-width, anteriorly orange. *fr* absent. Clypeus black; face black. Carina black, high, and long. Cheek yellowish orange, about 3/7 the greatest diameter of eye in breadth. *orb*<sub>2</sub> minute. Only one prominent *or*.

Mesonotum glossy black, somewhat bluish. Scutellum black. Thoracic pleura yellow, with a large black longitudinal stripe on each side; notopleural corner also black. Humerus paler, *hu* 2. *ac* in about 10 rows. Anterior *scut* slightly divergent. Sterno-index about 0.5.

Legs yellow, knee-joints black. Preapicals on hind tibiae; apicals on fore (small) and middle. Wings (Fig. 25 B) slightly fuscous, especially along costal margin; a large black diffused spot at the end of 1st costal section, extending below to reach *m*. Posterior crossveins clouded. Cindex about 1.7; 4V-index about 1.8; 4C-index about 1.2; 5X-index about 1.1. C1-bristles 1; C3-bristles on basal 7/10. Halteres apically black.

Abdominal tergites (Fig. 25 G) yellow with black patches: 2T with broad black band, which is narrowly interrupted at middle; 3-5T each with a broad caudal band, slightly projected for-

ward at middle and deeply curved forward at both lateral sides to reach anterior margin. 6-7 T almost entirely black. Sometimes 3-5 T also almost entirely black.

Fig 25

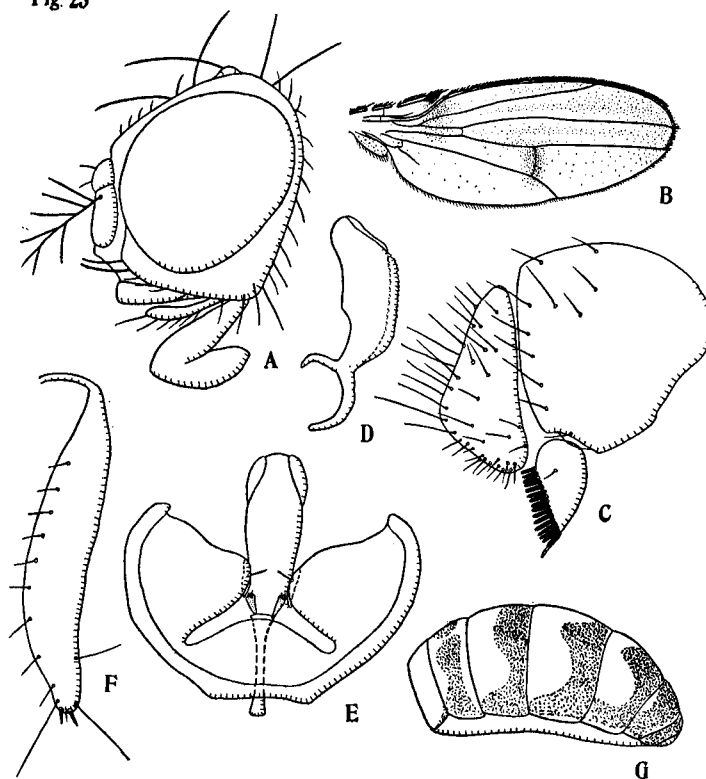


Fig. 25. *Mycodrosophila takachihonis* sp. nov.

A. Head; B. Wing; C. Periphallallic organs (lateral aspect); D. Aedeagus (lateral aspect); E. Phallic organs (ventral aspect); F. Egg-guide; G. Female abdomen.

Periphallallic organs (Fig. 25 C): Genital arch broad, black, truncate below, and with about 12 upper marginal hairs arranged in 2 rows, and one lower marginal hair. Primary clasper with about 16 black teeth and 1 short discal hair. Anal plate triangular, with about 45 hairs, lower hairs being short.

Phallic organs (Fig. 25 D,F): Aedeagus broad, straight, and finely serrate at dorsolateral margins. Ventral fragma broader than long. Anterior paramere minute, apically broaden and with a few sensilla. p.f. = Ab'CdEfg<sub>0</sub>HIkLmn. PI=2.0.

Egg-guides (Fig. 25 E): Lobes oblong, pale yellowish brown, each with about 14 marginal bristles, of which apical 2 longest; and also with about 2 black teeth at tip.

Internal structures: Yet unknown.

Holotype: ♂, Kirishima-jingū, 22 IX '54 M (Okada).

Paratopotypes: 2 ♂♂, collected together with holotype.

Distribution: Kyushu.

Feeding habits: M.

Relationships: Somewhat resembles *M. setipalpis* sp. nov. in the shape of aedeagus, but differs from the allied species in having ventral fragma broader than long, and anal plate without bristles.

***Mycodrosophila splendida* sp. nov. Fig. 26.**

Japanese name: Kuro-kinoko-shōjōbae.

♂ and ♀: Body mostly black, about 3 mm in length. and with front and face yellow. Head (Fig. 26 A): Eyes dark red, without piles. Antenna brown, 3rd joint yellowish. Arista with about 7 branches including a large fork, 1 below it. Palpus brownish black, with a few weak hairs. *orb*<sub>2</sub> very small, inserted close to proclinate *orb*. Only one prominent *or*. Ocellar triangle and periorbits black. Front 2/3 as broad as head-width, narrowing below; *fr* absent. Face yellow; clypeus black. Carina yellow and narrow. Cheek whitish apically and about 1/3 as broad as the greatest diameter of eye.

Mesonotum glossy black. Scutellum also glossy black, sometimes paler at middle. Thoracic pleura yellow; notopleural corner black. Sterno-index about 0.4. *hu* 2; *ac* in about 8-12 rows. Anterior *scut* slightly convergent.

Legs whitish, somewhat brownish in males. Fore tibia and tarsi each with a few long curved upright hairs in male. Preapicals evident on hind tibia; apicals on fore and middle. Wings (Fig. 26 B) clear, with a small black patch below  $r_1$ , reaching  $r_{2+3}$ . C-index about 1.6; 4 V-index about 2.2; 4 C-index about 1.5; 5 X-index about 1.7. C1-bristles only one, short but stout; C3-bristles on basal about 3/4. Halteres yellowish white, with black patch on the underside of each knob.

Abdomen (Fig. 26 F) with tergites yellowish white, with variable black stripes: 2-5 T in female and 1-5 T in male each with a black caudal band, which is often projecting forward at middle and at lateral sides; the black bands on 2-3 T in male often interrupted at middle.

Periphallic organs (Fig. 26 C,J); Genital arch yellow, finger-like below; upper margin with about 5 hairs; toe with several hairs. Clasper yellow, narrowing at base, and with about 6-10 black teeth arranged in a row, and with about 2 black secondary teeth. Anal plate yellow, broaden below, and with about 40 hairs. Decasternum rounded triangular and pale yellow.

Phallic organs (Fig. 26 D,E): Aedeagus broad and straight, with tip rounded or weakly divided at ventral view. Posterior parameres separated from aedeagus. Anterior parameres minute, without sensilla. Ventral fragma quadrate and broader than long. [p.f.=aBCdEf<sub>0</sub>g.HIklmn. PI= about 2.4.

Egg-guides (Fig. 26 H): Lobe narrow, oblong, and with about 14 marginal bristles, apical 2 or 3 bristles being tooth-like.

Fig 26

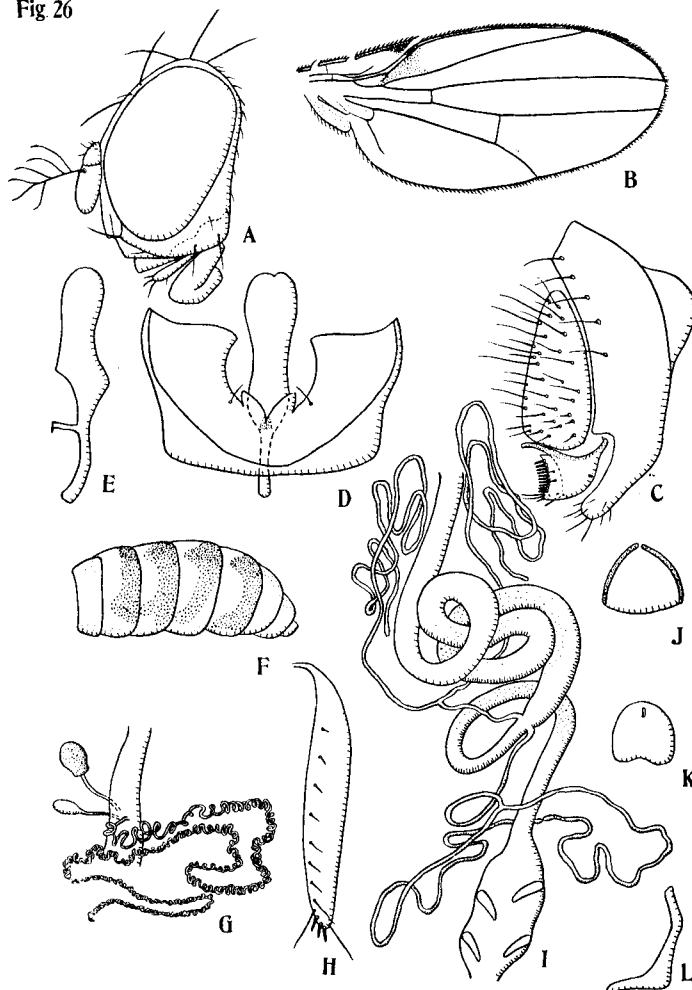


Fig. 26. *Mycodrosophila splendida* sp. nov.

A. Head; B. Wing; C. Periphallic organs (lateral aspect); D. Phallic organs (ventral aspect); E. Aedeagus (lateral aspect); F. Female abdomen; G. Female reproductive organs (ventral aspect); H. Egg-guide; I. Digestive system (ventral aspect); J. Decasternum of male periphallic organs; K. Ejaculatory apodeme (ventral aspect); L. do. (lateral aspect).

Internal structures (Fig. 26 G,I,K,L): Proximal intestine: C=3.0. Rectal papillae elongate; R=2.7. Malpighian tubes with common stalks comparatively long; posterior branches closely apposed to each other at tips. Testis with about 12 inner and 12 outer coils, and pale yellow. Paragonia folded 2-3 times. Ejaculatory bulb simple, with apodeme very weakly sclerotized; plate elongate triangular. Spermatheca pale brown, small, and longer than broad. Parovaria shorter than spermatheca, and with rounded head. Ventral receptacle densely coiled.

Holotype: ♂, Kamakura, Kanagawa Pref., 19 IV '51, collected from inside the spathe of *Arisaema Thumbergii* Bluma, var. *Urashima* Makino (Okada leg.).

Allotopotype: ♀, collected together with holotype.

Paratypes: Asakawa, Tokyo, 1 ♂, 20 V '51 M; 3 ♂♂ and 2 ♀♀, 5 VIII '51 M (Ohba); Mizonokuchi, Kanagawa Pref., 1 ♀, 22 XI '52 M; Meguro, Tokyo, 5 ♂♂ and 1 ♀, 11 X '53 M.

Other specimens examined: Asakawa, Tokyo, 1 ♀, 29 IV '52 M (Moriwaki); Anjō, Aichi Pref., 20 IX '54 F (Nozawa); Kirishima-jingū, Kagoshima Pref., 3 ♂♂ and 3 ♀♀, 22 IX '54.

Distribution: Honshu (Kanto, Chubu), Kyushu.

Feeding habits: MF, Flower.

Relationships: Somewhat resembles *M. fracticosta* (Lamb), from Seychelles, and *M. argenti-frons* Malloch, from Australia, in the colorations of abdomen, thoracic pleura, and wings, but differs from the former allied species in having larger costal-index, and from both allied species, in having not entirely black halteres. Also allied to *M. japonica* sp. nov., described in this paper, especially in abdominal patterns, but differs from it in having posterior crossveins not clouded, mesopleura non-striped, vertical rod of aedeagus well-developed, and egg-guide bristles partly teeth-like.

***Mycodrosophila basalis* sp. nov. Fig. 27.**

Japanese name: Neguro-kinoko-shōjōbae.

Fig. 27

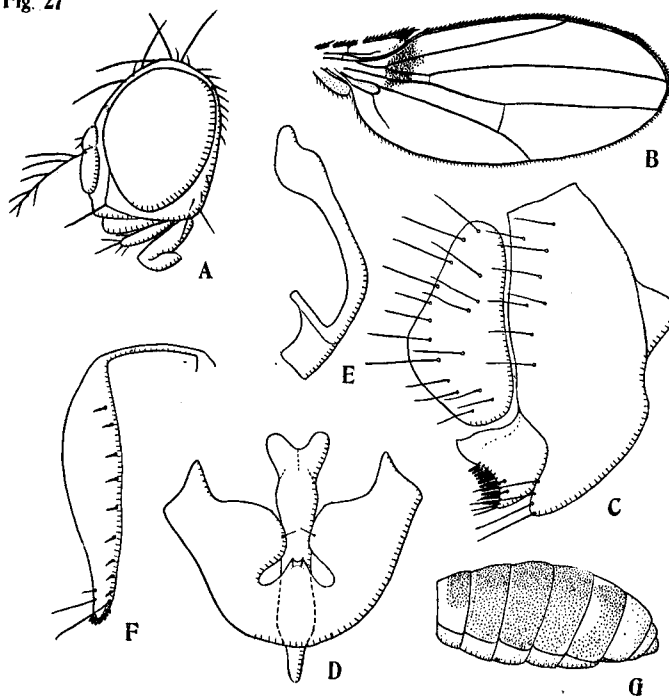


Fig. 27. *Mycodrosophila basalis* sp. nov.

A. Head; B. Wing; C.Periphallallic organs (lateral aspect); D. Phallic organs (ventral aspect); E. Aedeagus (lateral aspect); F. Egg-guide; G. Male abdomen.

♂ and ♀: Body about 2.3 mm. Head (Fig. 27 A) brownish black; eye greyish red and bare. Antenna with 2nd joint greyish brown; 3rd greyish yellow and oblong. Palpus yellow, with a long apical seta. Arista with about 7 branches, including small fork, one branch below it. Front dark orange brown, slightly broader than half the head-width. Clypeus dark brown. Cheek about 1/5 as broad as the greatest diameter or eye. Carina pale brown, high, and long. *orb*<sub>2</sub> minute. Only one prominent *or*.

Mesonotum brownish black, somewhat paler along *dc*-lines, and along mid-line. Scutellum black.

Thoracic pleura yellow, anterodorsal corner of mesepisternum black. Humerus black. *hu* 2, subequal in size. *ac* in about 14 irregular rows; Anterior *scut* short and convergent. Sterno-index about 0.5.

Legs entirely yellow; fore tibia and tarsi of male without recurved upright hairs. Preapicals prominent on hind tibia; apicals on middle. Wings hyaline; crossveins clear. A large black patch below *r*<sub>1</sub>, reaching *cu* below. C-index about 1.1; 4V-index about 1.9; 4C-index about 1.6; 5X-index about 1.5. C1-bristle one, small; C3-bristles on basal about 3/5. Halteres yellow.

Abdomen (Fig. 27 G) with 1-6 T almost entirely black; anterior and lateral sides of 1 T and anterior margin, except at middle, of 6 T yellow; 7 T to the caudal end of body yellowish.

Periphallalic organs (Fig. 27 C): Pale yellow in general. Genital arch broad, narrowing below, and with about 8 upper marginal and 4 lower marginal hairs. Anal plate somewhat triangular, and with about 16 long hairs. Primary clasper quadrate, and with about 9-10 black teeth as well as about 2 secondary teeth.

Phallic organs (Fig. 27 D, E): Aedeagus apically broaden and bilobed, curved ventrad near base. Anterior paramere obscure, probably confluent with novasternum, and without sensilla. Posterior parameres absent. Ventral fragma broader than long. Median notch bifid and laterally prolonged, as in *M. takachihonis* sp. nov., described in this paper. p. f. = aBCdEf<sub>0</sub>g<sub>0</sub>HIkLmn. PI = 2.9.

Egg-guides (Fig. 27 F): Lobe slender, pale yellow, with about 15 marginal bristles, including about 7 teeth on the apical margin, and 2 long subapical bristles.

Holotype: ♂, Asakawa, Tokyo, 20 V '51 M (Okada).

Allotopotype: ♀, collected together with holotype.

Paratypes: Asakawa, Tokyo, 1 ♀, 29 V '52; 1 ♀, 29 VII '52 M (Ohba); Kirishima-jingū, 1 ♂ and 1 ♀, 22 IX '54 M.

Distribution: Honshu (Kanto), Kyushu.

Feeding habits: M.

Relationships: Somewhat resembles *M. albicornis* (de Meijère), from Satellite Is., but differs from it in having larger wing. Also resembles *M. amabilis* (de Meijère), from Satellite Is. etc., but differs in having yellow palpi.

### *Mycodrosophila poecilogastra* (Loew, 1874) Fig. 28.

Japanese name: Mon-kinoko-shōjōbae.

*Amiota poecilogastra* Loew, 1874. Zeitschr. ges. Naturwiss., N.R., 18: 419.

*Mycodrosophila poecilogastra* Oldenberg, 1914. Arch. Naturg., 80 A (2): 6; Duda, 1924. Arch. Naturg., 90 A (3): 191; Duda, 1935. Die Fliegen, 58 g: 46; Sturtevant, 1921. Carn. Inst. Publ., 301: 132.

*Mycodrosophila Johni* Pokorny, 1896 (teste Oldenberg, 1914).

*Mycodrosophila* sp., Okada, 1952. Zool. Mag., 62: 280; Okada, 1954. Japan. Journ. Appl. Zool., 19: 81.

*Mycodrosophila* sp. II, Suzuki, 1955. Zool. Mag., 64: 47.

♂ and ♀: Body yellow, with black patches; length about 2.0 mm. Head (Fig. 28 A) largely black, with face, cheek, and front pale brown. Eye dark red and bare. Antenna yellow; arista with about 6 long branches including large fork; only one below and near the fork. Palpus yellow, slender, and with a long apical seta, as well as several shorter setae. Carina narrow, low, and wider below. *orb*<sub>2</sub> minute. Only one prominent *or*.

Mesonotum black, slightly paler along middle line and *dc*-lines. Scutellum black. Thoracic pleura yellowish white, with black patches on upper margin of mesepisternum, and upper margin of sternepisternum. *hu* 2, small. *ac* in about 8-10 irregular rows. Anterior *dc* often present, but very small and situated close to posterior ones. Anterior *scut* short and convergent. Sterno-index about 0.5.

Legs pale yellow, female femora slightly darker. Male fore tibia and fore tarsi (Fig. 28 H) with long recurved upright hairs along anterior margin. Preapicals on all three tibiae; apicals on fore and middle. Wings (Fig. 28 B) hyaline, black at the end of 1st costal section, and slightly fuscous below *r*<sub>1</sub>. Crossveins clear. C-index about 1.1; 4V-index about 1.8; 4C-index about 1.7; 5X-index about 1.1. C1-bristle only one; C3-bristles on basal 2/3. Halteres white, with a black spot at the base of knob.

Abdominal tergites (Fig. 28 D) pale yellow, with black patches. 2-4 T with large black bands broadly interrupted at middle. 5 T with caudal band projected at middle and at both lateral sides to reach anterior margin. 7 T anteriorly black. Sternites pale yellow.

Periphallalic organs (Fig. 28 C): Genital arch yellow, narrow below, with a few upper margi-

nal and 2 lower apical hairs. Clasper yellowish brown, with about 7 black teeth on the lower half, upper half having a long process. Anal plate yellow, with about 30 hairs. Decasternum bifid, each plate oval.

Phallic organs (Fig. 28 E, F): Aedeagus straight, orange yellow, apically bilobed and with dorsal fine serrations. Anterior paramere minute. Posterior parameres bar-like, connecting the tips of elongate novasteral plates. Ventral fragma basally rounded, much longer than broad. p. f. = ab'CdEf<sub>0</sub>gHIklmn. PI=2.5.

Egg-guides (Fig. 28 G): Lobes pale yellow, elongate and medially swollen exceedingly, and with about 15 yellowish marginal teeth, 2 discal teeth, and 2 long subapical setae.

Internal structures (Fig. 28. I-M): Proximal intestine: C=4.0. Rectal papillae: R=2.7. Posterior Malpighian tubes apposed at tips to each other. Common trunks comparatively long. Testis with about 4 inner and 3 outer coils. Paragonia thick, once folded. Ejaculatory bulb simple; apodeme with plate elongate oval, distally concaved. Spermatheca pale yellowish brown, narrowing basally. Parovaria smaller and shorter than spermatheca. Ventral receptacle with about 30 kinky coils.

Specimens examined: Abashiri, Hokkaieo, 1 ♀, 18 VIII '51 M; Tōbetsu, Hokkaido, 11 ♂♂ and 5 ♀♀, 17 VII '51 M; Sapporo, Hokkaido, 3 ♂♂ and 2 ♀♀, 19 VIII '53 M; Imagane, Hokkaido, 3 ♂♂ and 2 ♀♀, 2 VI '53 M (Suzuki); Hakkoda, Aomori Pref., 1 ♀, 23 VIII '5 M; Kumotoriyama, Tokyo, 1 ♀, 14 VII '53 M; Kirishimayama, Kagoshima Pref., 9 ♂♂ and 3 ♀♀, 22 IX '54 M.

Distribution: Hokkaido, Honshu (Tohoku, Kanto), Kyushu, Europe.

Feeding habits: M.

Fig. 28

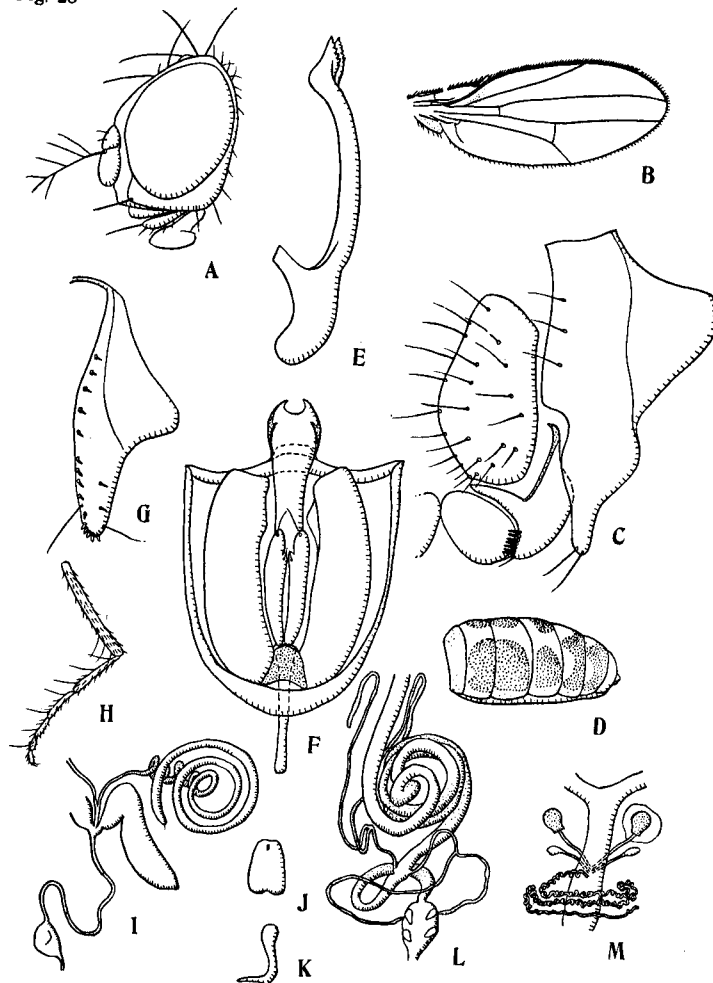


Fig. 28. *Mycodrosophila poecilogastra* (Loew).

A. Head; B. Wing; C. Peripheral phallic organs (lateral aspect); D. Male abdomen; E. Aedeagus (lateral aspect); F. Phallic organs (ventral aspect); G. Egg-guide; H. Male fore leg; I. Male reproductive organs, part; J. Ejaculatory apodeme (ventral aspect); K. do. (lateral aspect); L. Digestive system (ventral aspect); M. Female reproductive organs.

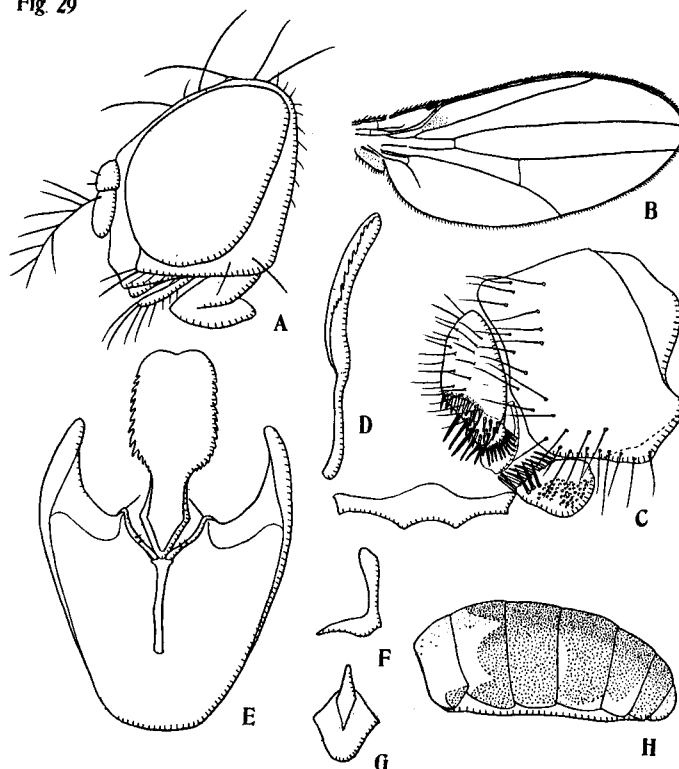


Remarks: Slightly different from the original form of Europe, in darker mesonotum and bare eyes. The presence of long recurved hairs in the male fore tarsi in the present species is as equal in European as in Japanese forms. *M. ciliatipes* Duda, from Singapore also has this character, but may be distinguished from *M. poecilogastra* in having 2-4 T almost entirely black. Egg of the present species with 4 filaments.

***Mycodrosophila setipalpis* sp. nov. Fig. 29.**

Japanese name: Hige-kinoko-shōjōbae.

Fig 29



**Fig. 29. *Mycodrosophila setipalpis* sp. nov.**

A. Head; B. Wing; C.Periphallallic organs (lateral aspect); D. Aedeagus (lateral aspect); E. Phallic organs (ventral aspect); F. Ejaculatory apodeme (lateral aspect); G. do. (ventral aspect); H. Male abdomen.

♂: Body about 2.7 mm. Head (Fig. 29 A) blackish. Antenna yellowish brown; arista with about 8 long branches including large fork, one below it. Palpus reddish brown, with a few very long setae. Ocellar triangle black; periorbit dark brown, paler at the insertions of orbital bristles. Front brown, glossy silvery white, without *fr*, about 1/2 as broad as head-width. Face reddish brown; clypeus black. Carina long, orange brown, and high. Cheek yellowish orange, about 1/4 as broad as greatest diameter of eye. *orb*<sub>2</sub> minute, hair-like. *or*<sub>2</sub> longer than vibrissa.

Mesonotum black, humerus paler. Thoracic pleura yellow, black at notopleural ridge. *hu* about 3, long. *ac* in about 10 irregular rows. Anterior *scut* convergent, short. Sterno-index about 0.5.

Legs yellow. Preapicals on hind tibia; apicals on fore and middle. Wings (Fig. 29 B) hyaline, slightly fuscous below *r*<sub>1</sub>. Crossveins clear. C-index about 1.5; 4V-index about 2.5; 4C-index about 1.7; 5X-index about 2.0. C1-bristles one; C3-bristles on basal 5/9. Halteres black.

Abdominal tergites (Fig. 29 H) mainly black. 1 T yellow, black at lateral corners; 2 T yellow, with broad caudal black band, which is deeply incised at middle and at lateral sides; 3-5 T almost entirely black; 6-7 T grey; 8 T yellow.

Periphallallic organs (Fig. 29 C): Genital arch pale yellowish brown, very broad, and broadly truncate at lower tip, and with about 15 upper hairs arranged in 2 rows, as well as about 12 lower hairs. Clasper yellow, oval, with about 3 long black pointed teeth, 12 marginal stout hairs, and discally with numerous minute conical processes. Anal plate pale yellow, with about 20 long hairs; lower portion with about 25 very stout black setae, and apically with a row of about 10 black teeth. Decasternum oblong, looks like a cross bar.

Phallic organs (Fig. 29 D, E): Aedeagus dark yellowish brown, very broad, fan-shaped in dorsal view, and laterally serrated with about 12 serrations. Anterior parameres fused to novasternum, each with about 2 sensilla. Posterior parameres obscure. Ventral fragma slightly truncate at anterior end and as broad as long. p. f.=abCdEfg<sub>0</sub>HiklMN. PI=about 1.6.

Internal structures: Ejaculatory apodeme (Fig. 29 F, G) pale brown, with plate rhombic.

Holotype: ♂, Kirishima-jingū, 22 IX '54 M (Okada).

Distribution: Kyushu.

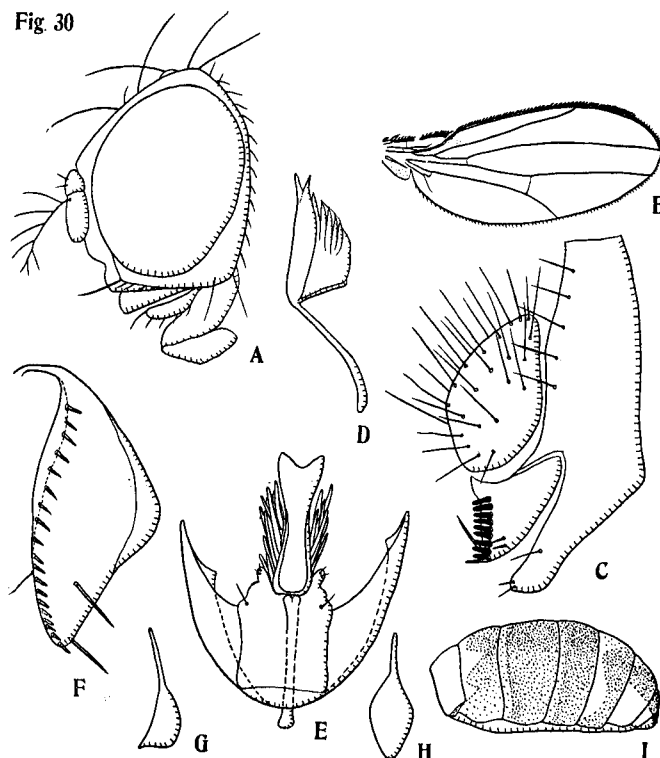
Feeding habits: M.

Relationships: Thoracic and abdominal colorations as in *M. nigrobrunnea* (Lamb, 1914), from Seychelles, but the coloration of halteres entirely different.

***Mycodrosophila palmata* sp. nov. Fig. 30.**

Japanese name: Tegata-kinoko-shōjōbae.

Fig 30



**Fig. 30.** *Mycodrosophila palmata* sp. nov.

A. Head; B. Wing; C. Peripheral phallic organs (lateral aspect); D. Aedeagus (lateral aspect); E. Phallic organs (ventral aspect); F. Egg-guide; G. Ejaculatory apodeme (lateral aspect); H. do. (ventrocaudal aspect); I. Male abdomen.

♂: Body about 2.1 mm. Eye dark red, bare. Head (Fig. 30 A): Antenna yellowish brown, 3rd joint grey. Arista with about 7 branches, one below small fork. Ocellar triangle and peri-orbits black. Front about half as broad as head-width, dark orange brown, and posteriorly black. Clypeus black. Carina orange brown, high, and narrow. Occiput black. Cheek yellowish orange, about 2/9 as broad as the greatest diameter of eye. *orb*<sub>2</sub> minute. Only one prominent *or*.

Mesonotum and scutellum black. Thoracic pleura yellow, with long black longitudinal band. Humerus blackish brown. *hu* 2. *ac* in about 10 irregular rows. Anterior *scut* slightly convergent. Sterno-index about 0.4.

Legs entirely yellow. Preapicals on middle and hind tibiae; apicals on middle. Wings (Fig. 30 B) hyaline, crossveins clear; a faintly fuscous patch below *r*<sub>1</sub>. C-index about 1.3; 4V-index about 2.1; 4C-index about 1.7; 5X-index about 1.9. C1-bristle one; C3-bristles on basal half. Halteres yellow, blackish at the base of knobs.

Abdominal tergites (Fig. 30 I): 1T yellow, slightly blackish at lateral corners; 2T black, and with yellowish patch on anterior margin; 3-5T black, 5T anteriorly pale; 6-7T and 9T yellow, medially black. Abdominal sternites yellow.

Peripheral phallic organs (Fig. 30 C): Genital arch narrow, tapering below, pale yellowish white,

darker above, and with about 5 upper marginal and 3 lower marginal hairs. Clasper pale yellowish white, narrowing proximally, and distally with about 9 black primary teeth as well as 2 small secondary teeth. Anal plate pale yellowish white, oval, and with about 25 long hairs.

Phallic organs (Fig. 30 D, E): Aedeagus yellow, bilobed at tip, and laterally with about 10 finger-like yellowish orange processes. Anterior parameres minute, each with about 2 apical sensilla. Posterior parameres seem to be absent. Ventral fragma hemispherical, with median notch shallow. p. f. = abCdEFg<sub>0</sub>HIkl'MN. PI=1.0.

Egg-gnides (Fig. 30 F): Lobe broad, yellow, with about 20 rather long yellowish marginal teeth, ultimate tooth being very long, and with a very long discal teeth. There is a subterminal hair on each lobe, distinctly different from the other neighbouring bristles.

Internal structures (Fig. 30 G,H): Ejaculatory apodeme with short, narrow stem, and fusiform plate.

Holotype: ♂, Kirishimayama, 22 IX '54 M (Okada).

Allotopotype: ♀, collected together with holotype.

Paratopotypes: 5 ♂♂ and 1 ♀, collected together with holotype.

Distribution: Kyushu.

Feeding habits: M.

Relationships: Allied to the fore-going species, *M. setipalpis* sp. nov., especially in abdominal patterns, but differs from it in having long black longitudinal stripe on thoracic pleura.

Remarks: Eminent subterminal hair of egg-guide, as well as well developed egg-guide teeth, possessed by the present species, are the features occur in ordinary *Drosophila* species, and quite diverse from the minor terminal hair and hair-like egg-guide bristles, which are found in number of *Mycodrosophila* species, e.g. *M. japonica* sp. nov., *M. shikohuana* sp. nov., and *M. sp.* from Kirishimayama. The remaining species of *Mycodrosophila*, reported in the present article, i.e. *M. takachihonis* sp. nov., *M. splendida* sp. nov., *M. basalis* sp. nov., and *M. poecilogastra* (Loew), are intermediate between above two groups, showing transient features of partially teeth-like marginal bristles, and more or less distinct subterminal hairs.

#### Genus *Dettopsomyia* Lamb

Japanese name: Yaribane-shōjōbae-zoku.

*Dettopsomyia* Lamb, 1914. Trans. Linn. Soc. London, 2 ser., 16:349; Sturtevant, 1921. Carn. Inst. Publ., 301:56; Duda, 1924. Arch. Naturg., 90 A (3):191; Wheeler, 1951. Pan Pacif. Ent.; Wheeler, 1952. Univ. Texas Publ., 5204:182.

Orthotype: *Dettopsomyia formosa* Lamb, 1914.

#### *Dettopsomyia argentifrons* sp. nov. Fig. 31.

Japanese name: Yaribane-shōjōbae.

*Styloptera* sp., Okada, 1953. Zool. Mag., 62:280; Okada, 1955. *ibid.*, 64:107.

♂ and ♀: Body about 1.3 mm, greyish brown to black, and somewhat shining. Head (Fig. 31 A) dark brown to black. Antenna with 3rd joint dark brown to black, 2nd greyish yellow, and basally black. Arista with about 10 long branches including fork, 2 or 3 below it. Eyes dark reddish, with minute black piles. Ocellar triangle black and large. Periorbits broad and silvery grey. Front black, about 3/5 as broad as the head-width, silvery grey at the margins of ocellar triangles, and orange brown above antenna. Front yellow. black at ocellar triangle, orange brown above antenna. Face yellow, black at middle and lateral sides. Carina very high and broad, but short, greyish, and apically black. Cheek dark brown, with whitish grey spot below eye, and about 3/8 as broad as the greatest diameter of eye. *orb*<sub>2</sub> minute, situated slightly before *orb*<sub>3</sub>. *or*<sub>2</sub> minute. Palpus yellowish grey to black, apically black, and with a few prominent bristles.

Mesonotum dark greyish brown to shining black, with 2 pairs of broad whitish grey longitudinal bands, in-and outside the *dc*-lines. Scutellum brown, medially paler. Thoracic pleura black. *hu* 2. *ac* in 4 rows, outer rows very close to *dc*-lines. Cross distance of *dc* about equal to the length distance. The 3rd *dc* often appear before suture, and slightly outside *dc*-lines. Anterior *scut* divergent; posterior *scut* crossed. Sterno-index about 0.3.

Legs grey, femora black except at apices; tibia with 2 black rings, subbasally and subapically. Preapicals on fore and hind tibiae; apicals on middle. wings (Fig. 31 B) with 1st costal section apically black and much swollen. C1-bristle one, long. C3-bristles on basal 3/5. Small black clouds on and below *r*<sub>1</sub>. C-index about 0.7; 4V-index about 2.3; 4C-index about 2.3; 5X-index about 2.2. Halteres yellowish grey.

Abdomen greyish yellow to glossy black, with caudal dark band on each T. Sternites black, each S broader than long.

Periphallic organs (Fig. 31 C): Genital arch slender, somewhat truncate below, and pale greyish yellow. Primary clasper pale yellowish orange, somewhat triangular, and with about 25 black stout bristles arranged in 3 rows on the upper half of clasper, except 2 strong and large bristles which are inserted on the lower tip. Secondary clasper, which is located just above and inside primary clasper, is dark grey, oblong, truncate at outer margin, and with 4 long marginal and one short subbasal bristles. Anal plate pale grey, contiguous to genital arch, slender, broaden below, and with numerous hairs. Decasterium with median piece black, rod-like; lateral piece pale brown, quadrate, and attached to the median piece at its lateral side.

Phallic organs (Fig. 31 D,E): Aedeagus yellowish grey, rod-like, slightly sinuate in lateral aspect, and dorsoapically pointed. Anterior parameres fused to novasternum, with numerous hairy sensilla. Posterior parameres absent. Ventral fragma pale yellow and oval. p.f.=aBCdEf<sub>0</sub>g<sub>0</sub>HIklmn. PI=3.0.

Egg-guides (Fig. 31 G): Lobe dark brownish black, slender, apically pointed, and with about 11 marginal and 2 discal brownish black short teeth. Basal isthmus short.

Internal structures (Fig. 31 F,H-L): Proximal intestine: C=2.0-2.5. Rectal papillae large, elliptical; R=2.0. Posterior Malpighian tubes closely apposed to each other apically; common stalks comparatively long. Testis white, with about 7 inner and 8 outer coils. Paragonia with about 2 folds. Ejaculatory bulb quite small, with plate of apodeme oval, stem longer than plate. Spermatheca elongate oval, basally narrowing, and pale brown. Parovaria hyaline, shorter than

Fig. 31

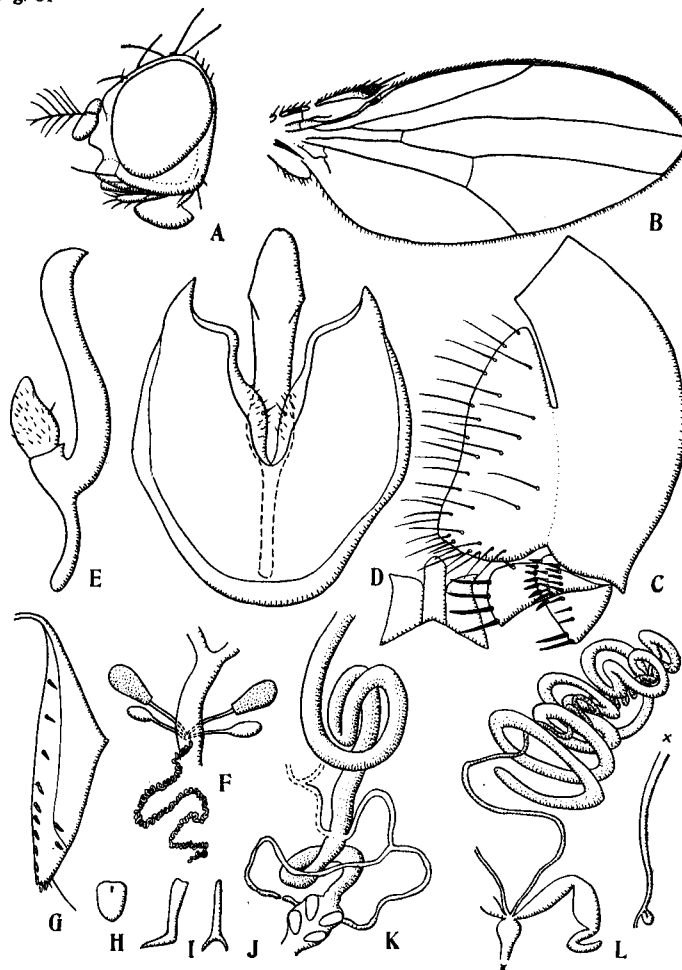


Fig. 31. *Dettopsomyia argentifrons* sp. nov.

A. Head; B. Wing; C. Periphallic organs (lateral aspect); D. Phallic organs (ventral aspect); E. do. part (lateral aspect); F. Ejaculatory apodeme (ventral aspect); G. Egg-guide; H. Ejaculatory apodeme (ventral aspect); I. do. (lateral aspect); J. do. (cephalic aspect); K. Digestive system, with anterior Malpighian tubes missing (ventral aspect); L. Male reproductive organs, part.

spermatheca, and with knobs globular. Ventral receptacle very long, with about 90 minute kinky coils.

Holotype: ♂, Setagaya, Tokyo, 4 XI '51 L (Okada).

Allotopotype: ♀, collected together with holotype.

Paratypes: Meguro, Tokyo, 1 ♂ and 4 ♀♀, 14 XI '51 S; ♀, 12 II '53 S; Setagaya, Tokyo. 2 ♀♀, 4 I '53.

Distribution: Honshu (Kanto).

Feeding habits: SL.

Relationships: Closely resembles *D. pictipes* (Duda) (= *Styloptera pictipes* Duda) from South Asia, especially in having white stripes on front, a pair of brownish spots just above antenna, and black rings on legs, but differs in having no brown spots on vertex.

Remarks: Dr. M.R. Wheeler, of Texas University, kindly gave the present author a private suggestion (5 May '55), that "I claim that Duda seriously over-split the genera in this part of the family, and that there may really be only two; *Dettopsomyia* (in which I would place your species) and *Spuriostyloptera*....." If Duda's splitting of genera be admitted, the present species might be referred to *Styloptera*, but the author prefer to obey Wheeler's opinion of putting it in *Dettopsomyia*. Egg elliptical, apically bifid, and with 3 pairs of very short filaments.

#### Genus *Liodrosophila* Duda, 1922

Japanese name: Sedaka-shōjōbae.

*Liodrosophila* Duda, 1922. Arch. Naturg., 88A (4):153.

Logotype: *Camilla coeruleifrons* de Meijère, 1911.

#### *Liodrosophila aerea* sp. nov. Fig. 32.

Japanese name: Ruri-sedaka-shōjōbae.

*Paramycodrosophila* sp., Okada, 1953. Zool. Mag., 62:380; 64:107.

♂ and ♀: Body about 2 mm, glossy bluish black, with mesonotum highly convex. Head (Fig. 32 A): Eyes dark red, bare. Antenna with 3rd joint orange brown, 2nd darker. Arista with about 9-10 branches including large fork, 2 below it. Palpus brownish black, with a long apical and a few shorter marginal setae. Ocellar triangle bluish black, metallically shining, and very small. Periorbits slightly paler than front and strongly narrowing anteriorly. Front shining bluish black, about half as broad as the head-width. Face glossy brown. Carina small, high, and short, fuscous below. Cheek brownish black, about 1/6 as broad as the greatest diameter of eye. Occiput black. *orb*<sub>2</sub> quite minute, like a microtrichia, slightly behind and outside *orb*<sub>3</sub>, *orb*<sub>3</sub> is much shorter than *orb*<sub>1</sub>, *pvt* minute.

Mesonotum and scutellum metallic black; pleura black, paler around anterior stigma, *hu* 2 or 3; *ac* in 6 rows. Anterior *dc* about half as long as posterior *dc*; Cross distance of *dc* about twice the length distance. Anterior *scut* convergent. Sterno-index about 0.6.

Legs yellow, except fore femur, which is black at basal 2/3. Fore femur also with a row of about 15-20 thick and short bristles on the inner surface. Preapicals on all three tibiae; apicals on middle. Wings (Fig. 32 B) hyaline, veins yellow. *r*<sub>1</sub> apically curved strongly to reach costa. Crossveins clear. C-index about 2.0; 4 V-index about 2.1; 4 C-index about 1.3; 5 X-index about 1.7. C1-bristle only one; C3-bristles on basal half. Halteres yellow.

Abdominal tergites glossy black, slightly bluish; 1 T less glossy than the others. Sternitis brown and quadrate.

Periphallic organs (Fig. 32 C): Genital arch brownish black, convex below; heel low; toe triangular; upper margin with about 4 hairs; lower portion with about 8 hairs; lower margin, however, bare. Clasper broader than long, protruded beyond genital arch, with about 10 brownish black teeth on entire outer margin, arranged in a concave row. No Secondary teeth. Upper margin of clasper dark brown and narrowly prolonged inward, Anal plate separated from genital arch, pale brownish black, narrowing below, and with about 35 hairs. Decasternum with lateral piece dark brown, and narrowing inward; median piece rhombic, orange brown.

phallic organs (Fig. 32 D,E): Aedeagus pale brown, straight; basal half bifid and elliptically swollen in dorsal aspect; apical half hyaline. Anterior paramere minute, fused to novasternum, and with a prominent sensillum. Posterior parameres seemingly absent. Ventral fragma hemispherical, pale brown, and discriminated from novasternum by a distinct cross furrow. p.f. = a'BCdEFg<sub>0</sub>HIkLMN. PI=1.2.

Fig. 32

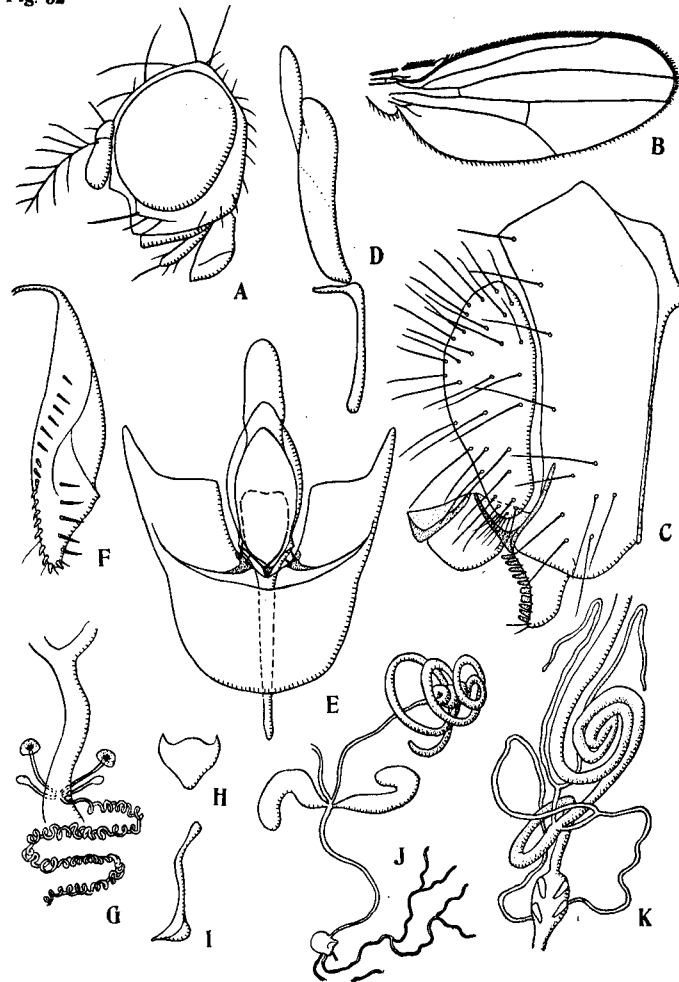


Fig. 32. *Liodrosophila aerea* sp. nov.

A. Head; B. Wing; C. Periphallalic organs (lateral aspect); D. Aedeagus (lateral aspect); E. Phallic organs (ventral aspect); F. Egg-guide; G. Female reproductive organs (ventral aspect); H. Ejaculatory apodeme (ventral aspect); I. do. (lateral aspect); J. Male reproductive organs; K. Digestive system (ventral aspect).

Egg-guides (Fig. 32 F): Lobe elongate, orange brown, with about 23 teeth, 4 discal and ultimate marginal bristles being very long but not tooth-like.

Internal structures (Fig. 32 G-K): Proximal intestine:  $C=3.0$ . Rectal papillae elongate:  $R=3.3$ . Posterior branches of Malpighian tubes fused to each other at tips; common stalks of Malpighian tubes moderate in length. Testis white and with about 4 inner and 4 outer coils. Paragonia thick and folded once. Ejaculatory bulb oval, probably with fine filiform dichotomous paired caeca. Ejaculatory apodeme with plate triangular, stem much longer than plate. Spermatheca hemispherical, transparent, and slightly brownish at middle. Parovaria much shorter than spermatheca and with knobs rounded. Ventral receptacle with about 45 kinky coils.

Holotype: ♂, Asakawa, Tokyo, 1 V '52 S (Okada).

Allotype: ♀, Meguro, Tokyo, 16 XI '51 S (Okada).

Paratypes: 3 ♀♀, collected together with allotype; 1 ♂, collected together with holotype; 16 ♂♂ and 27 ♀♀, Meguro (Educational Natural Garden), Tokyo, 11 X '53 S (all by Okada).

Other specimens examined: Meguro, Tokyo, 1 female, 20 XII '51 S; 1 ♂, 6 XI '53 S; Minamitama, Tokyo, 1 ♀, 18 XI '52 S; Hakone, Kanagawa Pref., 1 ♀, IX '54 F (Toda); Kyoto, 1 ♀, 12-22 XI '54 L (Arnaud); Ōtsu, Shiga Pref., 1 female, 1-12 XI '54 L (Arnaud); Miyoshi, 1 ♂ F, 1 ♂ and 1 ♀ S, 26 X '55, and Taishakukyo, Hiroshima Pref., 1 ♂, 26 X '55 F; Yubara, Okayama Pref., 2 ♂♂, 27 X '55 F; Matsuyama, Ehime Pref., 1 ♂ and 2 ♀♀, 8 XI '53 S; Susaki, Kōchi Pref., 17 ♂♂ and 13 ♀♀, 5 XI '53 S; Dazaifu, Fukuoka Pref., 1 ♂ and 1 ♀, 24 X '55 F; Kirishimajingū, 3 ♂♂ M, and 2 ♀♀ S, 22 IX '54.

Distribution ; Honshu (Kanto, Kinki, Chugoku), Shikoku, Kyushu.

Feeding habits : SLFM.

Relationships : Allied to *L. metallescens* (de Meijère), from New Guinea, but distinguishable from it in having C-index much larger.

Remarks : Egg with 4 filaments.

*Liodrosophila bicolor* sp. nov. Fig. 33.

Japanese name : Kurosedaka-shōjōbae.

Fig. 33

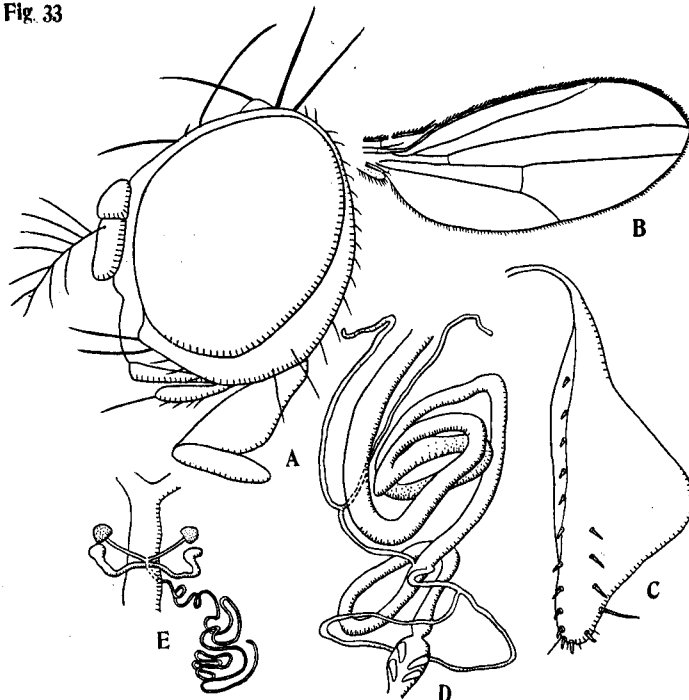


Fig. 33. *Liodrosophila bicolor* sp. nov.

A. Head; B. Wing; C. Egg-guide; D. Digestive system (ventral aspect); E. Female reproductive organs (dorsal aspect).

♀ : Body about 1.8 mm, glossy dark brown, with black abdomen. Head (Fig. 33 A) somewhat broader than thorax. Eye dark red, finely pilose. Antenna reddish brown, 3rd joint black. Arista with about 10 long branches including a large fork, 2 below it. Palpus dark brown, with only one prominent seta. Ocellar triangle black, with long ocellars. Periorbits broad, broaden anteriorly, and somewhat shining purplish. Front broad, about  $\frac{2}{3}$  as broad as head-width, and glossy reddish brown. *fr* absent. Clypeus brownish black. Face glossy reddish brown. Carina brown, high, and narrow but short. Cheek yellowish brown, about  $\frac{1}{7}$  as broad as the greatest diameter of eye. Occiput dark brown. *orb*<sub>2</sub> minute, *orb*<sub>1</sub> much nearer *orb*<sub>3</sub> than to *vti*. *or*<sub>2</sub> as long as *or*<sub>1</sub>.

Mesonotum yellowish brown, highly convex, Scutellum yellowish brown. Thoracic pleura dark brown, with sternepisternum black. *hu* 2. *ac* in 6 rows. Cross distance of *dc* over twice the length distance. Anterior scut slightly convergent, and much shorter than posterior ones. Sterno-index about 0.4.

Legs dark yellow; fore femur basally black, and with a row of black short teeth of generic character on middle. Wings (Fig. 33 B) hyaline, with anal vein vestigial. C-index about 1.5; 4 V-index about 2.2; 4 C-index about 1.5; 5 X-index about 2.1. C1-bristles 2; C3-bristles on basal  $\frac{1}{2}$ . Halteres yellowish white.

Abdomen with tergites glossy black, somewhat purplish. Sternites grey.

Egg-guides (Fig. 33 C): Lobe yellowish brown, medially swollen, apically narrowing, with upper margin slightly concaved subapically, and with about 13 marginal and 3 discal yellowish brown teeth, 3 discal and ultimate marginal ones being longest.

Internal structures (Fig. 33 D,E): Proximal intestine: C=3.0. Rectal papillae: R=2.4. Malpighian tubes with common stalks rather long, branches comparatively short, and posterior branches looped, Spermatheca brown, hemispherical. Parovaria with stems apically swollen and sinuated, and gradually shifting to knobs. Ventral receptacle with about 8 transverse folds.

Holotype: ♀, Aoshima, Miyazaki Pref., 23 IX '54 S.

Distribution : Kyushu.

Feeding habits : S.

Relationships : Allied to the fore-going species, but distinguished in having pilose eyes and black body which is not shining bluish.

Remarks : Egg with 4 long filaments.

Genus *Chymomyza* Czerny, 1903.

Japanese name : Hashiri-shōjōbae-zoku.

*Chymomyza* Czerny, 1903. Zeitschr. Hym. Dipt., 3:199; Strobl, 1910. Dipter. Steierm., 2:211; Oldenberg, 1914. Arch. Naturg., 80 A (2):18; Sturtevant, 1921. Carn. Inst. Publ., 301:61; Duda, 1924. Arch. Naturg., 90 A (3):179, 226; Duda, 1935. Die Fliegen, 58:41; Patterson, 1943. Univ. Texas Publ., 4313:37; Wheeler, 1952. Univ. Texas Publ., 5204:173.

*Amphoroneura* de Meijere, 1911. Tijd. Ent., 54:433.

Logotype : *Drosophila costata* Zetterstedt, 1838.

Key to Japanese species of the genus *Chymomyza*

1. Costal cell distinctly black..... *C. costata* (Zetterstedt).  
Costal cell not black. .... 2.
2. Body yellowish brown; fore tarsi not distinctly bicolorous. Wing milky apically.....  
..... *C. nigrimana* (Meigen).  
Body dark brown or brownish black; fore tarsi bicolorous, at least metatarsus being black.  
Wings not milky. apically. .... 3.
3. Distal 4 joints of fore tarsi entirely white..... *C. caudatula* Oldenberg.  
Distal 4 joints of fore tarsi not entirely white. .... 4.
4. 2nd joint of fore tarsi with proximal half black and distal half whitish. .... *C. japonica* sp. nov.  
2nd joint of fore tarsi entirely black..... 5.
5. Costal-index about 1.0. .... *C. obscura* (de Meijere).  
Costal-index about 2.0. .... *C. atrimana* sp. nov.

Key to Japanese species of the genus *Chymomyza*, with regard  
of the periphallie organs

1. Genital arch apically without thick short setae. Anal plate small. Clasper with about 10 teeth. ....  
..... *C. nigrimana* (Meigen).  
Genital arch apically with numerous thick short setae. Clasper teeth less than 10. .... 2.
2. Anal plate large and long..... *C. caudatula* Oldenberg.  
Anal plate small and oval..... *C. japonica* sp. nov.

Key to Japanese species of the genus *Chymomyza*, with regard  
of the phallic organs

1. Novasternum with a pair of extraordinarily enlarged prolongations..... *C. nigrimana* (Meigen).  
Novasternum without such prolongations. .... 2.
2. Aedeagus distally slender, neither twisted nor coiled, but somewhat asymmetrical. ....  
..... *C. caudatula* Oldenberg.  
Aedeagus distally very thick, asymmetrically twisted and coiled..... *C. obscura* (de Meijere).

Key to Japanese species of the genus *Chymomyza*, with regard  
of the egg-guides

1. Lobes apically pointed..... *C. caudatula* Oldenberg.  
Lobes apically truncate. .... 2.
2. Lobes narrow, distinctly tapering basally..... *C. nigrimana* (Meigen).  
Lobes broad, not distinctly tapering basally..... 3.
3. Upper margin of lobes subapically concaved..... *C. atrimana* sp. nov.  
Upper margin of lobes subapically not concaved..... *C. costata* (Zetterstedt).

*Chymomyza costata* (Zetterstedt, 1838)

Japanese name : Maeguro-hashiri-shōjōbae.

*Drosophila costata* Zetterstedt, 1838. Ins. Lapp. :776;5.

*Chymomyza costata* Czerny, 1903. Zeitschr. Hym. Dipt., 3:200; Sturtevant, 1921. Carn. Inst. Publ., 301:61; Duda, 1924. Arch. Naturg., 90 A (3):227; Duda, 1935. Die Fliegen, 58:42; Basden, 1952. Ent. Month. Mag., 88:201.

♀ : Body black, about 3.7 mm in length. Head black above, yellowish below, Eye red, bare. Antenna yellowish brown, 3rd joint darker. Arista with about 7 branches including a large fork, 2 below it. Palpus yellow, with a few short setae. Front black, anterior margin yellowish orange, about half as broad as head-width. *fr* present. Face yellow. Clypeus brown. Carina yellow, narrow and short. Cheek yellow, black above, and about 1/8 as broad as the greatest diameter of eye. An obscure orange spot on each side of ocellar triangle. *orb*<sub>2</sub> as long as *orb*<sub>3</sub>. *or*<sub>2</sub> 2/3 *or*<sub>1</sub>;



$or_3$  as long as  $or_2$ .

Mesonotum, scutellum, and thoracic pleura almost entirely black. Scutellum with yellow patches laterally.  $hu$  1.  $ac$  in 6 rows. Cross distance of  $dc$  about twice the length distance. Anterior  $scut$  about half the posterior. Sterno-index about 0.8.

Legs yellow; fore leg black except basal half of femur and distal 3 tarsal joints, which are yellowish white. Preapicals on hind tibia; apicals on middle. Wings hyaline; costa thick and black, and reaches tip of  $m$ .  $r_1$  straight, not curved at tip. C-index about 1.6; 4V-index about 2.4; 4C-index about 1.5; 5X-index about 3.0. C1-bristles 2, long; C3-bristles on basal 4/5. Halteres pale.

Abdomen entirely black; middle sternites longer than broad.

Egg-guides: Pale yellow, ventral half of lobe darker, with tip pointed, and with about 7 marginal and 2 discal black unequal-sized bristles, 2 subapical ones being longest.

Internal structures: Proximal intestine:  $C=1.0$ . Rectal papillae:  $R=1.3$ . Malpighian tubes with common stalks short, and posterior branches completely looped. Spermatheca small, black, oblong, and only slightly thicker than stem. Parovaria shorter than spermatheca, apically rounded. Ventral receptacle with about 6 small folds.

Specimen examined: Inokashira, Tokyo, 1 ♀, 3 XI '53 G (Ikuma).

Distribution: Honshu (Kanto), Europe.

Feeding habits: G.

Remarks: Ovarian eggs with about 12 very short filaments. Present specimen slightly differs from original European form, in having 3 distal tarsal joints of fore leg yellowish (4 distal ones yellow in original form), eyes bare (sparsely pubescent), and body larger.

### *Chymomyza nigrimana* (Meigen, 1830) Fig. 34.

Japanese name: Kiiri-hashiri-shōjōbae.

*Drosophila nigrimana* Meigen, 1830. Syst. Besch., 6:87.

*Chymomyza nigrimana* Duda, 1935. Die Fliegen, 58g:44.

*Chymomyza distincta* Egger, 1862. Verh. d. Kais. K. zool. bot. Ges., 12 (teste Duda, 1935); Oldenberg, 1914. Arch. Naturg., 80 A (2):16; Duda, 1924. Arch. Naturg., 90 A (3):227; Collin, 1952. Entom. Month. Mag., 88:197.

♂ and ♀: Body orange grey, about 2.5 mm in length. Eyes red, bare. Antenna orange; arista with 7 branches including a small fork, 2 below it. Palpus orange, with one prominent rather short bristle. Periorbits black, anteriorly narrowing. Front orange yellow, about half as broad as the head-width.  $fr$  numerous. Ocellar triangle black. Clypeus reddish brown. Cheek orange, black above, about 1/6 as broad as the greatest diameter of eye.  $orb_2$  as long as  $orb_3$ .  $or_2$  as long as vibrissa.

Mesonotum orange, slightly dark at notopleural region, and with, in female, a median longitudinal black stripe. Scutellum yellowish grey. Postscutellum and postnotum brownish black. Thoracic pleura pale.  $hu$  1.  $ac$  in 8 rows. Anterior  $scut$  slightly divergent. Cross distance of  $dc$  about 1.8 times the length distance. Sterno-index about 0.8.

Legs yellow; fore legs with tibiae and tips of femora slightly blackish. Preapicals on hind tibia, very weak, apicals on middle. Wings (Fig. 34 B) hyaline, dark along costa, and with dark oblong spot at the end of  $r_{2+3}$ , slightly milky white in dried condition. C-index about 2.2; 4V-index about 3.0; 4C-index about 1.5; 5X-index about 3.0. C1-bristles 2; C3-bristles on basal half or less. Halteres white.

Abdomen with tergites black; 1 T yellowish grey.

Periphallalic organs (Fig. 34 C): Genital arch yellowish grey, broad above, suddenly narrowing at middle, and with posterior margin deeply concaved, and ventral half tapering; the median concaved posterior margin deeply incised twice and provided with about 12 short hairs; ventral half with about 20 long and 20 shorter hairs. Clasper inserted on the median concaved and incised groove, and nearly quadrate, yellowish, and with about 10 long black somewhat curved teeth arranged in a row on the distal margin. Anal plate small, elongate oboval, yellowish brown, contiguous to genital arch by means of a narrow hairy bar, and covered with about 50 hairs. Decasternum minute, nearly X-shaped.

Phallic organs (Fig. 34 D, E): Aedeagus yellowish orange, distally broaden and bilobed; right lobe broad and straight, left lobe narrow and twisted. Anterior paramere club-shaped, yellowish grey, and apically with about 4 long hairs. Novasternum with large and long lateral processes, which are apically swollen and with about 15 long hairs. Ventral fragma yellowish grey, quadrate, and apically concaved. Posterior parameres conform a narrow bar connecting novasternal

corners. p. f. = ABCdEfgHIkLmn. PI=1.3.

Egg-guides (Fig. 34 G): Lobe narrow, pale yellow, distally broaden and truncate at tip, with about 10 marginal and 4 discal long black setae, which are not teeth-like.

Fig 34

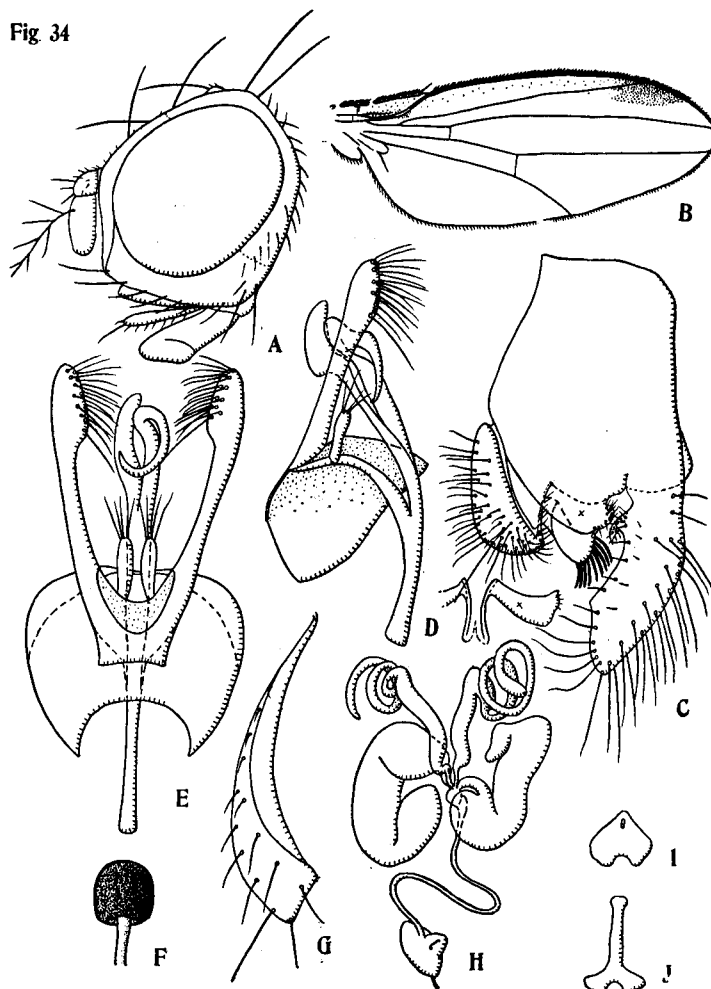


Fig. 34. *Chymomyza nigrimana* (Meigen).

A. Head; B. Wing; C. Peripheral phallic organs (lateral aspect); D. Phallic organs (lateral aspect); E. do. (ventral aspect); F. Spermatheca; G. Egg-guide; H. Male reproductive organs; I. Ejaculatory apodeme (ventral aspect); J. do. (cephalic aspect).

Internal structures (Fig. 34 F, H-J): Testis yellow, basally brownish black, and with about one inner and 2 outer coils. Paragonia white, very thick, and folded about twice. Ejaculatory bulb oval, without caeca; apodeme with plate triangular and distal margin concaved. Spermatheca black, short elliptical.

Specimens examined: Sôunkyo, Hokkaido, 20 ♂♂ and 1 ♀, 10-14 VIII '53 T; Wakkanai, Hokkaido, 1 ♂, 16 VIII '53 F; Tadeshina, Nagano Pref., 1 ♂ T, 1 ♀ S, 18 VII '54.

Distribution: Hokkaido, Honshu (Chubu), Europe.

Feeding habits: TSF.

Remarks: Strictly coincident with the European form, especially in the details of male genitalia. That organs of European form are illustrated by Oldenberg (1914) and Duda (1935). According to Collin (1952), evidence in support of claiming validity of Meigen's name, *nigrimana*, appears very weak, and Egger's name, *distincta*, should be fair.

Often found hovering on timber piles, gently vibrating left and right wings simultaneously.

***Chymomyza caudatula* Oldenberg, 1914. Fig. 35.**

Japanese name: Kuro-hashiri-shôjôbae.

*Chymomyza caudatula* Oldenberg, 1914. Arch. Naturg., 80 A (2):14; Sturtevant, 1921. Carn. Inst. Publ., 301:62; Duda, 1924. Arch. Naturg., 80 A (3):227; Duda, 1925. Arch. Naturg., 91 A (3):68; Duda, 1935. Die Fliegen, 58g:41; Wheeler, 1949. Univ. Texas Publ., 4920:164.

*Neotanygastrella* sp., Okada, 1954. Zool. Mag., 63:263.

Fig 35

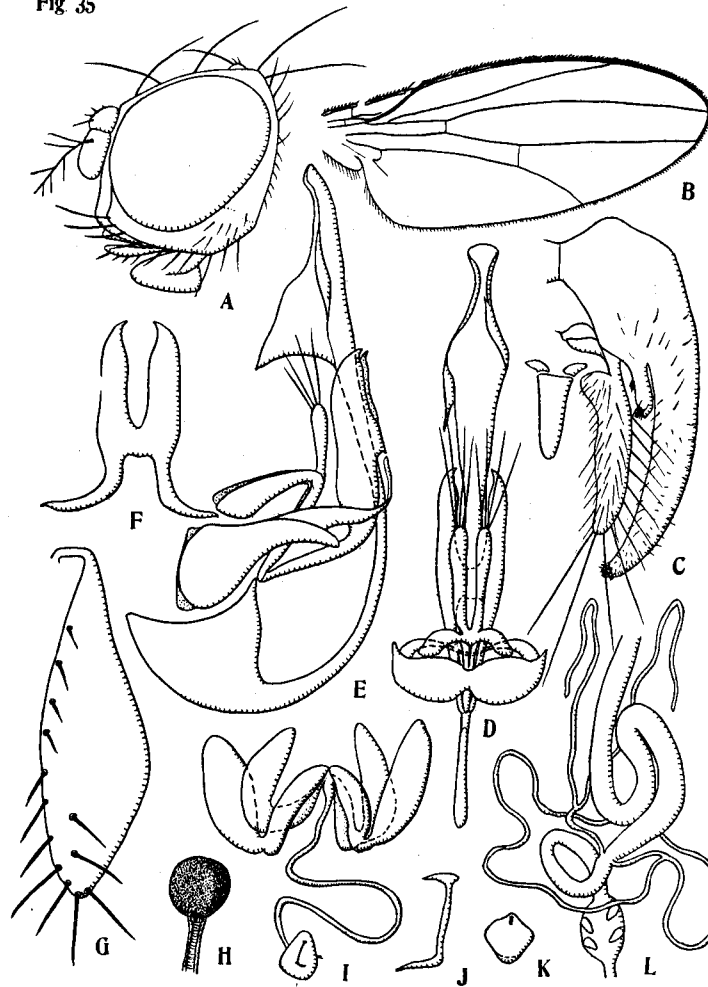


Fig. 35. *Chymomyza caudatula* (Zetterstedt).

A. Head; B. Wing; C. Periphallic organs (caudal aspect); D. Phallic organs (ventral aspect); E. do. (lateral aspect); F. Posterior paramere (dorsal aspect); G. Egg-guide; H. Spermatheca; I. Male reproductive organs; J. Ejaculatory apodeme (lateral aspect); K. do. (ventral aspect); L. Digestive system (ventral aspect).

♂ and ♀: Body about 2.5–3 mm, brownish with abdominal tergites black. Head (Fig. 35 A) dark yellowish brown. Occiput black. Postverticals short. Ocellars long. Antenna yellowish brown. Arista with about 7 branches including a small fork, 2 below it. Palpus yellow, narrow, with a subapical short seta and shorter proximal setae. Ocellar triangle black. Periorbits black, except at the insertion of bristles. Carina obscure, flat, yellow. Front dark yellowish brown, about half as broad as head width. *fr* present. Cheek yellow, about 1/4 as broad as the greatest diameter of eye. Clypeus brownish black, occiput black. *orb*<sub>2</sub> long, as long as other orbitals, situated far before and slightly outside *orb*<sub>3</sub>. *or*<sub>2</sub> as long as vibrissa, succeeding orals being nearly as long as *or*<sub>2</sub>.

Mesonotum and scutellum dark yellowish brown. Thoracic pleura somewhat darker. 2 *hu*, upper longer and thicker. *ac* in about 8 somewhat irregular rows. *dc* with cross distance slightly over half the length distance. Anterior *scut* parallel. Sterno-index about 0.4.

Legs yellow, fore legs with femora except both ends, tibia except proximal end, and metatarsus black. Preapicals on 3rd tibia; apicals on 2nd. Wings (Fig. 35 B) hyaline, veins yellowish brown. Crossveins clear. C-index about 1.9; 4V-index about 2.4; 4C-index about 1.0–1.5; 5X-index about 2.1–3.1. C1-bristles 2, subequal; C3-bristles on basal 5/6. Halteres yellowish grey, basally black.

Abdomen with tergites dark brown, darker on posterior margins. Caudal tergites also darker. Caudal margin of 6T concaved at middle. Sternites pale brown, median sternites longer than broad.

Periphallic organs (Fig. 35 C): Genital arch black, lower half narrow and gently curved cau-

dad, covered with short hairs, and apically with a mass of short stout setae. Clasper small, inserted at middle of genital arch, finger-like, hairy, and with 2 sets of black teeth, basal set with 4 and apical set with about 6 teeth. Anal plate brownish black, elongate ventrad, fused to genital arch above, and with about 4 very long apical hairs as well as numerous shorter hairs. Decasternum greyish brown, elongate and narrowing distally.

Phallic organs (Fig. 35 D-F): Aedeagus yellowish brown, medially curved ventrad, subapically with a pair of asymmetrical flaps, left flap large triangular, right flap small and flat. Anterior paramere rod-like, apically with about 4 long black hairs. Posterior parameres black, contiguous to each other in H-shape. Ventral fragma short, about 1/4 as long as broad, and black. Novasternum also small, and brown. p. f.=aBCDEfgHikLmn. PI=about 4.0. Apodeme of aedeagus triangular at lateral view.

Egg-guides (Fig. 35 G): Lobe pale yellow, fusiform, with about 12 marginal and 2 discal long black bristles. Basal isthmus very short.

Internal structures (Fig. 35 H-L): Proximal intestine: C=1.5. Rectal papillae: R=2.0-2.5. Malpighian tubes with posterior branches looped completely, and common stalks moderate in length. Testis yellow, elongate oval, proximally narrowing, and continues to banana-shaped seminal vesicle. Paragonia white, once folded. Ejaculatory bulb oval, apodeme with stem T-shaped, and plate rhombic. Spermatheca with knob small, rounded, and brownish black; neck region shortly black.

Specimens examined: Nakashibetsu, Hokkaido, 1 ♂, 16 VIII '51 S; Sōunkyō, Hokkaido, 46 ♂ ♂ and 8 ♀ ♀, 10-14 VIII '54 TF.

Distribution: Hokkaido, Europe, N. America.

Feeding habits: TFS.

Remarks: Slightly differs from European form, in having larger  $or_2$ , darker thoracic pleura,

Fig 36

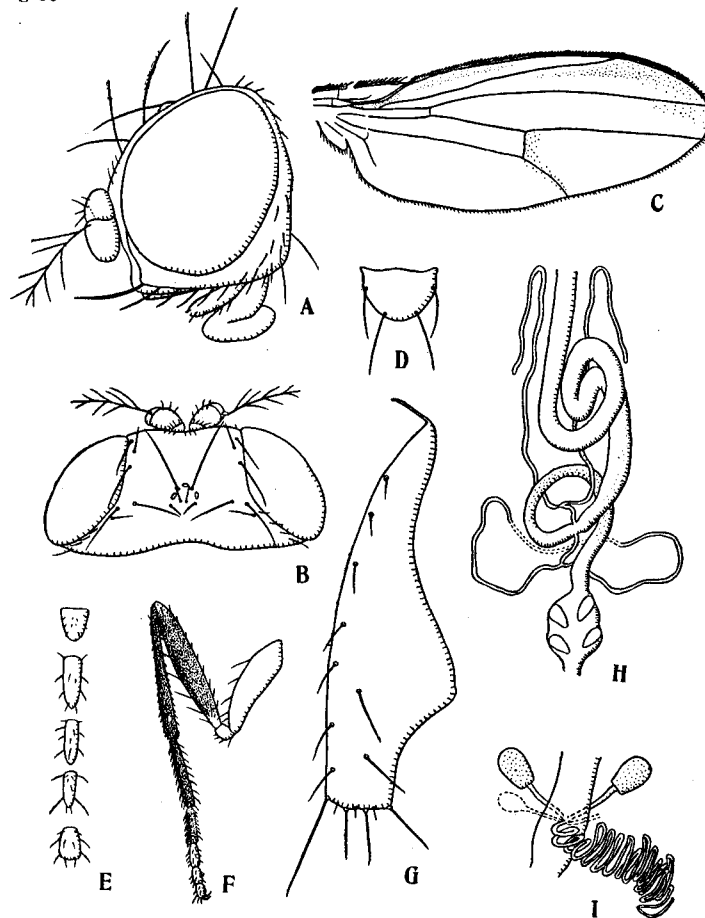


Fig. 36. *Chymomyza atrimana* sp. nov.

A. Head; B. do. (dorsal aspect); C. Wing; D. Scutellum; E. Abdominal sternites of female; F. Female fore leg; G. Egg-guide; H. Digestive system (ventral aspect); I. Female reproductive organs (ventral aspect).

$orb_3$  nearer to  $orb_2$  than to  $orb_1$ , and seminal vesicle without basal remarkable enlargement. Found hovering upon timber-piles, with their wings elected and vibrated like a *Sepsis* fly. In laboratory one generation takes about 20 days at room temperature, but breeding by usual corn-meals is rather difficult.

***Chymomyza atrimana* sp. nov. Fig. 36.**

Japanese name: Ashiguro-hashiri-shōjōbae.

♀: Body dark brown, about 4 mm in length. Eye red, bare, and large. Antenna with 2nd joint brownish black, 3rd paler. Arista with about 8 branches including a small or large fork, 2 below it. Palpus yellow, without prominent setae. Periorbits narrow, reddish brown. Front brownish black, slightly wider above, anteriorly reddish brown, and with a few *fr*, and about half as broad as head width. Carina yellow and obscure. Cheek yellow, about  $1/5$  as broad as the greatest diameter of eye. Occiput black.  $orb_2$  as long as  $orb_3$ .  $or_2$   $3/4$  vibrissa.

Mesonotum and scutellum black or dark brownish black, somewhat shining. Thoracic pleura paler. *hu* 2, lower smaller. *ac* in about 8 rows. Cross distance of *dc* nearly half the length distance. Sterno-index about 0.3.

Legs yellow, fore legs with femora except both ends, tibiae, and first 2 tarsal joints black. Wings (Fig. 36 C) hyaline, slightly fuscous at the anterior and outer margins and outside posterior crossveins. C-index about 2.0; 4V-index about 1.9; 4C-index about 1.1; 5X-index about 2.2. C1-bristles 2; C3-bristles on basal  $3/4$ . Halteres yellow.

Abdomen with tergites dark brown, slightly paler than mesonotum. Sternites yellow.

Egg-guides (Fig. 36 G): Lobe pale yellowish orange, proximally paler, broadly truncate at tip, and with about 11 marginal and 2 discal black setae, apicocaudal one being longest. Basal isthmus short, very weakly sclerotized.

Internal structures (Fig. 36 H, I): Proximal intestine: C=2.0; rectal papillae: R=about 2.0. Malpighian tubes with common stalks short; posterior branches apparently looped. Spermatheca globular, and black. Parovaria seem to be absent. Ventral receptacles folded about 16 times, apically tapering.

Holotype: ♀, Kamakura, Kanagawa Pref., 18 I '52 S (Okada).

Distribution: Honshu (Kanto).

Feeding habits: S.

Relationships: Somewhat resembles *C. nigrimana* (Meigen), but differs from which in having 2nd tarsus of fore legs black.

***Chymomyza obscura* (de Meijère, 1911)**

Japanese name: Susuiro-hashiri-shōjōbae.

*Amphoroneura obscura* de Meijère, 1911. Tijds. Ent., 54:424.

*Chymomyza obscura* Duda, 1924. Arch. Naturg., 90 A (3):226; Kikkawa & Peng, 1938. Japan. Journ. Zool., 7:547.

Kikkawa & Peng (1938) reported it from Hondo, but the present author have not seen any specimens from Japan.

Distribution: Hondo, Java.

***Chymomyza japonica* sp. nov. Fig. 37.**

Japanese name: Yamato-hashiri-shōjōbae.

♂ and ♀: Body about 2.7-3.8 mm, brownish black. Head (Fig. 37 A): eye bright red, with very few piles. Antenna yellowish grey; arista with about 7 branches including a large fork, 2 below it. Palpus white, with a few short setae. Ocellar triangle and periorbits yellowish grey. Front about  $3/7$  as broad as head width, black with anterior margin and posterior corners yellowish orange. Carina yellowish orange and obscure. Cheek whitish yellow, black above, about  $1/5$  as broad as the greatest diameter of eye.  $orb_2$  as long as  $orb_3$ .

Mesonotum brownish black, especially dark along middle line. Scutellum dark brownish black, with tip yellowish. Thoracic pleura dark brown. *hu* 1. *ac* in about 6 irregular rows. Anterior *scut* convergent. Cross distance of *dc* about 1.5 times the length distance. Sterno-index about 0.3.

Legs yellow; fore leg with femur except both ends, tibia, metatarsus, and proximal half of 2nd tarsal joint black. Preapicals on hind tibia; apicals on middle. C1-bristles 2, small; C3-bristles on basal  $5/6$ . Wings (Fig. 37 B) hyaline, crossveins clear. C-index about 1.6 (male)-2.0 (female); 4V-index about 1.9 (female)-2.3 (male); 4C-index about 1.4; 5X-index about 2.1. Hal-

teres yellowish brown.

Abdominal tergites black; 1-2 T medially white, 6-7 T with apical margins white. Sternites whitish grey.

Periphallic organs (Fig. 37 C): Genital arch dark brown, lower two thirds elongate and black, with about 60 long hairs and apically with numerous short black thick setae. Clasper small, whitish grey, apically with about 7 black teeth and 10 long marginal hairs. Anal plate small, grey, apparently fused to genital arch, and with about 25 outer and 25 inner discal hairs.

Fig 37

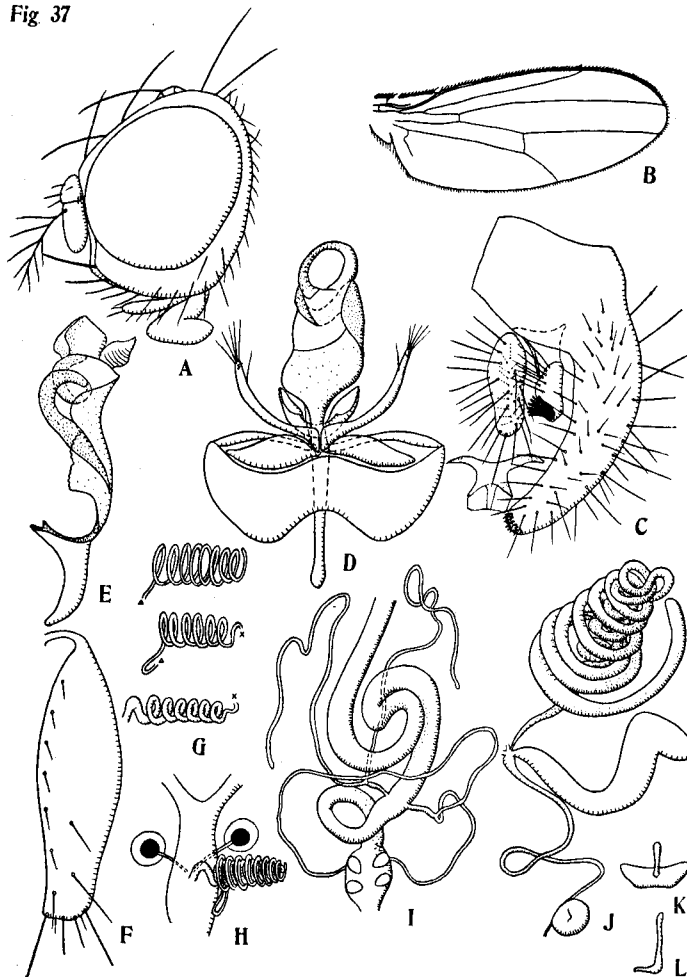


Fig. 37. *Chymomyza japonica* sp. nov.

A. Head; B. Wing; C. Periphallic organs (lateral aspect); D. Phallic organs (ventral aspect); E. Aedeagus (lateral aspect); F. Egg-guide; G. Ventral receptacle; H. Female reproductive organs (ventral aspect); I. Digestive system (ventral aspect); J. Male reproductive organ, part; K. Ejaculatory apodeme (ventral aspect); L. do. (lateral aspect).

Phallic organs (Fig. 37 D,E): Aedeagus large, oblong, basally tapering, brownish yellow, and apically bilobed and asymmetrically coiled or twisted. Anterior paramere elongate, yellowish orange, gently curved, and with about 5 apical long and 1 subapical long hairs, as well as a few minute subapical sensilla. Posterior paramere yellowish brown, small, medially narrowing, and basally contiguous to aedeagus. Ventral fragma yellowish brown, much broader than long, and apically concaved. Novasternum yellowish orange, bilobed into small fusiform lobes. p.f.=ABCdE-fgHiKl'mn. PI=3.0.

Egg-guides (Fig. 37 F): Lobe fusiform, yellowish brown, apically dark and truncate, and with about 12 marginal and 2 discal black bristles. Basal isthmus short.

Internal structures (Fig. 37 G-L): Proximal intestine: C=1.5. Rectal papillae: R=1.3. Malpighian tubes with common stalks short, and posterior branches completely looped. Testis with about 6 inner and 5 outer coils. Paragonia S-form. Ejaculatory bulb globular, apodeme with plate short and broad. Spermatheca globular and black. Parovaria seem to be absent. Ventral receptacle with 8 inner, 6 middle and 7 inner coils, cylindrical as a whole.

Holotype: ♂, Tadashina, Nagano Pref., 18 VIII '54 T (Okada).

Allotopotype: ♀, collected together with holotype.

Paratopotypes: 46 ♂♂ and 7 ♀♀, collected together with holotype (Okada, Matsudaira, Mori).

Distribution: Honshu (Chubu).

Feeding habits: T.

Relationships: Somewhat resembles *C. obscura* (de Meijère), but differs from it in having larger body, much larger costal-index (1.0 in *C. obscura*), and with tarsal joint of fore legs not entirely black, apical half being white (entirely black in *C. obscura*).

Found hovering on timber-piles with wings vibrating.

#### Genus *Scaptomyza* Hardy, 1849

Japanese name: Hime-shōjōbae-zoku.

*Scaptomyza* Hardy, 1849. Proc. Berwicksh. Nat. Club, 2:359; Becker, 1908 Mittlgn. Zool. Mus. Berlin, 4:159; Oldenberg, 1914. Arch. Naturg., 80 A (2):13; Sturtevant, 1921. Carn. Inst. Publ., 301:63; Duda, 1921, Jahresh. Ver. Schles. Insektenk. Breslau, 13:57; Duda, 1924. Arch. Naturg., 90 A (3):211; Duda, 1924. Ent. Meddel., 14:249; Duda, 1925. Arch. Naturg., 91 A (3):290; Hendel, 1928. Zool. Anz., 76:290; Duda, 1935. Die Fliegen, 58g:62; Patterson, 1943. Univ. Texas Publ., 4313:41; Wheeler, 1949. ibid., 4920:165; Wheeler, 1952. ibid., 5204:194; Collin, 1953. Entomologist, 86:148.

*Scaptomyzella* Hendel, 1928. Zool. Anz., 76:290.

*Parascaptomyza* Duda, 1924. Arch. Naturg., 90 A (3):203; Duda, 1924. Ent. Meddel., 14 B:218; Duda, 1935. Die Fliegen, 58g:58.

Logotype: *Drosophila graminum* Fallén, 1823.

This genus has been divided into two genera. *Scaptomyza* and *Parascaptomyza* by Duda (1924), and *Scaptomyzella* and *Scaptomyza* by Hendel (1928). Their subdivisions are, however, not easily accepted, because the characters they applied for separating genera often show complex combinations among a species, as discussed by Wheeler (1952).

#### Key to Japanese species of the genus *Scaptomyza*

1. Wings apically with black spots. *hu* one. *ac* in 2 or 4 rows. .... *S. unipunctum* (Zetterstedt).  
Wings apically without black spots. .... 2.
2. *ac* in 2 rows. *hu* one. Posterior *scut* long. .... *S. disticha* Duda.  
*ac* in 4 rows. *hu* 2. .... 3.
3. Posterior *scut* short and upright. .... 4.  
Posterior *scut* long and not upright. .... 5.
4. C-index about 3.5. .... *S. graminum* (Fallén).  
C-index about 3.0. .... *S. polygonia* sp. nov.
5. Yellowish species. Arista with about 2-3 branches below fork. .... *S. apicalis* Hardy.  
Blackish or brownish species. Arista with one branch below fork. .... *S. monticola* sp. nov.

#### Key to Japanese species of the genus *Scaptomyza*, with regard to the periphallic organs

1. Genital arch broadly bilobed below. Primary clasper large, semicircularly concaved, and with yellowish brown setae. Anal plate with a strongly setigerous appendage below. .... *S. disticha* Duda.  
Genital arch not or narrowly bilobed below. Primary clasper not semicircularly curved, and with black tooth-like primary teeth. Anal plate without strongly setigerous appendage below, if such appendage is present, it is only weakly setigerous. .... 2.
2. Genital arch broadly truncate at lower end, without macrotrichia on posterior margin. Clasper-teeth restricted at the lower half of clasper. .... *S. unipunctum* (Zetterstedt).  
Genital arch at least triangularly projected at lower end, with macrotrichia on posterior margin. Clasper-teeth not restricted at lower half of clasper. .... 3.
3. Genital arch only obtusely pointed at lower end, apically paler. Anal plate minute. Primary teeth in a weakly convex row. .... *S. apicalis* Hardy.  
Genital arch narrowly prolonged at lower end. Anal plate not minute. Primary teeth in a concaved or straight row. .... 4.
4. Anal plate constricted near middle, not very large. .... *S. monticola* sp. nov.  
Anal plate very large, not constricted near middle. .... 5.
5. Anal plate straight, without network sculptures below. Genital arch without non-setigerous finger-like process below. .... *S. graminum* (Fallén).  
Anal plate with ventral half curved caudad, and with fine network sculptures. Genital arch with a finger-like process below. .... *S. polygonia* sp. nov.

#### Key to Japanese species of the genus *Scaptomyza*, with regard to the phallic organs

1. Aedeagus apicodorsally with a palmate appendage. Anterior paramere longer than aedeagus, with sensilla scattered on whole length. Posterior parameres fused to each other. .... *S. apicalis* Hardy.

- Aedeagus without such appendage. Anterior paramere shorter than aedeagus, and with sensilla apical or absent. Posterior parameres seem to be absent. .... 2.
2. Anterior paramere large, about 2/3 as long as aedeagus, and without sensilla. Novasternum with a pair of long submedian processes. .... *S. monticola* sp. nov.  
Anterior paramere minute, with sensilla apical. Novasternum with or without long submedian processes. .... 3.
3. Aedeagus apparently bilobed, basally not swollen. .... 4.  
Aedeagus not bilobed, and basally broaden. .... 5.
4. Novasternum without a pair of long submedian processes. .... *S. graminum* Fallén.  
Novasternum with a pair of long submedian processes, which attain apex of aedeagus. .... *S. polygonia* sp. nov.
5. Aedeagus dorsally without acute processes. Submedian processes of novasternum much shorter than aedeagus. .... *S. unipunctum* Zetterstedt.  
Aedeagus dorsally with 3 low acute projections. Submedian processes of novasternum reach apex of aedeagus. .... *S. disticha* Duda.

### Key to Japanese species of the genus *Scaptomyza*, with regard to the egg-guides

1. Lobe apically truncate, with tooth-like bristles. .... 2.  
Lobe apically narrowing, triangular. .... 3.
2. Lobe with about 20 marginal and 12 discal teeth. .... *S. graminum* Fallén.  
Lobe with about 8 marginal and 3 discal tooth. .... *S. apicalis* Hardy.
3. Lobe with most of bristles teeth-like, discal bristles not tooth-like. .... *S. unipunctum* Zetterstedt.  
Lobe with most or all of bristle not tooth-like. .... 4.
4. Lobe with a black stripe along ventral margin, and with no bristles tooth-like. .... *S. monticola* sp. nov.  
Lobe with black spot apically, and with 2 apical bristles tooth-like. .... *S. disticha* Duda.

### *Scaptomyza disticha* Duda, 1921. Fig. 38.

Japanese name: Kofuki-himeshōjōbae.

*Scaptomyza disticha* Duda, 1921. Jahresh. Ver. schles. Insektenk. Breslau, 13: 64 (teste Hendel, 1928); Duda, 1924. Ent. Meddel., 14: 249; Hering, 1927. Zeitschr. f. angew. Ent.; 192; Hendel, 1928. Zool. Anz., 76: 289.

*Parascaptomyza disticha* Duda, 1924. Arch. Naturg., 90 A (3): 203; Duda, 1935. Die Fliegen, 58g: 58; Basden, 1952. Ent. Month. Mag., 88: 201 Collin, 1953. Entomologist, 86: 149; Basden, 1954. Trans. R. Soc. Edinburgh, 72: 617.

*Scaptomyza graminum* Bezzi, 1908. Bull. Soc. Ent. Ital.; 190; Becker, 1908. Mitt. Zool. Mus., 4: 157; Oldenberg, 1914. Arch. Naturg., 80 A (2): 13; Sturtevant, 1921. Carn. Inst. Publ., 301: 32; Hendel, 1928. Zool. Anz., 76: 290; Duda, 1929. Konowia, 8: 49; Séguéy 1933. Encycl. Ent., B II (7): 187; Stalker, 1945. Genetics, 30: 266; Patterson, 1943. Univ. Texas Publ., 4313: 43; Patterson & Mainland, 1944. ibid., 4445: 16; Hsu, 1949. ibid., 4920: 89; Wheeler, 1949. ibid., 4920: 169; Burla, 1951. Rev. Suis. Zool., 58: 66. (nec *Scaptomyza graminum* Fallén, 1823).

*Parascaptomæa graminum* Duda, 1924. Arch. Naturg., 90 A (3): 210; Duda, 1924. Ent. Meddel., 14: 249; Duda, 1904. Ann. Mus. Nat. Hung., 33: 21.

♂ and ♀; Body yellowish grey or dark grey, about 2-2.5 mm. Eye red, bare. Head (Fig. 38 A): Eye red, bare: antenna with 2nd joint grey, 3rd yellow. Palpus yellowish white, with only one prominent apical bristle. Arista with about 7 branches including a small fork, one below and near the fork. Ocellar triangle black. Periorbits brown, silvery pruinose. Front longer than broad, with obscure brownish V-shaped stripe. Carina rather high, greyish brown at middle. Cheek about 1/3 as broad as the greatest diameter of eye, yellowish white, and black above.  $orb_2$  small.  $or_2$  as long as or shorter than vibrissa.

Mesonotum variable in coloration, with silvery pruinosity.  $hu$  2.  $ac$  in 2 rows. Anterior *scut* convergent. Posterior *scut* long. Sterno-index about 0.7.

Legs yellow; preapicals on all three tibiae, apicals on middle. Wings (Fig. 38 B) hyaline. C-index about 3.7; 4V-index about 1.5; 4C-index about 0.5; 5X-index about 1.6. C1-bristles 2; C3-bristles on basal half to 2/7.

Abdomen yellow or brownish grey, posterior tergites glossy brownish black.

Periphallic organs (Fig. 38 C): As described by Hsu (1949). Decasternum like a membranous arch.

Phallic organs (Fig. 38 D,E): Aedeagus greyish brown, massive, apically bifid, ventrally with 3 black large projections. Anterior paramere small, black, and with about 3 apical sensilla. Novasternum laterally hemispherically curved, with a pair of long ventral processes. Ventral fragma longer than broad, and deeply notched. p.f.=aBCdEfg<sub>h</sub>IKLMN. PI=0.7.

Egg-guides (Fig. 38 F): Lobe fusiform, brown, apically with a black patch, and with about 8 marginal and 3 discal bristles, 2 apicomarginal ones being tooth-like and one apical and one subapical marginal bristles being longest. Basal isthmus very short.

Internal structures (Fig. 38 G-I): Proximal intestine: C=2.0. Rectal papillae elongate: R=



Fig 38

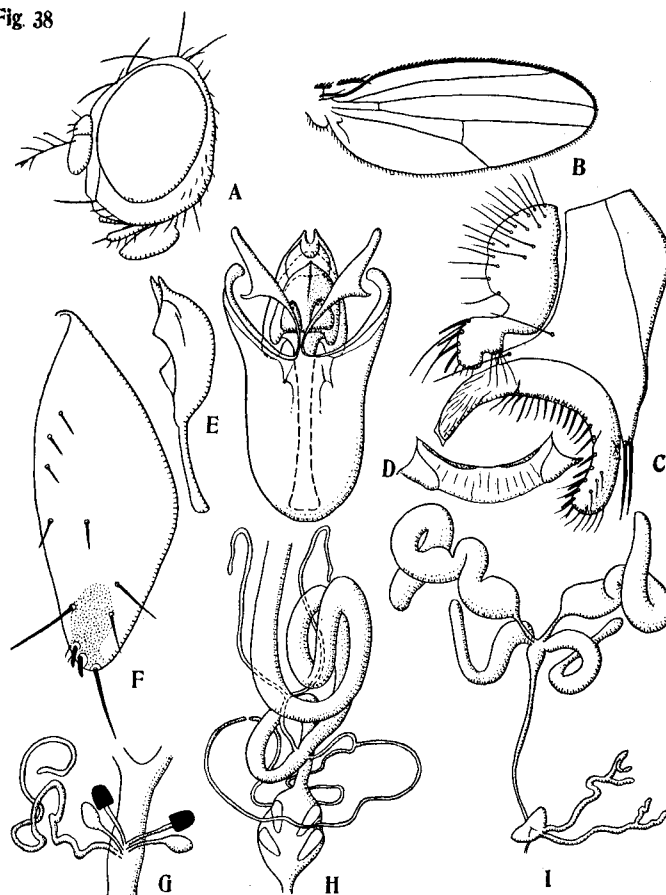


Fig. 38. *Scaptomyza disticha* (Duda).

A. Head; B. Wing; C. Periphallallic organs (lateral aspect); D. Phallic organs (ventral aspect); E. Aedeagus (lateral aspect); F. Egg-guide; G. Female reproductive organ (dorsal aspect); H. Digestive system (ventral aspect); I. Male reproductive organs.

3.0-4.0. Malpighian tubes with common stalks moderate in length, posterior branches apically apposed to each other. Male and female reproductive organs as described and figured by Patterson (1943): Testis thick, yellow, with about one inner and 1.5 outer small irregular coils. Seminal vesicles elliptical, pale yellow, and with narrow stalks basally. Paragonia transparent, once or twice folded loosely. Ejaculatory bulb with a pair of apically bifid long caeca. Spermatheca with knob dark, slightly longer than broad. Parovaria slightly smaller than spermatheca. Ventral receptacle loosely folded several times.

Specimens examined: In Hokkaido, Kushiro, Hakodate, Sôunkyo, Asahidake, Sapporo; Azumayama, Fukushima Pref.; Sendai; in Tokyo; Setagaya, Suginami Kotaira, Higashimurayama, Asakawa, Umenokidaira, Kumotoriyama; Noborito, Ôkurayama, Kikuna, Kamakura, Aburatsubo, in Kanagawa Pref.; Futtsu, Gyotoku, Chiba Pref.; Komayu, Chausuyama, Nagano Pref.; Tôjô, Hiroshima Pref. (by various persons).

Distribution: Hokkaido, Honshu (Tohoku, Kanto, Chubu, Chugoku), Europe, N. America, Africa, Canary Is.

Feeding habits: **SLMGF**.

Remarks: Dimorphic colour patterns of this species were experimentally analysed by Stalker (1945), who obtained light type at 26°C, and black type at 16°C, and proved the colour difference to be at least partially dependent upon temperature. Okada & Kurokawa (1956) are to make redescription of this species.

*Scaptomyza apicalis* Hardy, 1849 Fig. 39.

Japanese name: Sakiguro-himeshōjōbae.

*Scaptomyza apicalis* Hardy, 1849. Proc. Berwick. nat. Club, 2: 362; Duda, 1921. Jahresh. ver. Schles. Ins. Breslau, 13: 69; Duda, 1924. Ent. Meddel., 14: 249; Duda, 1935. Die Fliegen, 58 g: 63; Duda, 1940. Ann. Mus. Nat. Hung., 33: 22; Basden, 1952. Ent. Month. Mag., 88: 201.

*Drosophila flava* Fallén, 1823. Dipt. Suec. Geomyz., 7:10.

*Scaptomyza flava* Sturtevant, 1921. Carn. Inst. Publ., 301:132; Hendel, 1928. Zool. Anz., 76:12; Hering, 1932. Zeitschr. wiss. Ins., Biol., 27:36.

*Scaptomyza apicalis* var. *flava* Duda, 1921. Jahresh. ver. schles. Ins. Breslau, 13:68; Duda, 1924. Arch. Naturg., 90 A (3):211.

*Scaptomyza flaveola* Becker, 1908. Mittlgn. Zool. Mus. Berlin, 4:158; Oldenberg, 1914. Arch. Naturg., 80 A (2):14; Collin, 1953. Entomologist, 86:150 (nec *Notiphila flaveola* Meigen, 1830).

*Scaptomyza* sp. II, Suzuki, 1955. Zool. Mag., 64:44.

Fig 39

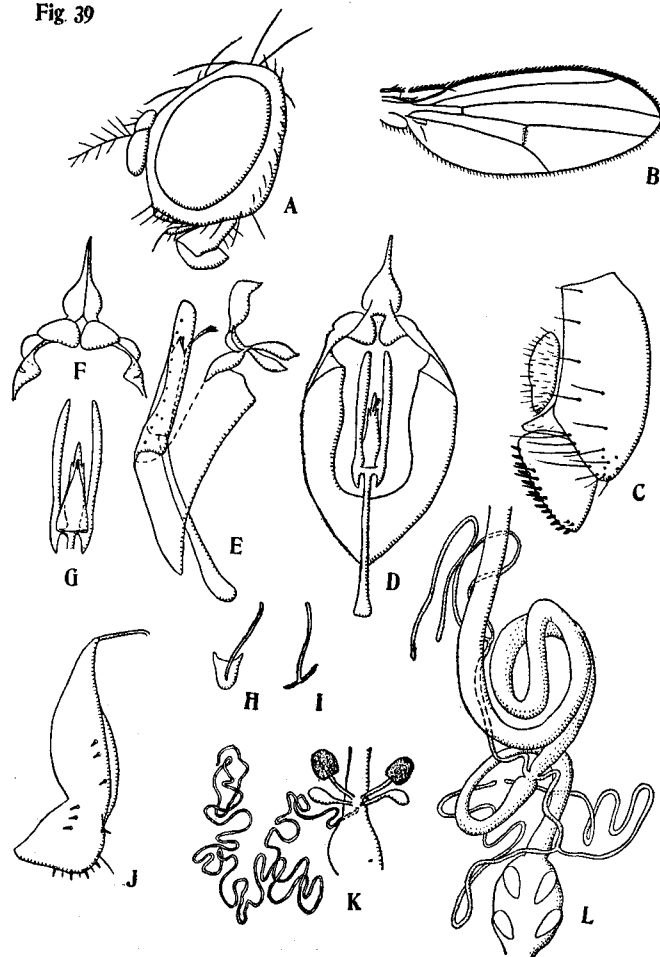


Fig. 39. *Scaptomyza apicalis* (Hardy).

A. Head; B. Wing; C. Peripheral organs (lateral aspect); D. Phallic organs (dorsal aspect); E. do. (lateral aspect); F. Posterior parameres (ventral aspect); G. Aedeagus and anterior parameres (ventral aspect); H. Ejaculatory apodeme (ventral aspect); I. do. (lateral aspect); J. Egg-guide; K. Female reproductive organs (dorsal aspect); L. Digestive system (ventral aspect).

♂ and ♀: Body yellowish brown or yellow, about 2.5 mm in length. Head (Fig. 39 A): Eyes bright red, with red piles. Antenna with 2nd joint brownish black, 3rd yellow. Arista with about 10 branches including a small fork, 2 or 3 below it. Palpus black, with a prominent apical seta. Ocellar triangle black; periorbits brown. Front pale brown, about half as broad as head-width, and with only a few *fr.* Carina dark, low, and broad. Cheek yellowish white, black above, and about 1/5 as broad as the greatest diameter of eye. *orb*<sub>2</sub> minute. *or*<sub>2</sub> as long as vibrissa.

Mesonotum and scutellum yellowish brown, without bands. Thoracic pleura pale brown, with a broad longitudinal black band. cross distance of *dc* slightly less than half the length distance. Anterior *suct* divergent. Sterno-index about 0.4.

Legs yellow. Preapicals on all three tibiae; apicals on middle. Wings (Fig. 39 B) hyaline, somewhat yellowish; crossveins slightly fuscous. C-index about 3.0; 4V-index about 2.0; 4C-index about 1.0; 5X-index about 0.8. C1-bristles 2, upper one shorter; C3-bristles on basal 1/4. Halteres pale.

Abdominal tergites yellow, with laterally broaden black caudal band on each tergite; caudal

tergites entirely black. Cross band is often interrupted at middle. Abdominal sternites yellowish grey.

Periphallic organs (Fig. 39 C): Genital arch obtuse triangular at lower tip, black with lower half paler. Clasper large, projected far below genital arch, with about 17 marginal black teeth arranged in a slightly convex row, and with about 4 secondary teeth. Genital arch with about 5 upper and 15 lower hairs. Anal plate small, with numerous short hairs.

Phallic organs (Fig. 39 D-G): Aedeagus small, slender, apically trilobed and with a small black appendage, which is distally broaden and serrate on dorsum. Anterior paramere orange brown, elongate, laterally flatten, basally projected ventrad to reach ventral fragma, and with a dozen sensilla arranged in a row on entire length of distal margin. Posterior paramere contiguous to each other, to form a pointed mediodorsal cap-like process. Ventral fragma pale, oval, somewhat pointed at tip. p.f.=aBCDEFgHiklMN. PI=0.9.

Egg-guides (Fig. 39 J): Lobes orange brown, with large triangular tip, and with about 8-9 marginal and 3-5 discal black teeth. Basal isthmus about 1/4 the length of lobe itself, and yellowish brown.

Internal structures (Fig. 39 H,I,K,L): Proximal intestine: C=2.0. Rectal papillae oval, large, R=2.0. Testis yellowish orange, with about a thick inner and 4 slender outer coils. Seminal vesicle very slender. Paragonia milky white, oblong, slightly curved at middle, and with short narrow stems. Ejaculatory apodeme with hyaline triangular plate and slender stem. Spermatheca globular, dark brown, and large. Parovaria small, with knobe rounded. Ventral receptacle long, loosely folded about 25 times.

Specimens examined: In Hokkaido: Tôbetsu, 1 ♀, 17 VIII '51; Sôunkyo, 1 ♂, 13 VIII '53 L; Sapporo, several ♂♂ and ♀♀, 19 VII '53 S (Suzuki), 7 ♂♂ and 3 ♀♀, '55 (Wakahama); Setagaya, Tokyo, 1 ♂ and 1 ♀, 27 XI '52 S; 1 ♀, 25 IV '53.

Distribution: Hokkaido, Honshu (Kanto), Europe, Africa, Canary Is.

Feeding habits: SL.

#### *Scaptomyza monticola* sp. nov. Fig. 40.

Japanese name: Miyama-himeshōjōbae.

*Scaptomyza* sp., Wakahama, 1956. Annot. Zool. Japon., 29: 118.

♂ and ♀: Body about 3 mm, blackish grey, with silvery pollinosity. Head (Fig. 40 A): Eye dark red, with piles. Antenna with 2nd joint dark brown, 3rd yellow. Arista with about 6 branches including a large fork, one below it. Palpus yellow, with slightly darker tip, and with only one prominent apical bristle. Ocellar triangle black; periorbits black, anteriorly yellow. Front orange brown, anteriorly yellowish, with a few *fr*, and slightly narrower than half the head width. Carina low, short and black. Cheek yellow, black above, and about 1/7 as broad as the greatest diameter of eye. *orb*<sub>2</sub> about 1/3 *orb*<sub>3</sub>, *or*<sub>2</sub> half as long as vibrissa.

Mesonotum silvery grey, with 3 longitudinal black stripes. Scutellum grey, silvery, and with a median longitudinal black stripe. *hu* 2. *ac* in 4 rows. Cross distance of *dc* about 1.3 times the length distance. Anterior *scut* convergent; posterior *scut* elongate. Sterno-index about 0.6.

Legs yellow. Preapicals on all three tibiae; apicals prominent only on middle. Wings (Fig. 40 B) hyaline, crossveins clear. C-index about 3.3; 4V-index about 1.5; 4C-index about 0.7; 5X-index about 1.8. C1-bristles 2; C3-bristles on basal about 1/4. Halteres yellow.

Abdominal tergite almost entirely black, with grey pollinosity, and anterior margin slightly paler. Abdominal sternites pale brown, narrow, and caudal sternites darker.

Periphallic organs (Fig. 40 C): Genital arch brownish black, paler below; lower portion narrowing and with about 5 hairs; upper portion with about 5 marginal hairs. Clasper large, brownish black, oblong, and with about 12 black teeth arranged in a concaved row, and several stout bristles below. Anal plate elongate, separated from genital arch, brownish black, and with about 70 hairs. Decasternum pale grey, flat, and triangular.

Phallic organs (Fig. 40 D,E): Aedeagus pale brown, compact, basally swollen, and subapically with a medioventral process. Anterior paramere large, laterally flatten, and with rounded tip in side view. No sensilla on the anterior parameres. Posterior paramere seems to be absent. Ventral fragma pale grey, longer than broad, and lateral margin concaved. Novasternum dark brown, and with a pair of slender sudmedian processes, which are divergent apically. p.f.=ABCDEF<sub>0</sub>g<sub>0</sub>HikL-mn. PI=about 1.5.

Egg-guides (Fig. 40 F): Lobe dark brown, with a black patch near tip, and the black patch

is contiguous to a black stripe along ventral margin of the lobe. About 10 marginal and 2 discal bristles, and a long subterminal hair are inserted on the lobe. Basal isthmus narrow and short.

Internal structures (Fig. 40 G-K): proximal intestine: C=about 2.5. Rectal papillae oval, R=1.8. Malpighian tubes with common stalks short, and posterior branches closely apposed to each other. Testis pale yellow, with about 0.5 inner and 1.5 outer thick coils. Seminal vesicle oval, with short stem. Paragonia slender, folded several times irregularly. Ejaculatory bulb with 2 long and thick caeca, which are about 3 times as long as bulb. Ejaculatory apodeme with plate oval, stem as long as plate. Spermatheca brown, semicircular. Parovaria small, with knobs rounded. Ventral receptacle with about 3.5 transverse folds.

Holotype: ♂, Sôunkyo, Hokkaido, 10 VIII '53 S (Okada).

Allotopotype: ♀, collected together with holotype.

Paratypes: Sôunko, Hokkaido, 3 ♂♂ and 4 ♀♀, 6-14 VIII '53 S; Kurotake, Hokkaido, 19 ♂♂ and 16 ♀♀, 8 VIII '53 SFL; Aizankei, Hokkaido, 4 ♂♂ and 6 ♀♀ F (Ohba).

Other specimens examined: Akkeshi, Hokkaido, 1 ♀, 13 VIII '51 T; 1 ♀, 15 VIII '53 F (Mori waki); Tokachi-Mitsumata, Hokkaido, 1 ♂ and 1 ♀, '55 (Wakahama); Asakawa, Tokyo, 1 ♀, 1 V '52 S; Kumotoriyama, Tokyo, 1 ♂ and 2 ♀♀, 14-16 VII '53 S; Kisokomagatake, Nagano pref. 2 ♂♂ and 4 ♀♀, 23 VII '52.

Distribution: Hokkaido, Honshu (Kanto, Chubu).

Feeding habits: SFLT, Flower. A lot of flies were found resting on the leaves and flowers of rhododendrons on the high mountain of Kisokomagatake, Nagano pref.

Relationships: Allied to *S. montana* Wheeler, from N. America, alike in having 4 rows of *ac*

Fig 40



Fig. 40. *Scaptomyza monticola* sp. nov.

A. Head; B. Wing; C. Peripheral organs (lateral aspect); D. Phallic organs (ventral aspect); E. do. (lateral aspect); F. Egg-guide; G. Female reproductive organs (ventral aspect); H. Digestive system (ventral aspect); I. Male reproductive organs; J. Ejaculatory apodeme (lateral aspect); K. do. (ventral aspect).

long posterior *scut*, 2 *hu*, one branch of arista below fork, and pale palpi, but differs from the allied species in having smaller parovaria. Wakahama (1956) described this species, with figures of the wing and the male and female genitalia.

***Scaptomyza graminum* (Fallén, 1823) Fig. 41.**

Japanese name: Nami-himeshōjōbae.

*Drosophila graminum* Fallén. 1823. Dipt. Suec. Geomyz., : 8.

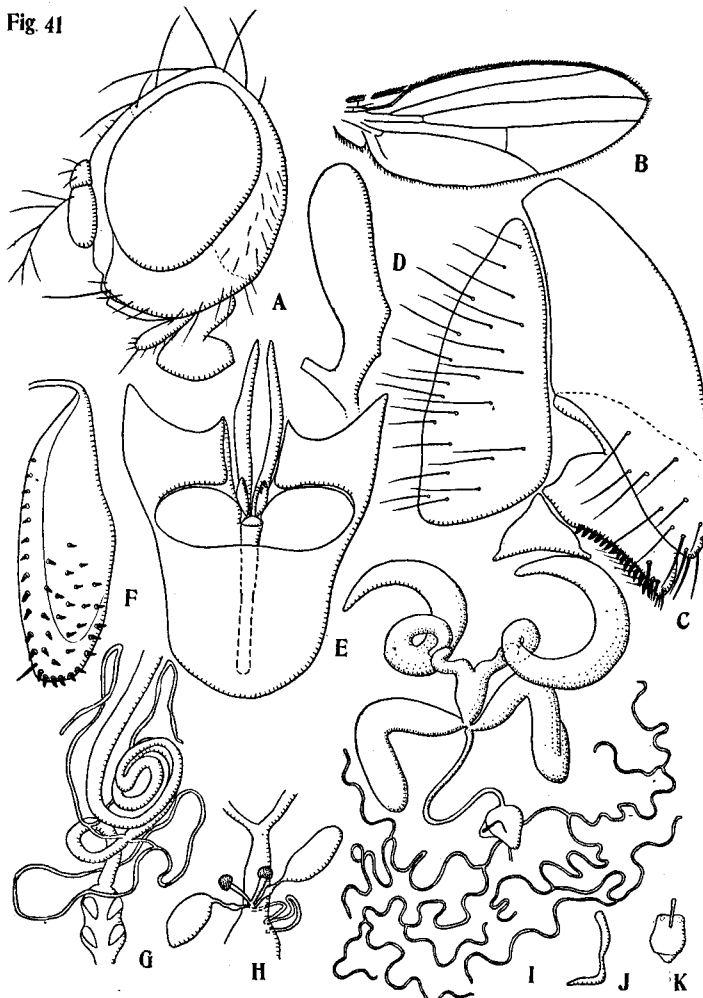
*Scaptomyza graminum* Duda, 1935. Die. Fliegen, 58 g:67; Collin, 1953. Entomologist, 86: 151; Basden, 1952. Ent. Month. Mag., 88:201; Basden, 1954. Trans. R. Soc. Edinburgh, 72:618.

*Scaptomyza tetrasticha* Sturtevant, 1921. Carn. Inst. Publ., 301:63; Becker, 1908. Mitt. Zool. Mus., Berlin, 4:158; Oldenberg, 1914. Arch. Naturg., 80 A (2):13; Hendel, 1928. Zool. Anzeig., 76:292; Duda, 1921. Jahresh. Ver. schles. Ins., 13:67.

*Drosophila rufipes* Meigen, 1830. Syst. Besch., 6:87.

*Drosophila griseola* Zetterstedt, 1847. Dipt. Scand., 6:2562.

Fig 41



**Fig. 41. *Scaptomyza graminum* (Fallén).**

A. Head; B. Wing; C. Peripheral organs (lateral aspect); D. Aedeagus (lateral aspect); E. Phallic organs (ventral aspect); F. Egg-guide; ♂G. Digestive system (ventral aspect); H. Female reproductive organs (dorsal aspect); I. Male reproductive organs; J. Ejaculatory apodeme (lateral aspect); K. do. (ventral aspect).

♂ and ♀: Body about 3.5mm, dark greyish brown. Head (Fig. 41 A): Antenna yellowish brown; arista with 6 branches including a large fork, one below it. Eyes red, with short piles. Ocellar triangle and periorbits black. Front pale yellowish brown, about half as broad as head width, and with a few fr. Carina black, rather high, narrow but wider below. Cheek pale yellowish brown, black above, about 1/3 as broad as the greatest diameter of eye. Clypeus black.

Mesonotum and scutellum greyish black, with black stripes. Thoracic pleura black. 2 *hu. ac* in 4 rows. Posterior *dc* long; cross distance of *dc* about equal to the length distance. Anterior *scut* divergent; posterior *scut* short and upright. Sterno-index about 0.4.

Legs dark brown, fore coxa yellow, femur black. Preapicals on all three tibiae. Apicals on

middle. Halteres white. Wings (Fig. 41 B) hyaline, slightly pointed at tip; crossveins clear. C-index about 3.5; 4 V-index about 1.4; 4 C-index about 0.7; 5 X-index about 1.5. C1-bristles 2; C3-bristles on basal half or less.

Abdomen with tergites entirely black, sternites dark brownish black, each sternite quadrate.

Periphallic organs (Fig. 41 C): Genital arch black, pale yellow below; toe tapering, heel absent; upper margin without hairs; lower margin with about 15 hairs. Clasper much broader than long, blackish brown, with about 20 minute primary teeth which are black and arranged in a slightly concave row, occupying lower 3/4 of distal margin, and also with about 2 secondary teeth. Anal plate large, brownish black, separated from genital arch, broaden below and with about 25 black hairs. Decasternum pale brown, median piece triangular and wider apically, lateral piece representing basal lobe of clasper.

Phallic organs (Fig. 41 D,F): Aedeagus pale brown, rounded at tip in side view, and apparently bifid. Anterior paramere minute, with about 3 apical sensilla. Novasternum pale yellow, with short submedian paired processes. Ventral fragma quadrate, dark brown. p.f.=ABCdEfg<sub>0</sub>HikLmn. PI=3.0.

Egg-guides (Fig. 41 F): Lobe entirely black, with about 20 marginal and 12 discal black teeth. Basal isthmus short.

Internal structures (Fig. 41 G-K): Proximal intestines: C=3.0. Rectal papillae: R=about 1.8. Testis orange, with about 0.5 inner and 1.5 outer coils. Seminal vesicle broad and fused to each other. Paragonia broad, transparent. and about once folded. Ejaculatory bulb with a pair of very slender caeca, which are dichotomously branched. Ejaculatory plate oval, stem twice as long as plate, Spermatheca pale brown, hemispherical. Parovaria with very large elliptical knob. Ventral receptacle short, about twice folded.

Specimens examined: In Hokkaido: Sounkyo, 1 ♀, 12 VIII '53 T; 1 ♀, 12 VIII '53 S; Kurotake, 1 ♂, 15 VIII '53 S; Sapporo, 1 ♀, VIII '53 S. In Tokyo: Setagaya, 1 ♀, 11 V '52 L; 1 ♀, 4 III '53 S; 1 ♂, 25 IV '53 S; 1 ♂ and 1 ♀, 2 IV '54; Asakawa, 5 ♂♂ and 9 ♀♀, 1 V '52; 1 ♂, 4 V '51; 3 ♂♂ and 6 ♀♀, 29 IV '52 S; Kumotoriyama, 7 ♂♂ and 3 ♀♀, 14 VII '53 S. In Kanagawa Pref.: Mizonokuchi, 1 ♂, 22 XI '52 S; Hatano, 1 ♀, 2 V '55 F; Gyotoku, Chiba Pref., 2 ♂♂, 6-9 VI '53 L (Toshioka); Senjodake, Nagano Pref., 1 ♂ and 2 ♀♀, 15 VIII '53 S (Ono & Kitagawa); Uji, Kyoto Pref., 1 ♀, 15 XI '54 L (Arnaud).

Distribution: Hokkaido, Honshu (Kanto, Chubu, Kinki), Europe, Canary Is., Madeira, S. Asia?

Feeding habits: SLFT.

Remarks: Belongs to the *montana* group (Wheeler, 1952). A female was obtained from a mine on the leaf of *Stellaria aquatica* Scop., 22 V '56, Setagaya, Tokyo.

### *Scaptomyza polygonia* sp. nov. Fig. 42 H-J.

Japanese name: Tade-himeshōjōbae.

*Scaptomyza* sp. VII, Suzuki, 1955. Zool. Mag., 64:45.

♂: Body about 2.5 mm, greyish black. Eyes dark red, with red piles. Ocellar triangle and periorbits black. Front black and anteriorly orange yellow, about half as broad as the head width, and with about a pair of *fr*. Carina yellow and narrow. Cheek yellowish orange, black above, and about 1/5 as broad as the greatest diameter of eye. Palpus yellow, and with a few stout apical setae. *orb*<sub>2</sub> about 2/3 *orb*<sub>3</sub>, just at the level of the latter, Antenna yellow; arista with about 6 branches including a large fork, only one below it. Only one prominent *or*.

Mesonotum and scutellum as in the preceding species, in both coloration and in chaetotaxy. Legs yellow, femora and tibiae darker; preapicals on all three tibiae; apicals on middle. Wings hyaline. Crossveins clear. C-index about 3.0; 4 V-index about 1.6; 4 C-index about 0.8; 5 X-index about 1.5. C1-bristles 2; C3-bristles on basal 1/3.

Abdomen black, somewhat glossy.

Periphallic organs (Fig. 42 J): Almost entirely black. Genital arch broad, incised at the insertion of clasper; toe with a bare finger-like process, bending ventrad; upper portion without macrotrichia; lower tip with several setae. Clasper broad triangular; outer margin straight and with about 15 long black teeth; inner surface with numerous stout setae. Anal plate broad and very large, with about 35 stout hairs; lower half darker and strongly curved anteriorly and with fine network sculptures.

Phallic organs (Fig. 42 H,I): Generally dark brown. Aedeagus elongate, bifid and rounded apically at side appearance. Anterior paramene minute, with a few apical sensilla. Novasternum

with a pair of strong submedian rod-like processes, which reach tip of aedeagus. Ventral fragma broader than long, broadly rounded at tip. p.f=ABCdEFg<sub>0</sub>HiKLmn'. PI=1.3. Decasternum pentagonal.

Holotype: ♂, Kogesawa, Tokyo, 21 V '55 S (Okada).

Paratype: 1 ♂, Sapporo, Hokkaido, 19 VIII '53 G (Okada).

Distribution: Hokkaido.

Feeding habits: SG. Especially rich among bushes of *Polygonum* weeds.

Relationships: Closely resembles the fore-going species, *S. graminum* (Fallén), almost undistinguishable from it in general constitutions, but shows characteristic male genitalia, which differ evidently from those of the latter species, as indicated in the key.

Remarks: Female is unknown yet, but a female, collected at the Sapporo Botanical Garden by late Mr. K. Suzuki, 21 XI '53 with sweeping net (*S. sp. VII*, Suzuki, 1955. Zool. Mag., 64:45), is found to have rounded tip of egg-guide, and seems to be referable to the present species. The decision requires, however, further collections.

Fig 42

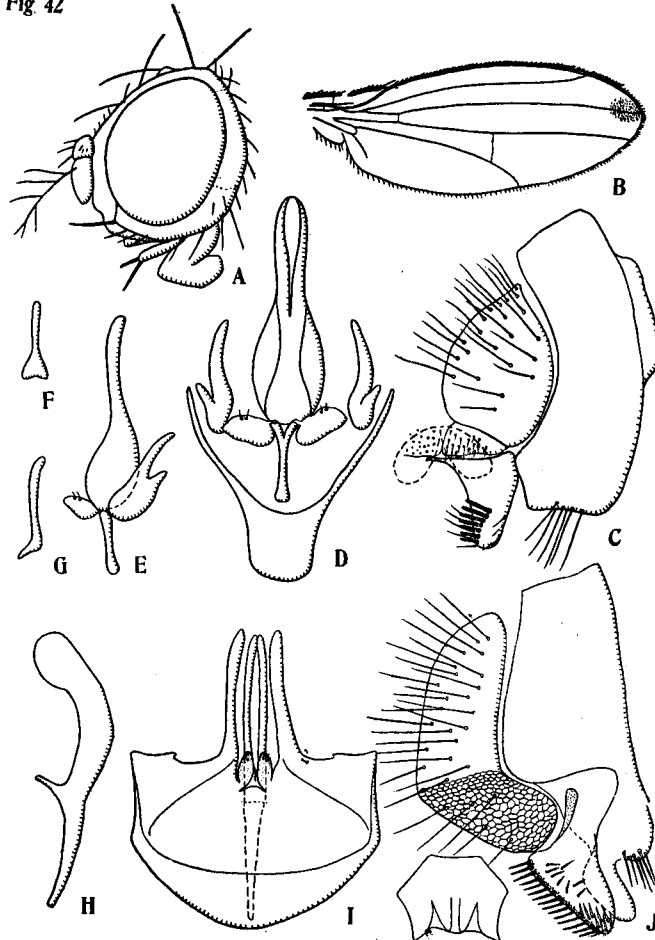


Fig. 42. *Scaptomyza unipunctum* (Zetterstedt).

A. Head; B. Wing (male); C. Periphallallic organs (lateral aspect); D. Phallic organs (ventral aspect); E. do., part (lateral aspect); F. Ejaculatory apodeme (cephalic aspect); G. do., (lateral aspect).

*Scaptomyza polygonia* sp. nov.

H. Aedeagus (lateral aspect); I. Phallic organs (ventral aspect); J. Periphallallic organs (lateral aspect).

*Scaptomyza unipunctum* (Zetterstedt, 1847) Fig. 42 A-G.

Japanese name: Itten-himeshōjōbae.

*Geomyza unipunctum* Zetterstedt, 1847. Dipt. Scand., 6:2553.

*Scaptomyza unipunctum* Czerny, 1903. Wien. ent. Zeit.: 22; Stutevant, 1921. Carn. Inst. Publ., 301:63; Duda, 1935. Die Fliegen, 58 g:70.

*Baliophora unipunctum* Beker, 1905. Kat. d. Palaeark. Dipt., 4:230.

*Scaptomyza* sp. Suzuki, 1955. Zool. Mag., 64:45.

♂: Body yellowish brown, with abdomen black, and about 2.5 mm in length. Head (Fig. 42 A) yellowish brown. Eyes red, with reddish piles. Antenna yellowish orange. Arista with about 7

branches including a small fork, one below it. Palpus yellow, apically with 2 very stout bristles. Front pale brown, darker along middle line. *fr* a few. Cheek about  $1/4$  as broad as the greatest diameter of eye. Carina low. *orb*<sub>2</sub> about  $1/3$  *orb*<sub>1</sub>. *or*<sub>2</sub> about  $1/3$  vibrissa.

Mesonotum yellowish brown, black along middle line, and with obscure dark line on each lateral side. Scutellum yellowish brown, with median large dark brown patch. Pleura slightly darker above. *hu* 2, upper one very long, over twice the length of lower. *dc* in 2 rows, sometimes a hair appears between *dc*- and *ac*-lines. Posterior *scut* long, somewhat upright. Sterno-index about 0.6.

Legs yellow; preapicals on all three tibiae; apicals on middle. Wings (Fig. 42 B) hyaline, with a small round spot at the tip of *r*<sub>4+5</sub>; crossveins pale. C-index about 2.8; 4 V-index about 1.5; 4 C-index about 0.8; 5 X-index about 1.4. C1-bristles 2; C3-bristles on basal half. Halteres yellowish brown.

Abdomen with tergites entirely brownish black; sometimes 2-4 T yellow and with broad median black cross bands. Abdominal sternites yellow.

Periphallic organs (Fig. 42 C): Genital arch black, truncate below; upper margin without macrotrichia; lower margin with about 7 long hairs. Clasper grey, with about 7 long black teeth arranged in a row, which occupies lower half of the outer margin. Anal plate deep black, with about 25 hairs, lower tip contacts with clasper and with numerous minute setae.

Phallic organs (Fig. 42 D, E): Aedeagus pale brown, flask-shaped. Anterior paramere broad but short, with about 2 minute apical sensilla. Posterior paramere seems to be absent. Ventral fragma small, quadrate, and with lateral long arms. Novasternum separated from ventral fragma, divided into 2 plates, each having a long inner process. p.f.=aBCdEfg<sub>0</sub>Hikl'mN.

Egg-guides: Lobe apically black, narrowing, weakly pointed, and with about 15 marginal black teeth and 2 long discal bristles. Subterminal hair and sensilla prominently developed.

Internal structures: Ejaculatory bulb with great caeca, and a minute apodeme (Fig. 42 F, G), which has a small triangular plate. Spermatheca black, nearly quadrate.

Specimens examined: Sapporo, Hokkaido, 2 ♂♂, 29 VII '53 S (Suzuki); 1 ♂ and 4 ♀♀, '55 (Wakahama).

Distribution: Hokkaido, Europe.

Feeding habits: S.

Remarks: Slightly different form European form in having 2 rows of *ac* (4 in the latter), and only one branches of arista below fork (2 in the latter).

### Genus *Drosophila* Fallén, 1823

Japanese name: Shōjōbae-zoku.

*Drosophila* Fallén, 1823. Dipt. Suec. Geomyz., 2, 4; Oldenberg, 1914. Arch. Naturg., 80 A (2):12; Sturtevant, 1921. Carn. Inst. Publ., 301:65; Duda, 1924. Arch. Naturg., 90 A (3):194; Duda, 1924. Ent. Meddel., 14:246; Sturtevant, 1927. Phil. Journ. Sci., 32:366; Duda, 1935. Die Fliegen, 58 g:47; Sturtevant, 1939. Proc. Nat. Acad. Sci., 25:137; Kikkawa & Peng, 1938. Japan. Journ. Zool., 7:509; Patterson, 1943. Univ. Texas Publ., 4313:46; Sturtevant, 1942:Univ. Texas Publ., 4213:5; Patterson & Stone, 1952. Evol. gen. Dros.: 6; Burla, 1921. Rev. Suis. Zool., 58:65.

Logotype: *Musca funebris* Fabricius, 1787.

### Key to Japanese subgenera of the genus *Drosophila*

1. Preapiads prominent only on the hind tibia. .... 2.
- Preapicals prominent on all three tibiae. .... 3.
2. The longest axis of eye nearly rectangular to body axis. Male with submedian spines of novasternum short and usually in a pair. Egg-guide bristles yellowish brown in most cases. .... *Hirtodrosophila* Duda.
- The longest axis of eye exceedingly oblique to body axis. Male novasternum with submedian spines rather long and in two pairs. Egg-guide bristles usually black. .... *Dorsilopha* Sturtevant.
3. Prescutellars present. Male with submedian spines of novasternum exceedingly long and stout. Egg-guide bristles yellowish brown. .... *Paradrosophila* Duda.
- Prescutellars absent. Male novasternum with submedian spines usually short and weak. Egg-guide bristles yellowish brown or black. .... 4.
4. Abdominal black bands not interrupted at middle. Anal plate separated from genital arch. Egg-guide bristles usually black. .... *Sophophora* Sturtevant.
- Abdominal black bands interrupted at middle. If the interruption is obscure due to uniformly blackish ground coloration, anal plate is contiguous to genital arch. Egg-guide bristles usually yellowish brown. .... *Drosophila* Fallén, s. str.

### Subgenus *Hirtodrosophila* Duda, 1924.

Japanese name: Fusa-shōjōbae-azoku.



*Hirtodrosophila* Duda, 1924. Arch. Naturg., 90 A (3):203; Duda, 1924. Ent. Meddel., 14:249; Sturtevant, 1927. Phil. Journ. Sci., 32:366; Sturtevant, 1942. Univ. Texas Publ., 4213:27; Patterson, 1943. Univ. Texas Publ., 4313:53; Frota-Pessoa, 1945. Rev. Brasil. Biol., 5:461; Burla, 1951. Rev. Suis. Zool., 58:69; Patterson & Stone, 1952. Evol. gen. Dros.:8; Burla, 1954. Rev. Suis. Zool., 61:108.

*Dasydrosophila* Duda, 1925. Ann. Mus. Nat. Hung., 22:192; Duda, 1935. Die Fliegen, 58 g:72; Sturtevant, 1939. Proc. Nat. Acad. Sci., 25:139.

*Drosophila* group E, Sturtevant, 1921. Carn. Inst. Publ., 301:77 (part).

Logotype: *Drosophila longecrinita* Duda, 1924.

#### Key to Japanese species of the subgenus *Hirtodrosophila*

1. Mesonotum without prominent dark stripes. .... 2.  
Mesonotum with prominent dark stripes. .... 7.
2. Body whitish yellow. Abdomen without dark bands. .... *D. (H.) sexvittata* sp. nov.(part).  
Body yellowish brown. abdomen usually with dark bands. .... 3.
3. Abdominal dark bands not interrupted at middle. .... 4.  
Abdominal dark bands interrupted at middle. Large species resembling *D. (D.) histrio* Meigen. ....  
..... *D. (H.)* sp. like *histrio*.
4. Arista with only one branch below fork. .... 5.  
Arista with 2 or more branches below fork. .... 6.
5. C-index about 2. 5. .... *D. (H.) nokogiri* sp. nov.  
C-index about 3. 5. .... *D. (H.) denticeps* Okada & Sasakawa.
6. C-index about 2. 5; 5X-index about 2. 0. .... *D. (H.) omogoensis* sp. nov.  
C-index about 3. 5; 5x-index about 0. 8. .... *D. (H.) asozana* sp. nov.
7. Crossveins clouded. Mesonotum with 4 blackish stripes, which are posteriorly broaden. ....  
..... *D. (H.) alboralis* Momma & Takada.  
Crossveins clear. .... 8.
8. Mesonotum with 3 broad longitudinal black stripes, which are confluent posteriorly with each other to become a large black patch. .... *D. (H.) trivittata* Strobl.  
Mesonotum with paired longitudinal black stripes. .... 9.
9. Mesonotum with 4 broad black stripes, inner pair broaden distally. .... *D. (H.) quadrivittata* sp. nov.  
Mesonotum with 2-6 narrow black stripes, none of them broaden distally. ....  
..... *D. (H.) sexvittata* sp. nov. (part).

#### Key to Japanese species of the subgenus *Hirtodrosophila*, with regard to the peripheral organs

1. Anal plate with long stout black bristles below. .... 2.  
Anal plate without such bristles. .... 4.
2. Stout bristles of anal plate arranged in a row. .... *D. (H.) denticeps* Okada & Sasakawa.  
Stout bristles of anal plate arranged in a bundle. .... 3.
3. Primary teeth of clasper arranged in a crescent row. .... *D. (H.) sexvittata* sp. nov.  
Primary teeth of clasper arranged in a straight row. .... *D. (H.) trivittata* Strobl.
4. Genital arch broadly truncate below. Clasper with about 5 black teeth. .... *D. (H.) nokogiri* sp. nov.  
Genital arch pointed or rounded below. Clasper with more than 10 black teeth. .... 5.
5. Genital arch largely yellow, rounded below, and without eminent basal fragma. Anal plate with short stout setae below. .... 6.  
Genital arch largely black, pointed below, and with eminent basal fragma. Anal plate without such setae. .... 7.
6. Genital arch apically yellow. Clasper with about 20 discal setae. Anal plate without short setae below. ....  
..... *D. (H.) alboralis* Momma & Takada.  
Genital arch apically black. Clasper with about 10 pointed marginal setae below primary teeth. Anal plate with short setae below. .... *D. (H.)* sp. like *histrio*.
7. Heel more or less prominent. Clasper with about 15 teeth arranged in a concave row. ....  
..... *D. (H.) quadrivittata* sp. nov.  
Heel absent. Clasper with about 10 teeth arranged in a straight row. .... *D. (H.) omogoensis* sp. nov.

#### Key to Japanese species of the subgenus *Hirtodrosophila*, with regard to the phallic organs

1. Ventral fragma with a pair of long submedian processes. .... *D. (H.) denticeps* Okada & Sasakawa.  
Ventral fragma without such processes. .... 2.
2. Aedeagus distally not furcated, and laterally dentate. Anterior paramere without sensilla. ....  
..... *D. (H.) nokogiri* sp. nov.  
Aedeagus distally furcated, and laterally not dentate. .... 3.
3. Apodeme of aedeagus bifurcate. .... *D. (H.) omogoensis* sp. nov.  
Apodeme of aedeagus not bifurcate. .... 4.
4. Apodeme of aedeagus shorter than aedeagus, but longer than half of the latter:  $PI < 2.0$  .... 5.  
Apodeme of aedeagus shorter than half of aedeagus:  $PI < 2.0$  .... 6.
5. Aedeagus apically concave and finely dentate, subapically with a pair of claws directed anteriorly. ....  
..... *D. (H.) alboralis* Momma & Takada.

- Aedeagus deeply bifurcate at tip, but not dentate, subapically with a pair of claws directed posteriorly. ... *D. (H.) quadrivittata* sp. nov.
6. Aedeagus slender, rectangularly curved proximally, and suddenly broaden at tip. .... *D. (H.)* sp. like *histris*.  
Aedeagus broad and gently curved proximally, and gradually broaden apically. .... 7.
7. Ventral fragma quadrate and slightly concave proximally. .... *D. (H.) sexvittata* sp. nov.  
Ventral fragma hemispherical and convex proximally. .... *D. (H.) trivittata* Strobl.

**Key to Japanese species of the subgenus *Hirtodrosophila*, with regard to the egg-guides**

1. Lobes with numerous discal teeth. .... *D. (H.) denticeps* Okada & Sasakawa.  
Lobes without or with a few discal teeth. .... 2.
2. Subterminal hair placed nearer middle than apex of lobe. .... 3.  
Subterminal hair nearer apex than middle of lobe. .... 4.
3. Lobe with about 25 teeth. .... *D. (H.) sexvittata* sp. nov.  
Lobe with more than 30 teeth. .... *D. (H.) trivittata* Strobl.
4. Lobes truncate or pointed at tip, and with a few strong black teeth. .... *D. (H.) nokogiri* sp. nov.  
Lobe rounded at tip. .... 5.
5. Lobe weakly swollen at middle. Basal isthmus rather long, about 1/3 length of lobe. .... *D. (H.) omogoensis* sp. nov.  
Lobe strongly swollen at middle. Basal isthmus short or long. .... 6.
6. Basal isthmus rather long, about 1/3 as long as lobe. Subterminal hair placed at 3/4 distad of lobe. .... *D. (H.) asozana* sp. nov.  
Basal isthmus short, about 1/5 as long as lobe. Subterminal hair placed near the apex of lobe. .... 7.
7. Lobe with about 30 teeth. .... *D. (H.)* sp. like *histris*.  
Lobe with about 20 teeth. .... *D. (H.) quadrivittata* sp. nov.

***Drosophila (Hirtodrosophila) alboralis* Momma & Takada 1954.**

Japanese name: Shiro-shōjōbae.

*Drosophila (Hirtodrosophila) alboralis* Momma & Takada, 1954. Annot. Zool. Japon., 27: 97; Momma, 1954. Journ. Fac. Sci. Hokkaido Univ., ser. VI, 12: 201.

*Drosophila (Hirtodrosophila)* sp. II. Okada, 1954. Japan. Journ. Appl. Zool., 19: 81; Suzuki, 1955. Zool. Mag., 64: 47.

*Drosophila (Dorsilopha)* sp., Takada, Momma & Nakahara, 1953. Zool. Mag., 68: 120.

♂ and ♀: General features described by Momma & Takada (1954).

Phallic organs: Aedeagus yellowish brown, broaden apically, and obliquely truncate and finely serrate at tip; mediodorsally with a pair of acute projections directed forward. Anterior paramere small, fused to novasternum, and apically with a sensillum. Posterior parameres fused to each other to become a semicircular plate, which continues to novasternum by means of a pair of narrow lateral arms. Novasternum yellowish grey, with a pair of rather long submedian spines. Ventral fragma pale greyish brown and rounded at anterior margin. p.f.=ab/CdEfgHIkl'MN. PI=1.2.

Proximal intestine: C=2.0. Rectal papillae: R=1.2.

Specimens examined: In Hokkaido: Akkeshi, 1 ♂, 13 VIII '51; Nopporo, 1 ♂, 1953 (Suzuki); Imagane, 1 ♂ and 1 ♀, 2 VI '53 M (Suzuki); Sōunkyo, 1 ♂ and 2 ♀♀, 10-14 VIII '53. Kumotori-yama, Tokyo, 1 ♂, 16 VII '53 M; Omogō, Ehime Pref., 2 ♂♂ and 3 ♀♀, 9 XI '53 M.

Previous records: In Hokkaido: (Suzuki, 1955) Sapporo; (Momma & Takada, 1954) Daisetsu-zan.

Distribution: Hokkaido, Honshu (Kanto), Shikoku.

Feeding habits: M.

Remarks: Details of phallic organs, internal genital apparatus of both sexes, eggs, puparia, as well as chromosomes were described by Momma & Takada (1954).

***Drosophila (Hirtodrosophila) sexvittata* sp. nov. Fig. 43.**

Japanese name: Musuji-Shōjōbae.

*Drosophila (Hirtodrosophila)* sp. I & II, Mizuno, 1952. Papers from Coord. Comit. Res. Genet. III: 51.

*Drosophila (Hirtodrosophila)* sp. I, Okada, 1954. Japan. Journ. Appl. Zool., 19: 81; Suzuki, 1955. Zool. Mag., 64: 46.

♂ and ♀: Body about 2.3 mm, yellow with dark stripes. Head (Fig. 43 A): Antenna yellow, 3rd joint evidently pubescent. Arista with about 10 branches including fork, 1 or 2 below it. Front yellow, about half as broad as head width, and medio-anteriorly with a pair of fine fr. Ocellar triangle dark grey. Periorbits yellow. orb<sub>2</sub> about 1/4 orb<sub>1</sub>, or<sub>2</sub> about 1/4 vibrissa. Palpus oval, yellow, lower half black, and with only one prominent apical bristle. Carina very high, narrow,

and yellow. Cheek yellow, about  $1/5$  as broad as the greatest diameter of eye. Eye dark red, roughly pubescent.

Mesonotum yellow, with 3 pairs of narrow black longitudinal stripes, outermost pair being broken into 4 spots. Scutellum yellow, with 2 indistinct broad black longitudinal stripes. *ac* in 6 rows. Cross distance of *dc* about thrice the length distance. *hu* 2, large and subequal. Sterno-index about 1.8. Anterior *scut* convergent.

Legs yellow; preapicals on middle and hind tibiae; apicals on middle. Wings (Fig. 43 B) hyaline, crossveins clear. C-index about 2.7; 4V-index about 1.8; 4C-index about 1.0; 5X-index about 1.7. C1-bristles 2; C3-bristles on basal  $2/5$ . Halteres white. Abdomen yellow, each of 2-6 T with broad black caudal band, which is broadly interrupted at middle, and often laterally broaden to reach anterior margin, or laterally narrowing and separated from the lateral black spots. 7 T yellow.

Periphallic organs (Fig. 43 C): Genital arch pale yellow, elongate, somewhat triangularly projected at lower tip, and without prominent basal fragma; upper portion with about 10 hairs; lower portion with about 20 hairs; posterior margin with setigerous conical process just above insertion of clasper, and a slender setigerous flap directed ventrad below insertion of clasper. Anal plate fusiform, with about 20 hairs, and 3 long stout black bristles inserted in a bundle at the tip of plate. Clasper crescent, with about 12 short black teeth arranged in a concave row.

Phallic organs (Fig. 43 D,E): Pale yellowish grey. Aedeagus rod-shaped, curved downward, and apically bilobed and finely serrate. Anterior paramere minute, apically with about 2 distinct sensilla. Posterior paramere like a cross-bar continuous to the tips of novasternal arms. Ventral fragma quadrate, deeply notched, and distally concave.  $p.f. = ab/CdEfgHIkLm'n$ .  $PI = \text{about } 2.8$ .

Fig 43

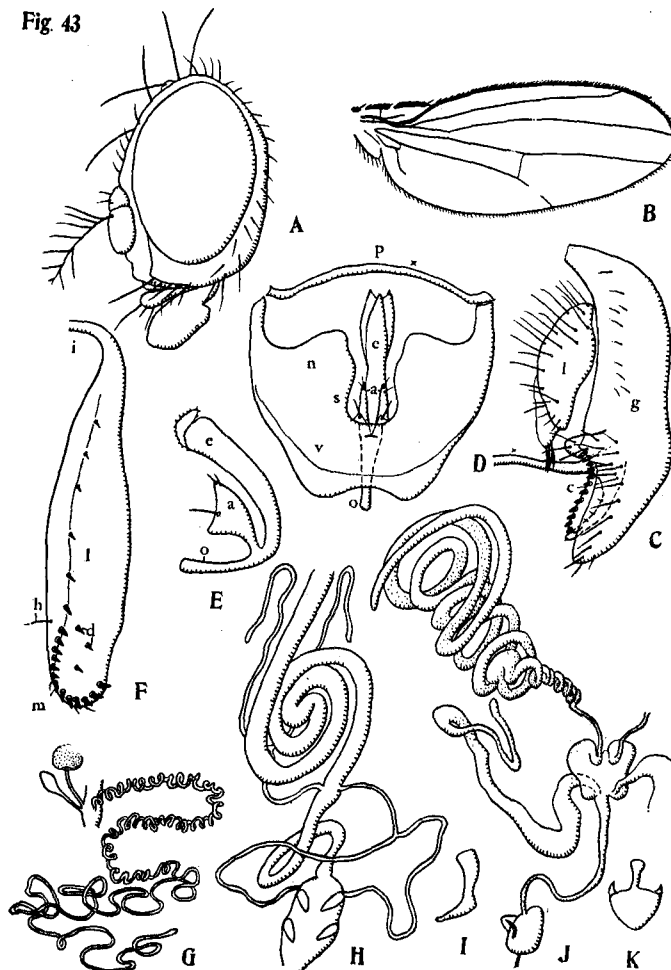


Fig. 43. *Drosophila (Hirtodrosophila) sexvittata* sp. nov.

A. Head; B. Wing; C. Peripheral organs (lateral aspect); D. Phallic organs (ventral aspect); E. do. part (lateral aspect); F. Egg-guide; G. Female reproductive organs (ventral aspect); H. Digestive system (ventral aspect); I. Ejaculatory apodeme (lateral aspect); J. Male reproductive organs; K. Ejaculatory apodeme (ventral aspect).

Egg-guides (Fig. 43 F): Lobe pale yellow, oblong, and with about 19 marginal and 3 discal black teeth. Subterminal hair inserted at the level of  $3/4$  distad to the lobe. Basal isthmus broad and short.

Internal structures (Fig. 43 G-K): Proximal intestine:  $C=2.5$ ; rectal papillae:  $R=2.3$ . Posterior Malpighian tubes with looped branches and rather long common stalk. Testis pale yellow, with about 8 inner minute and 7 outer thick coils. Seminal vesicle distally narrow, and proximally thickened. Paragonia with oblong knobs. Ventral receptacle long, proximally coiled densely about 18 times, and distally coiled loosely about 15 times.

Holotype: ♂, Abashiri, Hokkaido, 18 VIII '51 M (Okada).

Allotopotype: ♀, collected together with holotype.

Paratypes: 3 ♂♂ and 1 ♂, Abashiri, Hokkaido, 18 VIII '51 M; Akkeshi, Hokkaido, 3 ♂♂ and 6 ♀♀, 12 VIII '51 M; Tôbetsu, Hokkaido, 3 ♂♂ and 8 ♀♀, 17 VIII '51 MF; Asahikawa, Hokkaido, 1 ♀, 11 VII '50 (Mizuno); Kurotake, Hokkaido, 2 ♂♂ and 9 ♀♀, M, and 1 ♂ and 3 ♀♀, S, 14 VIII '51.

Other specimens examined: In Hokkaido: Nopporo, 14 ♂♂ and 8 ♀♀, 22 VIII '51 M (Ohba); Ônuma, 1 ♂ and 1 ♀, 22 VIII '51 M (Mizuno); Attoko, 1 ♀, 15 VIII '51 (Kanehisa); Sapporo, 1 ♂ and 3 ♀♀, 19 VIII '53 M (Momma & Suzuki); 1 ♂, Wakkanai, 15 VIII '53 F (Kanehisa). Tsutatsunosen, Aomori Pref., 6 ♀♀, VII '52 M (Ohba); Hôshi-onsen, Gumma Pref., 1 ♀, 4 IX '53 (Matsudaira); Kumotoriyama, Tokyo, 6 ♂♂ and 7 ♀♀, 15 VII '53 M (Ando); Kiso-fukushima, Nagano Pref., 1 ♂, 21 VII '52.

Previous records: (Mizuno, 1952) Sapporo, Higashitakas, Hokkaido.

Distribution: Hokkaido, Honshu (Tohoku, Kanto, Chubu).

Feeding habits: MF.

Relationships: Somewhat resembles *D. (H.) longala* Patterson & Wheeler, from N. America, in having striped mesonotum, but differs from it in abdominal patterns, number of branches of *ac*, male genitalia, and number of coils of testis.

Remarks: Eggs oblong, without filaments. Thoracic and abdominal patterns show extensive individual variability, occasionally very faint, different from strictly invariable structures of male and female genitalia.

### *Drosophila (Hirtodrosophila) trivittata* Strobl, 1893 Fig. 44.

Japanese name: Misuji-shôjôbae.

*Drosophila trivittata* Strobl, 1893. Wien. ent. Zeitg., 12: 281; Oldenberg, 1914. Arch. Naturg., 80A(2): 7; Duda, 1923. Ann. Mus. Nat. Hung., 20: 49; Duda, 1924. Arch. Naturg., 90 A (3): 212; Duda, 1924. Ent. Meddel., 14: 268; Duda, 1935. Die Fliegen, 58: 97.

*Drosophila* sp. II, Mizuno, 1952. Papers from Coord. Comit. Res. Genet., 3: 51.

♂ and ♀: Body about 2.5 mm, pale yellow, with remarkable black stripes on mesonotum and scutellum. Head (Fig. 44 A): Eye rounded, comparatively small, and with fine piles. Antenna with 3rd joint black. Arista with about 7-9 branches including minute fork, 2 or 3 below it. Palpus pale, broad, and apically with a prominent bristle. Ocellar triangle black. Periorbits yellow, posteriorly black. Front yellow, about half as broad as the head-width, and medially black. *fr* a few. Clypeus yellow. Cheek yellow, black above, about  $1/4$  as broad as the greatest diameter of eye, or broader than the 3rd antennal joint. Occiput yellowish brown, laterally and medially brown. *orb*<sub>2</sub> about  $1/3$  *orb*<sub>1</sub>, situated slightly nearer *orb*<sub>3</sub> than to *orb*<sub>1</sub>. *or*<sub>2</sub> minute.

Mesonotum yellow, with 3 broad black longitudinal stripes, which are confluent to become a quadrate patch near the scutellum: and also confluent anteriorly for a short length. Scutellum black, with anterior corners yellow. Thoracic pleura yellow. *hu* 2, upper one longer. *ac* in 6 rows. Cross distance of *dc* about twice the length distance. Anterior *scut* slightly convergent. Sternite index about 1.0.

Legs yellow; ultimate tarsal joints dark. Preapicals on all three tibiae; apicals on middle. Wings (Fig. 44 B) hyaline, crossveins clear. C-index about 2.7; 4V-index about 2.1; 4C-index about 2.1; 5X-index about 2.0. C1-bristles 2; C3-bristles on basal half. Halteres yellow.

Abdominal tergites yellow, indistinctly banded. Sternite yellow.

Periphallic organs (Fig. 44 E): Genital arch pale yellow, elongate, apically narrowing, deeply concave below, and slightly projected at the insertion of clasper; upper margin with about 10 hairs; lower margin with about 12 hairs. Clasper pale yellow, tapering below, with about 10 black teeth arranged in a slightly concave row, and with a few setae. Anal plate pale yellow, elongate, narrowing below, and with a tuft of about 3 black stout bristles directed ventrad, and about 25

hairs.

Phallic organs (Fig. 44 F,I): Aedeagus pale yellow, apically bilobed, and curved dorsad. Anterior paramere minute, with about 3 sensilla. Posterior paramere like a long straight bar, connecting the arms of novasternum. Novasternum with a pair of stout submedian spines. Ventral fragma semielliptic, and broadly rounded at tip.  $p.f. = aBCdEfgHIklmn$ .  $PI = 2.5$ .

Egg-guides (Fig. 44 G): Lobe pale yellowish brown, fusiform, and with upper margin slightly concave subapically, and with about 20 marginal and 3-6 discal black teeth. Subterminal hair inserted at about  $2/3$  distad of the lower margin of lobe.

Internal structures (Fig. 44 C,D,H,J): Proximal intestine:  $C = 2.0$ . Rectal papillae:  $R = 2.5$ . Posterior Malpighian tubes apparently free at tips; common stalks rather long. Spermatheca pale yellowish brown, elongate oval, and distally narrowing. Parovaria with very large elliptical knobs. Ventral receptacle with about 30 irregular rather loose coils.

Specimens examined: Abashiri, Hokkaido, many ♂♂ and ♀♀, 18 VIII '51 M; Sapporo, Hokkaido, 6 ♂♂ and 8 ♀♀, 19 VIII '53 M (Suzuki); Ōsugitani, Kyoto Pref., 12 VII '52 M (Nobuchi).

Previous records: (Mizuno, 1952) Higashitakasu, Hokkaido.

Distribution: Hokkaido, Honshu (Kinki), Europe, Siberia, Formosa, Java.

Feeding habits: M.

Relationships: Closely allied to *D. (H.) sexvittata* Okada (n. sp., in this paper), similar in having bar-like posterior parameres, both ends of which being attached to the bases of both claspers respectively like the lateral pieces of decasternum, and also in having narrow genital arch as well as clasper. These two species differs, however, from each other, in C-index, mesothoracic and abdominal patterns, and in detailed features of male and female genitalia. Strictly

Fig 44

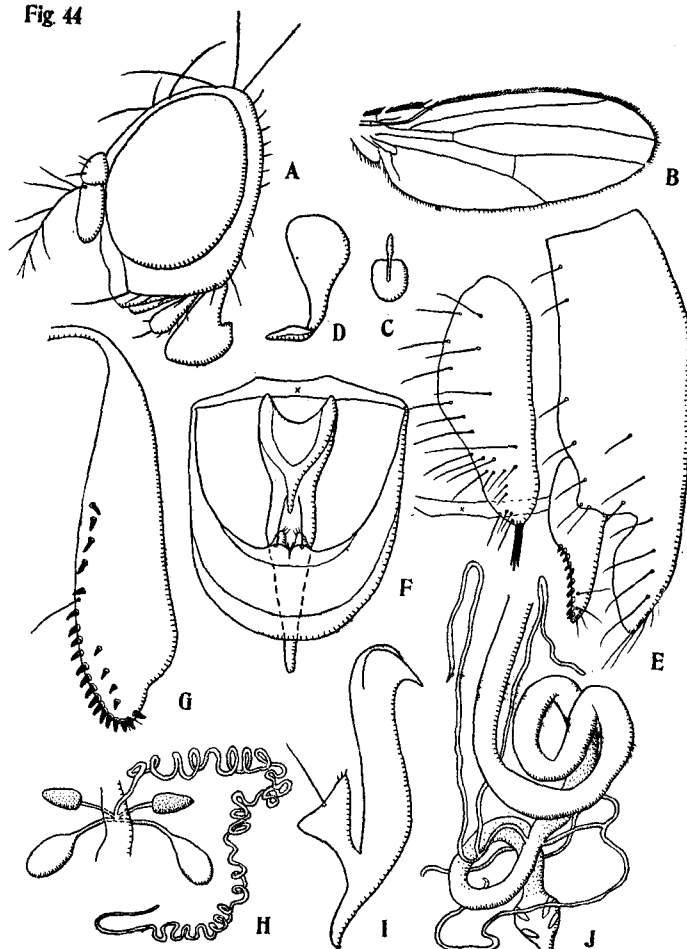


Fig. 44. *Drosophila (Hirtodrosophila) trivittata* strobl.

A. Head; B. Wing; C. Ejaculatory apodeme (ventral aspect); D. do. (lateral aspect); E. Periphallallic organs (lateral aspect); F. Phallic organs (ventral aspect); G. Egg-guide; H. Female reproductive organs (ventral aspect); I. Phallic organs, part (lateral aspect); J. Digestive system (ventral aspect).

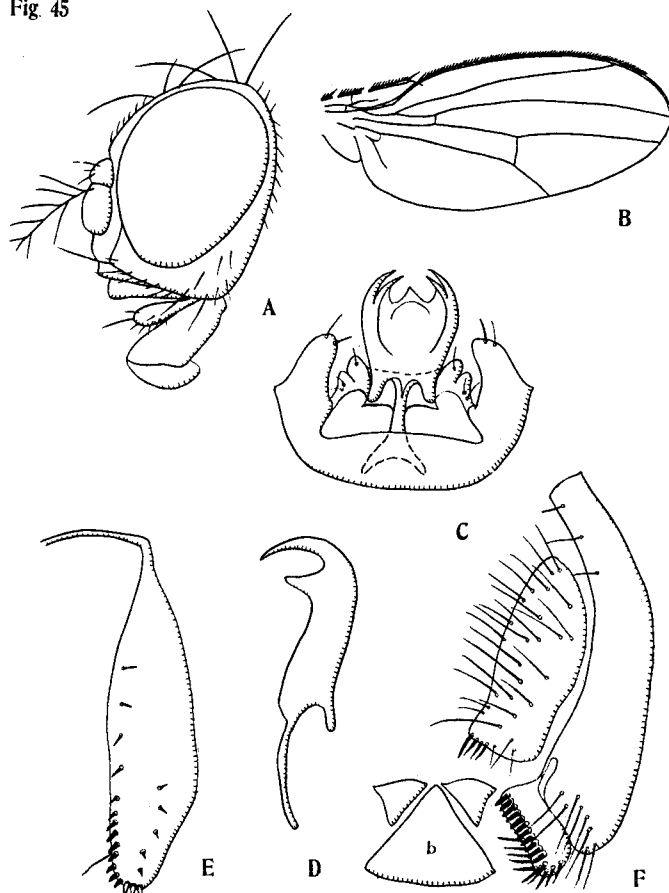
coincides with European form, except for abdominal patterns, which are obscure in the present form, but distinct in European form.

Remarks: Eggs (ovarian) without filaments. The larvae have been found breeding on a fungus, *Pleurotus ostreatus* (Jacq.), according to Mr. Nobuchi's personal information. Patterson & Stone (1952) indicated that no species of the subgenus *Hirtodrosophila* is known to occur in more than two zoogeographic regions. The present species is, if identification is valid, therefore, the first case of exception.

***Drosophila (Hirtodrosophila) omogoensis* sp. nov.** Fig. 45.

Japanese name: Yabu-shōjōbae.

Fig. 45



**Fig. 45. *Drosophila (Hirtodrosophila) omogoensis* sp. nov.**

A. Head; B. Wing; C. Phallic organs (ventral aspect); D. Aedeagus (lateral aspect); E. Egg-guide; F.Periphallic organs (lateral aspect).

♂ and ♀: Body yellowish brown, with black abdominal bands, and about 3 mm in length. Eye pubescent. Antenna with 3rd joint dark. Arista with 7 or 8 branches including a large fork, 2 below it. Ocellar triangle large and black. Periorbits black, paler at the base of orbitals. Front yellowish brown, about or slightly less than half the head width. *fr* arranged in V-shape. Clypeus yellowish brown. Cheek yellowish brown, about 1/4 as broad as the greatest diameter of eye. Carina yellowish brown, high, and broad. *orb*<sub>2</sub> about 2/3 *orb*<sub>3</sub>. *or*<sub>2</sub> weak, 2/5 vibrissa. Occiput black.

Mesonotum dark yellowish brown, indistinctly pale along *dc*-lines, as well as above wings. Scutellum yellowish brown, pleura slightly darker. *hu* 2, subequal. *ac* in 8 rows, somewhat irregularly arranged. Anterior *scut* convergent. Cross distance of *dc* about 1/2 the length distance. Sterno-index about 0.8.

Legs yellow, preapicals prominent on hind tibia, and very slightly developed on the fore; apicals on middle. Wings (Fig. 45 B) hyaline, crossveins clear. C-index about 2.6; 4V-index about 1.8; 4C-index about 1.0; 5X-index about 2.0. C1-bristles 2; C3-bristles on basal 2/5 or 1/3. Halteres yellow.

Abdominal tergites yellow. 2-6 T with broad black caudal bands, which are not interrupted at middle, and somewhat narrowing laterally.

Periphallic organs (Fig. 45 F): Genital arch pale yellow, darker above, narrow and broad below, and obtusely projected at lower tip; upper margin with about 3 hairs; lower margin with about one strong hairs. Clasper pale yellow, broad but short, and with about 11 stout setae and 11 black teeth arranged in a straight row. Anal plate separated from genital arch, pale yellow, darker above, oblong and truncate at lower tip, and with about 30 hairs, a few lower of which being very stout and short. Decasternum pale yellow, triangular, basally narrowing, and with lateral pieces small.

Phallic organs (Fig. 45 C,D): Aedeagus pale yellow, broad, projected narrowly at sides, and apically curved dorsad and with 4 pointed serrations. Basal apodeme of aedeagus bilobed at tip. Ventral fragma broader than long, pale yellowish white. Anterior paramere minute, apically bilobed and with about 3 distinct sensilla. Novasternum with 2 submedian spines of the tips of each lateral arm. p.f.=a'BCdEfg<sub>0</sub>HikLmn. PI=about 1.7.

Egg-guides (Fig. 45 E): Lobes pale yellowish brown, elongate, rounded at tip, and with about 16 marginal and 5 discal black teeth, 3 apical marginal teeth being yellow. Basal isthmus narrow and long.

Spermatheca yellowish brown, and quadrate. Other internal structures unknown.

Holotype: ♂, Omogō, Ehime Pref., 9 XI '53 M (Okada).

Allotopotype: ♀, collected together with holotype.

Paratype: 1 ♂, Nanokawa, Kōchi Pref., 6 XII '53 S (Okada).

Other specimens examined: Matsuyama, Ehime Pref., 1 ♂, 14 III '56 (Morikawa).

Distribution: Shikoku.

Feeding habits: MS.

Relationships: Somewhat resembles *D. (H.) carinata* Duda, from Formosa, in having high broad carina, but differs from it in venation and abdominal coloration.

Remarks: 2 branches below fork of arista is a case unusual, though not unique, to the subgenus *Hirtodrosophila*, and consequently to place the present species in this subgenus is somewhat doubtful. Holo- and allotypes have been collected at a fungus, *Phallus impudicus* (L.).

*Drosophila (Hirtodrosophila) quadrivittata* sp. nov. Fig. 46.

Japanese name: Yosuji-shōjōbae.

♂ and ♀: Body about 2.2 mm, brownish black. Head (Fig. 46 A): Eye dark red, with piles. Antenna with 2nd and 3rd joints greyish brown. Arista with about 7 branches including a small fork, 1 below it. Palpus yellow, with a few prominent setae. Ocellar triangle greyish black, slightly glossy, and medially darker. Periorbits greyish black. Front greyish black, bare, and about half as broad as the head width. Clypeus black. Cheek pale greyish orange, and about 2/7 the greatest diameter of eye. Carina dark brown, narrow, and low. Occiput dark brown. *orb*<sub>2</sub> minute, about 1/5 *orb*<sub>3</sub>, *or*<sub>2</sub> minute.

Mesonotum dark brown, with 4 black longitudinal stripes, inner pair broaden caudally and outer pair interrupted at suture. Scutellum black. Thoracic pleura mostly black. *hu* 2, subequal. *ac* in 6 rows. Cross distance of *dc* about half the length distance. Anterior *scut* convergent. Sterno-index about 0.4.

Legs yellowish grey, with femora black except on apical 1/4. Preapicals on hind tibia, apicals on middle. Wings (Fig. 46 B) hyaline, crossveins clear. C-index about 2.2; 4 V-index about 2.0; 4 C-index about 1.2; 5 X-index about 1.9. C1-bristles 2; C3-bristles on basal 2/5. Halteres white.

Abdominal tergites pale yellow, with large black caudal bands on 1-6 T, widely interrupted at middle. 5-6T largely black, anterior margin narrowly yellow. Sternites white.

Periphallic organs (Fig. 46 C): Genital arch pale yellow, elongate, truncate at lower tip, and with a low triangular process at the insertion of clasper; upper portion with about 12 hairs; lower margin with about 4 long hairs. Clasper triangular, slightly projecting beyond tip of genital arch, and with about 17 black teeth arranged in a concave row, and about 8 stout setae. Anal plate yellow, nearly oval, separated from genital arch, and with about 45 hairs including numerous short and stout setae inserted at lower tip. Decasternum pale brown, composed of a pair of small triangular lateral pieces.

Phallic organs (Fig. 46 D,E,J,K): Aedeagus narrow, apically swollen in lateral view, and with 2 pairs of acute inclinate processes. Anterior paramere apically pointed and with about 3

distinct sensilla, and basally broad and fused to novasternum. Ventral fragma pale yellow, nearly quadrate. Posterior parameres W-shaped and laterally fused to the long arms of novasternum.  $p.f. = a'BCdEfgHiklm'n$ .  $PI = 1.7$ .

Egg-guides (Fig. 46 F): Lobes yellowish grey, exceedingly broaden at middle, and with about 17 marginal black teeth and about 4 discal black bristles. Basal isthmus narrow and pale brown.

Internal structures (Fig. 46 G-I, L): Proximal intestine:  $C = 2.0$ . Rectal papillae elongate,  $R = 3.0$ . Malpighian tubes with common stalks rather short, and posterior branches seem to be contiguous at tips to each other. Ejaculatory bulb without caeca. Ejaculatory apodeme with long stem and elongate oval plate. Spermatheca yellowish brown, large, apically flatten, and much thicker than long. Ventral receptacle short, transversely folded about 2.5 times.

Holotype: ♂, Omogō, Ehime Pref., 9 XI '53 M. Collected on *Pleurotus* sp. (Okada).

Allotopotype: ♀, collected together with holotype.

Paratypes: 10 ♂♂ and 10 ♀♀, collected together with holotype; 1 ♀, Kumotoriyama, Tokyo, 15 VII '53 M.

Distribution: Honshu (Kanto), Shikoku.

Feeding habits: M.

Relationships: Somewhat allied to the foregoing species, *D. (H.) quadrivittata* sp. nov., similar in the features of male and female genitalia, but differs from the latter species in having mesonotum distinctly striped, and abdominal bands clearly interrupted at middle. Also resembles *D. orbospicula* Patterson & Wheeler, from N. America, in the shape of periphallallic organs, but differs from which in thoracic and abdominal patterns, and in having C-index smaller.

Fig 46

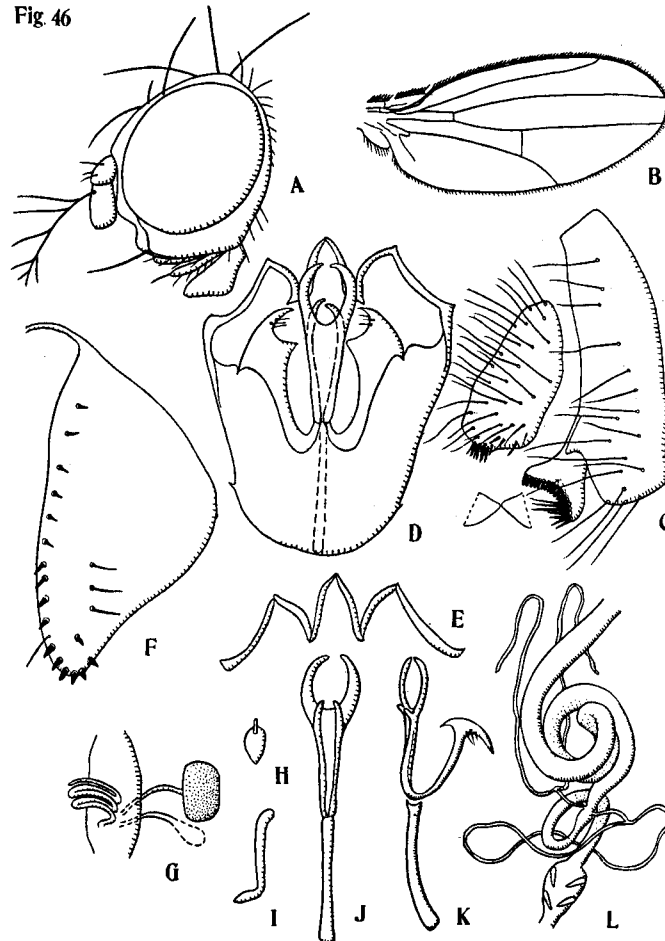


Fig. 46. *Drosophila (Hirtodrosophila) quadrivittata* sp. nov.

A. Head; B. Wing; C. Periphallallic organs (lateral aspect); D. Phallic organs (ventral aspect); E. Posterior parameres; F. Egg-guide; G. Female reproductive organs (ventral aspect); H. Ejaculatory apodeme (ventral aspect); I. do. (lateral aspect); J. Aedeagus (dorsal aspect); K. do. (lateral aspect); L. Digestive system (ventral aspect).

*Drosophila (Hirtodrosophila) nokogiri* sp. nov. Fig. 47.

Japanese name: Nokogiri-shōjobae.



Fig. 47

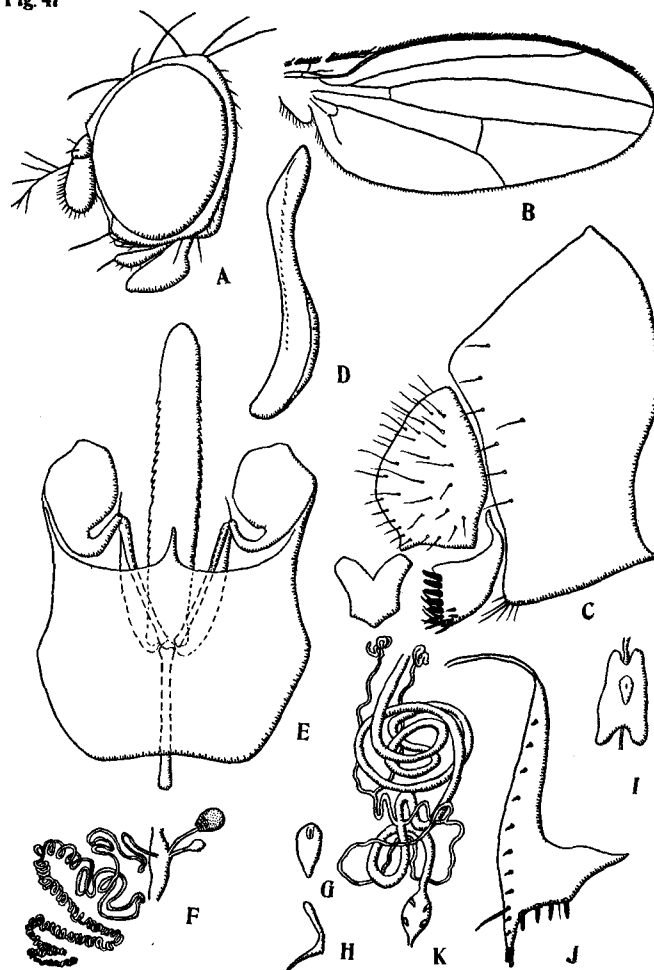


Fig. 47. *Drosophila (Hirtodrosophila) nokogiri* sp. nov.

A. Head; B. Wing; C. Peripheral phallic organs (lateral aspect); D. Aedeagus (lateral aspect); E. Phallic organs (ventral aspect); F. Female reproductive organs (ventral aspect); G. Ejaculatory apodeme (ventral aspect); H. do. (lateral aspect); I. Ejaculatory bulb (ventral aspect); J. Egg-guide; K. Digestive system (ventral aspect).

♂ and ♀: Body about 3.5 mm, reddish brown. Head (Fig. 47 A): Antenna yellowish brown, 3rd joint broad and large, with greyish long hairs. Arista with about 6 branches including a small fork, 1 below it. Eyes dark red, with minute reddish piles. Ocellar triangle and occiput black. Periorbits reddish brown. Carina short, low, and dark brown. Front orange brown, about  $\frac{3}{7}$  as broad as head-width, and with a few *fr*. Cheek dark yellow, about  $\frac{2}{3}$  as broad as the greatest diameter of eye. Clypeus brown. *orb*<sub>2</sub> about  $\frac{1}{3}$ - $\frac{1}{5}$  others, and inserted at the middle between *orb*<sub>1</sub> and *orb*<sub>3</sub>. Palpus pale yellowish brown, with only one or 2 prominent setae.

Mesonotum reddish brown, posteriorly slightly darker. Scutellum reddish brown. Thoracic pleura darker. *hu* 2, subequal. *ac* in 8-10 rows. Cross distance of *dc* about half the length distance. Anterior *scut* divergent. Sterno-index about 0.6.

Legs dark brown, femora and ultimate tarsal joints darker. Preapicals on hind tibia; apicals on middle. Wings (Fig. 47 B) slightly fuscous. Crossveins clear. C-index about 2.5; 4 V-index about 1.7; 4 C-index about 0.9; 5 X-index about 1.8. C1-bristles 2; C3-bristles on basal  $\frac{3}{5}$ . Halteres yellow.

Abdomen brown, each tergite with posterior band interrupted at middle, or not interrupted and medially and laterally projected forward to reach the anterior margin.

Peripheral phallic organs (Fig. 47 C): Genital arch black, broad, truncate below, and with about 7 short upper marginal hairs as well as about 5 short lower hairs. Clasper black, triangular, narrowing basally, and with about 5 black teeth in a straight row as well as about 10 stout setae. Anal plate black, nearly pentagonal, separated from genital arch, and with about 50 hairs. Decasternum black, thick, V-shaped.

Phallic organs (Fig. 47 D,E): Aedeagus orange brown, elongate, rod-shaped, and with finely serrate lateral margins. Anterior paramere brownish black, slender, fused to novasternum, apically with a few sensilla represented by pseudocanals. Novasternum dark brown, comma-shaped, and with a spine on the inner edge. Ventral fragma dark brown, quadrate. p.f.=abCDEf<sub>0</sub>g<sub>0</sub>HiklMn. PI=1.6.

Egg-guides (Fig. 47 J): Lobe yellow, obliquely truncate at tip, and with a few black stout marginal teeth arranged in a zigzag line near tip.

Internal structures (Fig. 47 F-I,K): Proximal intestine: C=4.5. Rectal papillae: R=2.4. Malpighian tubes with common stalks longer than usual, and branches comparatively short, posterior branches being completely looped. Ejaculatory bulb oblong, bilobed basally and apically, but without caeca. Ejaculatory apodeme with yellowish grey elliptical plate, which is pointed distally. Spermatheca yellowish brown, very large, and oval. Parovaria short. Ventral receptacle densely coiled about 120 times, proximal several coils large and loose.

Holotype: ♂, Akkeshi, Hokkaido, 1 ♂, 15 VIII '51 (Okada).

Allotype: ♀, Tōbetsu, Hokkaido, 17 VIII '51 M (Okada).

Paratypes: Asakawa, Tokyo, 1 ♀, 4 V '51; 1 ♀, 30 X '52 F (Ohba); 1 ♂, Sapporo, Hokkaido, 15 IX '53 S (Suzuki); 3 females, Kirishimayama, Kagoshima Pref., 22 IX '54 S.

Distribution: Hokkaido, Honshu (Kanto), Kyushu.

Feeding habits: SMF.

Relationships: Somewhat allied to *D. (H.) cinerea* Patterson & Wheeler, from N. America, but differs from it in having paler palpi, smaller 4 V- and 5 X-index, broader genital arch, as well as in having *ac* in more than 6 rows.

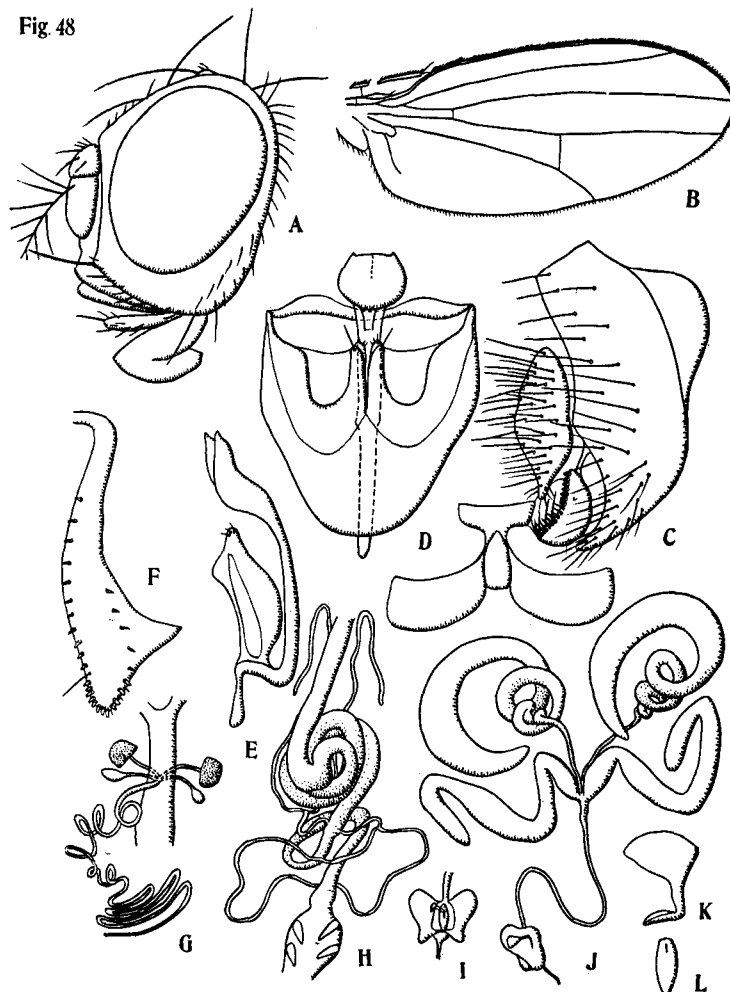


Fig. 48. *Drosophila (Hirtodrosophila)* sp. like *histrio*.

A. Head; B. Wing; C. Peripheral organs (lateral aspect); D. Phallic organs (ventral aspect); E. do., part (lateral aspect); F. Egg-guide; G. Female reproductive organs (ventral aspect); H. Digestive system; I. Ejaculatory bulb (ventral aspect); J. Male reproductive organs (ventral aspect); K. Ejaculatory apodeme (lateral aspect); L. do. (ventral aspect).

***Drosophila (Hirtodrosophila) sp. like histrio.*** Fig. 48.

Japanese name: Nise-ezoshōjōbae.

*Drosophila (Hirtodrosophila) sp. IX*, Suzuki, 1953. Zool. Mag., 64: 46.

♂ and ♀: General features are to be described by Okada & Kurokawa (1956). p.f.=aBCdEfg HIKlMn. PI=about 4.0. Proximal intestine: C=3.0. Rectal papillae: R=2.7.

Specimens examined: In Hokkaido: Akkeshi, 6 ♂♂ and 1 ♀, 12-18 VIII '53 FM (Moriwaki et al); Tôbetsu, 3 ♂♂ and 2 ♀♀, 17 VIII '51 F; Nakashibetsu, 16 VIII '51 F; Attoko, 3 ♂♂, 18 VIII '51 F (Okada and Kanehisa); Nishitappu, 8 ♂♂ and 1 ♀, 22 VIII '53 F (K. Moriwaki); Kurotake, 1 ♂ and 1 ♀, 9 VIII '53 F; Nopporo, 1 ♂, 23 VIII '51 M (Ohba); Imagane, 1 ♂ & 1 ♀, 2 VI '53 M (Suzuki); Sapporo, 1 ♂, 6 VII '53 M (Suzuki), 1 ♂, 19 VIII '53 M. Sukayu, Aomori Pref., 1 ♂, 22 VIII '51 F; Towada, Aomori Pref., 2 ♂♂ and 1 ♀, 23 VIII '52 F (Yoshida); Kinugawa, Tochigi Pref., 2 ♂♂, 1 VIII '53 F (Moriwaki & Yoshida); Hakamoriyama, Iwate Pref., 2 ♀♀, 7-11 V '52 F; Asakawa, Tokyo, 2 ♂♂ and 1 ♀, 27 V '52 F (Ohba); Kumotoriyama, Tokyo, 1-3 VI '52 MF, 20 ♂♂ and 4 ♀♀.

Distribution: Hokkaido, Honshu (Tohoku, Kanto).

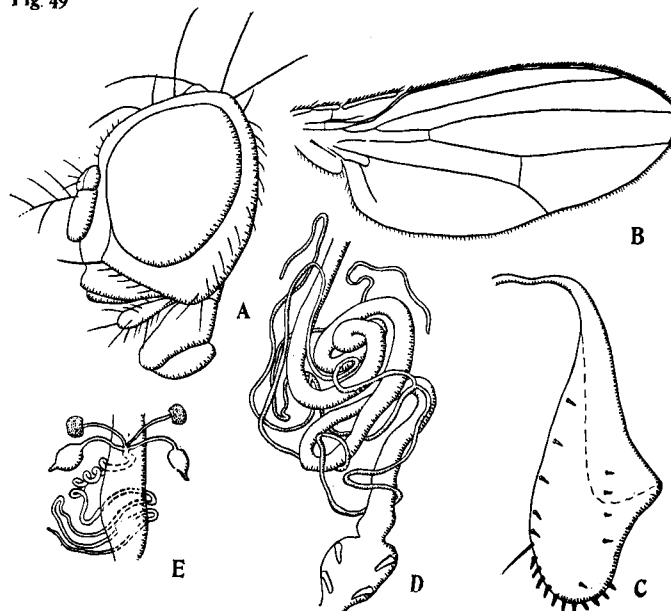
Feeding habits: FMS.

Remarks: Eggs, puparium, and chromosomes are to be briefly described in another paper (Okada & Kurokawa, 1956).

***Drosophila (Hirtodrosophila) asozana sp. nov.*** Fig. 49.

Japanese name: Yama-shōjōbae.

Fig 49



**Fig. 49.** *Drosophila (Hirtodrosophila) asozana sp. nov.*

A. Head; B. Wing; C. Egg-guide; D. Digestive system (ventral aspect); E. Female reproductive organs (dorsal aspect).

♀: Body about 3.7 mm, yellowish brown. Head (Fig. 49 A): Eyes red, very sparsely pilose. Antenna pale brown, 3rd joint black and finely pubescent. Arista unfortunately broken in the specimen examined. Palpus pale brown, slightly darker and broader at tip, and with about 2 prominent setae. *pvt* large. Front wider than long, about half as broad as width. Clypeus orange. Carina low, broad and pale brown. Cheek whitish yellow, darker above, and about 4/7 as broad as the greatest diameter of eye. Occiput black. *orb*<sub>2</sub> about 1/3 *orb*<sub>1</sub> and 2/3 *orb*<sub>3</sub>. Only one prominent *or*.

Mesonotum pale brown; pronotum black. Scutellum pale brown. Thoracic pleura paler. *hu* 2, long. *ac* in about 10 somewhat irregular rows. Anterior *dc* minute. Cross distance of *dc* about 3.5 times the length distance. Anterior *scut* Parallel. Sterno-index about 0.6.

Legs yellow. Preapicals on hind tibiae; apicals on middle. Wings (Fig. 49 B) hyaline, veins yellowish brown, anal vein well developed. Costa reaches the end of *m*. C-index about 3.5; 4 V-index about 1.6; 4 C-index about 0.7; 5 X-index about 0.8. C1-bristles 2; C3-bristles on basal 3/5. Halteres white.

Abdominal tergites yellow, each T with narrow non-interrupted black caudal band. Abdominal sternites yellowish grey.

Egg-guides (Fig. 49 C) : Lobes reddish brown, broad at tip, and with about 18 marginal as well as 5 discal black teeth. Basal isthmus darker, about 1/3 length of lobes.

Internal structures (Fig. 49 D,E) : Proximal intestine : C=3.0. Rectal papillae : R=3.0 Malpighian tubes with common stalks long, posterior branches probably contiguous to each other at tips. Spermatheca pale brown, apex flatten, and slightly broader than long. Parovaria longer than spermatheca, and with large and apically pointed knobs. Ventral receptacle with about 5 proximal kinky coils and about 2 distal long transverse folds.

Holotype : ♀, Aso, Kumamoto Pref., 28 IX '54 F (Okada).

Distribution : Kyushu.

Feeding habits : F.

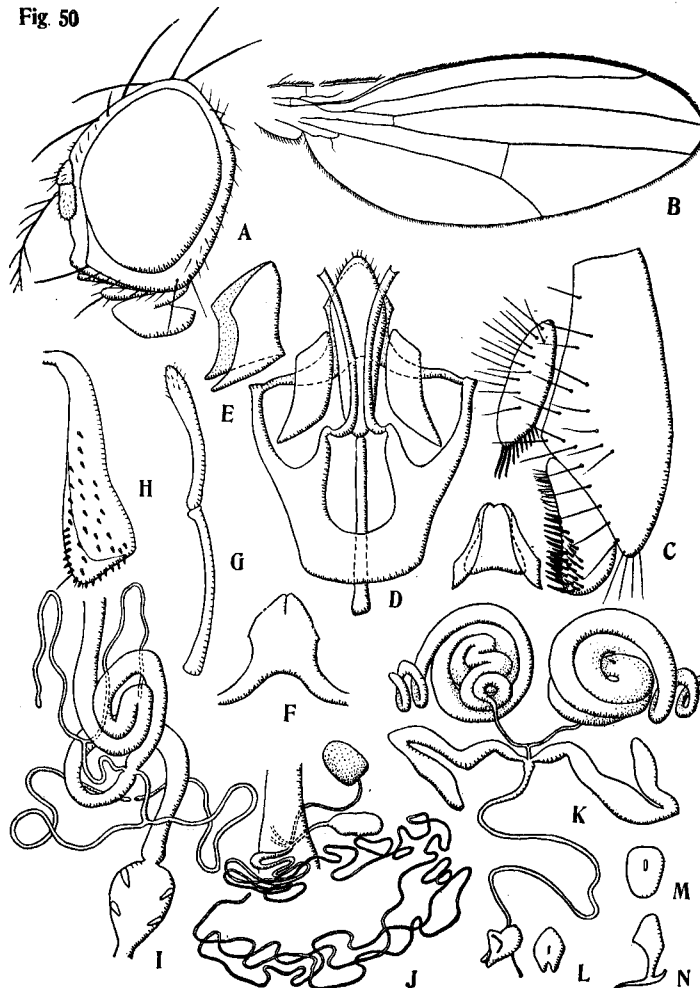
Relationships : Somewhat resembles the fore-going species, *D. (H.)* sp. like *histrion*, but differs from which in having uninterrupted abdominal bands, much rounded egg-guides, and fusiform parovaria.

***Drosophila (Hirtodrosophila) denticeps* Okada & Sasakawa, 1956 Fig. 50.**

Japanese name : Hitorishizuka-shōjōbae (Sasagawa, 1956).

*Drosophila (Hirtodrosophila) denticeps* Okada & Sasakawa, 1956. Akitu, 5: 26.

Fig. 50



**Fig. 50. *Drosophila (Hirtodrosophila) denticeps* Okada & Sasakawa.**

A. Head; B. Wing; C. Periphallic organs (lateral aspect); D. Phallic organs (ventral aspect); E. Posterior parameres (lateral aspect); F. do. (dorsal aspect); G. Aedeagus (lateral aspect); H. Egg-guide; I. Digestive system (ventral aspect); J. Female reproductive organs (ventral aspect); K. Male reproductive organs; L. Ejaculatory bulb (ventral aspect); M. Ejaculatory apodeme (ventral aspect); N. do. (lateral aspect).

♂ and ♀ : Body yellowish orange, about 3.0 mm. Head (Fig. 50 A) : Eye red, with short stout piles. Antenna with 3rd joint large, pubescent, and pale yellowish brown. Palpus yellow, with

only one prominent apical seta directed downward. Arista with about 8 branches including a small fork, one below it. Ocellar triangle and periorbits yellowish. Front yellow, about half as broad as head width. Cheek yellow, about 1/5 as broad as the greatest diameter of eye. Clypeus yellow, black above. Occiput black.  $orb_2$  very weak, about 1/5  $orb_3$ .  $or_2$  weak, about 1/4 vibrissa.

Mesonotum yellowish orange or yellowish brown, unicolorous. Scutellum same as mesonotum in coloration. Pleura slightly darker above.  $hu$  2, subequal.  $ac$  in 6 rows. Cross distance of  $dc$  about 5/3 the length distance. Sterno-index about 0.4.

Legs yellow, preapicals prominent on middle and hind tibiae, apicals on middle. Wings (Fig. 50 B) clear, veins yellow. Tip of  $r_{4+5}$  slightly pointed. Costa reaches  $m$ . C-index about 3.4; 4V-index about 1.6; 4C-index about 0.7; 5X-index about 1.5. C1-bristles 2, subequal; C3-bristles on basal 2/5 to 1/2. Halteres white.

Abdominal tergites each with narrow or broad caudal black band, deeply concave at middle. The band on 2T often interrupted at middle. Abdominal sternites pale yellow.

Periphallic organs (Fig. 50 C): Genital arch triangularly pointed below, pale brown and paler below, and with about 10 upper and 12 lower hairs. Clasper broad but short, slightly projected beyond tip of genital arch, with about 10 black pointed teeth arranged in a row, about 20 strong setae below teeth, and with a row of fine hairs on the upper half of distal margin. Anal plate pale yellow, oblong, with a row of about 10 strong black bristles on the apical margin, and with about 20 hairs. Decasternum orange brown, broaden and truncate below.

Phallic organs (Fig. 50 D-G): Aedeagus pale brown, fusiform, and apically with fine pubescence. Anterior paramere large, pale brown, pointed at both ends, and separated from aedeagus. Posterior parameres fused to each other to form a cross bar, which is medially swollen to be a quadrate plate, surrounding dorsal surface of aedeagus. Novasternum with median notch deep and broad, with submedian slender dark paired processes. Ventral fragma quadrate. p. f. = ABC'Def<sub>0</sub>g-HikLmN. PI = about 0.9.

Egg-guides (Fig. 50 H): Lobes dark brown, obliquely truncate at tip, with about 25 marginal black teeth as well as about 25 black (outer) or yellow (inner) discal teeth. Basal isthmus thick and short.

Internal structures (Fig. 50 I-N): Proximal intestine: C=2.0. Rectal papillae: R=2.0 or more. Malpighian tubes with common stalks moderate in length; posterior branches closely apposed to each other at tips. Testis pale yellow, with about 25 inner and about 4.5 outer coils, terminal 2 coils being smaller. Paragonia once folded. Ejaculatory bulb apically bilobed; ejaculatory apodeme with oval plate and proximally broaden stem. Spermatheca rounded elliptical, pale brown. Parovaria large and elliptical. Ventral receptacle slender and with about 30 loose folds.

Specimens examined: Azumayama, Fukushima Pref., 2 ♀♀, 14 VII '54 (Kotake). In Tokyo: Asakawa, 2 ♂♂ and 6 ♀♀, 20 V '51; Todoroki, 1 ♂, 27 XI '52 S; 1 ♂ and 1 ♀, 2 VI '52 T, Kumotoriyama, 2 ♂♂, 16 VII '53 S (Ohba); Hatano, Kanagawa Pref., 1 ♀, 2 V '55 (Sasakawa); Senjōdake, Nagano Pref., 1 ♀, 15 VII '53 (Kitagawa & Ono).

Distribution: Honshu (Tohoku, Kanto, Chubu).

Feeding habits: TS.

Remarks: Differs from ordinary members of the subgenus *Hirtodrosophila*, in having well developed preapical bristles on middle tibiae. Characteristic in having a pair of slender submedian processes of novasternum, similar as seen in *Scaptomyza disticha* (Duda) and *S. monticola* sp. nov., and also in having leaf-mining habits of the larvae, which has been reported by Sasakawa (in Okada & Sasakawa, 1956). Thus the present species should be regarded as a bridge between the genera *Drosophila* and *Scaptomyza*.

The larvae and puparium were described in detail by Sasakawa (in Okada & Sasakawa, 1956).

#### Subgenus *Dorsilopha* Sturtevant, 1942

Japanese name: Hyōmon-shōjōbae-azoku.

*Dorsilopha* Sturtevant, 1942. Univ. Texas Publ., 4213: 28; Patterson, 1943. Univ. Texas Publ., 4313: 63; Burla, 1951. Rev. Suis. Zool., 58: 75; Patterson & Stone, 1952. Evol. gen. Dros.: 10.

*Drosophila*, group E, Sturtevant, 1921. Carn. Inst. Publ., 301: 77 (part).

Orthotype: *Drosophila busckii* Coquillett, 1901.

#### *Drosophila* (*Dorsilopha*) *busckii* Coquillett, 1901 Fig. 51 F, G, I-M.

Japanese name: Hyōmon-shōjōbae (Kikkawa & Peng, 1938); Madara-syōjōbae (Chino & Kikkawa, 1934).

*Drosophila busckii* Coquillett, 1901. Ent. News, 12: 16; Sturtevant, 1921. Carn. Inst. Publ., 301: 77; Duba, 1924. Ent.

Meddel., 14: 301; Duda, 1924. Arch. Naturg., 90 A (3): 221, 251; Chino, 1927. Zool. Mag., 39: 473; Chino & Kikkawa, 1934. Shōjōbae no Iden to Jikkenho: 7; Duda, 1940. Ann. Mus. Nat. Hung., 33: 39; Peng, 1937. Annot. Zool., Japon., 16: 24; Kikkawa & Peng, 1938. Japan. Journ. Zool., 7: 541; Mizuno, 1952. Papers for Res. Genet., 3: 51; Kato & Hori, 1952. Sci. Rep. Tohoku Univ., 4th ser., 19: 231.

*Drosophila (Dorsilopha) busckii* Sturtevant, 1942. Univ. Texas. Publ., 4213: 29; Patterson, 1943. Univ. Texas Publ., 4313: 63; Patterson & Mainland, 1944. Univ. Texas Publ., 4445: 25; Hsu, 1949. Univ. Texas Publ., 4920: 92; Wheeler, 1949. Univ. Texas Publ., 4920: 171; Tan, Hsu, & Sheng, 1949. Univ. Texas Publ., 4920: 197; Burla, 1951. Rev. Suis. Zool., 58: 75; Shōgaki, 1952. Komai's Shōjōbae no Iden to Jikken: 19; Patterson & Stone, 1952. Evol. gen. Dros.: 10; Okada, 1953. Zool. Mag., 62: 280; Okada, 1955. Zool. Mag., 64: 106; Okada & Sasakawa, 1956. Akitu, 5: 26.

*Drosophila Buscki* (sic) Malloch, 1923. Proc. Linn. Soc. N.S. Wales, 48: 616; Duda, 1935. Die Fliegen, 58g: 77.

*Drosophila rubrostriata* Becker, 1908. Mitt. Zool. Mus., 4: 155.

*Drosophila plurilineata* Villeneuve, 1911. Wien. ent. Zeit., 30: 83.

♂ and ♀: General features as redescribed by Kikkawa & Peng (1938).

Periphallic organs: As described and figured by Hsu (1949).

Phallic organs (Fig. 51 L, M): Aedeagus pale yellowish grey, proximally narrowing, and apically with 4 pointed processes, 2 inner ones being longer. Anterior paramere fused to novasternum, with about 5 sensilla at tip. Posterior parameres absent. Novasternum pubescent, pale brown, and with 2 incurved subterminal spines on each plate. Ventral fragma pale brown, narrowly triangular. p. f. = aBcdEfg<sub>0</sub>HIklmn. PI = 3.5.

Egg-guides (Fig. 51 K): Lobe broad, yellowish brown, rounded at tip, and with about 16 black marginal teeth as well as a long subterminal hair. Basal isthmus narrow and short.

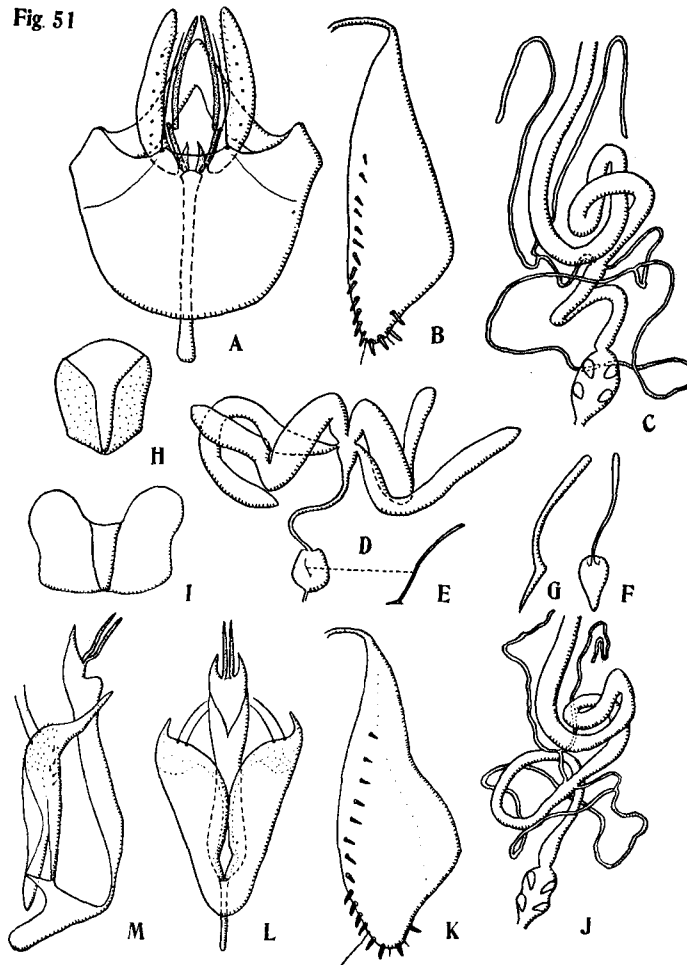


Fig. 51. *Drosophila (Paradrosophila) coracina* Kikkawa & Peng.

A. Phallic organs (ventral aspect); B. Egg-guide; C. Digestive system (ventral aspect); D. Male reproductive organs; E. Ejaculatory apodeme; H. Decasternum of male.

*Drosophila (Dorsilopha) busckii* Coquillett.

F. Ejaculatory apodeme (ventral aspect); G. do. (lateral aspect); I. Decasternum of male; J. Digestive system (ventral aspect); K. Egg-guide; L. Phallic organs (ventral aspect); M. do. (lateral aspect).

Internal structures (Fig. 51 J): Proximal intestine: C=1.5. Rectal papillae: R=about 2.0. Malpighian tubes with common stalks shorter and posterior branches completely looped. Ejaculatory apodeme with pointed oval plate and slender gently curved stem. Testis, spermatheca, ventral receptacle, and accessory glands as described and figured by Patterson (1943).

Specimens examined: In Tokyo: Shimouma, IV, V '51, X '53 FL (Moriwaki); Gōtokuji, I, III-VII, IX-XII '51-'53 FGSTL; Suginami, III '52, V, VII '51 FT (Ohnishi); Todoroki, IV, V '53 F (Toda); Meguro, VI, X '51 SF (Ohba); Sangenjaya, XI '53 G (Ikuma); Takagicho, IV '53 F (Toda); Kugayama, V '52; Kotaira, VII '53 (Saito); Aburatsubo, Kanagawa Pref., III '51, VI '52 (Ohba); Kumotoriyama, Tokyo, VII '53 G; Hakone, Kanagawa Pref., VIII '53 F (Toda); Tsuchiura, Chiba Pref., X '53 F (Kitagawa); Niihama, Chiba Pref., VI '53 (Toshioka); Tadeshina, Nagano Pref., VII '54 T; Shinkazawa, Gumma Pref., VII '54 F (Toda); Dazaifu, Fukuoka Pref., X '55 G.

Previous records from Japan: (Kikkawa & Peng, 1938) Sapporo, Innai, Niigata, Gotenba, Kyoto, Tsu, Oki, Tokuyama, Waihu, Amamiōshima, Shoutsu, Keijō.

Distribution: Hokkaido, Honshu (Tohoku, Chubu, Kinki, Chugoku), Kyushu, Amamiōshima, Korea; Orbis Terrarum.

Feeding habits: FGSTL. 6 females and one male were found on dead corpse of a wild duck at Niihama, Chiba Pref., VI '53 (Toshioka).

Remarks: Posterior Malpighian tubes do not surround gonads as a rule in this species, extremely diversified from the usual type of surrounding gonads in Drosophilidae (Okada, 1955).

The author could examine numerous specimens from Yond Dunc Po and Yongsan, Korea, VII, VIII '54 (Bullock, Newson). Larval leaf-mining habit of this species was reported by Sasakawa (in Okada & Sasakawa, 1956).

#### Subgenus *Paradrosophila* Duda, 1924

Japanese name: Mame-shōjōbae-azoku.

*Paradrosophila* Duda, 1924. Arch. Naturg., 90 A (3): 203; Duda, 1923. Ann. Mus. Nat. Hung., 20: 43; Sturtevant, 1927. Phil. Journ. Sci., 32: 366; Kikkawa & Peng, 1938. Japan. Journ. Zool., 7: 523.

*Pholadoris* Sturtevant, 1942. Univ. Texas Publ., 4213: 28; Patterson, 1943. Univ. Texas Publ., 4313: 60; Wheeler, 1949. Univ. Texas Publ., 4920: 143; Burla, 1951. Rev. Suisse. Zool., 58: 70; Patterson & Stone, 1952. Evol. gen. Dros.: 10; Burla, 1954. Rev. Suisse. Zool., 61: 115.

Logotype: *Drosophila pictipennis* Kertész, 1901. (designated by Sturtevant, 1927).

Judging from the facts that numerous species have so far been described from both the Oriental region by Duda (1923, 1924) in terms of *Paradrosophila* and the Ethiopian region by Burla (1954) in terms of *Pholadoris*, and that Sturtevant (1942) did not compare his *Pholadoris* to Duda's *Paradrosophila*, it seems to be valid to treat *Pholadoris* as synonymous with *Paradrosophila*. Wheeler (1949) established 2 species-groups in the subgenus *Pholadoris*: *victoria* and *mirim* species-groups. Mather (1954, 1955) proposed to add 3 new species-groups: *coracina*, *maculosa*, and *levis* groups, Burla (1954) added *saba* group and changed the group-name "*mirim*" as "*latifasciaeformis*".

#### Key to Japanese species of the subgenus *Paradrosophila*

1. Body yellowish. Periorbits without silvery stripes. C-index about 3.0.....*D. (P.) puncticeps* sp. nov.  
Body blackish. C-index less than 2.0.....2.
2. Front black. Periorbits without silvery stripes.....*D. (P.) coracina* Kikkawa & Peng.  
Front dark reddish brown. Periorbits with narrow longitudinal stripes. ....*D. (P.) rufifrons* Loew.

#### Key to Japanese species of the subgenus *Paradrosophila*, with regard to the periphallic organs

1. Heel rectangular. Clasper teeth distributed on entire length of clasper.....*D. (P.) coracina* Kikkawa & Peng.  
Heel acutely projected cephalad. Clasper teeth not on entire length.....2.
2. Lower portion of genital arch with about 25 hairs.....*D. (P.) rufifrons* Loew: European form.  
Lower portion of genital arch with about 15 hairs.....*D. (P.) rufifrons* Loew: Japanese form.

#### Key to Japanese species of the subgenus *Paradrosophila*, with regard to the phallic organs

1. Aedeagus not hairy. Novasternum with a pair of submedian spines.....*D. (P.) coracina* Kikkawa & Peng.  
Aedeagus hairy. Novasternum with a few pairs of submedian spines.....2.

2. Aedeagus densely hairy. Anterior parameres slender.....*D. (P.) rufifrons* Loew: European form.  
Aedeagus slightly hairy. Anterior parameres thick.....*D. (P.) rufifrons* Loew: Japanese form.

**Key to Japanese species of the subgenus *Paradrosophila*,  
with regard to the egg-guides**

1. Lobe covered with about 170 minute teeth on almost entire surface, and without subterminal hair.....*D. (P.) puncticeps* sp. nov.  
Lobe with less than 30 teeth around margin, and with subterminal hair.....2.  
2. Teeth about 16, distributed on the distal 2/3 of lobe.....*D. (P.) coracina* Kikkawa & Peng.  
Teeth more than 20, distributed on the distal 4/5 of lobe.....*D. (P.) rufifrons* Loew.

***Drosophila (Paradrosophila) coracina* Kikkawa & Peng, 1938 Fig. 51 A-E, H.**

Japanese name: Kurotsuya-shōjōbae (Kikkawa & Peng, 1938).

*Drosophila (Paradrosophila) coracina* Kikkawa & Peng, 1938. Japan. Journ. Zool., 7: 523.

*Drosophila (Pholadoris) coracina* Sturtevant, 1942. Univ. Texas Publ., 4213: 28; Hsu, 1949. Univ. Texas Publ., 4920: 92; Wheeler, 1949. Univ. Texas Publ., 4920: 147, 170; Tan, Hsu & Sheng, 1949. Univ. Texas Publ., 4920: 197; Shōgaki, 1952. Komai's Shōjōbae no Iden to Jikken: 19; Patterson & Stone, 1952. Evol. gen. Dros.: 10; Okada, 1953. Zool. Mag., 62: 284; Okada, 1954. Japan. Journ. Appl. Zool., 19: 79; Okada, 1955. Zool. Mag., 64: 107.

*Drosophila coracina* Mizuno, 1952. Paper for Res. Genet., 3: 51; Ohba, 1954. Kagaku, 24: 130; Suzuki, 1955. Zool. Mag., 64: 46; Ishihara, 1955. Zool. Mag., 64: 85.

*Drosophila* sp., *melanica* group III, Suzuki, 1955. Zool. Mag., 64: 46.

♂ and ♀: Wing with C1-bristles 2; C3-bristles on basal 4/5. Sterno-index about 0.9. *hu* 2, long and subequal. Cross distance of *dc* nearly thrice the length distance. Other general structures as described by Kikkawa & Peng (1938).

Periphallic organs: As described and figured by Hsu (1949). Decasternum hexagonal, laterally dark.

Phallic organs (Fig. 51 A): Aedeagus black, narrow, bifid, and basally geniculated. Anterior paramere black, slightly longer than aedeagus, finely pubescent, laterally compressed, and proximally broaden, and with about 7 sensilla arranged in a row along almost entire length. Posterior parameres yellowish brown, fused to each other to form a broad V-shaped arch. Novasternum with a pair of long submedian spines. Ventral fragma as broad as long, rounded at tip, and dark brown. p. f. = ABCDEFgHIKLMN. PI = 0.6.

Egg-guides (Fig. 51 B): Lobes yellowish orange, somewhat narrowly projected caudad, with about 17 marginal and 1 discal yellowish orange pointed teeth. Basal isthmus narrow and comparatively long.

Internal structures (Fig. 51 C-E, H): Proximal intestine: C = 2.0. Rectal papillae: R = 1.5. Malpighian tubes with common stalks fairly long, and the posterior branches apposed at tips. Male reproductive organs figured by Kikkawa & Peng (1938). Testis orange red, broad, elliptical, and contiguous to broad and short seminal vesicle. Paragonia once folded, nearly as long as testis. Ejaculatory bulb without caeca; ejaculatory apodeme with very slender gently curved stem and minute plate. Spermatheca black and hemispherical. Ventral receptacle minute, only slightly curved at base. Parovaria with rounded tip.

Specimens examined: In Hokkaido: Akkeshi, VIII '51 F; Attoko, VIII '51; Nakashibetsu, VIII '51 F; Tōbetsu, VIII '51 F; Sōunkyo, VIII '53; Kotoni, VIII '51 (Kanehisa); Sapporo, VII '50 (Mizuno). In Tokyo: Setagaya, III-IX '51-'53 FGTL; Aoyama, X '52 (Toda); Suginami, III '52 T, VI, VII, IX '51 T, IX '51 F (Ohnishi); Inokashira, V '52 F; Kunitachi, VI, VII '52 TFG; Meguro, VI '51 F (Ohba); Kotaira, VII '53 S (Saito); Asakawa, III-VI, IX '51-'53 F (Moriwaki et al); Kumotoriyama, VI '52, VII '53, VII '54 F (Kurokawa et al). Ikuta, Kanagawa Pref., XI '51, XI '53 S; Aburatsubo, Kanagawa Pref., V '51 S; Hatano, Kanagawa Pref., VI '51 (Kurokawa); Kinugawa, Gumma Pref., VIII '53 F (Moriwaki & Yoshida); Komayu, Nagano Pref., VII '52 F (Kurokawa); Hikosan, Fukuoka Pref., X '51 F (Ohba); Aso, Kumamoto Pref., IX '54 F; Kirishimayama, Kagoshima Pref., IX '54 FS; Kaimondake, Kagoshima Pref., IX '54 F.

Previous records from Japan: (Kikkawa & Peng, 1938) Shimoda, Kyoto; (Mizuno, 1953; Suzuki, 1955; Ishihara, 1955) Sapporo; (Ohba, 1954) Akkeshi, Hakkoda, Asakawa.

Distribution: Hokkaido, Honshu (Tohoku, Kanto, Chubu, Kinki), Kyushu, China.

Feeding habits: FTSGL.

Remarks: Wheeler (1949) mentioned that the position of the present species among the subgenus is still obscure due to the lack of information about color of larvae, anterior *scut*, common stalks of Malpighian tubes etc., and suggested it to represent still another species-group paralleled to *victoria* and *mirim* groups. The features in question have been examined in detail, and



are found to be intermediate between *victoria* and *mirim* types; broad cheek, blackish body, divergent anterior *scut*, white larvae with pale hooklets, etc. alike in *victoria* group; *ac* in 8 rows, long common stalks of Malpighian tubes, genital arch without horn-like process at heel and with slightly hairy lower half, smaller clasper having only a few fine hairs, etc. as are found in *mirim* group.

***Drosophila (Paradrosophila) rufifrons* Loew, 1873 Fig. 52.**

Japanese name: Ginsuji-shōjōbae.

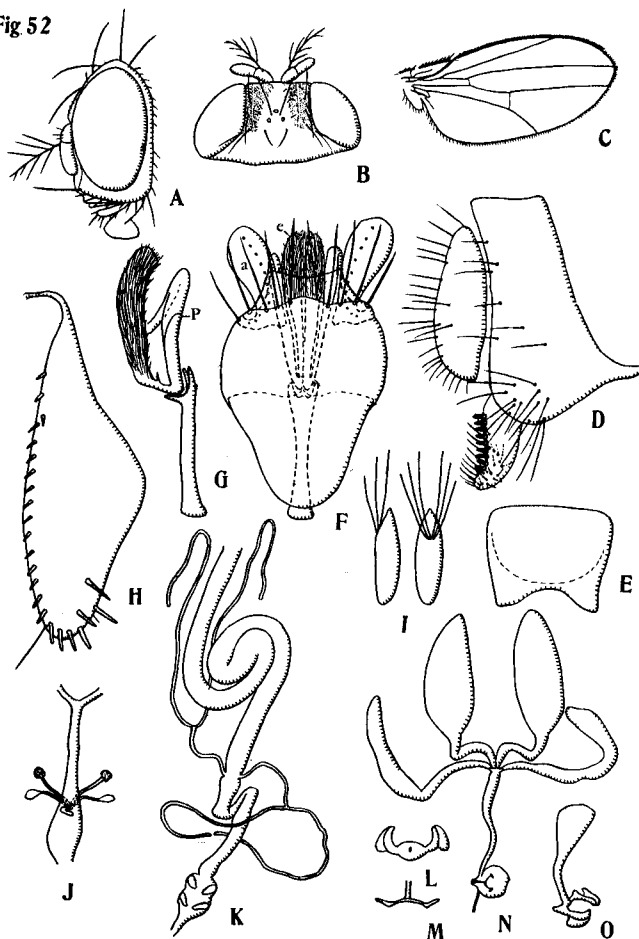
*Drosophila rufifrons* Loew, 1873. Berl. ent. Zeit., 17: 50; Duda, 1924. Arch. Naturg., 90 A (3): 222; Duda, 1924. Ent. Meddel., 14: 302; Duda, 1935. Die Fliegen, 58 g: 94; Herting, 1953. Beitr. Ent., 3: 167.

*Drosophila nitens* Buzzati, 1943. Rend. R. Inst. Lomb. d. Sci. e Lettr., 77: 2; Burla, 1948. Rev. Suiss. Zool., 55: 70 (teste Herting, 1943).

*Drosophila (Pholadoris) nitens* Hsu, 1949. Univ. Texas Publ., 4920: 91; Wheeler, 1949. Univ. Texas Publ., 4920: 147, 170; Burla, 1951. Rev. Suis. Zool., 58: 70; Patterson & Stone, 1952. Evol. gen. Dros.: 10; Okada, 1955. Zool. Mag., 64: 107 (?).

*Drosophila (Pholadoris)* sp. like *D. lebanonensis* Wheeler, Okada, 1953. Zool. Mag., 62: 284; Okada, 1955. Zool. Mag., 64: 111.

Fig 52



**Fig. 52. *Drosophila (Paradrosophila) rufifrons* Loew.**

A. Head; B. do. (dorsal aspect); C. Wing; D. Periphallallic organs (lateral aspect); E. Decasternum of male; F. Phallic organs (ventral aspect); G. do. (lateral aspect); H. Egg-guide; I. Female reproductive organs (ventral aspect); J. Digestive system (ventral aspect); K. Ejaculatory apodeme (ventral aspect); L. Ejaculatory apodeme (cephalic aspect); M. Male reproductive organs; N. Ejaculatory apodeme (ventral aspect); O. Ejaculatory apodeme (ventral aspect).

♂ and ♀: Body about 2.0 mm, glossy black. Head (Fig. 52 A, B): Antenna brown; arista with about 8 branches including minute terminal fork, about 3 below it. Front dark reddish brown, about 2/5 as broad as head width, and with a few *fr*. Ocellar triangle and periorbits glossy black. *orb*<sub>2</sub> minute, about 1/6 *orb*<sub>1</sub>. A narrow silvery line is present on each periorbit slightly inside and parallel to eye margin. *or*<sub>2</sub> fine, about 1/4 vibrissa. Palpus greyish brown, with a few prominent setae. Carina black, somewhat narrow and high, and broaden below. Clypeus black. Cheek black, posteriorly dark brown, and about 1/6 as broad as the greatest diameter of eye.

Eye dark red, with short black piles.

Mesonotum glossy black, somewhat pollinose. *ac* in 6 rows. Cross distance of *dc* slightly longer than the length distance. Anterior *scut* divergent. Sterno-index about 0.8. Thoracic pleura black.

Legs dark brown, femora black. Apicals on fore and middle tibiae; preapicals on all three. Wings (Fig. 52 C) transparent. Costa reaches tip of *m*. C-index about 1.6; 4V-index about 2.4; 4C-index about 1.6; 5X-index about 2.1. C1-bristles 2; C3-bristles on basal 2/3. Halteres pale yellow.

Abdomen with tergites glossy black; pleura white, and sternites pale brown, 3-6 S in female white.

Periphallic organs (Fig. 52 D, E): Genital arch broad, dark brown, rounded below, and with a strongly pointed process at heel; the upper portion with about 4 hairs; lower portion with about 15 hairs. Clasper dark brown, oblong, with about 9 black large teeth arranged in a straight row, which does not reach the lower tip of clasper. Inner surface of clasper setigerous. Anal plate dark brown, separated from genital arch, oblong, narrowing below, and with about 25 long hairs and numerous short apical hairs.

Phallic organs (Fig. 52 F, G): Dark brown in general. Aedeagus bifid, oblong and with numerous hairy structures tightly entangled. Anterior paramere orange brown, as long as aedeagus, and with a row of about 10 sensilla covering entire length of the paramere. Posterior paramere rod-like, contiguous to the base of aedeagus. Apodeme of aedeagus bifid basally, and with a short vertical rod. Novasternum broad, quadrate, and with about 5 pairs of long stout submedian spines. Ventral fragma triangular. *p. f.* = ABCDEFGHIKLM'N. *PI* = 0.8.

Egg-guides (Fig. 52 H): As figured by Burla (1951). Lobe yellowish brown, fusiform, rounded at tip, and with about 20 marginal and 2 discal yellowish brown teeth, ultimate teeth being longest. Basal isthmus pale brown, and narrow.

Internal structures (Fig. 52 J-O): Proximal intestine: *C* = 2.0. Rectal papillae: *R* = 1.5 or more. Malpighian tubes with common stalks fairly long; posterior branches closely apposed at tips. Testis elliptical, without coils, dark yellowish brown, and basally narrowing and contiguous to a curved narrow seminal vesicle. Paragonia slender, rectangularly curved at meson. Ejaculatory bulb globular, without caeca; ejaculatory apodeme with brown U-shaped plate and apically dilated black stem. Spermatheca hemispherical, dark brown. Parovaria with round tip. Ventral receptacle minute, U-shaped.

Specimens examined: In Tokyo: Suginami, 1 ♂ and 1 ♀, 18 VI '51 T (Ohnishi); 1 ♂, 11 VII '51 T (Ohnishi); 6 ♂♂ and 4 ♀♀, 27-30 VII '51 T (Ohnishi); 1 ♂, 18 V '52 T (Ohnishi); Kunitachi, 5 ♂♂ and 4 ♀♀, 17 VI '52 T; Asakawa, Tokyo, 1 ♂ and 1 ♀, 23 VI '51 F.

Distribution: Honshu (Kanto), Europe.

Feeding habits: TF.

Remarks: Very slightly differs from the European form in having darker wing, fewer submedian spines of novasternum, wider range of C3-bristles, etc. Egg (Fig. 52 I) with 6-7 filaments. Larvae skip. Majority of specimens examined are collected from tree-blood of *Quercus acutissima* Carruth in early summer (Ohnishi). Belongs to the *victoria* species-group (teste wheeler, 1949 in terms of *nitens*).

***Drosophila (Paradrosophila) puncticeps* sp. nov. Fig. 53.**

Japanese name: Akazu-shōjōbae.

♀: Body about 3.0 mm., yellowish. Head (Fig. 53 A): Occiput black. Antenna pale yellowish orange. Arista with 5 or 6 branches including a minute fork, 1 below it. Palpus pale yellow, slender, and with only one prominent apical seta. Eyes dark red, with fine pale piles. Ocellar triangle yellow, and black at the inner margins of ocelli. Periorbits yellow. Carina yellow, high, narrow, and long. Front bright red, about 3/7 as broad as the head width, and with irregularly arranged *fr*. Cheek pale yellow, about 1/14 the greatest diameter of eye. *orb*<sub>2</sub> about 1/4 or less of *orb*<sub>1</sub>. *or*<sub>2</sub> minute, with only one very long *or*.

Mesonotum (Fig. 53 C) pale orange yellow, unicolorous. Scutellum pale yellow. Thoracic pleura yellow, somewhat dark at the base of wings. *hu* 2, subequal, and long. 2 long *prsc. ac* in 8 rows. Cross distance of *dc* little more than twice the length distance. Anterior *scut* slightly divergent. Sterno-index about 0.8. Median sternopleural bristle as long as posterior one.

Legs pale yellow. Preapicals on all three tibiae; apicals on middle. Wings (Fig. 53 B)

Fig 53

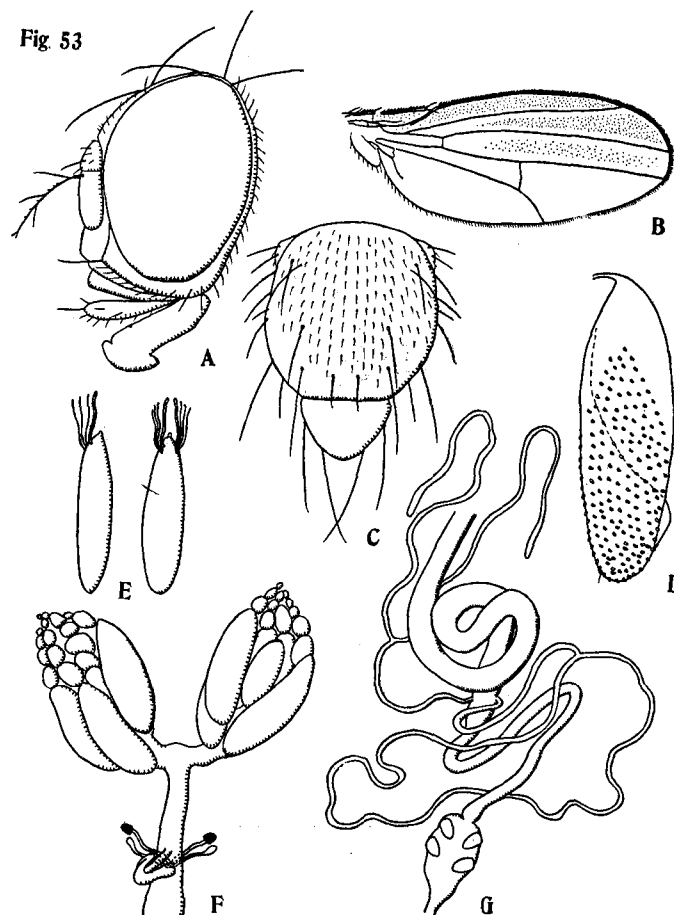


Fig. 53. *Drosophila (Paradrosophila) puncticeps* sp. nov.

A. Head; B. Wing; C. Mesonotum; D. Egg-guide; E. Eggs; F. Female reproductive organs (ventral aspect); G. Digestive system (ventral aspect).

somewhat brownish along costa; veins brown; costa reaches end of *m*. Crossveins clear. C-index about 3.0; 4V-index about 1.9; 4C-index about 0.9; 5X-index about 1.4. C1-bristles 2, subequal; C3-bristles on basal about 2/5. Halteres yellow.

Abdomen yellow, with small indistinct paired dark patches on the posterior margins of 1-4T.

Egg-guides (Fig. 53 D): Lobe yellow, slender, with numerous (ca 150) brown minute bristles all over the surface. Basal isthmus very short, about 1/12 length of lobe.

Internal structures (Fig. 53 F-G): Proximal intestine: C=2.0. Rectal papillae oval: R=1.4. Malpighian tubes with common stalks rather long, and posterior branches fused to each other at tips. Spermatheca minute, quadrate, and slightly thicker than stem. Parovaria with small round knobs. Ventral receptacle small, twice folded.

Holotype: ♀, Takamizuyama, Tokyo, 29 IV '53 S (Okada).

Paratype: 1 ♀, Todoroki, Tokyo, 28 IV '53 S (Okada).

Distribution: Honshu (Kanto).

Feeding habits: S.

Relationships: Somewhat related to *D. (P.) dorsata* Duda, from South Asia, in having minute *or*<sub>2</sub>, hyaline wings, and yellow mesonotum, but differs from it in the lesser number of branches of arista and well developed *prsc*. Characteristic in having punctuated egg-guides, similar as seen in *Scaptomyza graminum* (Fallén), and also in having 3 long sternopleurals, alike in *Drosophila (Drosophila)* sp. of *quinaria* section. Probably belongs to the *latifasciaeformis* species-group.

#### Subgenus *Sophophora* Sturtevant, 1939

Japanese name: Shima-shōjōbae-azoku.

*Sophophora* Sturtevant, 1939. Proc. Nat. Acad. Sci., 25: 139; Sturtevant, 1940. Genetics, 25: 246; Sturtevant, 1942.

Univ. Texas Publ., 5213: 28; Patterson, 1943. Univ. Texas Publ., 4313: 66; Weeeler, 1949. Univ. Texas Publ., 4920: 174; Burla, 1951. Rev. Suis. Zool., 58: 76; Patterson & Stone, 1952. Evol. gen. Dros.: 14; Burla, 1954. Rev.

*Drosophila*, group A and group F, Sturtevant, 1921. Carn. Inst. Publ., 301: 40, 78 (part).

Logotype: *Drosophila melanogaster* Meigen, 1830.

Sturtevant (1940) recognized 4 specie-groups (1-4) in this subgenus, and he (1942) named them *saltans*, *willistoni*, *melanogaster*, and *obscura* groups respectively. Wheeler (1949) added *nannoptera* and *alagitans* groups to the subgenus; the latter group had been placed by Patterson & Mainland (1944) in the subgenus *Drosophila*. Patterson & Stone (1952) enumerated 7 groups including *bromeriae* group. Another group, *fima*, was established by Burla (1954). Mather (1955) added *dispar* group. In Japan *melanogaster* and *obscura* groups have so far been known to occur, the former being exceedingly rich in species, obviously richer than in any other locality of the world, so far as the author is aware.

# Key to Japanese species-groups, species-subgroups, and species of the subgenus *Sophophora*

- ① Blackish species. Testis not or only slightly coiled. Ventral receptacle usually short. .... *obscura* species-group. 2.
- Usually yellowish species. Testis with well developed coilings. Ventral receptacle usually long. .... *melanogaster* species-group. ④.
2. ac in 6 rows. Sex-comb with 1 or 2 teeth. Genital arch with truncate toe. Clasper with teeth. .... *D. (S.)* sp. cf. *helvetica* Burla.
- ac in 8 rows at least before the level of anterior dc. Sex-comb with more than 5 teeth. Genital arch with tapering toe. .... 3.
3. Abdomen proximally pale. Sex-comb large, covering almost entire length of the tarsal joints. Clasper without teeth. .... *D. (S.) alpina* Burla.
- Abdomen proximally dark. Sex-comb smaller, not covering entire length of the tarsal joints. Clasper with teeth. .... *D. (S.) bifasciata* Pomini.
- ④. *orb*<sub>2</sub> minute, 1/5 as long as *orb*<sub>1</sub>. .... *nipponica* subgroup. 5.
- orb*<sub>2</sub> larger, about 1/3 or more of *orb*<sub>1</sub>. .... ⑥.
5. Palpus with a few prominent setae. .... *D. (S.) nipponica* Kikkawa & Peng.
- Palpus with only one prominent seta. .... *D. (S.) magnipunctinata* sp. nov.
- ⑥. Palpus with a few prominent setae. .... *melanogaster* subgroup. 7.
- Palpus with only one prominent seta. .... ⑧.
7. C3-bristles on basal 2/5. .... *D. (S.) simulans* Sturtevant.
- C3-bristles on basal 1/4. .... *D. (S.) melanogaster* Meigen.
8. C3-bristles on basal 1/3. .... 9.
- C3-bristles on basal 1/2. .... ⑩.
9. Male wing apically with black spot. Female egg-guide narrow and apically pointed. .... *suzukii* subgroup, excl. *unipectinata* Duda. 10.
- Male wing apically without black spot. Female egg-guide broad and apically rounded. .... ⑪.
- ⑩. C-index about 2.0. Black spot of male wing somewhat fusiform, not truncate at its proximal margin. Sex-comb of fore metatarsus in 2 transverse rows. Egg-guide teeth on upper margin as stout as that on lower margin. .... *D. (S.) pulchrella* Tan, Hsu, & Sheng.
- C-index about 3.5. Black spot of male wing round and truncate at its proximal margin. Sex-comb of fore metatarsus in one transverse row. Egg-guide teeth on upper margin much weaker than that on lower margin. .... *D. (S.) suzukii* (Matsumura).
11. *or*<sub>2</sub> fine, less than 1/3 length of vibrissa. Sex-comb large on metatarsus, absent on 2nd tarsal joint. .... *D. (S.) unipectinata* Duda.
- or*<sub>2</sub> larger, 1/2 or more of vibrissa. Sex-comb minute on each of 1st and 2nd tarsal joints. .... 12.
12. A black spot present in the groove located on the posterior base of fore coxa. Posterior paramere with along basal branch. .... *D. (S.) lutea* Kikkawa & Peng.
- No such black spot present. Posterior paramere with a minute basal branch. .... *D. (S.) takahashii* Sturtevant.
13. C-index about 1.2. Sex-combs small. .... *ananassae* subgroup. 14. — 15.
- C-index about 2.0. Sex-combs larger. .... 15.
14. *or*<sub>2</sub> about 1/2 vibrissa. .... *D. (S.) ananassae* (Doleschall).
- or*<sub>2</sub> about 1/3 vibrissa. .... *D. (S.) bipectinata* Duda.
15. Thoracic pleura with a longitudinal black stripe. 5X-index about 3.0. .... *D. (S.) rufa* Kikkawa & Peng.
- Thoracic pleura without such stripe. 5X-index less than 2.5. .... 16.
16. 5X-index about 1.5. Sex-combs extend beyond tips of the tarsal joints themselves. .... *ficusphila* subgroup: *D. (S.) ficusphila* Kikkawa & Peng.
- 5X-index about 2.0 or more. Sex-combs not extend beyond tips of the tarsal joints themselves. .... *montium* subgroup. 17.
17. C3-bristles on basal 3/5. Face yellow in both sexes. .... *D. (S.) kikkawai* Burla.
- C3-bristles on basal 1/2. Face white in male, yellow in female. .... *D. (S.) auraria* Peng. 18.
18. Hexasternum of male bare and glossy. .... Type B.
- Hexasternum of male hairy and mat. .... 19.

19. Hexasternum of male with more than 10 hairs.....Type A.  
Hexasternum of male with only a few hairs.....Type C.

**Key to Japanese species-groups, species-subgroups, and species of the subgenus *Sophophora*, with regard to the peripallic organs**

1. Clasper without teeth or with primary teeth arranged in a row, not divided into 2 groups. No secondary clasper. Anal plate without heavy bristles.....*obscura* species-group...2.  
Clasper with primary teeth arranged in irregular rows, often divided into 2 groups, or secondary clasper present, or anal plate often with heavy bristles.....*melanogaster* species-group...4.
2. Clasper without teeth.....*D. (S.) alpina* Burla.  
Clasper with teeth.....3.
3. Genital arch pointed at lower tip. Clasper teeth not reach the lower tip of clasper.....*D. (S.) bifasciata* Pomini.  
Genital arch somewhat rounded at lower tip. Clasper teeth reach the lower tip of clasper.....*D. (S.)* sp. cf. *helvetica* Burla.
4. Genital arch with toe narrowly pointed and curved caudad.....*suzukii* subgroup...5.  
Genital arch with toe not narrowly pointed.....7.
5. Lower tip of anal plate narrow, without thick short hairs.....*D. (S.) unipunctinata* Duda.  
Lower tip of anal plate with thick short hairs.....6.
6. Anal plate pointed below. Lower clasper elongate below.....*D. (S.) suzukii* (Matsumura).  
Anal plate truncate below. Lower clasper slightly narrowing below.....*D. (S.) pulchrella* Tan, Hsu, & Sheng.
7. Lower tip of genital arch rectangularly bent caudad.....8.  
Lower tip of genital arch not rectangularly bent caudad. Clasper fused to anal plate. Anal plate with short hairs below.....10.
8. Anal plate with a black pointed projection below.....*ficuspshila* subgroup.....*D. (S.) ficuspshila* Kikkawa & Peng.  
Anal plate without such projection.....*takahashii* subgroup...9.
9. Clasper with about 2 or 3 secondary teeth.....*D. (S.) takahashii* Sturtevant.  
Clasper with about 4 to 6 secondary teeth.....*D. (S.) lutea* Kikkawa & Peng.
10. Clasper one. Genital arch with round process at middle of posterior margin.....*melanogaster* subgroup...11.  
Clasper two (primary and secondary), if one, anal plate with a bundle of stout black processes below.....*montium* series...12.
11. Genital arch with triangular flap on caudal margin.....*D. (S.) melanogaster* Meigen.  
Genital arch with semicircular flap on caudal margin.....*D. (S.) simulans* Sturtevant.
12. Clasper one. A bundle of stout black projections at the lower tip of anal plate.....*nipponica* subgroup...13.  
Claspers two. No such projections at the lower tip of anal plate.....14.
13. Genital arch truncate below. Upper clasper attached to the lower subapical margin of anal plate. Lower clasper with about 15 teeth and without numerous discal setae.....*D. (S.) nipponica* Kikkawa & Peng.  
Genital arch weakly pointed below. Upper clasper attached to the lower tip of anal plate. Lower clasper with about 20 teeth as well as about 20 discal thick setae.....*D. (S.) manipsectinata* sp. nov.
14. Lower clasper with teeth divided into 2 separate groups.....*ananassae* subgroup...15.  
Lower clasper with teeth not divided into 2 separate groups.....*montium* subgroup...16.
15. Genital arch with caudal flap rounded. Lower clasper with about 5 upper and 4 lower teeth.....*D. (S.) ananassae* (Dolschall).  
Genital arch with caudal flap triangularly pointed. Lower clasper with about 2 upper and 3 lower teeth.....*D. (S.) bipsectinata* Duda.
16. Upper clasper separated from anal plate.....*D. (S.) kikkawai* Burla.  
Upper clasper fused to anal plate.....17.
17. Caudal flap of genital arch lowly convexed.....*D. (S.) rufa* Kikkawa & Peng.  
Caudal flap of genital arch highly projected.....*D. (S.) auraria* Peng...18.
18. Caudal flap of genital arch entirely pale yellow, and obtusely pointed. Decasternum with lateral margins convergent distally and strongly divergent at tips.....Type B.  
Caudal flap of genital arch apically dark brown, and acutely pointed. Decasternum with lateral margins parallel or gently sinuate, and apically weakly divergent.....19.
19. Caudal flap of genital arch less sharply pointed. Decasternum with lateral margins gently sinuate.....Type A.  
Caudal flap of genital arch very sharply pointed. Decasternum broad, with lateral margins parallel.....Type C.

**Key to Japanese species-groups, species-subgroups, and species of the subgenus *Sophophora*, with regard to the phallic organs**

1. Anterior paramere pale brown and with sensilla arranged in a row covering entire length.....*obscura* species-group...2.  
Anterior paramere dark brownish black, with sensilla constricted either at meson or at distal or proximal

- end. .... *melanogaster* species-group...4.
2. Aedeagus subapically with fine serrations. .... *D. (S.) alpina* Burla.  
Aedeagus subapically without fine serrations. ....3.
3. Aedeagus slightly dilated at apex. .... *D. (S.) bifasciata* Pomini.  
Aedeagus simply pointed at apex. .... *D. (S.)* sp. cf. *helvetica* Burla.
4. Posterior paramere without branches. ....5.  
Posterior paramere with branches. ....16.
5. Aedeagus apparently bifid. Anterior paramere large. Aedeagus with branches, if without branches the posterior parameres not contiguous to each other. .... *suzukii* subgroup...6.  
Aedeagus apparently bifid and anterior paramere small, or aedeagus not bifid and anterior paramere large. Aedeagus without branches, if with branches, posterior parameres contiguous to each other. .... *montium* series...8.
6. Aedeagus with prominent serrations. .... *D. (S.) unipunctinata* Duda.  
Aedeagus without prominent serrations. ....7.
7. Anterior paramere with triangular apex. .... *D. (S.) suzukii* (Matsumura).  
Anterior paramere with slender curved apex. .... *D. (S.) pulchrella* Tan, Hsu, & Sheng.
8. Aedeagus with branches. .... *nipponica* subgroup...9.  
Aedeagus without branches. ....10.
9. Aedeagus with finger-like branches. Anterior paramere as long as aedeagus. .... *D. (S.) nipponica* Kikkawa & Peng.  
Aedeagus with spike-like branches. Anterior paramere much shorter than aedeagus. .... *D. (S.) magnipunctinata* sp. nov.
10. Anterior paramere contiguous to aedeagus, if separated, the anterior paramere is exceedingly small. .... *ananassae* subgroup...11.  
Anterior paramere separated from aedeagus, and large. .... *montium* subgroup...12.
11. Aedeagus apparently fused to a mass and pubescent. Anterior paramere with a long, recurved, basal process. Novasternum with median projection on caudal margin. .... *D. (S.) ananassae* (Doleschall).  
Aedeagus apparently bifid and bare. Anterior paramere without long basal process. Novasternum without median projection. .... *D. (S.) bipectinata* Duda.
12. Aedeagus bare. Novasternum with prominent median projection, on which are inserted a pair of very long submedian spines. .... *D. (S.) kikkawai* Burla.  
Aedeagus pubescent. Novasternum without median projection, submedian spines short or absent. ....13.
13. Aedeagus with a pair of lateral claws. Median notch of novasternum deep and acute. Posterior parameres distinctly contiguous to each other. .... *D. (S.) rufa* Kikkawa & Peng.  
Aedeagus with or without lateral claws. Median notch of novasternum rounded. Posterior parameres obscurely contiguous to each other. .... *D. (S.) auraria* Peng...14.
14. Novasternum with submedian spines. Anterior paramere with sensilla apically and apically bilobed. Aedeagus with lateral claws. .... Type B.  
Novasternum without submedian spines. Anterior paramere with sensilla medially. ....15.
15. Aedeagus without lateral claws. Median notch of novasternum shallow. .... Type A.  
Aedeagus with lateral claws. Median notch of novasternum deep. .... Type C.
16. Anterior paramere large. .... *takahashii* subgroup...17.  
Anterior paramere small. ....18.
17. Posterior paramere with basal branch very short. .... *D. (S.) takahashii* Sturtevant.  
Posterior paramere with basal branch very long. .... *D. (S.) lutea* Kikkawa & Peng.
18. Aedeagus fused to become a compact body, not pectinated. .... *ficuspila* subgroup...19.  
Aedeagus apparently bifid and pectinate. .... *melanogaster* subgroup...19.
19. Novasternum without median notch. Aedeagus with short serrations. Posterior paramere with flag-like quadrate apical flap. Anterior paramere T-shaped. .... *D. (S.) melanogaster* Meigen.  
Novasternum with shallow median notch. Aedeagus with long serrations. Posterior paramere with flag-like oval apical flap. Anterior paramere rod-shaped. .... *D. (S.) simulans* Sturtevant.

#### Key to Japanese species-groups, species-subgroups, and species of the subgenus *Sophophora*, with regard to the egg-guides

1. Basal isthmus narrow and long, about 2/5 as long as lobe, and roundly convex. .... *obscura* species-group...2.  
Basal isthmus usually short, less than 1/3 length of lobe, if it is longer, somewhat concave. .... *melanogaster* species-group...4.
2. Lobe somewhat pointed at tip. .... *D. (S.) bifasciata* Pomini.  
Lobe broadly rounded at tip. ....3.
3. Lobe pale yellow, often with 2 long subterminal hairs. .... *D. (S.) alpina* Burla.  
Lobe dark brown, with only one short subterminal hair. .... *D. (S.) helvetica* Burla (European).
4. Lobe narrowly pointed at tip. .... *suzukii* subgroup, excl. *D. unipunctinata* Duda...5.  
Lobe not narrowly pointed at tip, broadly rounded or truncate. ....6.
5. Upper marginal teeth much smaller than distal lower teeth. .... *D. (S.) suzukii* (Matsumura).  
Upper marginal teeth as strong as lower marginal teeth. .... *D. (S.) pulchrella* Tan, Hsu, & Sheng.

6. Lobe broadly truncate at tip, the truncate margin having no teeth.....*D. (S.) unipectinata* Duda.  
Lobe more or less rounded at tip, if truncate, the truncate margin with teeth.....7.
7. Lobe narrow, orange brown, and with less rounded tip.....8.  
Lobe broad, with tip broadly rounded.....10.
8. Subterminal hair very long. Discal teeth not prominent.....*ficuspshila* subgroup.....*D. (S.) ficuspshila* Kikkawa & Peng.  
Subapical hair not very long. Discal teeth prominent.....*nipponica* subgroup.....9.
9. Discal teeth about 3, weaker than marginal ones.....*D. (S.) nipponica* Kikkawa & Peng.  
Discal teeth about 8, as strong as distal marginal ones.....*D. (S.) magnipectinata* sp. nov.
10. Basal isthmus about 1/3 or more of the length of lobe. Penultimate marginal teeth as far from ultimate as from the third one.....*melanogaster* series.....11.  
Basal isthmus about 1/4 or less of the length of lobe. Penultimate marginal teeth at least twice as far from ultimate as from the third teeth.....*montium* series.....13.
11. Apical marginal teeth more densely arranged than proximal marginal teeth.....*melanogaster* subgroup.....12.  
Apical marginal teeth not more densely arranged than proximal marginal teeth.....*takahashii* subgroup.....*D. (S.) takahashii* Sturtevant & *D. (S.) lutea* Kikkawa & Peng.
12. Lobe narrow at middle, distal upper portion not divided from main portion by means of a dark line. Basal isthmus narrow, not broaden at middle.....*D. (S.) melanogaster* Meigen.  
Lobe broad at middle, distal upper portion divided from main portion by means of a dark line. Basal isthmus much broaden at middle.....*D. (S.) simulans* Sturtevant.
13. Lobe weakly sclerotized.....*ananassae* subgroup.....14.  
Lobe strongly sclerotized.....*montium* subgroup.....15.
14. Lobe apically uniformly rounded.....*D. (S.) ananassae* (Doleschall).  
Lobe apically rather truncate.....*D. (S.) bipectinata* Duda.
15. Lobe with upper margin shallowly concave at middle.....16.  
Lobe with upper margin deeply concave at middle.....*D. (S.) auraria* Peng.....17.
16. Lobe broadly rounded at tip.....*D. (S.) kikkawai* Burla.  
Lobe rather narrowly projected at tip.....*D. (S.) rufa* Kikkawa & Peng.
17. Apical portion of the lobe quadrate.....Type A.  
Apical portion of the lobe triangular.....18.
18. Apical triangular portion very large, nearly as large as the basal portion.....Type C.  
Apical triangular portion smaller, about 1/2 as large as the basal portion.....Type B.

*obscura* Species-group, Sturtevant, 1942, Univ. Texas Publ., 4213: 29; species-group 4 of *Sophophora*, Sturtevant, 1940. Genetics, 25: 347.

The *obscura* species-group is usually divided into 2 subgroups: *obscura* and *affinis*. Patterson & Stone (1952) established *pseudoobscura* subgroup, separating it from *obscura* subgroup. Japanese species are represented by 2 species of *obscura* subgroup s. str. and one of *affinis* subgroup.

Decasternum and ejaculatory apodeme of 8 species of this group, including exotic forms, are figured by Moriwaki, Okada, Ohba, & Kurokawa (1952), without special descriptions. These organs of the 8 species plus 2 newly added Japanese species may be distinguished by the keys below, as well as Figs. 55, 56.

#### Decasternum

1. Lateral pieces distinctly sclerotized and as broad as median piece.....*pseudoobscura* subgroup: *pseudoobscura* Frolova, *miranda* Dobzhansky, *persimilis* Dobzhansky (Fig. 55 M).  
Lateral pieces obscurely sclerotized, much narrower than median piece.....2.
2. Lateral pieces narrowly sclerotized; median piece rod-shaped.....*affinis* subgroup: sp. cf. *helvetica* Burla; *helvetica* Burla (in the latter species lateral pieces are less prominent).  
Lateral pieces not distinctly sclerotized.....*obscura* subgroup, s. str.....3.
3. Median piece rod-shaped, much longer than broad.....6.  
Median piece quadrate or triangular, as broad as or broader than long.....4.
4. Median piece with lateral margins distally divergent.....*subobscura* Collin (Fig. 55 L).  
Median piece with lateral margins distally convergent.....5.
5. Median piece apically truncate.....*obscura* Fallén (Fig. 55 K).  
Median piece apically pointed.....*alpina* Burla (Fig. 54 C).
6. Median piece with lateral margins weakly divergent apically.....*ambigua* Pomini (Fig. 55 J).  
Median piece with lateral margins weakly convergent distally.....*bifasciata* Pomini (Fig. 55 G), *tristis* Fallén (Fig. 55 I).

#### Ejaculatory apodeme

1. Plate with cephalic margin concaved and caudal margin convex.....*pseudoobscura* subgroup: *pseudoobscura* Frolova, *miranda* Dobzhansky, *persimilis* Dobzhansky (Fig. 55 R).  
Plate with cephalic margin convex.....2.
2. Plate with cephalic margin weakly sclerotized.....*affinis* subgroup: *helvetica* Burla; sp. cf. *helvetica* Burla (Fig. 56 E, F).

- Plate with cephalic margin strongly sclerotized.....*obscura* subgroup, s. str....3.
3. Plate distinctly narrowing proximally.....*subobscura* Collin (Fig. 55 Q).  
 Plate not distinctly narrowing proximally.....4.
4. Plate with cephalic margin broadly convex.....5.  
 Plate with cephalic margin narrowly convex.....6.
5. Plate with caudal margin simply concave.....*obscura* Fallén (Fig. 52 P).  
 Plate with caudal margin concave, medially slightly convex.....*alpina* Burla (Fig. 54 K, L).
6. Plate with caudal margin angularly concave.....*ambigua* Pomini (Fig. 55 J, O).  
 Plate with caudal margin roundly concave.....*bifasciata* Pomini (Fig. 55 E, F), *tristis* Fallén (Fig. 55 N).

*obscura* species-subgroup, Patterson & Stone, 1952. *Evol. gen. Dros.*: 130, 191; *obscura* subgroup, Patterson & Wheeler, 1949. *Univ. Texas Publ.*, 4920: 211 (part); subgroup 'a' of *obscura* group, Sturtevant, 1942. *Univ. Texas Publ.*, 4213: 29 (part).

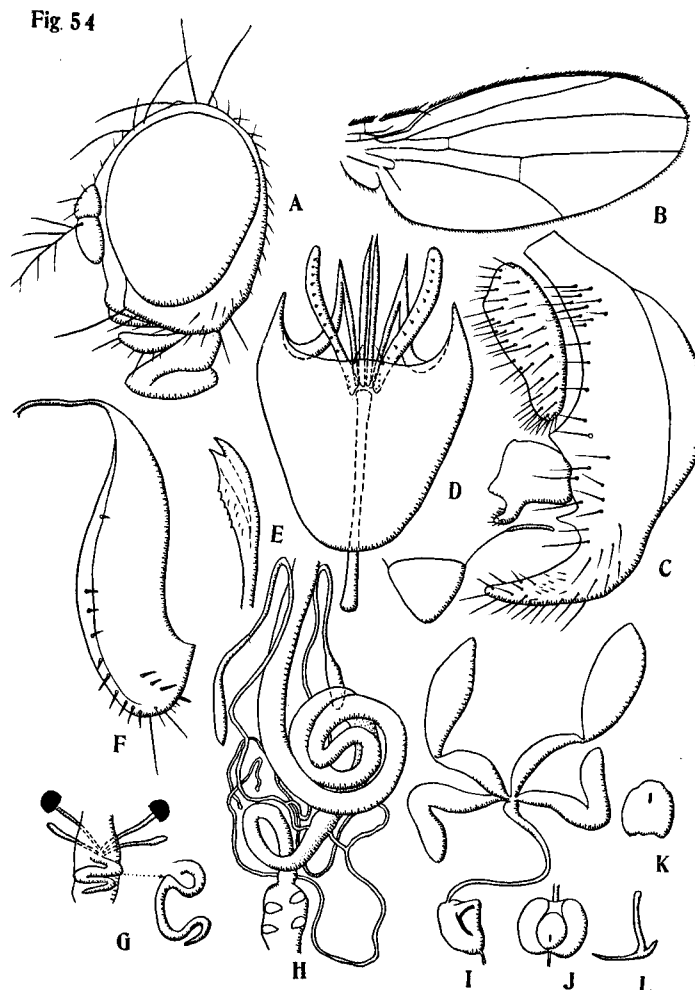
***Drosophila (Sophophora) alpina* Burla, 1948 Fig. 54.**

Japanese name: Takane-shôjôbae.

*Drosophila (Sophophora) alpina* Burla, 1948. *Rev. Suis. Zool.*, 55: 274; Wheeler, 1949. *Univ. Texas Publ.*, 4920: 175; Burla, 1951. *Rev. Suis. Zool.*, 58: 96; Patterson & Stone, 1952. *Evol. gen. Dros.*: 18.

*Drosophila alpina* Ohba, 1954. *Kagaku*, 24: 130; Buzzati-Traverso, 1953. *Advances in Genetics*, 7: 59.

*Drosophila (Sophophora)* sp. like *alpina* Burla, Okada, 1953. *Zool. Mag.*, 62: 284.



**Fig. 54. *Drosophila (Sophophora) alpina* Burla.**

A. Head; B. Wing; C. Peripheral genitalia (lateral aspect); D. Phallic organs (ventral aspect); E. Tip of aedeagus (lateral aspect); F. Egg-guide; G. Female reproductive organs (ventral aspect); H. Digestive system (ventral aspect); I. Male reproductive organs; J. Ejaculatory bulb (ventral aspect); K. Ejaculatory apodeme (ventral aspect); L. do. (lateral aspect).

♂ and ♀: Body about 2.5-2.8 mm, dark brown, with abdominal tergites black especially in caudal segments. Head (Fig. 54 A): Eye red, with fine piles. Antenna yellowish brown, 3rd joint darker. Arista with about 8 branches including a large fork, 2 below it. Palpus yellow, with 2



prominent ventral setae, one subapical and one submedian. Ocellar triangle and periorbits pale brown. Front dark brown, about half as broad as head width, and with a few *fr*. Clypeus dark brown. Carina brown, low, and broader below. Cheek paler, about 1/4 as broad as the greatest diameter of eye. *orb*<sub>2</sub> about 1/3 *orb*<sub>3</sub>. *or*<sub>2</sub> about 1/2 to 1/3 vibrissa. Occiput black.

Mesonotum dark brown, without special markings. Scutellum medially dark brown. Thoracic pleura paler below. *hu* 2, long. *ac* in 8 rows. Cross distance of *dc* slightly more than half of the length distance. Anterior *scut* parallel. Sterno-index about 0.6.

Legs pale yellowish grey, 1st and 2nd fore tarsal joints with large black sex combs, occupying almost entire length of the tarsal joints, upper comb with about 15-25 (19 in average) and, lower comb about 13-20 (16 in average) teeth. Preapicals on all 3 tibiae; apicals on middle. Wings (Fig. 54 B) hyaline, crossveins clear. C-index about 2.2-2.5; 4 V-index about 1.9-2.2; 4 C-index about 1.0-1.2; 5 X-index about 1.7-2.4. C1-bristles 2, long; C3-bristles on basal 1/3 to 2/5. Halteres yellowish white.

Abdomen pale brown, with medially non-interrupted caudal black bands, which are broaden on posterior tergites. Sternites pale grey.

Periphallic organs (Fig. 54 C): Genital arch dark brown; lower portion pointed caudad, with about 20 long and numerous short hairs; upper portion with about 25 marginal hairs; caudal margin with a low triangular process just above insertion of clasper. Clasper dark brown, nearly quadrate and ventrally with a finger-like process, which is pubescent above; teeth entirely absent. Anal plate separated from genital arch, oblong, ventrally narrowing, and with about 45 hairs. Decasternum triangular, dark brown.

Phallic organs (Fig. 54 D, E): Aedeagus bifid, slender, orange brown, each lobe apically slightly broaden, black, bilobed and pubescent at tip, and finely serrate at ventral margin. Anterior paramere pale yellow, long, broad, and rounded apically, and with about 15 sensillae arranged in a row along entire length. Posterior paramere pale yellowish orange, pointed at tip. p.f. = ABC'D'EFGHIKLMN. PI = 0.7.

Egg-guides (Fig. 54 F): As figured by Burla (1951). Lobe pale yellow, marginally pale brown, broadly rounded apically, with about 12 marginal and 3 discal black pointed teeth as well as one or 2 long subterminal hairs. Basal isthmus pale yellow, narrow, and very long, about 1/3 as long as lobe.

Internal structures (Fig. 54 G-L): Proximal intestine: C=3.0. Rectal papillae: R=1.5. Malpighian tubes with posterior branches ending free. Testis orange, fusiform, basally very narrow and slightly twisted. Seminal vesicle orange, banana-shaped. Paragonia once folded. Ejaculatory bulb globular, apodeme with nearly quadrate plate and slender stem. Spermatheca black, hemispherical, tiny. Parovaria with oblong knob. Ventral receptacle minute, twice folded.

Specimens examined: Nishikomagatake, Nagano Pref., 2 ♂♂ and 2 ♀♀, 22-24 VII '52 F (Kurokawa); Yatsugatake, Nagano Pref., 35 ♂♂ and 19 ♀♀, 26-28 VII '52 F (Okada & Kurokawa); many ♂♂ and ♀♀, 10-12 VIII '53 (Kurokawa); Senjōdake, Nagano Pref., 1 ♂, 15 VII '53 F (Kitagawa & Ono).

Distribution: Honshu (Chubu), Europe.

Feeding habits: F.

Remarks: Eggs with 2 filaments. Well agrees to the European form of this species, except that the teeth of sex combs are slightly more in number in Japanese form than in European, which shows, according to Burla (1948), 14-16 and 11-14 teeth on upper and lower tarsi respectively. Same as the European form, more over, the Japanese one inhabits high mountains, about 1900-2700 m, in middle Honshu.

### *Drosophila (Sophophora) bifasciata* Pomini, 1940 Fig. 55 A-H.

Japanese name: Futasuji-shōjōbae (Moriwaki, 1952)

*Drosophila bifasciata* Pomini, 1940. Boll. Ent. R. Univ. Bologna, 12: 155; (?) Moriwaki, Okada, Ohba, & Kurokawa, 1952. Zool. Mag., 61: 284; Ishihara, 1955. Zool. Mag., 64: 85; Ohba, 1954. Kagaku, 24: 130; Moriwaki & Kitagawa, 1955. Cytologia, 20: 247-257.

*Drosophila (Sophophora) bifasciata* Hsu, 1949. Univ. Texas Publ., 4920: 98; Wheeler, 1949. Univ. Texas Publ., 4920: 175; Burla, 1951. Rev. Suis. Zool., 58: 92; Patterson & Stone, 1952. Evol. gen. Dros.: 18; Okada, 1952. Komai's Shōjōbae no Iden to Jikken: 198; Buzzati-Traverso, 1953. Advance in Genet., 7: 57; Okada, 1953. Zool. Mag., 63: 24; Okada, 1954. Japan. Journ. Appl. Zool., 19: 79; Okada, 1954. Kontyū, 22: 41.

*Drosophila bilineata* Pomini 1940. Boll. Ent. Univ., Bologna, 12: 155.

*Drosophila obscura* Coquillett, 1898. Proc. U.S. Nat. Mus., 21: 340.

*Drosophila (Sophophora)* sp. I, Mizuno, 1952. Papers Res. in Genet., 3: 51.

Fig 55

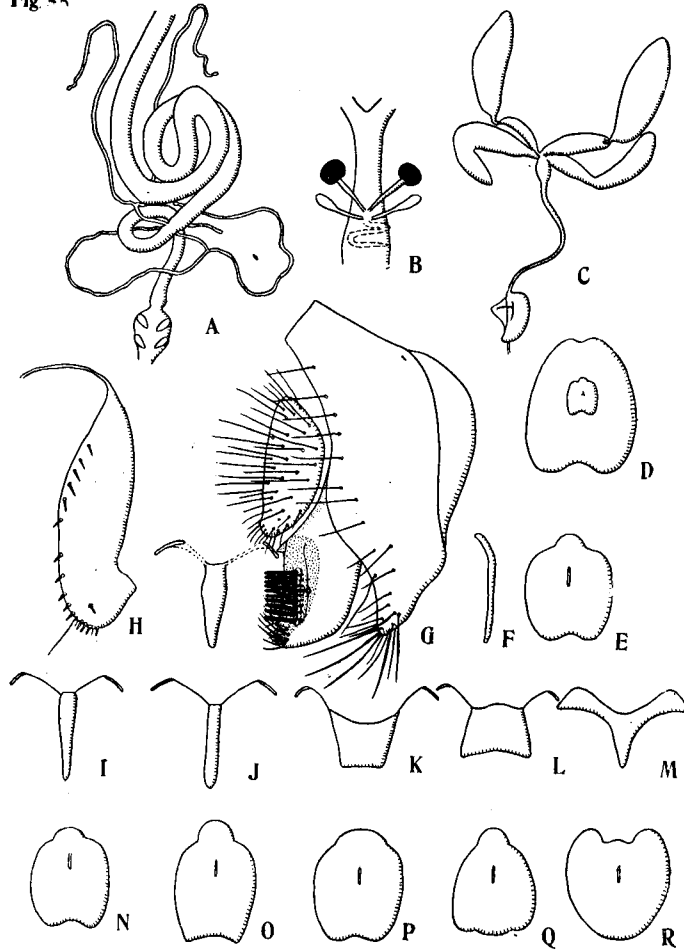


Fig. 55. *Drosophila (Sophophora) bifasciata* Pomini.

A. Digestive system (ventral aspect); B. Female reproductive organs (dorsal aspect); C. Male reproductive organs; D. Ejaculatory bulb (ventral aspect); E. Ejaculatory apodeme (ventral aspect); F. do. (lateral aspect); G.Periphallallic organs (lateral aspect); H. Egg-guides.

Decasternum of several foreign species of the *obscura* group.

I. *Drosophila (Sophophora) tristis* Fallén; J. *D. (S.) ambigua* Pomini; K. *D. (S.) obscura* Fallén; L. *D. (S.) subobscura* Collin; M. *D. (S.) pseudoobscura* Frolova and its allies.

Ejaculatory apodeme of several foreign species of the *obscura* group.

N. *Drosophila (Sophophora) tristis* Fallén; O. *D. (S.) ambigua* Pomini; P. *D. (S.) obscura* Fallén; Q. *D. (S.) subobscura* Collin; R. *D. (S.) pseudoobscura* Frolova and its allies.

♂ and ♀: Body about 2.5 mm (1.5-3.0 mm) in length, dark brown to brownish black. Front about half as broad as head width and with a few *fr*. Ocellar triangle and periorbits somewhat reddish. Eyes dark red, with short black piles. Cheek about 1/4 as broad as the greatest diameter of eye. *orb*<sub>2</sub> about 1/3 *orb*<sub>3</sub>. Antenna black, apical half of 2nd joint paler. Arista with about 7 branches, including a rather small fork, 2 below it. Palpus brown, with a few prominent bristles.

Mesonotum with 4 indistinct broad black stripes. *ac* in 6 rows. Cross distance of *dc* about half the length distance. *hu* 2, subequal. Sterno-index about 0.7.

Legs black, tibiae and 3 proximal tarsal joints paler. Preapicals on all tibiae; apicals on middle. Proximal 2 tarsal joints of male fore legs provided with sex combs, composed of about 10 (6-12) and 8 (6-12) teeth respectively. Wings hyaline, slightly fuscous along costa. C-index about 3.0 (2.4-3.5); 4V-index about 2.2 (1.8-2.8); 4C-index about 1.1 (0.8-1.4); 5X-index about 2.0 (1.5-3.0). C1-bristles 2; C3-bristles on basal 1/3. Halteres white.

Abdominal tergites anteriorly paler, especially in female. Sternites greyish.

Periphallallic organs (Fig. 55 G): Genital arch black, triangular below; lower portion with about 15 hairs, upper portion about 6 hairs. Primary clasper dark brown, with a row of about 9 (7-11) black teeth at middle of its caudal margin, and one or 2 (rarely 0) secondary teeth. Secondary

clasper with about 9 brown stout setae arranged in 2 rows, and several marginal hairs. Anal plate separated from genital arch, apically narrowing at tip, and with short setae. Decasternum pale brown, rod-like, and distally narrowing.

Phallic organs: Aedeagus pale brown, bifid, slightly broaden at apex. Anterior paramere orange brown, lanceolate, gently curved and tapering distally, and with a row of about 10 sensilla arranged on almost entire length of the paramere. Posterior paramere orange brown, pointed at tip, and bilobed below. Novasternum with a pair of short submedian spines. Ventral fragma pale brown, fused to novasternum, and semielliptical. p.f.=ABCDEFGHIJKLMN. PI=about 0.6.

Egg-guides (Fig. 55 H): Figured by Burla (1951). Lobe pale yellowish brown, rounded at tip, with about 14 (12-17) black marginal and about one black discal teeth. Basal isthmus very long, about 2/5 as long as the lobe itself, and pale brown.

Internal structures: Proximal intestine: C=2.0. Rectal papillae: R=1.6. Malpighian tubes with common stalks short, posterior branches ending free. Testis orange, elongate elliptical, apically rounded or slightly pointed, and proximally narrowing and with about 0.5 coils. Seminal vesicle banana-shaped. Paragonia white, weakly folded once. Ejaculatory bulb (Fig. 55 D) oval, cephalic and caudal margins weakly bilobed. Ejaculatory apodeme (Fig. 55 E,F) with plate quadrate, anterior margin projected, and posterior margin concaved. Spermatheca hemispherical and black. Paragonia with head oval. Ventral receptacle very short, transversely folded about 1.5 times.

Specimens examined: In Hokkaido, Akkeshi, 1 ♀, 10 VII '50 F (Kanehisa); 594 ♂♂ and 153 ♀♀, 12-18 VIII '51 F (Moriwaki et al); 16 ♂♂ and 3 ♀♀, 14-16 VI F (K. Moriwaki); 75 ♂♂ and 37 ♀♀, 23-24 VIII '54 F (K. Moriwaki); Wakkanai, 21 ♂♂ and 1 ♀, 15-16 VIII '53 F; Attoko, 1 ♀, 15 VIII '51 F; Nakashibetsu, 6 ♂♂ and 2 ♀♀, 16 VIII '51 F; Tōbetsu, 11 ♂♂ and 1 ♀, 17 VIII '51 F; Meakan, 2 ♀♀, 11 VIII '53 F (K. Moriwaki); Kamiohoro, several specimens, 18 VIII '51 F (Ohba); Nishitappu, 40 ♂♂ and 11 ♀♀, 22 VIII '53 F (K. Moriwaki); Sapporo, 1 ♂, 28 V '50 (Makino); 1 ♂, 18 VIII '53; Horoizumi, 3 ♂♂ and 1 ♀, 22 VIII '54 F (K. Moriwaki); Rausu, 1 ♀, 27 VIII '54 F (K. Moriwaki). Hakkoda, Aomori Pref., 27 ♂♂ and 6 ♀♀, 22-24 VIII '51 F; Hakamoriyama Iwate Pref., 1 ♂, 7 V '52; Azumayama, Fukushima Pref., 1 ♀, 1954 (date obscure) (Kotake); Oze, Gumma Pref., 1 ♂, 19 IX '52 F (Matsudaira). In Tokyo: Gōtokuji, 1 ♂ and 2 ♀♀, 26 III '53 F; Todoroki, 2 ♂♂ and 1 ♀, 3 V '53 F (Toda); Meguro, 1 ♀, 10 II '54 F (Toda); Asakawa, 2 ♂♂, 31 XII '52 F (Ohba); many ♂♂ and ♀♀, 28 II '53 F (Ohba); 1 ♂, 17 III '54 (Kurokawa); Kumotoriyama, 2 ♂♂ and 1 ♀, 1-3 VI '52 TF; 2 ♂♂ and 1 ♀, 14-16 VII '53 F (Ohba et al); 1 ♀, 22 VII '54 F (Moriwaki et al). Hatano, Kanagawa Pref., 1 ♀, 2 V '55 F. In Nagano Pref.: Yatsugatake, 35 ♂♂ and 25 ♀♀, 26-28 VII '52 F (Kurokawa et al); 6 ♂♂ and 7 ♀♀, 10-12 VIII '53 F (Kurokawa); Tadeshina, 5 ♂♂ and 1 ♀, 17-19 VII '54 F (Okada et al); Nishikomagatake, 17 ♂♂ and 10 ♀♀, 22-24 VII '52 F (Kurokawa et al); Chausuyama, 1 ♀, VI '54 F (Nozawa); Hoppo, 30 ♂♂ and 16 ♀♀, 9-10 VIII '52 (Ohnishi); Senjōdake, 13 ♂♂ and 1 ♀, 15 VII '53 (Kitagawa & Ono); Hōkitaisen, Shimane Pref., 5 ♂♂ and 1 ♀, 15 VIII '51 F (Ōshima); Kujūzan, Ōita Pref., 1 ♂, 27 IX '54 F; Ishizuchiya, Ehime Pref., 1 ♂, 14 VIII '55 F (Morikawa).

Previous records from Japan: (Coquillett, 1898) Hondo (under name of *D. obscura* (Fallén)—Kikkawa & Peng (1938) referred the specimens examined by Coquillett to *D. virilis* Sturtevant; *D. obscura* has repeatedly been cited by Matsumura (1906), Shiraki (1913), Suzuki (1915), and Nawa (1920) as a representative of Japanese *Drosophila* species; Kurisaki (1925, 1926) reported that Matsumura's *obscura* should be *D. melanogaster* Meigen.—(Mizuno, 1952) Sapporo, Akkeshi; (Moriwaki et al, 1952) Akkeshi, Kamiohoro, Attoko, Nakashibetsu, Tōbetsu, Abashiri, Sapporo, Nopporo, Hakodate; (Ohba, 1954) Sōunkyo; Akkeshi, Nopporo, Hakkoda, Yatsugatake, Kumotoriyama; (Ishihara, 1955) Sapporo, Asahidake; (Moriwaki and Kitagawa, 1955) Akkeshi, Hoppo, Hakkoda, Asakawa, Daisetsuzan, Nopporo, Yatsugatake, Kitazawatoge (Senjōdake), Oze, Kumotoriyama, Gōtokuji, Meakan, Nishitappu, Horoizumi, Rausu. Full data of collection at the localities shown above are to a great extent same as given herein under "Specimens examined."

Distribution: Hokkaido, Honshu (Tohoku, Kanto, Chubu, Chugoku), Shikoku, Kyushu, Europe. Feeding habits FT (M?).

Remarks: Strictly coincides with the European form with regard of general appearance, fine structures of male genitalia as well as karyotypes, the crossability between them being almost normal (Moriwaki, Okada, Ohba, & Kurokawa, 1952. DIS, 26: 112). One of the most common wild drosophilid species distributed in Japan (Moriwaki, Okada, Ohba, & Kurokawa, 1953. DIS, 27: 104).

*affinis* species-subgroup, Patterson & Wheeler, 1949. Univ. Texas Publ., 4920: 211; subgroup 'b' of *obscura* group, Sturtevant, 1942. Univ. Texas Publ., 4213: 29.

*Drosophila* (*Sophophora*) sp. cf. *helvetica* Burla, 1948 Fig. 56.

Japanese name: Daisetsu-shōjōbae.

*Drosophila* sp. like *D. helvetica* Burla, Okada, 1953. Zool. Mag., 62:284.

Fig 56

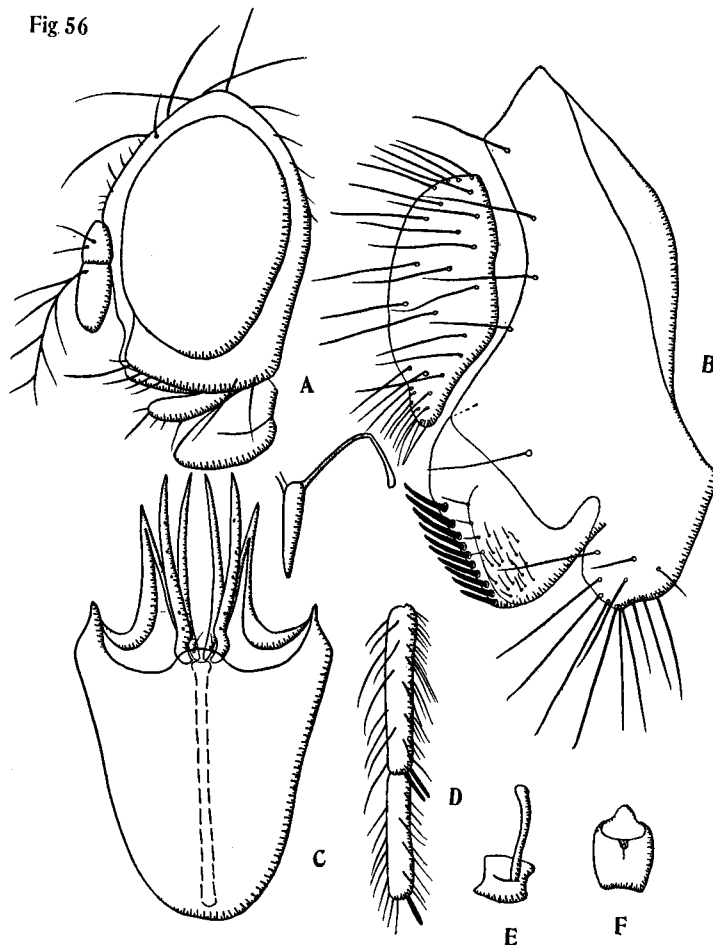


Fig. 56. *Drosophila* (*Sophophora*) sp. cf. *helvetica* Burla.

A. Head; B. Peripheral organs (lateral aspect); C. Phallic organs (ventral aspect); D. Proximal two tarsal joints of male fore leg; E. Ejaculatory apodeme (ventrolateral aspect); F. do. (ventral aspect).

♂: Body blackish brown, about 2.0 mm. Head (Fig. 56 A): Eye dark red, with piles. Antenna black; arista with 7 branches including a large fork, 2 below it. Palpus black, much rotund, with only one prominent apical bristle. Front about 5/8 as broad as head width, *fr* present. Carina paler and narrower above, retracted below at side view. Cheek dark brown. *orb*<sub>2</sub> about 1/3 *orb*<sub>1</sub>; *or*<sub>2</sub> about 1/3 vibrissa. Occiput black.

Thorax uniformly blackish brown. *hu* probably one. *ac* in 6 rows. Cross distance of *dc* about twice the length distance.

Legs (Fig. 56 D): Yellowish brown, with small sex comb on proximal two tarsal joints of fore legs, composed of 2 and 1 black teeth respectively. Preapicals on all three tibiae; apicals on middle. Wings hyaline, unfortunately exceedingly damaged, distal halves of both wings being broken, in the specimen examined. Abdominal tergites entirely black.

Peripheral genitalia (Fig. 56 B): Genital arch dark brown, quadrate below, upper margin with about 5 hairs; lower portion with about 15 hairs. Clasper large, yellowish brown, with a row of about 10 black teeth arranged in a straight line, occupying almost entire length of distal margin of clasper itself. These teeth are equal in length. Numerous brownish setae on the inner surface of clasper. Anal plate black, separated from genital arch, with lower tip narrowing and with numerous short hairs. Decasternum elongate, brown, proximally with arcuated lateral pieces.

Phallic organs (Fig. 56 C): Generally pale brown. Aedeagus bifid, slender, apically pointed.

Anterior paramere oblong, pointed at tip, and with a row of sensilla covering nearly entire length of the paramere itself. Novasternum with minute paired submedian spines. p.f.=ABCDEFGHIKL-MN. PI=about 0.9.

Internal structures: Ejaculatory apodeme (Fig. 56 E,F) with plate quadrate and brown, and distal margin slightly concaved.

Specimen examined: Daisetsuzan, Hokkaido, 1 ♂, 29 VIII '52 F (Takada).

Distribution: Hokkaido.

Feeding habits: F.

Relationships: Although only one male specimen collected by Mr. H. Takada was examined, it shows close resemblance to *Drosophila* (S.) *helvetica* Burla, from Europe. Only remarkable differences seem to be the shape and distribution of clasper teeth. In the Japanese species the teeth are subequal in size and arranged on the entire length of the distal margin of clasper, while in the European species marginal teeth are smaller than the median ones, and they are distributed at the middle of the distal margin of clasper, according to Hsu (1949) and Dyson Hudson (1954) as well as to the author's own comparison of the Japanese form with the specimens of *D. (S.) helvetica* Burla, sent over to Dr. Moriwaki from Prof. Buzzati-Traverso, through kindness of Dr. Komai.

*melanogaster* species-group, Sturtevant, 1942. Univ. Texas Publ., 4213:29; species-group 3 of *Sophophora*, Sturtevant, 1940. Genetics, 25:347.

Hsu (1949) distinguished in this group five species-subgroups: *melanogaster*, *montium*, *takahashii*, *ananassae*, and *suzukii* subgroups. *ficuspila* and *nipponica* subgroups were added to them by the present author (1954), separated from *montium* subgroups. He put these seven subgroups into three different series: *suzukii* subgroup into *suzukii* series, *takahashii*, *melanogaster*, and *ficuspila* subgroups into *melanogaster* series, and *nipponica*, *ananassae* and *montium* subgroups into *montium* series.

*suzukii* series, Okada, 1954. Kontyû, 22:43.

Posterior paramere not branched; aedeagus apparently bifid and usually not pectinated; anterior paramere large. If aedeagus is pectinated, posterior parameres are separated from each other.

*suzukii* species-subgroup, Hsu, 1949. Univ. Texas. Publ., 4920:122.

Genital arch narrowing below. Clasper apically tapering, with two groups of primary teeth. Egg-guide with lobe narrow and pointed, and with a few proximal discal teeth.

Includes *D. (S.) suzukii* (Matsumura), *D. (S.) pulchrella* Tan, Hsu, & Sheng, *D. (S.) unipectinata* Duda.

### *Drosophila (Sophophora) suzukii* (Matsumura) Fig. 59-62.

Japanese name: Otô-shôjôbae (Kanzawa, 1934); Suzuki-shôjôbae (Matsumura, 1931); Tsumaguro-shôjôbae (Kikkawa & Peng, 1938).

*Leucophenga suzukii* Matsumura, 1931. 6000 Illus. Insects Japan Empire: 367.

*Drosophila suzukii* Kanzawa, 1934. Report Yamanashi Agric. Exp. St.: 1; Mishima, 1935. Journ. Appl. Zool., 10: 93; Kanzawa, 1936. Ins. World, 40: 240, 274, 318; Kanzawa, 1936. Journ. Plant Protect., 23: 69; Peng, 1937. Annot. Zool. Japon., 16: 21; Kikkawa & Peng, 1938. Japan. Journ. Zool., 7: 536; Kanzawa, 1939. Report Yamanashi Agric. Exp. St., (1939): 1; Nakayama & Okamoto, 1940. Ann. Agric. Exp. St. Gov. General Chosen, 12: 196; Esaki, 1950. Icon. Ins. Japon.: 1673; Mizuno, 1952. Papers Res. Genet., 3: 51; Kato & Hori, 1952. Sci. Rep. Tohoku Univ., 4th ser., 19: 231; Kato, 1954. Sci. Rep. Tohoku Univ., 4th ser., 20: 267; Shiraki, 1954. Class. Ins.: 747; Ishihara, 1955. Zool. Mag., 64: 85.

*Drosophila (sophophora) suzukii* Sturtevant, 1942. Univ. Texas Publ., 4213:29; Hsu, 1949. Univ. Texas Publ., 4920: 97; Wheeler, 1949. Univ. Texas Publ., 4920:175; Tan, Hsu & Sheng, 1949. Univ. Texas Publ., 4920: 197; Shôgaki, 1952. Komai's Shôjôbae no Iden to Jikken: 20; Okada, 1953. Zool. Mag., 62: 284; okada, Kontyû, 22: 37; Patterson & Stone, 1952. Evol. gen. Dros.: 16.

*Drosophila* sp. Uchiike, 1925. Insect World, 29: 407; Kanzawa, 1934. Kontyû, 8: 302; Shiraki, 1940. Gaichu Ekichu: 370.

♂ and ♀: Cross distance of *dc* about 2.5 times as long as the length distance. 2 *hu*, subequal. Legs with preapicals on all three tibiae, apicals on fore and middle. Halteres white. Wings with C1-bristles 2, C3-bristles on basal 1/3. Other general structures as redescribed by Kikkawa & Peng (1938).

Periphallic organs: Described and figured by Hsu (1949). Decasternum (Fig. 59:I) trilobed.

Phallic organs: Described and figured by Okada (1954).

Egg-guides (Fig. 60 A): Described and figured by Kanzawa (1934). Lobes slender, orange brown, apically pointed, and with about 30 black teeth, including about 5 proximal discal and 3 upper marginal teeth. Upper marginal teeth are smaller than the lower marginal ones.

Internal structures (Fig. 61 A, 62 A): Proximal intestine:  $C=2.0$ . Malpighian tubes with long common stalks and short branches, posterior branches ending free. Testis pale yellow, basally swollen, with about one inner and 3 outer coils. Seminal vesicle slender. Paragonia thick, weakly folded about twice. Ejaculatory bulb globular. Ejaculatory apodeme with long stem and elongate pentagonal plate, distal half of plate being paler. Spermatheca brownish black, longer than broad, and swollen proximally. Parovaria slightly shorter than spermatheca. Ventral receptacle with about 5 transverse folds.

Specimens examined: Akkeshi, Hokkaido, VIII '51; VIII '53 F (K. Moriwaki); Nishitappu, Hokkaido, VIII '53 F (K. Moriwaki); Hakkoda, Aomori Pref., VIII '51 FS; Towada, VIII '52 F (Yoshida); Hakamoriyama, Iwate Pref., X '53 F; Sendai, 5 X '52 F. In Tokyo; Setagaya, IV, VI '51 F; IX '52 LF (Moriwaki); X '52 F; IV '53 (Toda); X '53 G; Meguro, XI '51 S; Suginami, XI '51 G; (Ohnishi); Aoyama, X '52 F (Toda); Asakawa, V '52 S; V '52 F (Ohba); I '53 F (Ohba); Kumotoriyama, VII '53 S; Mukôgaoka, Kanagawa Pref., XI '51 T; XI '53 S; Mizouokuchi, Kanagawa Pref., XI '52 S; Tsuchiura, Ibaraki Pref., X '53 F (Kitagawa); Kinugawa, Tochigi Pref., VIII '53 F (Moriwaki & Yoshida); Hakone, IX '54 (Toda); Shinkazawa, Gumma Pref., VII '54 F (Toda); Komoro, Nagano Pref., IX '54; Kisofukushima, Nagano Pref., VII '52 (Kurokawa et al); Tamano, Okayama Pref., X '55 F (Kurokawa); Yubara, Okayama Pref., X '55; Taishakukyo, Hiroshima Pref., X '55 F; Susaki, Kochi Pref., XI '53 F; Aso, Kumamoto Pref., IX '54 F; Dazaifu, Fukuoka Pref., X '55 S.

Previous records from Japan: (Kanzawa, 1934, 1939) Hokkaido, Akita, Yamagata, Iwate, Fukushima, Tochigi, Ibaraki, Kanagawa, Niigata, Yamanashi, Shizuoka, Aichi, Nagano, Gifu, Nara, Mie, Wakayama, Hyogo, Simane, Okayama, Hiroshima, Yamaguchi, Tokushima, Ehime, Oita, Saga, Miyazaki, Nagasaki?, Kagoshima, Prefs.; (Kikkawa & Peng, 1938) Kofu, Gotenba, Kyoto, Oita; (Mizuno, 1952) Higashitakasu, Hokkaido; (Kato & Hori, 1952) Sendai; (Ohba, 1954) Asakawa; (Ishihara, 1955) Sapporo; (Kato, 1954) Sendai.

Distribution: Hokkaido, Honshu (Tohoku, Kanto, Chubu, Chugoku, Kinki), Shikoku, Kyushu, China, Korea, Manchuria.

Feeding habits: FSLGT.

Remarks: Sturtevant & Novitsky (1941) thought it turns out to be intermediate between the *melanogaster* and the *obscura* groups from the facts that it resembles the latter in larger C-index and long *orb*<sub>2</sub>, and similar to the other members of the former in having yellowish body colour and long *or*<sub>2</sub>, and that its 4 V-index comes intermediate between that of both groups.

### *Drosophila (Sophophora) pulchrella* Tan, Hsu, & Sheng, 1949 Figs. 59-62.

Japanese name: Nise-ôto-shôjôbae.

*Drosophila (Sophophora) pulchrella* Tan, Hsu & Sheng, 1949. Univ. Texas Publ., 4920: 198; Hsu, 1949. Univ. Texas Publ., 4920: 97; Wheeler, 1949. Univ. Texas Publ., 4920: 175; Patterson & Stone, 1952. Evol. gen. Dros.: 16; Okada, 1953. Zool. Mag., 62: 284; Okada, 1954. Kontyû, 22: 37.

♂ and ♀: General features as described by Tan, Hsu, and Sheng (1949).

Periphallic organs: Described and figured by Hsu (1949).

Phallic organs: Described and figured by Okada (1954). PI=0.6.

Egg-guides Fig. 60 B): Lobe pale yellow, pointed apically, with about 24 marginal teeth, including about 4 upper marginal ones, which are as large as lower marginal ones, and also including a few small proximal discal teeth. Basal isthmus short, yellowish brown.

Internal structures (Fig. 61 B, 62 B): Proximal intestine:  $C=2.0$  or less. Malpighian tubes with common stalks rather short; posterior branches long and ending free. Testis yellow, basally swollen, with about 2 inner and 4 outer coils, and distally straight. Paragonia slender, weakly folded once. Ejaculatory bulb oval, apodeme with stem twice as long as plate, and plate quadrate. Spermatheca black and oblong. Parovaria shorter than spermatheca. Ventral receptacle with about 6 transverse folds.

Specimens examined: In Todoroki, II '53 F; Asakawa, 1-III '53 F (Ohba); III '54 F (Kurokawa); Kotaira, VII, VIII '53 (Saito); Kyodô, X '53 S (Kitagawa); Kumotoriyama, VIII '53 S. In Kanagawa Pref.: Kamakura, I '52 S; Hakone, IX '54 F (Toda); Kinugawa, Tochigi Pref., VIII '53 F (Moriwaki & Yoshida); Shinkazawa, Gumma Pref., VII '54 F (Toda). In Nagano Pref., Ko-

moro, IX '54; Norikuradake, VIII '54 F (Nozawa); Kyoto, XI '54 L (Arnaud). In Hiroshima Pref.: Taishakukyo, X '55 F; Miyoshi, X '55. Nanokawa, Kôchi Pref., XI '53 F; Kujûzan, Ôita Pref., X '54 F; Dazaifu, Fukuoka Pref., X '55 G; Aso, Kumamoto Pref., IX '54 F; Kirishimayama, Kagoshima Pref., IX '54 F.

Distribution: Honshu (Kanto, Chubu, Kinki, Chugoku), Shikoku, Kyushu, China.

Feeding habits: FSLG.

Remarks: The differences from the close relative, *D. (S.) suzukii* (Matsumura), are as shown in the keys. Distributions of these two species are highly overlapped, but the present species seems to be more restricted to southern parts of Japan, and less abundant as compared to the allied species.

***Drosophila (Sophophora) unipectinata* Duda, 1924 Fig. 57.**

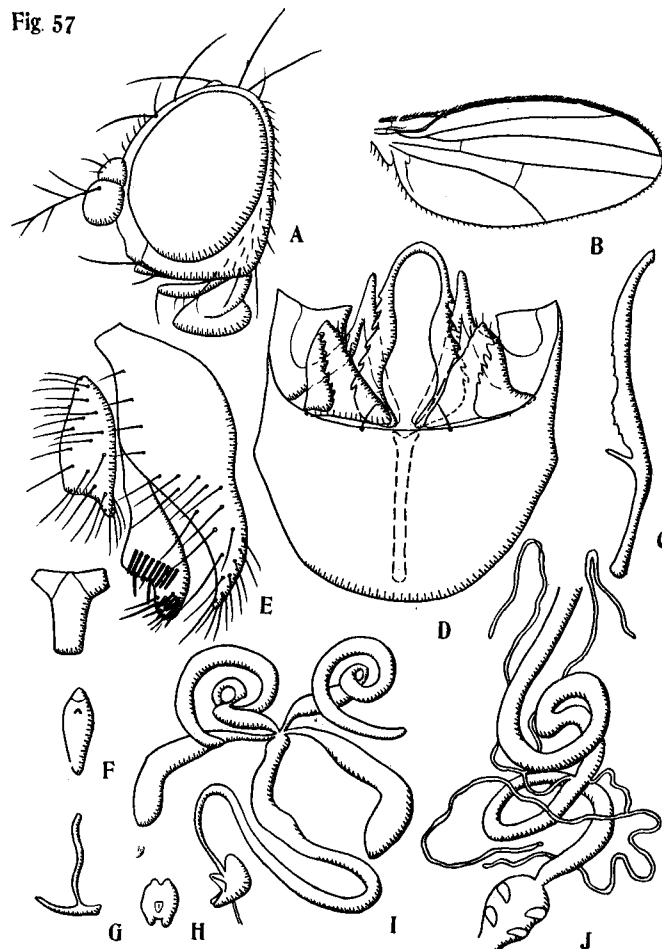
Japanese name: Hitokushi-shôjôbae.

*Drosophila unipectinata* Duda, 1924. Arch. Naturg., 90 A: 215.

*Drosophila (Sophophora) unipectinata* Sturtevant, 1942. Univ. Texas Publ., 4213: 29; Wheeler, 1949. Univ. Texas Publ., 4920:175; Patterson & Stone, 1952. Evol. gen. Dros.: 16; Okada, 1954. Kontyû, 22: 38.

*Drosophila (Sophophora)* sp. like *unipectinata* Duda, Okada, 1953. Zool. Mag., 62: 284.

Fig 57



**Fig. 57. *Drosophila (Sophophora) unipectinata* Duda.**

A. Head; B. Wing; C. Aedeagus (lateral aspect); D. Phallic organs (ventral aspect); E. Peripheral organs (lateral aspect); F. Ejaculatory apodeme (ventral aspect); I. Male reproductive organs (ventral aspect); J. Digestive system (ventral aspect).

♂ and ♀: Body yellowish brown to dark brown, about 2.5-3.0 mm. Head (Fig. 57 A): Antenna brown, 3rd joint paler. Arista with about 5 long branches including a large fork, one below it. Palpus pale, slender, with a long apical bristle, directed below, and also with a few short bristles. Eyes dark red, with red piles. Ocellar triangle and periorbits slightly pollinose. Carina narrow and long. Front velvety orange, about half as broad as the head width, and with *fr* in 2 rows. Cheek about 1/5 as broad as the greatest diameter of eye. *orb*<sub>2</sub> about 1/3 or less *orb*<sub>1</sub>. *or*<sub>2</sub> about 1/3 vibrissa and very weak.

Mesonotum somewhat glossy, pleura darker. *hu* 2, subequal. Sterno-index about 0.5. *ac* in 8 rows. Cross distance of *dc* slightly more than half the length distance. Anterior *scut* convergent.

Legs yellowish grey; fore metatarsus with a large comb of about 26-30 black teeth, occupying its entire length (in male). Preapicals on all three tibiae; apicals on fore and middle. Wings (Fig. 57 B) clear, slightly yellowish especially along costa; slightly angulated at tips;  $r_{2+3}$  straight, curved to costa at tip. C-index about 2.8; 4 V-index about 2.0; 4 C-index about 1.0; 5 X-index about 2.0. C1-bristles 2, long, subequal; C3-bristles on basal 2/5 or 1/2. Halteres pale.

Abdomen dark brown, black at the posterior margin of each tergite.

Periphallic organs (Fig. 57 E): Genital arch dark brown, lower half pale brown, narrowing below; upper portion with about 4 marginal hairs; lower portion with about 25 hairs. Clasper distally broaden, with black teeth in 2 groups; upper group with about 10 teeth, lower about 4, along slightly concave distal margin. Anal plate separated from aedeagus, prolonged at lower anterior tip, and with about 23 hairs. Decasternum broad, T-shaped.

Phallic organs (Fig. 57 C,D): Described and figured by Okada (1954). PI=1.1.

Egg-guides: Lobe dark brown, with about 13 black lower marginal teeth; distal margin broadly truncate and without teeth; upper margin also without teeth. Basal isthmus narrow and black.

Internal structures (Fig. 57 F-J): Proximal intestine: C=2.0. Malpighian tubes with short common stalks and freely ending posterior branches. Testis pale yellow, with about 0.5 inner and 1.5 outer coils. Seminal vesicle thick and oblong. Paragonia weakly folded once. Ejaculatory bulb globular, distally bifid; apodeme with stem twice as long as triangular plate.

Specimens examined: Asakawa, Tokyo, XI '52 F (Ohba); II '53 F (Ohba); II '54 F (Kurokawa); III '54 F (Kurokawa); Yatsugatake, Nagano Pref., VIII '53 F (Kurokawa); Kujūzan, Ōita Pref., IX '54 F.

Distribution: Honshu (Kanto, Chubu), Kyushu, Formosa.

Feeding habits: F.

Remarks: Slightly differs from Formosan form, in having somewhat larger costal index and 8 rows of *ac* (6 in Formosan, according to Duda). A male from Kyushu and a female from Asakawa show the body colour paler and crossveins more oblique than usual.

*melanogaster* series, Okada, 1954. Kontyū, 22: 43.

Posterior paramere branched. Includes *takahashii*, *melanogaster*, and *fusciphila* subgroups.

*takahashii* species-subgroup, Hsu, 1949. Univ. Texas Publ., 4920: 122.

Genital arch with a finger-like geniculation below. Clasper fan-shaped, with two groups of teeth. Posterior paramere with conical processes. Anterior paramere large. Egg-guide rounded at tip and only apically sclerotized. Including *D. (S.) takahashii* Sturtevant, *D. (S.) lutea* Kikkawa & Peng, as well as *D. (S.) nepalensis* Okada.

*Drosophila (Sophophora) lutea* Kikkawa & Peng, 1938 Figs. 59-62.

Japanese name: Kihada-shōjōbae (Kikkawa & Peng, 1938).

*Drosophila lutea* Kikkawa & Peng, 1938. Japan. Journ. Zool., 7: 533; Kato & Hori, 1952. Sci. Rep. Tohoku Univ., 4th ser., 19: 231; Kato, 1953. Sci. Rep. Tohoku Univ., 4th ser., 20: 267; Kato & Hori, 1954. Kontyū, 20: 44; Ohba, 1954. Kagaku, 24: 130; Suzuki, 1955. Zool. Mag., 64: 46; Ishihara, 1955. Zool. Mag., 64: 46.

*Drosophila (Sophophora) lutea* Sturtevant 1952. Univ. Texas Publ., 4213: 29; Shōgaki, 1952. Komai's Shōjōbae no Iden to Jikken: 14, 20; Patterson & Stone, 1952. Evol. gen. Dros.: 16; Okada, 1953. Zool. Mag., 62: 284; Okada, 1954. Japan. Journ. Appl. Zool., 19: 79; Okada, 1954. Kontyū, 22: 38.

♂ and ♀: Legs with preapicals on all three tibiae, apicals on fore and middle. Wings with C1-bristles 2, subequal, C3-bristles on basal 1/3. Cross distance of *dc* slightly larger than twice the length distance. *hu* 2, subequal. Other structures in general are as described by Kikkawa & Peng (1938).

Periphallic organs: Figured by Kikkawa & Peng (1938). Genital arch blackish brown, lower end narrow and finger-like, geniculated rectangularly, and directed caudad; upper margin with about 6 hairs; lower portion with about 10 long and numerous fine hairs. Clasper dilated apically, dark brown, with 2 groups of teeth, lower or primary teeth about 12 (11-14), upper or secondary teeth about 5 (4-7). Anal plate separated from genital arch, fusiform, truncate below, and with dense hairs, lower hairs being short. Decasternum (Fig. 59 M) dark brown, with median piece narrowing and truncate below. A male from Miyakejima (Fig. 59 N) has the median piece somewhat pointed at tip, similar with that found in *D. (S.) takahashii*.



Phallic organs : Described and figured by Okada (1954). PI=0.7.

Egg-guides (Fig. 60 C) : Lobe pale yellow, only apically pale yellow, apically rounded, with about 15 black marginal teeth, but without discal teeth. Penultimate tooth much nearer to 3rd than to ultimate one. Basal isthmus long and narrow, somewhat concaved proximally.

Internal structures (Fig. 61 C, 62 C) : Proximal intestine : C=2.5. Malpighian tubes with common stalks rather long, and posterior branches ending free. Rectal papillae : R=1.8. Testis white, transparent, with about one inner and 2 outer coils. Seminal vesicle slender. Paragonia folded once. Ejaculatory bulb oval, apodeme with quadrate plate. Spermatheca small, brownish black, longer than broad, proximally swollen. Parovarium with knob as large as spermatheca. Ventral receptacle with about 4 semicircular transverse coils.

Specimens examined : Abundant in various localities. Wakkanai, Shioya (Takada), in Hokkaido; Hakamoriyama, Iwate Pref., Towada, Aomori Pref. (Yoshida); Sendai, Miyagi Pref.; Nikko (Moriwaki), Kinugawa (Moriwaki & Yoshida), in Tochigi Pref.; Usuitôge (Kurokawa), Shinkazawa (Toda), in Gumma Pref.; Gytoku, Chiba Pref. (Toshioka). In Tokyo: Asakawa (Ohba et al), Takao, Kunitachi, Kotaira (Saito), Suginami (Ohnishi), Setagaya (Moriwaki et al), Aoyama (Toda), Meguro, Kumotoriyama (Moriwaki et al), Ôshima (Onishi), Miyakejima (Udagawa). Hatanô, Mizonokuchi, Ôkurayama, Kamakura, Ikuta, Aburatsubo, Hakone (Toda), in Kanagawa Pref. Tadeshina, Kisofukushima (Kurokawa et al), in Nagano Pref.; Anjo, Aichi Pref. (Nozawa); Kyoto (Arnaud); Tamano (Kurokawa), Yubara, in Okayama Pref.; Miyoshi, Taishakukyô, in Hiroshima Pref.; Kôchi (Taira), Sagawa, Susaki, in Kôchi Pref.; Dazaifu, Fukuoka Pref.; Kujûmachi, Oita Pref.; Aso, Kumamoto Pref.; Kirishimayama, Kirishimamachi, Kaimondake, in Kagoshima Pref. Collection records cover all the year round.

Previous records from Japan : (Kikkawa & Peng, 1938) Innai, Sendai, Sado, Niigata, Kanazawa, Nagano, Kamisuwa, Kofu, Gotenba, Shizuoka, Shimoda, Yaizu, Gifu, Ayabe, Kyoto, Ashiya, Kobe, Oki, Matsuyama, Kôchi, Ôita, Miyazaki. (Shôgaki, 1952) Kyoto, Kisofukushima. (Kato & Hori, 1952-1954) Sendai; (Ohba, 1954) Kumotoriyama, Asakawa.

Distribution : Hokkaido, Honshu (Tohoku, Kanto, Chubu, Kinki, Chugoku), Shikoku, Kyushu, Miyakejima.

Feeding habits : ESTGL.

### *Drosophila (Sophophora) takahashii* Sturtevant, 1927 Figs. 59, 60, 62.

Japanese name: Takahashi-shôjôbae (Chino & Kikkawa, 1934).

*Drosophila takahashii* Sturtevant, 1927. Philip. Journ. Sci., 32: 371; Chino, 1927. Zool. Mag., 39: 473; Chino & Kikkawa, 1934. Shôjôbae no Iden to Jikken: 32; Peng, 1937. Annot. Zool. Japon., 16: 27; Kikkawa & Peng., 1938. Japan. Journ. Zool., 7: 534.

*Drosophila (Sophophora) takahashii* Sturtevant, 1942. Univ. Texas Publ., 4213: 29; Hsu, 1949. Univ. Texas Publ., 4920: 96; Wheeler, 1949. Univ. Texas Publ., 4920: 175; Tan, Hsu, & Sheng, 1949. Univ. Texas Publ., 4920: 197; Patterson & Stone, 1952. Evol. gen. Dros.: 16; Okada, 1953. Zool. Mag., 62: 284; Okada, 1954. Kontyû, 22: 38; Okada, 1955. Sci. Res. Japan. Exped. Nepal Himalaya, 1: 388.

♂ and ♀ : General features : Anterior *scut* convergent. Wings with C1-bristles 2; C3-bristles on basal 2/5. Other structures as described by Sturtevant (1927), and as indicated by Kikkawa & Peng (1938).

Periphallic organs : Described and figured by Hsu (1949). Figured by Kikkawa & Peng (1938). Decasternum (Fig. 59 O) narrow and pointed at tip.

Phallic organs : Described and figured by Okada (1954, 1955). PI=0.6.

Egg-guides (Fig. 60. C) : Same as in *D. (S.) lutea* Kikkawa & Peng.

Internal structures : (Fig. 62. D) : Spermatheca brownish black, proximally swollen. Parovaria with elliptical knobs. Ventral receptacle with about 5 folds.

Specimens examined : Sagawa, Kôchi Pref., 1 male, 5 XI '53 G; 1 female, Susaki, Kôchi Pref., 5 XI '53 F; Kôchi Pref., several specimens, 28 X '53 (Taira); Kaimondake, Kagoshima Pref., 1 female, 20 IX '54 F; Kirishima-machi, Kagoshima Pref., Aoshima, Miyazaki Pref., 9 males and 2 females, 24 IX '54 F; 25 males and 21 females, 24 IV '54 F (on the coast apposed to the island).

Previous records from Japan : Kôchi Pref. (Okada, 1955).

Distribution : Shikoku, Kyushu, Okinawa, Formosa, Manchuria, China, Nepal, Australia.

Feeding habits : F.

Remarks : Mather (1955) recorded it from Queensland. Very closely resembles the fore-going species, *D. (S.) lutea* Kikkawa & Peng, slightly differs from it as indicated by Kikkawa & Peng (1938) and Okada (1954, 1955).

*melanogaster* species-subgroup, Hsu, 1949. Univ. Texas Publ., 4920: 121.

Palpus with a few prominent bristles. Genital arch with a large circular process on the posterior margin. Clasper with somewhat irregularly arranged teeth. Aedeagus distinctly pectinate. Anterior paramere minute. Posterior paramere with rod-like and flag-like appendages. Egg-guide lobe pale, apically rounded, and with penultimate marginal tooth as far from ultimate as from the 3rd tooth; upper margin without teeth.

Includes *D. (S.) melanogaster* Fallén, *D. (S.) simulans* Sturtevant.

***Drosophila (Sophophora) melanogaster* Meigen, 1830 Figs. 59-61.**

Japanese name: Kiïro-shôjôbae (Esaki, 1932).

*Drosophila melanogaster* Meigen, 1830. Syst. Besch., 6: 85; Sturtevant, 1921. Carn. Inst. Wash. Publ., 301: 89; Malloch, 1923. Proc. Linn. Soc. N.S. Wales, 48: 617; Kurisaki, 1925. Bul. Sci. Fak. Terkultura, 1: 274; Kurisaki, 1926. Zool. Mag., 38: 263; Chino, 1927. Zool. Mag., 39: 473; Sturtevant, 1927. Phil. Journ. Sci., 32: 370; Kikkawa, 1934. Shôjôbae no Iden to Jikken: 5; Esaki, 1932. Nippon Konchû Zukan: 28; Strasburger, 1935. Berl. Verlag. Julius Springer, 1; Peng, 1937. Annot. Zool. Japon., 16: 25; Kikkawa & Peng, 1938. Japan. Journ. Zool., 7: 534; Esaki, 1950. Icon. Ins. Japon.: 1672; Takada, 1952. Kagaku, 22: 541; Shiraki, 1954. Class. Ins.: 748.

*Drosophila (Sophophora) melanogaster* Sturtevant, 1942. Univ. Texas Publ., 4213: 29; Patterson, 1943. Univ. Texas Publ., 4313: 71; Patterson & Mainland, 1944. Univ. Texas Publ., 4445: 32; Hsu, 1949. Univ. Texas Publ., 4920: 96; Wheeler, 1949. Univ. Texas Publ., 4920: 174; Tan, Hsu, & Sheng, 1949. Univ. Texas Publ., 4920: 197; Burla, 1951. Rev. Suis. Zool., 58: 77; Malogolowkin, 1951. Rev. Brasil. Biol., 11: 431; Basden, 1952. Ent. Month. Mag., 88: 200; Patterson & Stone, 1952. Evol. gen. Dros.: 16; Shôgaki, 1952. Komai's shôjôbae no Iden to Jikken: 13; Okada, 1953. Zool. Mag., 62: 284; Burla, 1954. Rev. Suis. Zool., 61: 147; Okada, 1954. Kontyû 22: 38; Okada, 1955. Sci. Resul. Japan. Exped. Nepal Himalaya, 1: 387.

? *Drosophila obscura* Matsumura, 1906. List Japan. Inj. Ins.: 52; Shiraki, 1911. Catalog. Inj. Ins. Formosa: 34 (nec Fallén).

? *Drosophila obscurus* (sic) Matsumura, 1925. Manual Japan. Inj. Ins., 3: 51.

Other synonymies: *ampelophila* Loew, 1862; *nigriventris* Zetterstedt, 1847; *uvarum* Rondani, 1875; *approximata* Zetterstedt, 1847; *pilosula* Becker, 1908; *fasciata* Meigen, 1830; *cameraria* Haliday, 1833.

♂ and ♀: General features: Cf. Kikkawa & Peng (1938), Patterson (1943), Burla (1951), etc.

Periphallalic organs: Figured by Sturtevant (1921), Kikkawa & Peng (1938), Burla (1951), Shôgaki (1952). Figured and described by Hsu (1949), Salles (1947). Decasternum (Fig. 59 K) is a broad transverse band, medially concaved on proximal and distal margins.

Phallic organs: Described and figured by Salles (1947), Okada (1954).

Egg-guides (Fig. 60 D): Lobe pale yellowish grey, with about 10 black marginal teeth; tip rounded; upper margin with submedian deep incision. Basal isthmus narrow and long, not swollen at middle.

Internal structures (Fig. 61 D): Strasburger (1935), Patterson (1943), Ferris (1950), Burla (1951) made extensive studies. Ejaculatory bulb oval, proximal end incised, distal margin broaden and bilobed. Apodeme with oval plate which is concaved at the proximal end.

Specimens examined: In Hokkaido; Daisetsuzan (Takada), Shioya (Takada). In Tokyo: Aoyama (Toda), Setagaya (Moriwaki et al), Kotaira (Saito). Tsuchiura, Ibaraki Pref. (Kitagawa); Futtsu, Chiba Pref. (Toda); Aburatsubo, Kanagawa Pref. (Ohba); Kurama, Kyoto; Okayama (Matsudaira, in the train); Yonekawa, Yamaguchi Pref. (Moriwaki); Yubara, Okayama Pref.; Susaki, Kôchi Pref.; Sagawa, Kôchi Pref.; Hakata, Fukuoka Pref. (in the train); Kujûzan, Ôita Pref.; Aso, Kumamoto Pref.; Soki, Aoshima, Miyazaki Pref.; Kirishima, Kitanaganoda, Kago-shima Pref.; Amamiôshima (Shirôzu).

Previous records from Japan; (Kurisaki, 1925; Esaki, 1932) Honshu, Shikoku, Kyushu; (Kikkawa & Peng, 1938) various localities of Honshu as north as Kôfu, Shikoku, Kyushu, Ogasa-wara, Rhukyu, as well as Korea, Formosa, Manchuria; (Takada, 1952) Odaru, Utsunomiya.

Distribution: Hokkaido, Honshu (Kanto, Chubu, Kinki, Chugoku), Shikoku, Kyushu, Rhukyu, most parts of the world.

Feeding habits: GF.

Remarks: Although Kurisaki (1925) referred *D. obscurus* Matsumura (sic) (nec Fallén) to the present species, Matsumura's figure (1915, Fig. 9, 5) of this species shows a wing quite different from usual type of drosophilid flies. The author is not aware of the occurrence of this species in Tohoku district of Honshu. It was found in Hokkaido very recently by Mr. H. Takada. Near Tokyo, it seems to be far less abundant than *D. (S.) lutea* Kikkawa & Peng.

***Drosophila (Sophophora) simulans* Sturtevant, 1919 Figs. 59-61.**

Japanese name: Onaji-shôjôbae (Kikkawa & Peng, 1938).

*Drosophila simulans* Sturtevant, 1919. Psyche, 26:153; Sturtevant, 1921. Carn. Inst. Publ., 301: 91; Kikkawa & Peng, 1938. Japan. Journ. Zool., 58: 81.

*Drosophila (Sophophora) simulans* Sturtevant, 1942. Univ. Texas Publ., 4213: 29; Patterson, 1943. Univ. Texas Publ., 4313: 72; Patterson & Mainland, 1944. Univ. Texas Publ., 4445: 32; Hsu, 1949. Univ. Texas Publ., 4920: 96; Wheeler, 1949. Univ. Texas Publ., 4920: 174; Burla, 1951. Rev. Suis. Zool., 58:81; Basden, 1952. Ent. Month. Mag., 88: 201; Patterson & Stone, 1952. Evol. gen. Dros.:16; Shōgaki, 1952. Komai's shōjōbae no Iden to Jikken: 19; Okada, 1953. Zool. Mag., 62: 284; Okada, 1954. Kontyū, 22: 39.

♂ and ♀: General features described by Patterson (1943) under current form of description.

Periphallalic organs: Described and figured by Hsu (1949). Figured by Sturtevant (1921), Kikkawa & Peng (1938), Burla (1951). Decasternum (Fig. 59 L) concave at both distal and proximal margins.

Phallic organs: Described and figured by Salles (1947), Okada (1954). PI=0.4.

Egg-guides (Fig. 60 E): Lobe pale yellowish grey, with about 18 black marginal teeth, without discal teeth; upper apical margin is separated from the lobe by a dark longitudinal stripe. Basal isthmus pale brown, long, medially much swollen, and arcuated.

Internal structures (Fig. 61 H): Ejaculatory bulb proximally narrowing and incised, distally broaden and bilobed. Ejaculatory apodeme as in *D. (S.) melanogaster* Meigen. Other internal structures as described by Patterson (1943).

Specimens examined: The author has not seen any Japanese specimens, and the present descriptions were made from the specimens from Texas.

Previous records from Japan: (Kikkawa & Peng, 1938) Ogasawara.

Distribution: Ogasawara, widely distributed in the tropical and subtropical regions of the world.

Remarks: The differences from *D. (S.) melanogaster* Meigen are pointed out by Sturtevant (1919, 1921), Kikkawa & Peng (1938), Salles (1947), Hsu (1949), Burla (1951), Okada (1954), regarding structures of eye, cheek, palpi, periphallalic organs, phallic organs, as well as egg-guides. See also in the keys.

*ficuspshila* species-subgroup, Okada, 1954. Kontyū, 22: 43.

*orb*<sub>2</sub> large, about 3/4 as broad as *orb*<sub>1</sub>. Anal plate with a stout black process below. Posterior parameres separated from each other, laterally contiguous to novasternum. Anterior paramere large. Aedeagus compact. Egg-guides with very narrow, and strongly sclerotized lobes. Includes *D. (S.) ficuspshila* Kikkawa & Peng.

*Drosophila (Sophophora) ficuspshila* Kikkawa & Peng, 1938 Figs. 59-61.

Japanese name; Ichijiku-shōjōbae (Kikkawa & Peng, 1938).

*Drosophila ficuspshila* Kikkawa & Peng, 1938. Japan. Journ. Zool., 7: 531.

*Drosophila (Sophophora) ficuspshila* Sturtevant, 1942. Univ. Texas Publ., 4213: 29; Hsu, 1949. Univ. Texas Publ., 4920: 121; Wheeler, 1949. Univ. Texas Publ., 4920: 175; Shōgaki, 1952. Komai's shōjōbae no Iden to Jikken: 20; Patterson & Stone, 1952. Evol. gen. Dros.: 16; Okada, 1953. Zool. Mag., 62: 284; Okada, 1954. Kontyū, 22: 39.

♂ and ♀: General features as described by Kikkawa & Peng (1938). Supplementary notes as below. Legs with preapicals on all three tibiae, although the hind one is weak; apicals on fore and middle. Wings with C1-bristles 2; C3-bristles on basal half. Cross distance of *dc* slightly larger than twice the length distance. *hu* 2, subequal in length.

Periphallalic organs (Fig. 59 B): Genital arch black, tapering below, and apically with a short finger-like process; upper margin bare; lower portion with about 20 hairs. Clasper fusiform, caudo-apically with about 5 black teeth. Anal plate oblong, pale brown, with about 20 hairs, and ventrally prolonged and clavate. Decasternum with a pair of narrow black bars as well as a pair of paler triangular lateral pieces.

Phallic organs (Fig. 60 F): Described and figured by Okada (1954). PI=0.7.

Egg-guides (Fig. 60 F): Lobe yellow, narrow, with about 15 black marginal and a discal teeth. Basal isthmus narrow and short.

Internal structures (Fig. 61 E): Proximal intestine: C=2.0. Rectal papillae: R=1.2. Malpighian tubes with common stalks rather short, about 1/4 as long as branches, posterior branches ending free.

Testis with about 2.5 inner thick white and 3.5 outer yellow coils. Seminal vesicle narrow. Paragonia weakly folded once. Ejaculatory bulb globular, apodeme with long stem and oval plate, the latter is proximally concave. Spermatheca pale brown, hemispherical, proximally much swollen.

Specimens examined: In Tokyo: Aoyama, X '52 (Toda); Setagaya, X '53 S (Kitagawa); Meguro, X '53 S. Kamakura, Kanagawa Pref., XII '51 S; Tamano, Okayama Pref., X '55 F (Kurokawa); Susaki, Kōchi Pref., XI '53 S; Aso, Kumamoto Pref., IX '54 F; Kirishimamachi, Kagoshima Pref., IX '54 F; Kirishimayama, IX '54 F; Kitanaganoda, Kagoshima Pref., IX '54 S; Kaimon-dake, Kagoshima Pref., IX '54 F; Aoshima, Miyazaki Pref., IX '54 F.

Previous records from Japan: (Kikkawa and Peng, 1938) Kōfu, Kyoto, Katsuura, Wakayama Pref.

Distribution: Honshu (Kanto, Chubu, Kinki, Chugoku) Shikoku, Kyushu.

Feeding habits: SF.

Remarks: All the specimens examined have been obtained in autumn and early winter. Rather rare in Tokyo, which is the northern limit of distribution of this species ever known. The position of this species in the *melanogaster* species-group was discussed by Okada (1954).

*montium* series, Okada, 1954. Kontyū, 22: 43.

Posterior paramere non-branched. Aedeagus non-pectinated. Aedeagus apparently bifid and anterior paramere minute, or aedeagus fused to be a compact body and anterior paramere large. If aedeagus is pectinated, posterior parameres are contiguous to each other (Okada, 1954).

*nipponica* species-subgroup, Okada, 1954. Kontyū, 22: 43.

*orb*<sub>2</sub> minute, about 1/5 *orb*<sub>1</sub>. Anal plate with a stout black process below. Posterior parameres fused to be a compact body, separated from novasternum. Egg-guides with lobes very narrow and strongly sclerotized. Aedeagus pectinate. Includes *D. (S.) magnipectinata* sp. nov., *D. (S.) nipponica* Kikkawa & Peng, and a species like *magnipectinata*.

*Drosophila (Sophophora) nipponica* Kikkawa & Peng. 1938 Fig. 59-62.

Japanese name: Yamato-shōjōbae (Kikkawa & Peng, 1938).

*Drosophila nipponica* Kikkawa & Peng, 1938. Japan. Journ. Zool., 7: 531; Suzuki, 1955. Zool. Mag., 64: 44.

*Drosophila (Sophophora) nipponica* Sturtevant, 1942. Univ. Texas Publ., 4213: 29; Hsu, 1949. Univ. Texas Publ., 4920: 121; Wheeler, 1949. Univ. Texas Publ., 4920: 175; Patterson & Stone, 1952. Evol. gen. Dros.: 16; Shōgaki, 1952. Komai's Shōjōbae no Iden to Jikken: 20; Okada, 1953. Zool. Mag., 62: 284; Okada, 1954. Japan. Journ. Appl. Zool., 19: 79; Okada, 1954. Kontyū, 22: 39; Okada, 1955. Zool. Mag., 64: 107.

♂ and ♀: General features as described by Kikkawa and Peng (1938). Further descriptions as below. Cross distance of *dc* slightly shorter than twice the length distance. *hu* 2, upper shorter. Legs with preapicals on all three tibiae; apicals on middle. Wings with C1-bristles 2; C3-bristles on basal 2/3.

Periphallic organs (Fig. 59 A): Genital arch yellow, broad, and truncate below, upper portion with about 4 long hairs, lower portion with about 15 long hairs. Clasper broad, yellow, with a straight row of about 16 black teeth occupying the entire length of the clasper. Anal plate narrow, oblong, tapering below, separated from genital arch, and with about 10 hairs and long thick black process below. Decasternum trapezoid, medially and laterally projected both at proximal and distal margins.

Phallic organs: Described and figured by Okada (1954). PI=0.6.

Egg-guides (Fig. 60 G): Lobe narrow, orange brown, apically rounded, subapically constricted, and with about 19 marginal and 3 discal black teeth. Basal isthmus short and narrow.

Internal structures (Figs. 61 G, 62 F): Proximal intestine: C=2.5-3.0. Rectal papillae: R=2.0-2.4. Malpighian tubes with common stalks very long, about 1/2 (anterior) or 1/3 (posterior) the length of branches; posterior branches end free. Testis yellow, with about 3 inner and 3 outer coils. Paragonia thick, once folded. Ejaculatory bulb globular; ejaculatory apodeme pale brown, stem long, and plate narrow triangular. Spermatheca large, elliptical, or lamp-shaped, pale brown. Parovaria much shorter than spermatheca, with knob weakly swollen. Ventral receptacle with about 5 transverse folds.

Specimens examined: In Hokkaido: Sōunkyo, VIII '53 S; Kurotake, VIII '53 MS; Nakashibetsu, VIII '51 F; Imagane, VI '53 M (Suzuki); Sapporo, VII '53 S (Suzuki), VIII '53 MS. In Tokyo: Setagaya, III, XI '52 S, II '53 S; Aoyama, IV '53 S (Toda); Higashimurayama, XII '53 S. Mukogakoka, Kanagawa Pref., XII '53 S; Gyotoku, Chiba Pref., V '53 L (Toshika); Anjō, Aichi Pref., VI '54 F (Nozawa).

Previous records: (Kikkawa & Peng, 1938) Ayabe; (Suzuki, 1955) Sapporo.

Distribution: Hokkaido, Honshu (Kanto, Cnubu, Kinki).

Feeding habits: **SMFL**.

Remarks: In the vicinities of Tokyo, the specimens have been obtained only by sweeping and in the colder seasons.

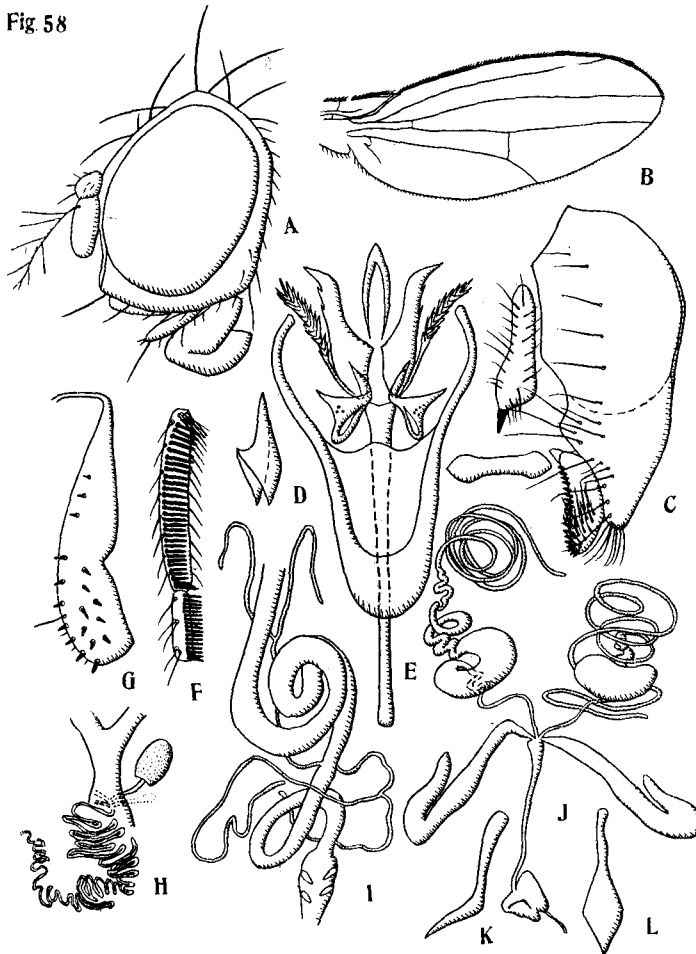
***Drosophila (Sophophora) magnipectinata* sp. nov. Fig. 58.**

Japanese name: Okushi-shōjōbae.

*Drosophila (Sophophora)* sp. from Sapporo, Okada, 1954. Kontyû, 22: 39; Okada, 1955. Zool. Mag., 64: 107.

*Drosophila megaloplectinata* (nom. und.) Suzuki, 1955. Zool. Mag., 64: 45; Okada, 1955. Zool. Mag., 64: 110.

Fig 58



**Fig. 58. *Drosophila (Sophophora) magnipectinata* sp. nov.**

A. Head; B. Wing; C. Peripheral organs (lateral aspect); D. Posterior parameres (lateral aspect); E. Phallic organs (ventral aspect); F. Proximal two tarsal joints of male fore leg; G. Egg-guide; H. Female reproductive organs (ventral aspect); I. Digestive system (ventral aspect); J. Male reproductive organs; K. Ejaculatory apodeme (lateral aspect); L. do. (ventrocaudal aspect).

♂ and ♀: Body yellowish brown, about 2.7-3.5 mm in length. Head (Fig. 58 A): Eye red, with with rough piles. Antenna pale brown, 3rd joint paler. Arista with about 8 branches including a small fork, 2 below it. Palpus yellowish brown, apically darker, narrow, and with only one long apical bristles. Ocellar triangle and periorbits orange brown. Front yellowish brown, medially darker, about half as broad as head width. A few *fr* present. Clypeus yellowish brown. Cheek yellowish orange, about 1/4 as broad as the greatest diameter of eye. Carina yellow, low, and narrow. *orb*<sub>2</sub> minute, about 1/5 *orb*<sub>1</sub>. *or*<sub>2</sub> about 1/2 or 2/3 vibrissa. Occiput black. Vertex yellowish brown.

Mesotum and scutellum yellowish brown. Thoracic pleura dark brown. *hu* 2, lower longer. *ac* in 4-6 somewhat irregular rows. Cross distance of *dc* about one and half times as long as the length distance. Anterior *scut* convergent. Sterno-index about 0.3.

Legs yellow; Proximal two joints of fore tarsi of male with large combs of about 30 and 22 black teeth respectively, occupying entire lengths of the joints, projecting beyond tips. wings (Fig. 58 B) hyaline, veins yellow; crossveins clear. C-index about 3.0; 4V-index about 1.6; 4C-index about 0.8; 5X-index about 1.6. C1-bristles 2, subequal in size. C3-bristles on basal

2/5. Halteres pale yellow.

Abdominal tergites black, 1 T yellow, 2-5 T medially yellow. Cerci yellow. Abdominal sternites pale brown, broader than long.

Periphallalic organs (Fig. 58 C): Genital arch blackish, tapering below, roundly projected caudo-medially, above insertion of clasper; upper margin with about 10 black hairs; lower margin with about 20 black hairs. Clasper brownish black, oblong, with about 10 black teeth in somewhat concave row occupying almost entire length of caudal margin of the clasper itself, and with about 20 upright setae on the inner surface. Anal plate yellowish, oblong, broaden below, separated from genital arch, and with about 20 hair as well as a stout black pointed process at the lower end, directed ventrad. Decasternum long, transverse, bar-like, medially constricted.

Phallic organs: (Fig. 58 D, E): Described and figured by Okada (1954). PI=0.4.

Egg-guides (Fig. 58 G): Lobe narrow, dark brown, elliptical at tip, and with about 11 lower marginal and 8 discal black teeth. Basal isthmus short and black.

Internal structures (Fig. 58 H-L): Proximal intestine: C=2.5. Rectal papillae: R=about 3.0. Malpighian tubes with common stalks long and branches short, posterior branches ending free. Testis yellowish white, with about 4 inner and about 9 outer coils, inner coils distally much broaden. Paragonia slender, folded once. Ejaculatory bulb triangular at lateral aspect. Apodeme with plate rhombic, nearly as long as stem. Spermatheca pale yellowish orange, very large, and

Fig. 59

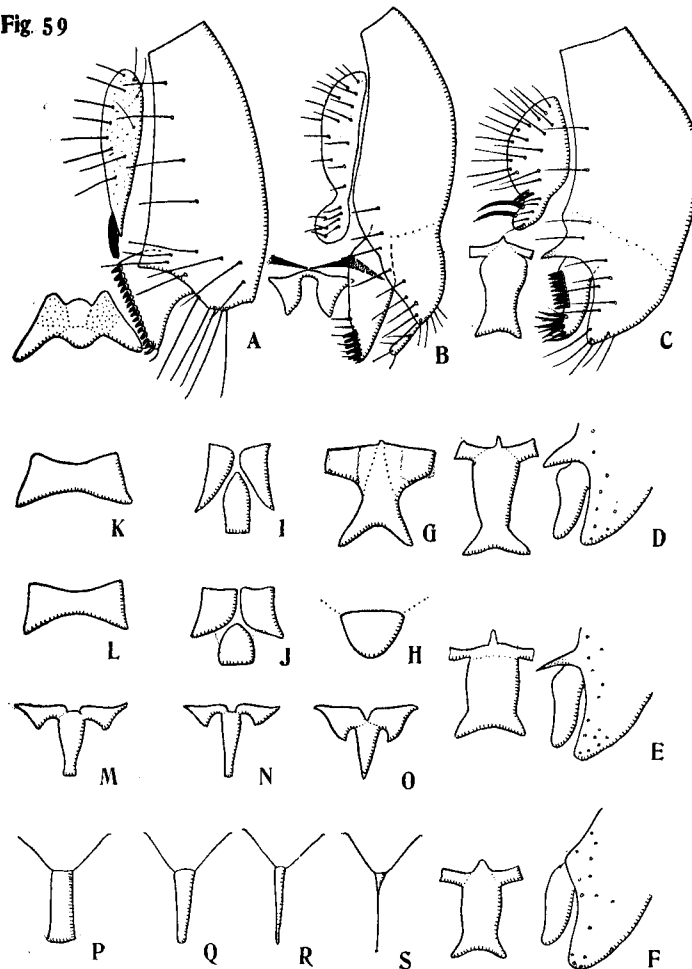


Fig. 59.Periphallalic organs: (lateral aspect).

A. *Drosophila (Sophophora) nipponica* Kikkawa & Peng; B. *D. (S.) ficusphila* Kikkawa & Peng; C. *D. (S.) auraria* Peng, Type A; D. *D. (S.) auraria*, Type B; E. *D. (S.) auraria*, Type C; F. *D. (S.) rufa* Kikkawa & Peng (D-F: parts).

Decasternum of various species of the *melanogaster* group.

G. *Drosophila (Sophophora) kikkawai* Burla; H. *D. (S.) bipectinata* Duda; I. *D. (S.) suzukii* (Matsumura); J. *D. (S.) pulchrella* Tan, Hsu, & Sheng; K. *D. (S.) melanogaster* Meigen; L. *D. (S.) simulans* Sturtevant; M. *D. (S.) lutea* Kikkawa & Peng; N. *D. (S.) lutea* from Miyakejima; O. *D. (S.) takahashii* Sturtevant; P. *D. (S.) ananassae* Doleschall, from Mexico; Q. *D. (S.) ananassae*, from Hawaii, Costa Rica, and a certain Oriental region; R. *D. (S.) ananassae*, from Panama; S. *D. (S.) ananassae*, from Texas, Sao Paulo.

elliptical. Ventral receptacle very long and transversely folded about 25 times, unusually numerous among the subgenus *Sophophora*.

Holotype: ♂, Sapporo, Hokkaido, 10 VII '53 S (Suzuki).

Allotopotype: ♀, collected together with holotype.

Paratypes: 5 ♂♂ and 1 ♀, Sapporo, Hokkaido, 10 VII '53 S (Suzuki); 4 ♂♂, Sōunkyo, Hokkaido, 10-14 VIII '53 S (Okada); 2 ♀♀, Kurotake, Hokkaido, 10 VIII '53 F (Ohba et al).

Distribution: Hokkaido.

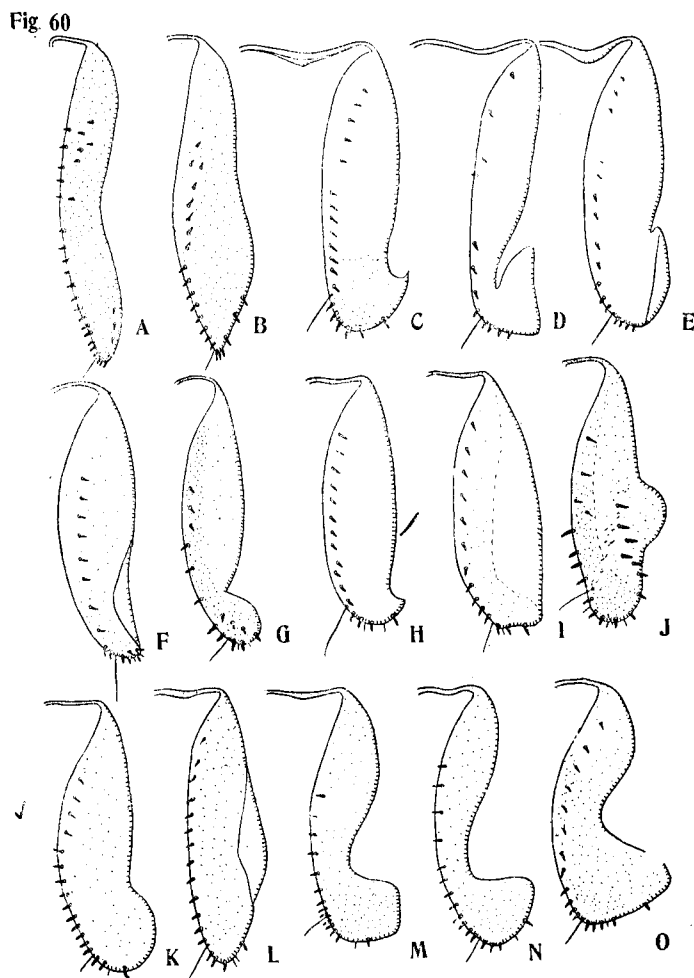
Feeding habits: SF.

Relationships: Allied to *D. (S.) nipponica* Kikkawa & Peng, but differs in having C-index larger, palpus with only one prominent seta, C3-bristles larger in range, discal peg-like bristles of egg-guides more numerous, and tarsal sex-combs larger.

***Drosophila (Sophophora) sp. like magnipectinata sp. nov.* Fig. 60.**

Japanese name: Nise-ōkushi-shōjōbae.

♀: Body about 2.2mm, dark brown, with legs and cerci yellow. Eye red, with piles. Antenna yellowish brown. Arista with 9 long branches including a small fork, 3 below it. Ocellar triangle and periorbits dark brown. *pvt* long. Front brownish black, about half as broad as head width. Clypeus black. Carina low, short. Face orange brown, exceedingly broaden and convex below carina. Cheek brownish black, about 1/4 as broad as the greatest diameter of eye. *orb*<sub>2</sub> minute. *orb*<sub>3</sub> about half *orb*<sub>1</sub>. *or*<sub>2</sub> weak, 1/3 or less length of vibrissa. Palpus with only one prominent bristle.



**Fig. 60.** Egg-guides of various species of the *melanogaster* group.

A. *Drosophila (Sophophora) suzukii* (Matsumura); B. *D. (S.) pulchrella* Tan, Hsu, & Sheng; C. *D. (S.) lutea* Kikkawa & Peng, and D. *D. (S.) takahashii* Sturtevant; D. *D. (S.) melanogaster* Meigen; E. *D. (S.) simulans* Sturtevant; F. *D. (S.) ficusphila* Kikkawa & Peng; G. *D. (S.) nipponica* Kikkawa & Peng; H. *D. (S.) ananassae* Doleschall; I. *D. (S.) bipectinata* Duda; J. *D. (S.) sp. like magnipectinata*; K. *D. (S.) kikkawai* Buala; L. *D. (S.) rufa* Kikkawa & Peng; M. *D. (S.) auraria* Peng, Type A; N. *D. (S.) auraria*, Type B; O. *D. (S.) auraria*, Type C.

Mesonotum glossy black, highly convex. Scutellum and thoracic pleura glossy brownish black. *hu* only one and long. *ac* in 6 rows. Cross distance of *dc* about 2.5 times the length distance. Anterior *scut* divergent. Sterno-index about 0.3.

Legs yellow. Preapicals on all three tibiae; apicals on middle.

Wings hyaline, somewhat pointed at tips; veins yellow.  $r_{2+3}$  apically strongly curved to costa. C-index about 3.0; 4V-index about 1.9; 4C-index about 0.9; 5X-index about 1.3. C1-bristles 2; C3-bristles on basal 1/4-1/5. Halteres white.

Abdominal tergites entirely somewhat glossy brownish black, except cerci which are yellow. Abdominal sternites quadrate, brownish black.

Egg-guides (Fig. 60 J): Lobe brown, apically rounded, medially swollen, upper margin convexed subapically, and with about 16 marginal and 7 upper discal black teeth. Basal isthmus black, short and narrow.

Specimens examined: Asakawa, Tokyo, 1 ♀, 4 V '51 S; Kogesawa, Tokyo, 2 ♀ ♀, 5 V '51 S.

Distribution: Honshu (Kanto).

Feeding habits: S.

Relationships: Seems to be a member of *nipponica* subgroup. Differs from *D. (S.) magnipectinata* sp. nov. in the shapes of egg-guides and wing venations;  $r_{2+3}$  being strongly curved at tip, and wing slightly pointed at tip.

*ananassae* species-subgroup, Hsu, 1949. Univ. Texas Publ., 4920: 121.

Claspers 2 sets; primary teeth in 2 groups. Aedeagus not pectinated. Anterior paramere U-shaped. Egg-guides scarcely sclerotized, ultimate marginal tooth being isolated from the succeeding teeth. Includes *D. (S.) ananassae* Doleschall, *D. (S.) bipectinata* Duda.

*Drosophila (Sophophora) ananassae* Doleschall, 1858 Fig. 59-61.

Japanese name: Ananasu-shōjōbae (Moriwaki, 1936).

*Drosophila ananassae* Doleschall, 1858. Nat. Tijds. Ned. Ind., 17:128; de Meijère, 1908. Tijds. Ent., 51: 159; de Meijère, 1911. Tijds. Ent., 54: 399; Duda, 1923. Ann. Mus. Nat. Hung., 20: 53; Duda, 1924. Arch. Naturg., 90 A (3): 247; Duda, 1925. Arch. Naturg., 91A (11): 211; Duda, 1926. Suppl. Ent., 14: 98; Sturtevant, 1927. Phil. Journ. Sci., 32: 371; Moriwaki, 1934. Journ. Genet., 9:164; Moriwaki, 1935. Genetica, 17: 33; Moriwaki, 1936. Zool. Mag., 48: 693; Moriwaki, 1936. Japan. Journ. Genet., 12: 183; Peng, 1937. Annot. Zool. Japon., 16: 26; Kikkawa & Peng, 1938. Japan. Journ. Zool., 7: 526; Duda, 1940. Ann. Mus. Nat. Hung., 33: 45; Moriwaki & Okada, 1952. Annot. Zool. Japon., 25: 212.

*Drosophila (Sophophora) ananassae* Sturtevant, 1942. Univ. Texas Publ., 4213: 29; Patterson, 1943. Univ. Texas Publ., 4313: 74; Patterson & Mainland, 1944. Univ. Texas Publ., 4445: 32; Malogolowkin, 1948. Summ. Brasil. Biol., 1: 429; Hsu, 1949. Univ. Texas Publ., 4920: 96; Wheeler, 1949. Univ. Texas Publ., 4920: 175; Tan, Hsu, & Sheng, 1949. Univ. Texas Publ., 4920: 197; Patterson & Stone, 1952. Evol. gen. Dros.: 16; Shōgaki, 1952. Komai's Shōjōbae no Iden to Jikken: 19; Okada, 1953. Zool. Mag., 62: 284; Okada, 1954. Kontyū, 22: 39; Burla, 1954. Rev. Suis. Zool., 61: 157.

*Drosophila caribbea* Sturtevant, 1916. Ann. Ent. Soc. Amer., 9: 355.

*Drosophila impertata* Walker, 1859. Proc. Linn. Soc., 3: 126.

♂ and ♀: General features as described by Kikkawa & Peng (1938) and Patterson (1943).

Periphallic organs: Figured by Kikkawa & Peng (1938). Described and figured by Malogolowkin (1948), Hsu (1949). Decasternum (Fig. 59 P-S) variable in development according to strains. It is most highly developed in a strain from Mexico, median piece being broad, broaden apically, and truncate at tip. Strains from Hawaii, Costa Rica, and certain Oriental area show the median piece narrower, narrowing apically, and blunt at tip. In a strain from Panama the median piece is very narrow and apically pointed. The least developed type of decasternum is seen in a strain from Sao Paulo as well as that examined by Malogolowkin (1948), in which the median pieces are exceedingly degenerated.

Phallic organs: Described and figured by Malogolowkin (1948) and Okada (1954).

Egg-guides (Fig. 60 H): Described by Malogolowkin (1948), Moriwaki & Okada (1952). Lobe very weakly sclerotized, tip rounded, and with about 13-18 black teeth, ultimate tooth usually isolated from the others. Basal isthmus gently concave proximally, about 1/5 as long as lobe.

Internal structures (Fig. 61 F): Proximal intestine: C=2.5. Rectal papillae: R=about 1.2. Ejaculatory apodeme elongate triangular, proximally concave deeply. Other structures as described by Patterson (1943).

Specimens examined: All from the stocks of exotic forms.

Previous records from Japan and adjacent localities: (Moriwaki, 1934) Tokyo; (Kikkawa & Peng, 1938) Ogasawara, Okinawa, Formosa, Palau.



Distribution: Tropical and subtropical regions of the world. Japanese examples collected by Dr. Moriwaki (1934) may be of temporary introduction from a Tropical region, probably Formosa, by means of banana-fruit importation.

Feeding habits: F?

***Drosophila (Sophophora) bipectinata* Duda, 1923. Fig 59-62.**

Japanese name: Futakushi-shōjōbae (Kikkawa & Peng, 1938).

*Drosophila bipectinata* Duda, 1923. Ann. Mus. Nat. Hung., 20: 52; Duda, 1924. Arch. Naturg., 90 A (3): 214; Duda, 1926. Suppl. Ent., 14: 98; Kikkawa & Peng, 1938. Japan. Journ. Zool., 7: 527.

*Drosophila (Sophophora) bipectinata* Sturtevant, 1942. Univ. Texas Publ., 4213: 29; Hsu, 1949. Univ. Texas Publ., 4920: 122; Wheeler, 1949. Univ. Texas Publ., 4920: 175; Patterson & Stone, 1952. Evol. gen. Dros.: 16; Shōgaki, 1952. Komai's Shōjōbae no Iden to Jikken: 19; Okada, 1953. Zool. Mag., 62: 284; Okada, 1954. Kontyū, 22: 39; Okada, 1955. Sci. Result. Japan. Exped. Nepal Himalaya, 1: 387.

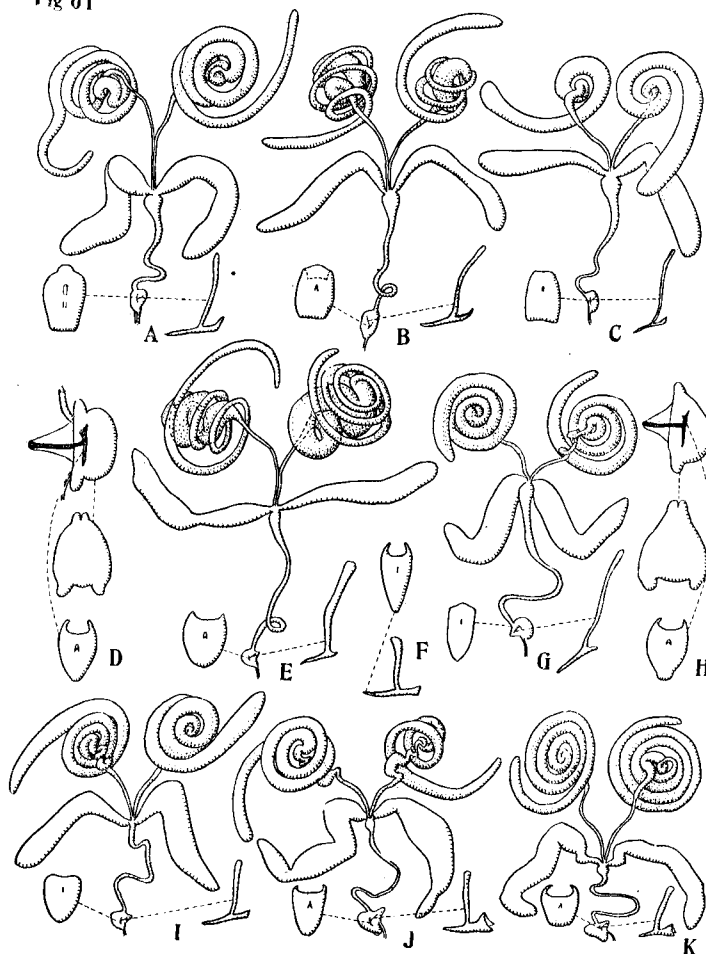
♂ and ♀: General features as described by Kikkawa & Peng (1938). *hu* 2, subequal. Cross distance of *dc* about 2.5 times the length distance. Legs with preapicals on all three tibiae, apicals on fore and middle. Wings with C1-bristles 2; C3-bristles on basal  $\frac{2}{5}$ - $\frac{1}{2}$ .

Periphallic organs: Figured by Kikkawa & Peng (1938). Described and figured by Hsu (1949). Decasternum (Fig. 59 H) triangularly rounded and pale grey.

Phallic organs: Described and figured by Okada (1954). PI=0.5.

Egg-guides (Fig. 60 I): Lobe weakly sclerotized, broad and truncate at tip, and with about 13 marginal black teeth, ultimate one strongest and isolated from the succeeding ones. Basal isthmus pale brown, narrow, and nearly straight.

Fig 61



**Fig. 61. Male reproductive organs of various species of the *melanogaster* group.**

A. *Drosophila (Sophophora) suzukii* (Matsumura); B. *D. (S.) pulchrella* Tan, Hsu, & Sheng; C. *D. (S.) lutea* Kikkawa & Peng; D. *D. (S.) melanogaster* Meigen; E. *D. (S.) ficusphila* Kikkawa & Peng; F. *D. (S.) ananassae* Doleschall; G. *D. (S.) nipponica* Kikkawa & Peng; H. *D. (S.) simulans* Sturtevant; I. *D. (S.) bipectinata* Duda; J. *D. (S.) auraria* Peng, Type A; K. *D. (S.) rufa* Kikkawa & Peng.

Internal structures (Fig. 60 I, 61 I, 62 E): Proximal intestine:  $C=2.5$ . Rectal papillae:  $R=2.3$ . Malpighian tubes with common stalks moderate in length, posterior branches ending free. Testis pale yellow, with about 1.5 inner and 3 outer coils. Seminal vesicles narrow, proximally fused to each other. Paragonia white, gently curved. Ejaculatory apodeme with palte oval, shallowly concave at the proximal margin. Spermatheca brownish black, apically black, elliptical, and basally narrowing and truncate. Ventral receptacle folded several times semicircularly. Parovaria with stem longer than spermatheca, knob rounded.

Specimens examined: No Japanese specimens have been collected yet. Examined specimens came from Taipei, Formosa, 7 ♂♂ and 11 ♀♀, 7 X '51 L (Barnett); Nepal, several specimens, 18 VIII '53 F (Nakao); India, stock, I '55 (Mukherji).

Previous records from Japan and adjacent localities: (Kikkawa & Peng, 1938) Ishigakijima, Formosa; (Pipkin, 1952) Micronesia.

Distribution: Ishigakijima, Formosa, India, Nepal, Micronesia.

Feeding habits: FL.

*montium* species-subgroup, Hsu, 1949. Univ. Texas Publ., 4920:121.

2 claspers in male. Primary teeth of primary clasper in one row. Anterior paramere large, straight, not contiguous to aedeagus. Egg-guide with lobe well sclerotized, ultimate tooth being evidently isolated from the succeeding ones.

Including *D. (S.) montium* Duda, *D. (S.) kikkawai* Burla, *D. (S.) séguyi* Smart, *D. (S.) auraria* Peng, *D. (S.) rufa* Kikkawa & Peng. *D. (S.) serrata* Malloch (1927), from Queensland seems to be included here. This, however, differs from any of the Japanese members of the *melanogaster* species-group, in having proximal sex-comb composed of two sets of teeth of different size, arranged in a row occupying total length of the tarsal joints. The author come across with a species, resembling *D. (S.) séguyi* Smart, collected by Drs. P. Banerji (VIII '55) and D.P. Mukherjee (I '56) in India. This probably unnamed Indian species has median process of male novasternum widely truncate at tip, while the process is pointed in *D. (S.) séguyi* Smart, *D. (S.) montium* Duda, as well as *D. (S.) kikkawai* Burla.

*Drosophila (Sophophora) kikkawai* Burla, 1954. Figs 59, 60, 62.

Japanese name: Torafu-shōjōbae (Kikkawa & Peng, 1938); Hime-shōjōbae (Chino & Kikkawa, 1934).

*Drosophila (Sophophora) kikkawai* Burla, 1954. Rev. Brasil. Biol., 14: 47; Okada, 1955. Sci. Result. Exped. Nepal Himalaya, 1:387.

*Drosophila montium* Duda, 1923. Ann. Mus. Nat. Hung., 20: 53; Duda, 1924. Arch. Naturg., 90 A (3): 215; Chino & Kikkawa, 1934. Shōjōbae no Iden to Jikkenho: 32; Kikkawa, 1936. Japan. Journ. Genet., 12: 137; Kikkawa & Peng, 1938. Japan. Journ. Zool., 7: 530; Pavan & Dacunha, 1947. Facul. Fil. Ciên. e Letr. Univ. S. Paulo, 86: 20 (Biol. Geral., 7). (nec *montium* de Meijère, 1917).

*Drosophila (Sophophora) montium* Sturtevant, 1942. Univ. Texas Publ., 4213: 29; Hsu, 1949. Univ. Texas Publ., 4920: 97; Tan, Hsu, & Sheng, 1949. Univ. Texas Publ., 4920: 197; Wheeler, 1949. Univ. Texas Publ., 4920: 175; Patterson & Wheeler, 1949. Univ. Texas Publ., 4920:211; Patterson & Stone, 1952. Evol. gen. Dros: 16; Shōgaki, 1952. Komai's Shōjōbae no Iden to Jikken: 19; Okada, 1953. Zool. Mag., 62: 284; Okada, 1954. Kontyū, 22: 39.

♂ and ♀: General features as reported by Kikkawa & Peng (1938).

*hu* 2, lower one slightly longer. Cross distance of *dc* slightly longer than twice the length distance. Legs with preapicals on all three tibiae, apicals on fore and middle. Wings with C1-bristles 2; C3-bristles on basal half.

Periphallic organs: Figured by Kikkawa & Peng (1938). Described and figured by Hsu (1949) and Burla (1954).

Decasternum (Fig. 59 G) with well developed quadrate lateral pieces and distally forked median piece.

Phallic organs: Described and figured by Burla (1954), Okada (1954). PI=1.0.

Egg-guides (Fig. 60 K): Figured by Burla (1954). Lobe yellowish brown, proximal half paler, upper margin weakly concave, apex rounded, and with about 18 marginal black teeth. The ultimate tooth usually isolated from the remaining teeth. Basal isthmus narrow and short.

Internal structures (Fig. 62 G): Proximal intestine:  $C=2.0$ . Rectal papillae:  $R=1.6$ . Malpighian tubes with common stalks moderate or rather long, sometimes anterior stalk being longer than the posterior one; posterior branches end free. Testis white, with about 2 inner and 3 outer coils, outer coils thick and straightly elongated at tip. Seminal vesicles slender, proximally confluent. Paragonia once folded. Ejaculatory bulb globular, comparatively large. Ejaculatory apodeme minute, very weakly sclerotized; stem long, and plate broad and oval, apically truncate,

basally concave weakly. Spermatheca globular, hyaline, not sclerotized. Parovaria fine, knob only slightly swollen. Ventral receptacle semicircularly and transversely folded about 5 times.

Specimens examined: Sagawa, Kōchi Pref., XI '53 G; Ochide, Kōchi Pref., XI '53 S; Kujūma-chi, Ōita Pref., IX '54 F; Kitanaganoda, Kagoshima Pref., IX '54 F; Soki, Miyazaki Pref., IX '54 F; Aoshima, Miyazaki Pref., IX '54 F. Also examined stocks from Kumamoto and Kanazawa, sent from Ōsaka University.

Previous records from Japan and adjacent localities: (Kikkawa & Peng, 1938) Race A: Tokuyama, Fukuoka, Ōita, Tomioka, Miyanojō, Amami-ōshima, Naha, Ishigakijima, Keijo, Port-Arthur, Taipei, Shinchiku. Race B: Shimoda, Yuasa, Matsuyama, Saipan.

Distribution: Honshu (Chubu, Kinki), Shikoku, Kyushu, Rhukyu, China, South Asia, Micronesia, Hawaii, Samoa?

Feeding habits: FSG.

Remarks: The author has examined stocks from Okinawa, Nepal and Hawaii, and found them strictly coincident with Japanese form. Burla (1954) examined de Meijère's type of *D. (S.) montium* from Java and discovered it to be quite different from the species which has been widely accepted to have the name *montium*, and he afforded the latter a new name, *kikkawai*. Kikkawa & Peng (1938) recognized two races (A, B) in this species, with respect to different metaphase configurations. Wheeler (1949) proved Duda's two varieties (*atrophyga*, *xanthopyga*) (1924) to be phenotypes caused by autosomal single allele. Similar results were obtained by Freire-Maia (1949).

Fig 62

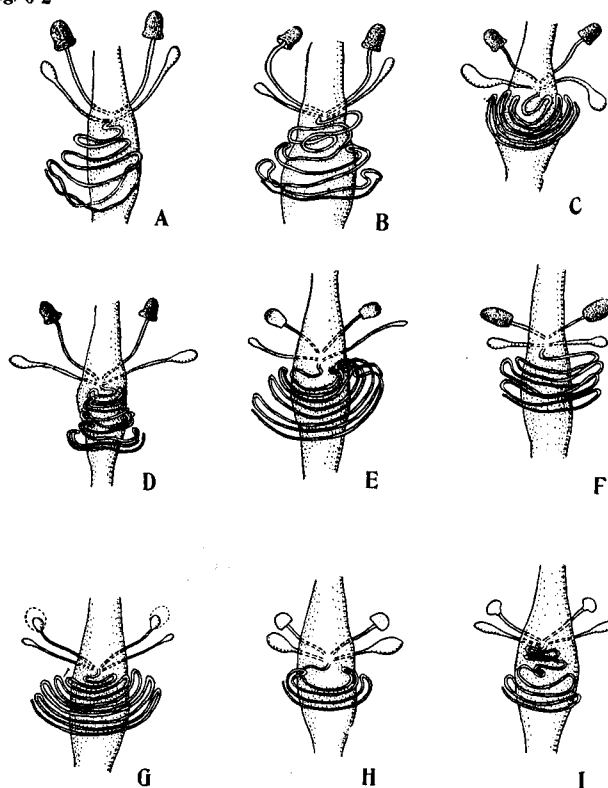


Fig. 62. Female reproductive organs of various species of the *melanogaster* group (ventral aspect).

A. *Drosophila (Sophophora) suzukii* (Matsumura); B. *D. (S.) pulchrella* Tan, Hsu & Sheng; C. *D. (S.) lutea* Kikkawa & Peng; D. *D. (S.) takahashii* Sturtevant; E. *D. (S.) bipectinata* Duda; F. *D. (S.) nipponica* Kikkawa & Peng; G. *D. (S.) kikkawai* Burla; H. *D. (S.) rufa* Kikkawa & Peng; I. *D. (S.) auraria* Peng, Type A.

### *Drosophila (Sophophora) auraria* Peng, 1937 Figs. 59-62.

Japanese name: Kaojiro-shōjōbae (Kikkawa & Peng, 1938).

*Drosophila auraria* Peng, 1937. Annot. Zool. Japon., 16: 20; Kikkawa & Peng, 1938. Japan. Journ. Zool., 7: 528; Mizuno, 1952. Papers Res. Genet., 3: 51; Takada, 1952. Kagaku, 22: 541; Kurokawa, 1952. Japan. Journ. Gen., 27: 225; Ohba, 1954. Kagaku, 24: 130; Takada, 1954. Japan. Journ. Genet., 29: 109; Kato, 1954. Sci. Rep. Tohoku Univ. Biol., 20: 267; Ishihara, 1955. Zool. Mag., 64: 85; Suzuki, 1955. Zool. Mag., 64: 44.

*Drosophila (Sophophora) auraria* Sturtevant, 1942. Univ. Texas Publ., 4213: 29; Hsu, 1949. Univ. Texas Publ., 4920:

97; Wheeler, 1949. Univ. Texas Publ., 4920: 175; Tan, Hsu, & Sheng, 1949. Univ. Texas Publ., 4920: 197; Patterson & Stone, 1952. Evol. gen. Dros.: 16; Shōgaki, 1952. Komai's Shōjōbae no Iden to Jikken: 19; Okada, 1953. Zool. Mag., 62: 284; Burla, 1954. Rev. Brasil. Biol., 14: 46; Okada, 1954. Kontyū, 22: 40; Okada, 1955. Zool. Mag., 54: 107.

♂ and ♀: General features as described by Peng (1937) and Kikkawa & Peng (1938). *hu* 2, subequal. Cross distance of *dc* about 2.7 times the length distance. Legs with preapicals on all three tibiae; apicals on middle. Wings with C1-bristles 2; C3-bristles on basal half or slightly more.

Periphallic organs (Fig. 59 C-E): Figured by Peng (1937), Kikkawa & Peng (1938). Described by Hsu (1949), Burla (1954). Decasternum yellowish brown, median piece oblong and distally bifid.

Phallic organs: Described and figured by Burla (1954), Okada (1954). PI=1.0-1.1.

Egg-guides (Fig. 60 M-O): Lobe orange brown, well sclerotized, apically round, and with about 15-18 black marginal teeth, ultimate tooth being isolated from succeeding ones. Basal isthmus short.

Internal structures (Fig. 61 J, 62 I): Proximal intestine: C=2.5. Rectal papillae: R=1.3. Testis pale yellow, with about 2 inner and 3-4 outer coils. Paragonia folded once. Ejaculatory bulb globular; ejaculatory apodeme with plate oval, somewhat narrow and concave at proximal margin. Spermatheca small, hyaline, flattened globularly. Parovaria longer than spermatheca, with elliptical tip. Ventral receptacle with about 5 transverse small folds.

Race differentiation: Kurokawa (1952) recognized two different types, A and B, in the present species, and made crossing tests between them. Okada (1954) distinguished the third type (C), and described differences present between these three types, with special reference to the phallic organs. Takada (1954) compared vertical distribution of types A and B. Morphological differentiations of the three types with respect to general external features seem to be not clearcut, but that of phallic organs, periphallic organs as well as of egg-guides are rather prominent, as shown in the keys. Male hexasternum is a good character to distinguish types A and B: it is pubescent in the former and bare in the latter; type C shows pubescent hexasternum, but, according to Mr. Kurokawa's study, the pubescency is less pronounced than in type A. His experiments show also that type C closely resembles a hybrid between types A and B, regarding to phallic organs. Geographical distribution of these types are greatly overlapped in middle Japan, but type B is abundant in Hokkaido, and type A in the southern parts of Japan. Further discussions are to be published by Mr. Kurokawa (1956).

Specimens examined: Type A: Shioya (Takada), Sapporo, Chitose (Kasaki), Hakodate, in Hokkaido; Hakamoriyama, Iwate Pref; Sendai, Miyagi Pref; Setagaya, Meguro, Suginami (Ohnishi), Aoyama (Toda), Inokashira (Ikuma), Asakawa (Ohba), Kobotoke, Kunitachi, Kotaira (Saito), Kumotoriyama (Moriwaki et al), Takaozan, Itabashi (Yamaura), in Tokyo; Hachijōshima (Kato), Ōshima (Ōnishi). Mizonokuchi, Ikuta, Kikuna, Kamakura, Hakone (Toda), in Kanagawa Pref.; Mishima, Shizuoka Pref. (Watanabe); Tadeshina, Yatsugatake (Kurokawa), in Nagano Pref.; Gyōtoku, Chiba Pref. (Toshioka); Anjo Aichi Pref. (Nozawa); Uji (Arnaud), Kurama, Kyoto Pref.; Dazaifu, Fukuoka Pref.; Kujūzan, Ōita Pref.; Aoshima, Miyazaki Pref.; Kirishima-jingū, Kagoshima Pref. Also observed specimens from Yongsan, Korea (Bullock).

Type B: Abashiri, Akkeshi (Moriwaki et al), Tobetsu, Attoko, Nakashibetsu, Horoizumi (K. Moriwaki), Nishitappu (K. Moriwaki), Sōunkyō, Shioya (Takada), Nopporo (Ohba), in Hokkaido; Hakkoda, Towada (Yoshida), in Aomori Pref.; Sendai, Miyagi Pref.; Shinkazawa, Gumma Pref. (Toda); Setagaya, Meguro, Kotaira (Saito), Asakawa, Kogesawa, in Tokyo; Shichiseimura, Hatanō, Hakone, Kanagawa Pref.; Tadeshina, Hoppo (Ohnishi), Nagano Pref.; ? Hachijōjima (Udagawa).

Type C: Setagaya, Kotaira (Saito), Suginami (Ohnishi), Kogesawa, Kumotoriyama, Miyakejima (Udagawa) in Tokyo; Noborito, Kanagawa Pref.; Kisokomagatake, Yatsugatake (Kurokawa), ? Tadeshina, Usuitoge (Kurokawa), Kisofukushima, in Nagano Pref.; Taishakukyo, Miyoshi, Hiroshima Pref.; Kurama, Kyoto Pref.; Susaki, Kōchi Pref.

Previous records from Japan: (Kikkawa & Peng, 1938) Various parts of Honshu (from Tohoku to Chugoku districts), Shikoku, Kyushu; (Takada, 1952, 1954) Shioya, Imagane, Muroran, Otaru, Asahikawa, in Hokkaido (A and B types); (Mizuno, 1952) Sapporo, Ōyachi, Ichinosawa, Shizuuchi, Imagane, Ōnuma, Hakodate, Higashitakasu, Noboribetsu, in Hokkaido; (Suzuki, 1955) Sapporo; (Ishihara, 1955) Sapporo.

Distribution: Type A: Hokkaido, Honshu (Tohoku, Kanto, Chubu, Kinki), Shikoku, Kyushu, Korea, China. Type B: Hokkaido, Honshu (Tohoku, Kanto, Chubu). Type C: ? Hokkaido, Honshu (Tohoku, Kanto, Chubu, Kinki), Shikoku, ? China.

Feeding habits: Type A: **FSGLT**. Type B: **FS**. Type C: **FSL**.

Remarks: Judging from the figures of Burla (1954) of phallic and periphallallic organs of this species from China, it will be very probable that Chinese forms are referable either to Type A or to type C. The author examined a male from Hachijōjima (Kato) having quite large fusiform aedeagus which has no lateral claws, and having other structures as in Type B.

***Drosophila (Sophophora) rufa* Kikkawa & Peng, 1938 Figs. 59-62.**

Japanese name: Munasuji-shōjōbae (Kikkawa & Peng, 1938).

*Drosophila rufa* Kikkawa & Peng, 1938. Japan. Journ. Zool., 7: 229; Ōshima, 1953. Seibutsu Shinka, 1: 5; Ohba, 1954. Kagaku, 24: 130; Ishihara, 1955. Zool. Mag., 64: 85.

*Drosophila (Sophophora) rufa* Sturtevant, 1942. Univ. Texas Publ., 4213: 29; Hsu, 1949. Univ. Texas Publ., 4920: 97; Wheeler, 1949. Univ. Texas Publ., 4920: 175; Tan, Hsu, & Sheng, 1949. Univ. Texas Publ., 4920: 197; Patterson & Stone, 1952. Evol. gen. Dros.: 16; Shōgaki, 1952. Komai's Shōjōbae no Iden to Jikken: 201; Okada, 1953. Zool. Mag., 62: 284; Okada, 1954. Kontyū, 22: 40.

♂ and ♀: General features as described by Kikkawa & Peng (1938). *hu* 2, lower one slightly longer than the upper one. Cross distance of *dc* slightly larger than twice the length distance. Anterior *scut* divergent. Legs with preapicals on all three tibiae; apicals on fore and middle. Wings with C1-bristles 2, subequal in size; C3-bristles on basal half.

Periphallallic organs (Fig. 59 F): Described and figured by Hsu (1949). Decasternum with median piece longer than broad, lateral margins parallel, and apically divergent.

Phallic organs: Described and figured by Okada (1954). PI=1.0.

Egg-guides (Fig. 60 L): Lobe yellowish brown, proximal half paler, apex narrowing and weakly pointed, and with about 18 black marginal teeth. According to Ōshima (1953) the number of teeth is greater in light type than in dark type (see Remarks).

Internal structures (Figs. 61 K, 62 H): Proximal intestine: C=2.0. Rectal papillae: R=about 1.3. Malpighian tubes with common stalks rather long, anterior stalk sometimes longer than the posterior; posterior branches ending free. Testis yellow, with about 2 inner and 3.5 outer coils. Paragonia weakly folded twice. Seminal vesicle slender. Ejaculatory bulb globular; ejaculatory apodeme pale yellow, with plate quadrate and proximally concave. Spermatheca hyaline, globular. Parovaria with elliptical knobs. Ventral receptacle with about 6 transverse semicircular folds.

Specimens examined: Sapporo? (Kanehisa); in Tokyo: Setagaya, III-VII, IX-XI '51-'53 **FS-GTL**; Suginami, VI '51 **T** (Ohnishi); Meguro, V, VI, X, XI, '51-'53 **ST**; Aoyama, X '52 **F** (Toda); Kunitachi, VI, IX '52 **G**; Kotaira, VII, VIII, XI '52-'53 **SF** (Saito); Asakawa, IV, VII, IX '51-'53 **F** (Ohba). Mizonokuchi, X '52 **S**, Ikuta, XI '51 **T**, in Kanagawa Pref.; Aburatsubo, Kanagawa Pref., V '51 **F**; Ōshima, V '51 (Ohnishi); Miyakejima, V '52 **F** (Udagawa); Taishakukyo, Hiroshima Pref., X '55; Susaki, Kōchi Pref., XI '53 **S**; Aoshima, Miyazaki Pref., IX '54 **F**; Aso, Kumamoto Pref., IX '54 **F**; Kaimondake, IX '54 **F**, Kirishimajingū, IX '54 **F**, in Kagoshima Pref.

Previous records from Japan: (Kikkawa & Peng, 1938) Kōfu, Kyoto, Ashiya, Ōita; (Ōshima, 1953) Kōchi; (Suzuki, 1955) Sapporo; (Ishihara, 1955) Sapporo.

Distribution: Hokkaido, Honshu (kanto, Chubu, Kinki, Chugoku), Shikoku, Kyushu, Miyakejima, China.

Feeding habits: **FSGTL**.

Remarks: Ōshima (1953) distinguished light and dark types in regard to female abdominal coloration, which are proved to be determined by an autosomal allele, and to show a balanced polymorphism.

**Subgenus *Drosophila* Fallén, 1823.**

Japanese name: Shōjōbae-azoku.

*Drosophila* Fallén, 1823. Dipt. Suec. Geomys.: 2; Sturtevant, 1939. Proc. Nation. Acad. Sci., 25: 139; Sturtevant, 1942. Univ. Texas Publ., 4213: 30; Patterson, 1943. Univ. Texas Publ., 4313: 83; Patterson & Mainland, 1944. Univ. Texas Publ., 4445: 33; Wheeler, 1949. Univ. Texas Publ., 4920: 179; Patterson & Wheeler, 1949. Univ. Texas Publ., 4920: 212; Burla, 1951. Rev. Suis. Zool., 58: 99; Patterson & Stone, 1952. Evol. gen. Dros.: 21; Malogolowkin, 1953. Rev. Brasil. Biol., 13: 245.

Logotype: *Musca funebris* Fabricius, 1787.

Sturtevant (1939) recognized finely coiled ventral receptacle, apically contiguous posterior branches of Malpighian tubes, 3-4 egg-filament, and medially interrupted abdominal black bands, as features characteristic to this subgenus. Sturtevant (1942) subdivided it into 14 species-groups: *pinicola*, *quinaria*, *guttifera*, *virilis*, *testacea*, *tripunctata*, *funebris*, *repleta*, *robusta*, *melanica*, *polychaeta*, *carbonaria*, *cardini*, and *immigrans* groups. Patterson (1943) added *macroptera* group

as the fifteenth member. Then *rubrifrons* and *alagitans* groups were established by Patterson & Mainland (1944), but the latter was shifted to the subgenus *Sophophora* by Wheeler (1949). Several other species-groups have been enumerated by various authors: e.g. *annulimana* (Pavan & da Cunha, 1947), *guarani* (King, 1947), *melanderi* (Wheeler, 1949), *bizonata* (Tan, Hsu, & Sheng, 1949), *dreyfusi* (Dobzhansky & Pavan, 1950), *pallidipennis* (Patterson & Stone, 1952), *calloptera* (Burla & Pavan, 1953), *fenestrarum* (Basden, 1954). In this report will be designated *subtilis* group, represented by a single species, *D. (D.) subtilis* Kikkawa & Peng, which shows "primitiveness" in various organs so much as *D. (D.) pinicola* Sturtevant of N. America does. Japanese members belonging to the subgenus *Drosophila* may be classified into 12 species-groups including *subtilis* group. Several species are left ungrouped, as they are not referable to any of the known groups.

With respect to the structures of periphallallic organs, Hsu (1949) divided the subgenus *Drosophila* into *virilis* and *quinaria* sections. In the latter, the anal plate is separated from the genital arch and the genital arch has fewer hairs, while in the former, the anal plate is fused to the genital arch and the genital arch has denser hairs. The present author (1955) distinguished the two sections in accordance with the phallic organs, as mentioned in the key below. *D. (D.) subtilis* Kikkawa & Peng has the male anal plates separated from genital arch, although it has been referred to the *virilis* section. The *quinaria* section is thought to include *quinaria*, *guttifera*, *testacea*, *bizonata*, *tripunctata*, *funnebris*, *cardini*, *immigrans*, *macroptera*, *rubrifrons*, *guarani*, *melanderi*, *calloptera*, *bizonata*, *pallidipennis* and *fenestrarum* groups; the remaining groups may belong to the *virilis* section.

#### Key to Japanese species of the subgenus *Drosophila*

1. Abdominal tergites with black spots.....2.
- Abdominal tergites without spots, but often with bands.....6.
2. Abdominal black spots not finely demarcated, confluent with each other to become a medially interrupted cross band, with its anterior margin undulated.....*D. (D.) kuntzei* Duda (part).
- Abdominal black spots finely demarcated, not or only slightly confluent with each other.....3.
3. Crossveins and wing-tip clouded, 2-5 T each with 6 black spots.....*D. (D.) nigromaculata* Kikkawa & Peng.
- Crossveins and wing-tip clear; 2-5 T each with 4 black spots.....4.
4. Abdominal spots large, slightly confluent with each other. (Aedeagus with a long apical recurved process; egg-guide with quadrate tip and waved upper margin).....*D. (D.) unispina* sp. nov.
- Abdominal spots smaller, usually isolated from each other. (Aedeagus without long apical recurved process; egg-guide with rounded tip and straight upper margin).....5.
5. Aedeagus straight and with a strong medio-ventral claw. Egg-guide with broad tip and short upper margin.....*D. (D.) brachynephros* sp. nov.
- Aedeagus rectangularly curved at middle and with a minute medioventral claw. Egg-guide with narrower tip and longer upper margin.....*D. (D.) angularis* sp. nov.
6. Fore femur with a longitudinal row of minute spinules on its inner surface.....7.
- Fore femur without such spinules.....10.
7. Blackish species. 2 bristles at the end of first costal section.....*D. (D.)* sp. of *immigrans* group.
- Yellowish species. One bristle at the end of first costal section.....8.
8. Mesonotum without black stripes.....9.
- Mesonotum with black longitudinal stripes.....*D. (D.) virgata* Tan, Hsu, & Sheng.
9. Cheek about 1/3 as broad as the greatest diameter of eye.....*D. (D.) immigrans* Sturtevant.
- Cheek about 1/10 as broad as the greatest diameter of eye.....*D. (D.) komaii* Kikkawa & Peng.
10. Presutural acrostichal bristles present.....*D. (D.) testacea* van Roser.
- Presutural acrostichal bristles absent.....11.
11. Yellowish or yellowish brown species.....12.
- Blackish or dark brown species.....19.
12. 2nd oral over 3/4 the length of 1st oral.....13.
- 2nd oral 1/3 or less the length of 1st oral.....15.
13. 3rd costal section with heavy bristles on its basal 1/4.....*D. (D.) binonata* Kikkawa & Peng.
- 3rd costal section with heavy bristles on its basal 1/2.....14.
14. 2 long sternopleurals.....*D. (D.) histrio* Meigen.
- 3 long sternopleurals.....*D. (D.)* sp. of *quinaria* section.
15. 5 X-index about 1.5 or less.....16.
- 5 X-index about 2.0 or more.....17.
16. 3rd costal section with heavy bristles on its basal 2/3. Mesonotum striped. 2nd orbital about 1/3 length of 3rd. Cross veins clear.....*D. (D.) grandis* Kikkawa & Peng.
- 3rd costal section with heavy bristles on its basal 1/2 or less. Mesonotum not striped. 2nd orbital minute, about 1/5 length of 3rd. Abdominal black bands laterally broaden to reach the anterior margins.....*D. (D.) kuntzei* Duda (part).
17. Abdominal tergum dark and without distinct bands. 5 X-index about 2.0. 3rd costal section with heavy

- bristles on its basal 2/5.....*D. (D.) acutissima* sp. nov.  
Abdominal black bands prominent.....18.
18. 5X-index about 3.0. 3rd costal section with heavy bristles on its basal 1/4.....*D. (D.) tenuicauda* sp. nov.  
5X-index about 2.0. 3rd costal section with heavy bristles on its basal 1/3.....*D. (D.) makinoi* sp. nov.
19. Mesonotum with black spots.....20.  
Mesonotum almost entirely black or dark brown.....24.
20. 3rd costal section with heavy bristles on its basal 2/5.....21.  
3rd costal section with heavy bristles on its basal 1/2 or more.....23.
21. Carina non-sulcate.....*D. (D.) maculinotata* sp. nov.  
Carina sulcate.....22.
22. Costal-index about 3.5.....*D. (D.) hydei* Sturtevant.  
Costal-index about 3.0.....*D. (D.) repleta* Wollaston.
23. Carina non-sulcate.....*D. (D.) chinoi* sp. nov.  
Carina distinctly sulcate.....*D. (D.)* sp. of *robusta* group II.
24. Costal-index 3.0 or more.....25.  
Costal-index 2.5 or less.....29.
25. 3rd costal section with heavy bristles on its basal 2/5 or more. 2nd oral about 2/3 length of 1st.....26.  
3rd costal section with heavy bristles on its basal 1/3 or less.....27.
26. Carina high.....*D. (D.) lacertosa* sp. nov.  
Carina low.....*D. (D.) multispina* sp. nov.
27. 3rd costal section with heavy bristles on its basal 1/5.....*D. (D.) melanissima* of Kikkawa & Peng.  
3rd costal section with heavy bristles on its basal 1/3.....28.
28. 2nd oral about 1/4 length of 1st.....*D. (D.) sordidula* Kikkawa & Peng.  
2nd oral about 4/5 length of 1st.....*D. (D.) funebris* (Fabricius).
29. Palpus with only one prominent apical bristle.....*D. (D.) virilis* Sturtevant.  
Palpus with a few prominent bristles.....30.
30. Wings somewhat pointed and darken at tip. Glossy black species.....*D. (D.) subtilis* Kikkawa & Peng.  
Wings rounded and clear at tip. Mat dark brown species.....*D. (D.) daruma* sp. nov.

**Key to Japanese species of the subgenus *Drosophila*,  
with regard to the periphallic organs**

1. Anal plate separated from genital arch, which has a few hairs.....*quinaria* section.....2.  
Anal plate fused to genital arch, which has denser hairs. (excl. *D. (D.) subtilis* Kikkawa & Peng.).....  
.....*virilis* section.....20.
2. Secondary claspers present.....*D. (D.) makinoi* sp. nov.  
Secondary claspers absent.....3.
3. Anal plate with a few heavy bristles.....4.  
Anal plate without heavy bristles.....7.
4. Genital arch with heavy bristles below.....5.  
Genital arch without heavy setae below.....6.
5. Anal plate narrowly pointed below, and with heavy bristles constricted at lower 1/3 of itself.....  
.....*D. (D.) multispina* sp. nov.  
Anal plate not narrowly pointed below, and with heavy bristles at its lower half.....*D. (D.) funebris* Fabricius.
6. Heavy bristles of anal plate only 2, inserted at its lower tip. Upper margin of genital arch bare.....  
.....*D. (D.) histrio* Meigen.  
Heavy bristles of anal plate numerous, about 25, covering lower half of itself. A few upper marginal hairs of genital arch present.....*D. (D.) maculinotata* sp. nov.
7. Upper marginal hairs of genital arch absent.....8.  
Upper marginal hairs of genital arch present.....17.
8. Genital arch rounded or weakly angular below.....9.  
Genital arch narrowly prolonged below.....13.
9. Only one or 2 marginal hairs on genital arch.....*D. (D.) testacea* van Roser.  
More than 5 marginal hairs on genital arch.....10.
10. Marginal hairs of genital arch constricted at the lower tip.....*D. (D.) bizonata* Kikkawa & Peng.  
Marginal hairs of genital arch scattered on the lower portion.....11.
11. Clasper with teeth on its lower half. Anal plate with fine setae at the lower tip.....  
.....*D. (D.) virgata* Tan, Hsu, & Sheng.  
Clasper with teeth on its nearly entire length. Anal plate without fine setae below.....12.
12. Genital arch and anal plate hyaline at lower tip. Clasper with lateral margins convergent proximally.....  
.....*D. (D.) kuntzei* Duda.  
Genital arch and anal plate not hyaline at lower tip. Clasper with lateral margins parallel.....  
.....*D. (D.)* sp. of *quinaria* section.
13. Clasper much longer than broad. Primary teeth arranged in a concave row.....  
.....*D. (D.) immigrans* Sturtevant.  
Clasper nearly as long as broad.....14.
14. Primary teeth at most 10.....*D. (D.) migromaculata* Kikkawa & Peng.  
Primary teeth at least 10.....15.

15. Lower tip of anal plate without heavy setae.....16.  
Lower tip of anal plate with heavy setae.....*D. (D.) unispina* sp. nov.
16. Lower tip of anal plate with fine setae.....*D. (D.) angularis* sp. nov.  
Lower tip of anal plate without fine setae.....*D. (D.) brachynephros* sp. nov.
17. Clasper prolonged and twisted below, extending beyond tip of genital arch.....  
.....*D. (D.)* sp. of *immigrans* group.  
Clasper prolonged but not sinuated below, extending beyond tip of genital arch.....*D. (D.) komaii* Kikkawa & Peng.  
Clasper neither prolonged nor sinuated below, not extending beyond tip of genital arch.....18.
18. Clasper without secondary teeth.....*D. (D.) grandis* Kikkawa & Peng.  
Clasper with stout secondary teeth.....19.
19. Anal plate narrowly prolonged below.....*D. (D.) tenuicauda* sp. nov.  
Anal plate not prolonged below.....*D. (D.) acutissima* sp. nov.
20. Upper portion of genital arch without marginal hairs.....21.  
Upper portion of genital arch with marginal hairs.....23.
21. Clasper contiguous to anal plate.....*D. (D.) daruma* sp. nov.  
Clasper separated from anal plate.....22.
22. Genital arch broad below, with heel low, and rectangular.....*D. (D.) virilis* Sturtevant.  
Genital arch narrow below, with heel dull-angular.....*D. (D.) melanissima* of Kikkawa & Peng.
23. Genital arch broad and truncate below. Heel low and acute-angular.....*D. (D.) subtilis* Kikkawa & Peng.  
Genital arch not broadly truncate below. Heel absent.....24.
24. Median teeth of clasper longer than lateral teeth. Genital arch narrowly pointed and curved caudad below.  
.....*D. (D.) chinoi* sp. nov.  
Clasper teeth subequal in length. Genital arch not pointed below or not curved caudad.....25.
25. Genital arch rounded at lower tip.....26.  
Genital arch more or less pointed at lower tip.....27.
26. Clasper with rounded process extending beyond level of teeth-row.....*D. (D.) hydei* Sturtevant.  
Clasper without rounded process extending beyond level of teeth-row.....*D. (D.) repleta* Wollaston.
27. Lower portion of genital arch narrow triangular, posterior margin concave, anterior margin straight.....  
.....*D. (D.)* sp. of *robusta* group II.  
Lower portion of genital arch broader, posterior margin concave.....28.
28. Lower anterior margin of genital arch convex.....*D. (D.) sordidula* Kikkawa & Peng.  
Lower anterior margin of genital arch concave.....*D. (D.) lacertsa* sp. nov.

**Key to Japanese species-groups and species of the subgenus *Drosophila*,  
with regard to the phallic organs**

1. Aedeagus horizontally flattened at least apically, and with lateral lobes apparently fused to each other at greater length.....*quinaria* section.....2.  
Aedeagus laterally flattened at least apically and with lateral lobes separated from each other at least partially.....*virilis* section.....20.
2. Aedeagus without distinct vertical rod at its base. Sinuous bow usually present, connecting lateral arms of novasternum.....3.  
Aedeagus with distinct vertical rod at its base. Sinuous bow absent.....12.
3. Ventral fragma broader than long. Anterior parameres completely separated from novasternum.....  
.....(*melanderi* group).....*D. (D.) makinoi* sp. nov.  
Ventral fragma longer than broad. Anterior parameres fused to, or incompletely separated from, novasternum.....4.
4. Aedeagus gently broadened at apex. Sinuous bow narrow and obscure, or absent.....  
.....(*quinaria* group and its allies).....5.  
Aedeagus exceedingly broadened at apex. Sinuous bow broad at middle, to form a quadrate plate.....11.
5. Aedeagus pubescent and apically with 4 serrations.....*D. (D.) nigromaculata* Kikkawa & Peng.  
Aedeagus not pubescent and apically not serrated.....6.
6. Aedeagus basally without paired rod-like processes, apically truncate or incised at ventral aspect. Sinuous bow narrow and obscure.....7.  
Aedeagus basally with a pair of rod-like processes, apically neither truncate nor incised. Sinuous bow absent.....10.
7. Aedeagus without dorsal claw. Novasternum with submedian spines very large.....*D. (D.) kuntzei* Duda.  
Aedeagus with a ventral claw. Novasternum with submedian spines weak.....8.
8. Aedeagus with a huge ventral claw. Novasternal plates semicircular.....*D. (D.) unispina* sp. nov.  
Aedeagus with ventral claw minute and inserted at its meson. Novasternum not semicircular.....9.
9. Aedeagus straight. Novasternal plate triangular.....*D. (D.) brachynephros* sp. nov.  
Aedeagus rectangularly curved upward at meson. Novasternal plate crescent.....*D. (D.) angularis* sp. nov.
10. Ventral fragma Y-shaped. Aedeagus fusiform in ventral aspect.....*D. (D.) acutissima* sp. nov.  
Ventral fragma not Y-shaped. Aedeagus rod-like in ventral aspect.....*D. (D.) tenuicauda* sp. nov.
11. Aedeagus subapically serrate but subbasally smooth.....(*testacea* group).....*D. (D.) testacea* van Roser.  
Aedeagus subapically smooth but subbasally serrate.....  
.....(*bizonata* group).....*D. (D.) bizonata* Kikkawa & Peng.
12. Aedeagus apically broadened in lateral aspect.....13.



- Aedeagus apically narrowing in lateral aspect.....15.
13. Aedeagus pubescent, apically with a pair of finger-like processes curving ventrad.....*D. (D.) histrio* Meigen.  
Aedeagus bare, without apicoventral finger-like processes.....14.
14. Ventral fragma much longer than broad. Aedeagus slender and without medioventral flap.....*D. (D.)* sp. of *quinaria* section.  
Ventral fragma broader than long. Aedeagus thick and with a medioventral flap.....*D. (D.) grandis* Kikkawa & Peng.
15. Aedeagus apically or subapically bifid.....(*funnebris* group).....16.  
Aedeagus apically or subapically not bifid.....(*immigrans* group).....18.
16. Aedeagus apically with small claws.....*D. (D.) funnebris* (Fabricius).  
Aedeagus subapically with claws.....17.
17. A pair of claws on the aedeagus.....*D. (D.) maculinotata* sp. nov.  
Two pairs of claws on the aedeagus.....*D. (D.) multispinata* sp. nov.
18. Aedeagus without dorsal appendage. Anterior parameres with apical sensilla.....*D. (D.) virgata* Tan, Hsu, & Sheng.  
Aedeagus with dorsal appendage. Anterior parameres without sensilla.....19.
19. Aedeagus with a one-jointed dorsal appendage.....*D. (D.)* sp. of *immigrans* group.  
Aedeagus with a two-jointed dorsal appendage.....*D. (D.) immigrans* Sturtevant.
20. Anterior parameres large and basally with sensilla. Novasternum without median notch. Submedian spines in about 3 pairs.....*D. (D.) subtilis* Kikkawa & Peng.  
Anterior parameres minute; sensilla apical or absent. Novasternum deeply notched. Submedian spines at most one pair.....21.
21. Ventral fragma broader than long.....22.  
Ventral fragma longer than broad.....23.
22. Ventral fragma quadrate. Aedeagus partially bilobed.....*D. (D.) daruma* sp. nov.  
Ventral fragma semicircular. Aedeagus apparently bifid at entire length.....(*melanica* group).....*D. (D.) melanissima* of Kikkawa & Peng.
23. PI about 1.0. Ventral fragma basally round.....*D. (D.) virilis* Sturtevant.  
PI much more than 1.0.....24.
24. Ventral fragma strongly quadrate at base.....(*robusta* group).....25.  
Ventral fragma rounded or weakly quadrate at base.....(*repleta* group).....27.
25. Novasternum without submedian spines. Aedeagus tapering to base, without minute serrations.....*D. (D.) sordidula* Kikkawa & Peng.  
Novasternum with submedian spines.....26.
26. Aedeagus suddenly narrowing at base, ventrally with minute serrations.....*D. (D.) lacertosa* sp. nov.  
Aedeagus gently narrowing at base, dorsally with minute serrations.....*D. (D.)* sp. of *robusta* group II.
27. Aedeagus simple, broad. Novasternum without submedian spines.....*D. (D.) repleta* Wollaston.  
Aedeagus basally narrowing. Novasternum with submedian spines.....28.
28. Aedeagus with a pair of broad, dorsally curved apical lobes, and dorsomedian conical processes.....*D. (D.) chinoi* sp. nov.  
Aedeagus with a pair of narrow, ventrally recurved subapical spurs, and without cone-like processes.....*D. (D.) hydei* Sturtevant.

**Key to Japanese species of the subgenus *Drosophila*,  
with regard to the egg-guides**

1. Lobe usually rounded at tip, if pointed, the bristles are short.....*quinaria* section.....2.  
Lobe somewhat pointed at tip, and with bristles longer.....*virilis* section.....18.
2. Lobe rounded at tip.....3.  
Lobe somewhat pointed at tip.....11.
3. Teeth deep black.....*D. (D.) makinoi* sp. nov.  
Teeth yellowish orange or yellowish brown.....4.
4. Upper margin of lobe strongly projected and blackish.....5.  
Upper margin only weakly projected and yellowish.....6.
5. Upper margin distally concave weakly.....*D. (D.) kuntzei* Duda.  
Upper margin distally concave strongly.....*D. (D.) unispina* sp. nov.
6. Lobe somewhat quadrate at tip.....7.  
Lobe broadly rounded at tip.....9.
7. Basal isthmus black.....*D. (D.) nigromaculata* Kikkawa & Peng.  
Basal isthmus yellowish.....8.
8. Basal isthmus slightly swollen at middle.....*D. (D.) testacea* van Roser.  
Basal isthmus not swollen at middle.....*D. (D.) bizonata* Kikkawa & Peng.
9. Lobe apically yellow, with about 17 teeth. Basal isthmus short, about 1/3 as long as the greatest width of lobe.....*D. (D.) histrio* Meigen.  
Lobe apically yellowish brown, with teeth usually more than 20.....10.
10. Basal isthmus about half as long as the greatest width of lobe.....*D. (D.) brachynephros* sp. nov.  
Basal isthmus longer than half the greatest width of lobe.....*D. (D.) angularis* sp. nov.
11. Basal isthmus as long as the greatest width of lobe.....12.  
Basal isthmus about 1/3 as long as the greatest width of lobe.....14.
12. Discal teeth absent. Ultimate tooth as large as the neighbouring teeth.....*D. (D.) grandis* Kikkawa & Peng.

- Discal teeth present.....13.
13. Ultimate tooth very large, much larger than the neighbouring teeth.....*D. (D.) acutissima* sp. nov.  
 Ultimate tooth as large as the neighbouring teeth.....*D. (D.) tenuicauda* sp. nov.
14. Lobe blackish distally.....*D. (D.) maculinotata* sp. nov.  
 Lobe yellowish orange apically.....15.
15. Upper margin of lobe more or less concave.....*D. (D.)* sp. of *immigrans* group.  
 Upper margin of lobe straight.....16.
16. Teeth about 17.....*D. (D.)* sp. of *quinaria* section.  
 Teeth about 20 or more.....17.
17. Ultimate tooth as long as penultimate.....*D. (D.) immigrans* Sturtevant, *D. (D.) komaii* Kikkawa & Peng.  
 Ultimate tooth much larger than penultimate.....*D. (D.) virgata* Tan, Hsu, & Sheng.
18. Discal bristles absent.....*D. (D.) subtilis* Kikkawa & Peng.  
 Discal bristles present.....19.
19. Ultimate marginal tooth much longer than penultimate.....20.  
 Ultimate marginal tooth as long as penultimate.....24.
20. Lobe rather quadrate apically, upper margin only apically dark.....21.  
 Lobe apically rather pointed.....22.
21. Teeth about 16-21.....*D. (D.) virilis* Sturtevant.  
 Teeth about 25-31.....*D. (D.) melanissima* of Kikkawa & Peng.
22. Teeth about 18-21; discal teeth as long as ultimate marginal one.....23.  
 Teeth about 23-26; discal teeth much longer than ultimate marginal one.....*D. (D.) lacertosa* sp. nov.
23. Lobe narrowly pointed apically.....*D. (D.) daruma* sp. nov.  
 Lobe abically rounded.....*D. (D.) chinoi* sp. nov.
24. All bristles long and narrow.....*D. (D.)* sp. of *robusta* group II.  
 All bristles short and thick.....25.
25. Lobe pale yellowish brown, slightly truncate apically.....*D. (D.) sordidula* Kikkawa & Peng.  
 Lobe dark brown, narrowly pointed apically.....*D. (D.) hydei* Sturtevant.

*quinaria* section, Hsu, 1949. Univ. Texas Publ., 4920: 123

Japanese members belonging to this section are referable to *quinaria*, *testacea*, *melanderi*, *funebri*, *immigrans*, and *bizonata* species-groups. Several ungrouped species are also included here.

*quinaria* species-group, Sturtevant, 1942. Univ. Texas Publ., 4213: 30

*Drosophila (Drosophila) transversa* Fallén is a widely known species belonging to this group and originally described from Europe. It has been reported also from N. America, Japan, and China, but Patterson & Wheeler (1949) stated that, it seems to be certain that 2 or more species are here involved, and Hsu (1949) suggested that the Chinese form should belong to still another species.

The Japanese forms, which were tentatively referred to this species by Kikkawa & Peng (1938), were carefully compared with European specimens sent to the author from Prof. Buzatti-Traverso, and it was found that there are three distinct Japanese species closely allied to, but clearly distinguished from, the European species. These three species are described here as *D. (D.) brachynephros*, *D. (D.) angularis* and *D. (D.) unispina*, spp. nov. respectively. Two of the three species were reported to occur in Hokkaido by Takada, Momma, & Nakahara (1953), as two types of *D. (D.) transversa* Fallén, and the 3rd type was recorded by Wakahama (1956) also from Hokkaido.

Further known Japanese members of this group are *D. (D.) nigromaculata* Kikkawa & Peng and *D. (D.) kuntzei* Duda.

*Drosophila (Drosophila) brachynephros* sp. nov. Fig. 63.

Japanese name: Nagareboshi-shōjōbae.

*Drosophila (Drosophila) transversa*, type A, Okada, 1953. Zool. Mag., 62: 285; Wakahama, 1956. Annot. Zool. Japon., 29: 117 (figures).

*Drosophila (Drosophila) transversa*, type I, Okada, 1954. Japan. Journ. Appl. Zool., 19: 79; Okada, 1955. Zool. Mag., 64: 108; Okada, 1955. Kontyû, 23: 98.

♂ and ♀: Body about 2 mm, yellowish brown. Eye pubescent. Arista with about 9 branches, 2 below fork. Palpus yellowish grey, with about 2 prominent bristles. Front yellowish brown, about half as broad as head width. Face yellowish brown. Carina high, broad, and broader below. Cheek yellowish brown, about 1/6 as broad as the greatest diameter of eye. *orb*<sub>2</sub> minute, about 1/5 *orb*<sub>1</sub>. *or*<sub>2</sub> weak, about 1/2-1/3 size of *or*<sub>1</sub>.

Mesonotum deep yellowish brown, slightly paler along middorsal line and *dc*-line. Scutellum

and pleura deep yellowish brown. *hu* 2, long. *ac* in 6 rows. Cross distance of *dc* about half the length distance. Anterior *scut* parallel or slightly divergent.

Legs yellow. Preapicals on all three tibiae. Apicals on middle. Wing hyaline; crossveins narrowly fuscous. C-index about 2.6; 4V-index about 1.6; 4C-index about 1.2; 5X-index about 1.2. C1-bristles one thick and one thin; C3-bristles on basal about 1/3-2/5. (Fig. 63 B)

Abdominal tergites with lateral black patches comparatively large and somewhat confluent with each other.

Periphallic organs (Fig. 63 C): Genital arch with upper half bare, lower half yellow, tapering and with about 10 hairs. Clasper with about 10-15 teeth in a row, and about 5-8 secondary teeth arranged in one or 2 rows. Anal plate with about 40 long hairs. Decasternum with median piece triangular, lateral pieces oval and smaller.

Phallic organs (Fig. 63 E, F): Aedeagus yellowish orange, apically concave, with short medioventral claw directed forward. Anterior paramere minute, with an apical sensillum. Nova-sternal plate triangular, with fine submedian spine. Ventral fragma narrow triangular. Posterior parameres forming a sinuated cross bow. p.f.=aBCdEfgHIkIMN. PI=1.1.

Egg-guides (Fig. 63 G): Lobe broadly rounded at tip, orange brown, with about 18-21 teeth. Basal isthmus short and narrow.

Internal structures (Fig. 63 H-L): Proximal intestine: C=2.0-2.5. Rectal papillae: R=2.7-3.3. Malpighian tubes with common stalks long; anterior common stalk especially long and apically broadened, but branches are exceedingly vestigial. Posterior branches long and fused at tips. Testis with about 3 inner and 12 outer coils. Paragonia folded about twice. Ejaculatory bulb oval, with 2 short caeca, slightly longer than the bulb itself. Spermatheca yellowish brown, oval,

Fig 63

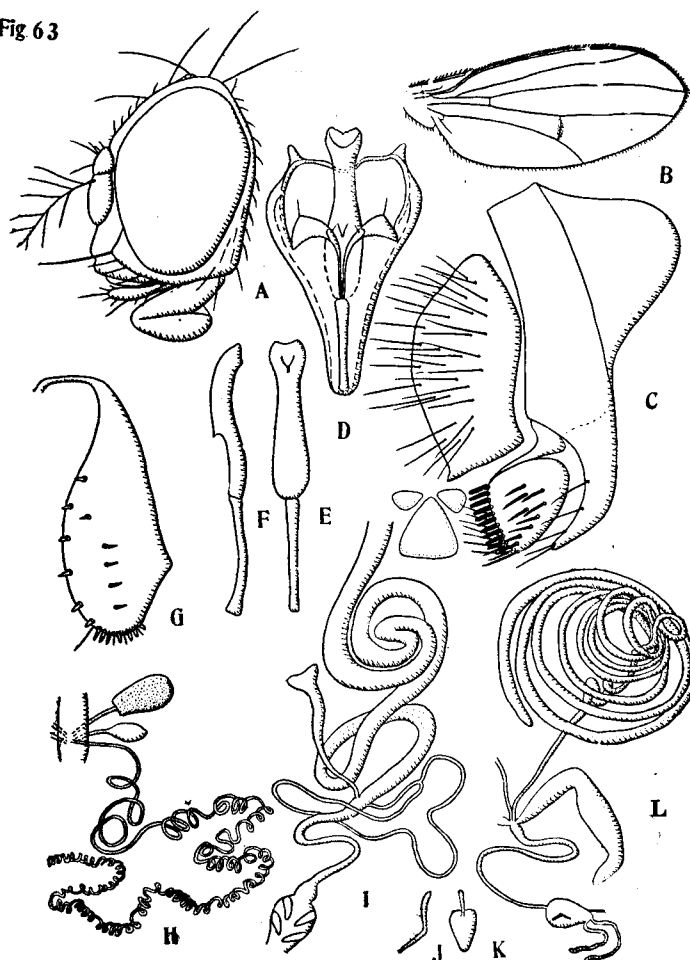


Fig. 63. *Drosophila (Drosophila) brachynephros* sp. nov.

A. Head; B. Wing; C. Periphallic organs (lateral aspect); D. Phallic organs (ventral aspect); E. Aedeagus (dorsal aspect); F. do. (lateral aspect); G. Egg-guide; H. Female reproductive organs (ventral aspect); I. Digestive system (ventral aspect); J. Ejaculatory apodeme (lateral aspect); K. do. (ventral aspect); L. Male reproductive organs (ventral aspect).

basally narrowing. Parovaria fusiform, shorter than spermatheca. Ventral receptacle with about 90 kinky coils.

Holotype: ♂, Morioka, Iwate Pref., 6 X '52 F (Okada).

Allotopotype: ♀, collected together with holotype.

Paratopotypes: 1 ♂ and 4 ♀♀, collected together with holotype.

Other specimens examined: In Hokkaido: Akkeshi, VIII '51, VIII '53 F (K. Moriwaki); Sōunkyo, VIII '53 F (K. Moriwaki); Nishitappu, VIII '53 F (K. Moriwaki), Sukayu, Aomori Pref., VIII '51; Towada, Aomori Pref., VIII '52 F (Yoshida). In Tokyo: Meguro, X '53; Kunitachi, IX '52 T; Asakawa, V '51, V '52 SF (Ohba et al). Aburatsubo, Kanagawa Pref., V '51 S; Miyakejima, V '52 F (Udagawa); Chausuyama, Nagano Pref., IV '54 F (Nozawa); Komayu, Nagano Pref., VII '52 (Kurokawa et al); Niugawa, Aichi Pref., VII '53 (Nozawa); Miyoshi, Hiroshima Pref., X '55 S; Kaimondake, Kagoshima Pref., IX '54 S.

Distribution: Hokkaido, Honshu (Tohoku, Kanto, Chubu, Chugoku, Miyakejima), Kyushu.

Feeding habits: FTS.

Remarks: Egg with 3 filaments, median one thicker and shorter than the lateral ones. Wakahama (1956) figured the male and female genitalia.

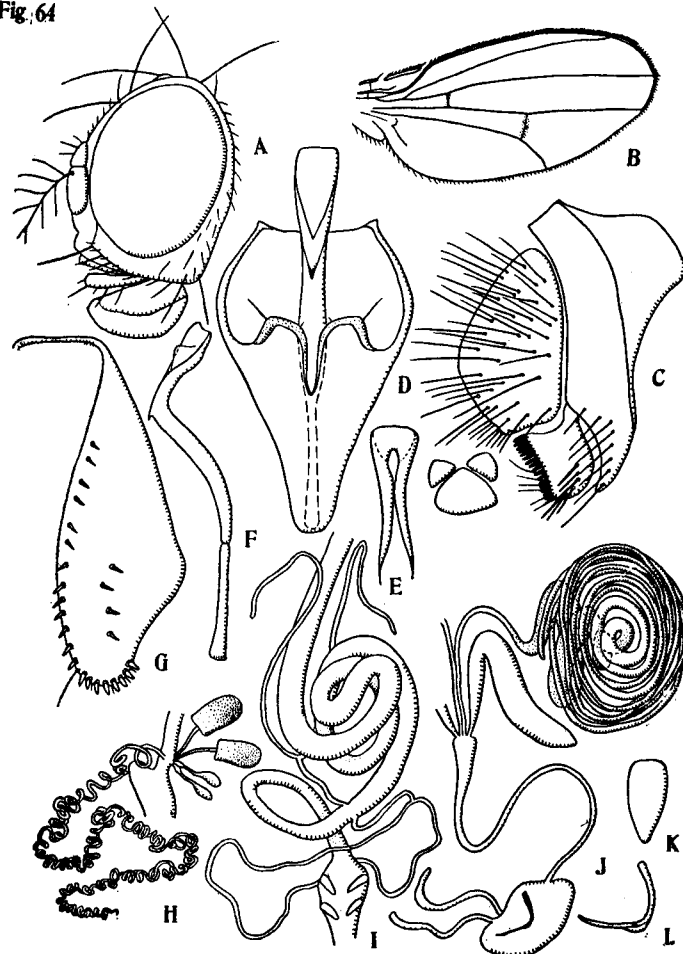
Relationships: Distinctly different from *D. (D.) transversa* Fallén from Europe, in the shapes of phallic organs, egg-guides, and Malpighian tubes (see table below).

***Drosophila (Drosophila) angularis* sp. nov. Fig. 64.**

Japanese name: Himehoshi-shōjōbae.

*Drosophila (Drosophila) transversa*, type B, Okada, 1953. Zool. Mag., 62: 285; Wakahama, 1956. Annot. Zool. Japon.,

Fig. 64



**Fig. 64. *Drosophila (Drosophila) angularis* sp. nov.**

A. Head; B. Wing; C. Periphallic organs (lateral aspect); D. Phallic organs (ventral aspect); E. Aedeagus, tip (dorsal aspect); F. Aedeagus (lateral aspect); G. Egg-Guide; H. Female reproductive organs (ventrolateral aspect); I. Digestive system (ventral aspect); J. Male reproductive organs (ventral aspect); K. Ejaculatory apodeme (ventral aspect); L. do. (lateral aspect).

29: 117 (figures).

*Drosophila (Drosophila) transversa*, type II, Okada, 1954. Japan. Journ. Appl. Zool., 19: 81; Okada, 1955. Zool. Mag., 54: 107.

♂ and ♀: Body about 2.7 mm, yellowish brown species. Eye pubescent. Arista with about 8-9 branches including fork, 2 or 3 below it. Palpus yellowish, with a few bristles. Front yellowish brown, about half as broad as head width. *fr* a few. Cheek yellowish brown, very narrow, about 1/6 as broad as the greatest diameter of eye. Carina broad, high, wider below, but not reaches the mouth margin. *orb*<sub>2</sub> weak, about 1/4 *orb*<sub>1</sub>. *or*<sub>2</sub> rather stout, about 1/2 vibrissa.

Mesonotum yellowish brown, with a pair of obscure dark patches mediocaudally. Scutellum yellowish brown. *hu* 2, lower longer slightly. *ac* in 6 rows. Cross distance of *dc* about half the length distance. Anterior *scut* slightly divergent. Sterno-index about 0.6.

Legs yellow; preapical on all three tibiae; apicals on middle. Wings hyaline, crossveins clear or very slightly fuscous. C1-bristles only one prominent; C3-bristles on basal 2/5. C-index about 2.8; 4V-index about 1.5; 4C-index about 0.9; 5X-index about 1.3. Halteres yellowish white.

Abdominal tergite yellow, with clearly demarcated rather small black spots.

Periphallic organs (Fig. 64 C): Genital arch yellow, apically tapering, and with about 7 hairs; upper portion bare. Anal plate pale yellow, densely hairy. Clasper with about 17-18 teeth, upper teeth being larger than the lower ones; secondary teeth about 6, arranged in a row. Decasternum pale yellow, median piece triangular.

Phallic organs (Fig. 64 D-F): Aedeagus pale yellow, rectangularly curved dorsad at middle, truncate apically, with a minute claw medioventrally, and finely serrate apicodorsally. Anterior paramere with a sensillum apically. Posterior parameres are represented by a narrow cross bar. Novasternal plate crescent, with short submedian spine. Ventral fragma narrow triangular. p.f.=aBCdEfgHIkIMN. PI=1.8.

Egg-guides (Fig. 64 G): Lobe yellowish orange, broadly rounded at tip, with about 24 orange teeth including about 4 discal teeth. Basal isthmus comparatively long.

Internal structures (Fig. 64 H-M): Proximal intestine: C=3.0. Rectal papillae: R=2.6. Malpighian tubes with anterior common stalk slightly longer than the posterior one; anterior branches long; posterior branches fused to each other at tips. Testis yellow, with about 4 inner and 10 outer coils. Seminal vesicle narrow. Paragonia folded once. Ejaculatory bulb with 2 thick caeca, about twice as long as bulb itself. Ejaculatory apodeme somewhat longer than stem, elongate oval, and apically narrowing. Parovaria much shorter than spermatheca and with elongate knobs. Spermatheca pale brown, proximal half paler, and elliptical with truncate proximal end. Ventral receptacle with about 85 kinky coils.

Holotype: ♂, Morioka, Iwate Pref., 6 X '52 (Okada).

Allotopotype: ♀, collected together with holotype.

Paratypes: 4 ♂♂ and 1 ♀, collected together with holotype; 3 ♂♂ and 1 ♀, 18 IX '53 F, Setagaya, Tokyo.

Other specimens examined: Towada, Aomori Pref., VIII '52 F (Yoshida); Kinugawa, Tochigi Pref., VIII '53 F (Moriwaki & Yoshida). In Tokyo: Suginami, XI '51 M (Ohnishi); Kunitachi, IX '53 F; Kotaira, I '54 S (Saito); Asakawa, VIII '51 F (Ohba et al), IV, V, VII '52 FMS (Moriwaki et al). Anjō, Aichi Pref., VIII '53 (Nozawa); Tadotsu, Kagawa Pref., XI '53 S.

Distribution: Honshu (Tohoku, Kanto, Chubu), Shikoku.

Feeding habits: FSM.

Remarks: Egg about 2 mm including filaments which are 3, median filament being thicker and shorter than lateral ones. Puparium with posterior spiracles closed; anterior spiracle with about 7 branches. Wakahama (1956) figured the male and female genitalia.

Relationships: Differs from *D. (D.) transversa* Fallén from Europe in the structure of phallic organs and egg-guides (see table below).

### *Drosophila (Drosophila) unispina* sp. nov. Fig. 65.

Japanese namd: Kakuhoshi-shōjōbae.

*Drosophila (Drosophila) transversa*, type C, Okada, 1953. Zool. Mag., 62: 285; Wakahama, 1956. Annot. Zool. Japon., 29: 116.

*Drosophila (Drosophila) transversa*, type III, Okada, 1954. Japan. Journ. Appl. Zool., 19: 79; Okada, 1955. Zool. Mag., 55: 107.

♂ and ♀: Body about 2.8 mm, yellowish brown. Eye pubescent. Arista with about 10 branches including a small fork, 3 below it. Front about half as broad as head-width. Carina broad and

high. Cheek about  $1/7$  as broad as the greatest diameter of eye.  $orb_2$  minute, about  $1/6 orb_1$ .  $or_2$  about  $2/5$  vibrissa.

Mesonotum yellowish brown.  $hu$  2,  $ac$  in 6 rows. Cross distance of  $dc$  about 2.5 times the length distance.

Legs yellow. Preapicals on all three tibiae; apicals on middle. Wings hyaline, crossveins slightly fuscous. C-index about 3.0; 4V-index about 1.6; 4C-index about 0.8; 5X-index about 1.2. C1-bristles 2, unequal in thickness. C3-bristles on basal  $1/3-2/5$ . Halteres yellowish brown.

Abdominal tergites dark or pale yellowish brown, with black large triangular patches, which are often fused to each other.

Fig 65

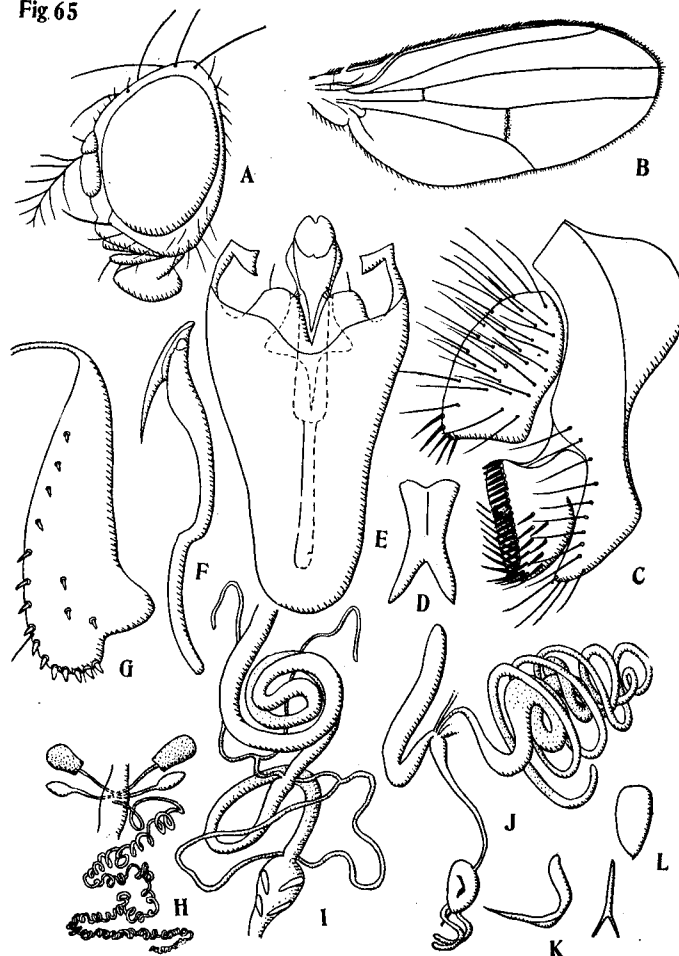


Fig. 65. *Drosophila (Drosophila) unispina* sp. nov.

A. Head; B. Wing; C. Periphallallic organs (lateral aspect); D. Decasternum; E. Phallic organs (ventral aspect); F. Aedeagus (lateral aspect); G. Egg-guide; H. Female reproductive organs (ventral aspect); I. Digestive system (ventral aspect); J. Male reproductive organs (dorsal aspect); K. Ejaculatory apodeme (lateral aspect); L. do. (ventral aspect); M. do. (cephalic aspect).

Periphallallic organs (Fig. 65 C,D): Genital arch dark brown, apically narrow, upper portion bare, lower portion with about 12 hairs. Clasper with about 16-20 black teeth arranged in a row, and about 10 secondary teeth arranged in 2 or 3 rows. Anal plate oval, truncate below, and with about 35 long hairs as well as about 6 short setae ventrally. Decasternum H-shaped.

Phallic organs (Fig. 65 E,F): Aedeagus dark yellowish brown, apically with a large recurrent spur directing ventrad. Anterior paramere with a few sensilla, and fused to novasternum. Posterior paramere obscure. Novasternal plate semicircular, and with a fine submedian spine. Ventral fragma oblong, yellowish orange, and with round tip. p.f.=aBCdEfg'HIkLMN. PI=1.2.

Egg-guides (Fig. 65 G): Lobe orange, proximally paler, with tip rounded, upper margin prominently swollen upward and black. Peg-like teeth orange, about 15 marginal and discal ones. Basal isthmus short, about  $1/5$  as long as lobe.

Internal structures: R=3.2. Malpighian tubes with common stalks short, branches long; posterior branches apically fused to each other. Testis pale yellowish white, with 3 inner and 10

outer coils, inner coils being thicker. Seminal vesicle slender. Paragonia folded once. Ejaculatory bulb oval, apodeme with stem thick and dark, and plate small, rhomic, and half as long as stem. Spermatheca large, lamp-shaped, pale yellowish grey, and proximally truncate. Ventral receptacle with about 60 kinky coils. Parovaria with elliptical knob.

Holotype: ♂, Daisetsuzan, Hokkaido, 9 VIII '55 M (Okada).

Allotopotype: ♀, collected together with holotype.

Paratype: Sōunkyo and Daisetsuzan, Hokkaido, 9 ♂♂ and 2 ♀♀, 6-14 VIII '53 FS.

Other specimens examined: Asakawa, Tokyo, V '51, V '52 F (Ohba); Kumotoriyama, Tokyo, VI '52 F, VII '53 F; Omogō, Ehime Pref., XI '53 FS.

Previous records: (Wakahama, 1956) Sapporo, Tokachi-mitsumata.

Distribution: Hokkaido, Honshu (Kanto, Chugoku), Shikoku.

Feeding habits: FS.

Remarks: Differs from *D. (D.) transversa* Fallén from Europe as well as from the fore-going two related Japanese species, in the shapes of aedeagus and egg-guides (see also table below). Wakahama (1956) described this species, with figures of the male and female genitalia.

	<i>transversa</i>	<i>brachynephros</i>	<i>angularis</i>	<i>unispina</i>
aedeagus	straight, apically swollen, with paired hooklets on lateral margin	straight, with a small medioventral claw	long, rectangularly curved at middle, with a minute medioventral claw	straight, with a very long large ventroapical claw
novasternal plate	oblong	triangular	crescent	semicircular
ventral fragma	oblong	triangular	triangular	oblong
egg-guide bristles	ca 23	ca 18-21	ca 24	ca 18
lobe of egg-guide	tip narrow, upper margin straight	tip much rounded, upper margin straight and short	tip narrower, upper margin straight and long	tip quadrate, upper margin prominently swollen upward.
ventral receptacle	? ca 40 coils	ca 90 coils	ca 90 coils	? ca 60 coils
primary teeth of clasper	11-12	10-15	12-18	16-20
secondary teeth of clasper	ca 13-14, in a few rows	ca 5-8, in one or two rows	ca 5-8, in one row	ca 10, in two rows
anterior branches of Malpighian tube	normal	vestigial	normal	normal
coillings of testis	ca 9 (2 inner, 7 outer)	ca 15 (3 inner, 12 outer)	ca 14 (3 inner, 12 outer)	ca 13 (3 inner, 10 outer)

***Drosophila (Drosophila) nigromaculata* Kikkawa & Peng, 1938 Figs. 74-77.**

Japanese name: Ohoshi-shōjōbae (Kikkawa & Peng, 1938); Hoshi-shōjōbae (Matsumura, 1931).

*Drosophila nigromaculata* Kikkawa & Peng, 1938. Japan. Journ. Zool. 7: 537; Mizuno, 1952. Paper. Coord. Comit. Res. Genet., 3: 51; Ohba, 1954. Kagaku, 24: 130; Suzuki, 1955. Zool. Mag., 64: 44; Ishihara, 1955. Zool. Mag., 64: 85.

*Drosophila (Drosophila) nigromaculata* Sturtevant, 1942. Univ. Texas Publ., 4213: 30; Wheeler, 1949. Univ. Texas Publ., 4920: 179; Patterson & Stone, 1952. Evol. gen. Dros.: 21; Shōgaki, 1952. Komai's Shōjōbae no Iden to Jikken: 20; Okada, 1953. Zool. Mag., 62: 285; Okada, 1954. Japan. Journ. Appl. Zool., 19: 79; Okada, 1955. Kontyū, 23: 98.

*Drosophila histrio*, forma *jejonica* matsumura, 1931. 6000 Illustr. Ins. Japan Empire: 366 (nec *histrio* Meigen, teste Kikkawa & Peng, 1938).

♂ and ♀: Posterior *scut* divergent. Cross distance of *dc* about twice the length distance. Legs with preapicals on all three tibiae; apicals on fore and middle. Wings with C1-bristles 2; C3-bristles on basal half. Other general features as described by Kikkawa & Peng (1938).

Periphallic organs (Fig. 74 B): Genital arch black, paler below, toe narrowing; upper margin bare; Lower portion with about 10 hairs. Clasper quadrate, with about 10 primary teeth arranged in a straight row, and with about 10 secondary teeth arranged in about 2 rows. Anal plate separated from genital arch, yellowish brown, broadly truncate below, and with about 45 hairs. Decasternum quadrate, pale yellowish grey.

Phallic organs: Aedeagus yellowish orange, apically swollen and with 4 serrations, and lateral margins pubescent. Anterior paramere fused to novasternum, apically with a few sensilla. Nova-

sternum with plates rounded at tips, and submedian spines stout. Ventral frame oval. Posterior parameres or sinuous bow obscure. p.f.=aBcdEfg/HIKlMN. PI=1.0.

Egg-guides (Fig. 75 B): Lobe orange brown, upper margin swollen, with about 17 marginal and 4-5 discal brownish orange teeth. Basal isthmus black.

Internal structures (Figs. 76 B, 78 D): Malpighian tubes with common stalks short, branches long, and posterior branches fused apically to each other. Proximal intestine: C=3.0. Rectal papillae: R=2.3. Testis with 2 inner and 4.5 outer coils; inner coils basally thick. Paragonia folded once or twice. Seminal vesicles slender. Ejaculatory bulb oval, with 2 very long caeca, about 7 times as long as bulb itself. Ejaculatory apodeme with oval pale yellow plate and pale brown stem, the latter is slightly longer than the former. Spermatheca pale brown, lamp-shaped, apically darker and basally truncate. Ventral receptacle with about 25-30 kinky coils. Parovaria with knob oblong.

Specimens examined: In Hokkaido: Akkeshi, VIII '51 F (Moriwaki et al), VIII '53 F; Attoko, VIII '51; Nakashibetsu, VIII '51 F; Uenai VI '53 (Suzuki); Wakkanai, VIII '53 F; Sôunkyo, VIII '53; Aizankei, VIII '53 F (Ohba); Sapporo, VIII '53 FS; Hakodate, VIII '51 S. VIII '53. Hokamoriyama, Iwate Pref., X '52 F; Sendai, Miyagi Pref., X '52 F. In Tokyo: Setagaya, III-V, X '51-'53 (Moriwaki et al); Meguro, X '51, IV '53, IV '54; Suginami, VI '51, IV '52 T (Ohnishi); Aoyama, IV '53 (Toda); Kotaira, XI '53 (Saito); Kumotoriyama, VI '52 F. In Kanagawa Pref.: Mukôgaoka, XI '53 S; Ikuta, XI '51 T; Kikuna, III '52 S; Aburatsubo, V '51 S. Anjo, Aichi Pref., VI-VII '53-'54 F (Nozawa); Kurama, Kyoto Pref., XI '53 G; Tadotsu, Kagawa Pref., XI '53 S; Sagawa, Kôchi Pref., XI '53 G; Nanokawa, Kôchi Pref., XI '53 F; Okinawa, V '51 (Jinnouchi).

Previous records: (Matsumura, 1931) Hokkaido, Honshu; (Kikkawa & Peng, 1938) Sapporo, Ayabe, Kyoto; (Mizuno, 1952) Ôyachi, Ichinosawa, Shizuuchi, Hakodate, Higashitakasu. Akkeshi; (Ohba, 1954) Sôunkyo, Akkeshi, Noppo; (Suzuki, 1955) Sapporo; (Ishihara, 1955) Sapporo, Daisetsuzan.

Distribution: Hokkaido, Honshu (Tohoku, Kanto, Chubu, Kinki), Shikoku, Okinawa.

Feeding habits: FSGT.

Remarks: Egg with 3 filaments, median one being as broad as lateral ones.

### *Drosophila (Drosophila) kuntzei* Duda, 1924 Fig. 66.

Japanese name: Kakureboshi-shôjôbae.

*Drosophila kuntzei* Duda, 1924. Arch. Naturg., 90 A (3): 218; Duda, 1924. Ent. Med. del., 14: 288; Duda, 1935. Die Fliegen, 58 g: 86.

*Drosophila (Drosophila) kuntzei* Hsu, 1949. Univ. Texas Publ., 4920: 117; Burla, 1951. Rev. Suis. Zool., 58: 104.

♂ and ♀: Body about 3.0 mm, dark yellowish brown, somewhat pollinose. Head (Fig. 66 A) yellowish orange. Eye dark red, with piles. Antenna yellowish brown, 3rd joint darker, basally yellow, and with long macrotrichia. Arista with 8-9 branches including a large fork, 2 below it. Palpus yellowish brown, darker at tip, and with a few brownish long bristles. Ocellar triangle dark yellowish brown. Periorbits yellowish brown. Front dark orange brown, somewhat pollinose, and slightly broader than twice the head width. Clypeus yellowish brown, with a median cross black line. Carina yellowish brown, broad and long. Face yellowish brown. Cheek yellowish brown, about 1/3.5 as broad as the greatest diameter of eye. *orb*<sub>2</sub> minute, about 1/5 size of others. *or*<sub>2</sub> weak. about 1/4 size of vibrissa.

Mesonotum dark reddish brown, medially dark, especially on posterior portion. Scutellum dark reddish brown. Thoracic pleura dark brown, somewhat pollinose. *hu* 2, subequal. *ac* in 6-8 row. Cross distance of *dc* about twice the length distance. Sterno-index about 0.6.

Legs yellowish grey, femur darker except at base. Fine upright hairs on fore tarsi. Preapicals on all three tibiae; apicals on fore and middle. Wings (Fig. 66 B) slightly fuscous, crossveins deeply clouded, veins brown. C-index about 3.5; 4V-index about 1.5; 4C-index about 0.7; 5X-index about 1.0. C1-bristles 2, subequal; C3-bristles on basal 1/3. Halteres yellowish grey.

Abdominal tergites yellowish brown, with medially interrupted caudal black bands, which are laterally reaching anterior margin on 2-4 T (dark type), or are undulated at front margins, or incompletely divided into a few spots (pale type). Abdominal sternites brownish black; 5 S pale yellow.

Periphallic organs (Fig. 66 G): Genital arch black, with lower tip white; upper portion bare, and lower portion with about 10 hairs. Clasper dark brown, broaden apically, and with about 16 black teeth arranged in a slightly sinuated row. Anal plate dark brown, oval, with lower tip white, and with about 45 hairs. Decasternum with median piece heart-shaped.



Phallic organs (Fig. 66 D-F): Aedeagus pale yellowish orange, distally much dilated in ventral aspect, apically somewhat concaved, and medioventrally with a minute claw. Anterior parameres minute, fused to novasternum, and with a few sensilla apically. Novasternum dark brown, S-shaped, and with stout submedian spines. Ventral fragma weakly quadrate, with black median longitudinal stripe. p.f.=aBCdEfg<sub>0</sub>HIkLMN. PI=about 1.3.

Egg-guides (Fig. 66 C): Lobe broad, orange, upper margin much swollen and blackish, and with about 20 marginal and 4 discal short orange teeth. Basal isthmus straight, short, and narrow.

Internal structures (Fig. 66 H-L): Proximal intestine: C=about 3.0. Rectal papillae elongate, R=about 2.5. Malpighian tubes with common stalks short, posterior branches ending free. Testis with about 3 inner and 4 outer coils. Seminal vesicle narrow. Ejaculatory bulb globular, and with a pair of very long caeca. Ejaculatory apodeme with oblong plate. Paragonia basally narrowing, folded twice. Spermatheca brown and oval. Parovaria short. Ventral receptacle with about 35 kinky coils.

Specimens examined: Yotsukura, Fukushima pref., VIII '54 (Kotake); Senjōdake, Nagano Pref., VII '53 (Kitagawa & Ono); Yatsugatake, Nagano Pref., VIII '53 F (Kurokawa); Taishakukyo, Hiroshima Pref., X '55 F; Kotaira, Tokyo, VIII '53 (Saito).

Distribution: Honshu (Tohoku, Kanto, Chubu, Chugoku), Europe.

Feeding habits: F.

Remarks: Well agrees with the European specimens sent from prof. Buzatti-Traverso, but slightly differs from which in having less prominent ventromedian claw of aedeagus. Two types of abdominal patterns occur in Japanese forms as indicated in the description above. The pale type corresponds to the European form.

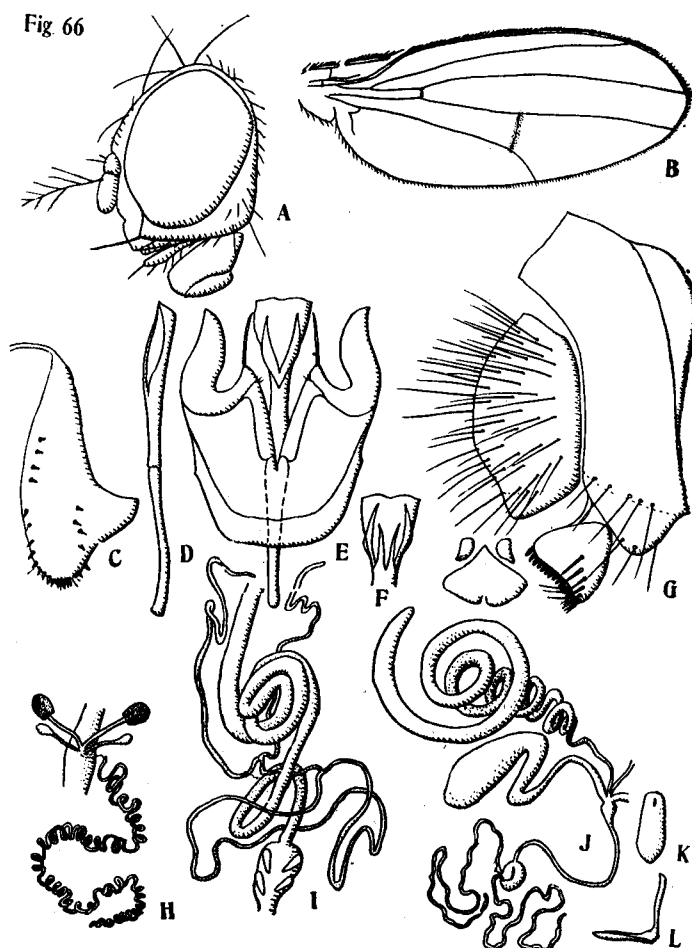


Fig. 66. *Drosophila (Drosophila) kuntzei* Duda.

A. Head; B. Wing; C. Egg-guide; D. Aedeagus (lateral aspect); E. Phallic organs (ventral aspect); F. Tip of aedeagus (dorsal aspect); G. Periphallallic organs (lateral aspect); H. Female reproductive organs (dorsal aspect); I. Digestive system (ventral aspect); J. Ejaculatory apodeme (ventral aspect); K. Ejaculatory apodeme (lateral aspect); L. Ejaculatory apodeme (lateral aspect).

*testacea* species- group, Sturtevant, 1942. Univ. Texas Publ., 4213: 30

*Drosophila (Drosophila) testacea* van Roser, 1840 Figs. 74-76, 78.

Japanese name; Kumoma-shōjōbae.

*Drosophila testacea* Van Roser, 1840. Württemb. Corbl.: 62; Becker, 1902. Jahresh. Ver. Vaterl. Naturk. Württemb., 59: 58; Sturtevant, 1921. Carn. Inst. Publ., 301: 130; Mizuno, 1952. Papers Res. Genet., 3: 51; Ohba, 1954. Kagaku, 24: 130; Suzuki, 1955. Zool. Mag., 64: 46; Ishihara, 1955. Zool. Mag., 64: 85.

*Drosophila (Acredrosophila) testacea* Duda, 1924. Ent. Medd., 14: 259; Duda, 1924. Arch. Naturg., 90 A (3): 203; Duda, 1935. Die Fliegen, 58 g: 53; Collin, 1952. Ent. Month. Mag., 88: 197.

*Drosophila (Drosophila) testacea* Sturtevant, 1942. Univ. Texas Publ., 4213: 30; Hsu, 1949. Univ. Texas Publ., 4920: 103; Wheeler, 1949. Univ. Texas Publ., 4920: 180; Burla, 1951. Rev. Suis. Zool., 58: 111; Patterson & Stone, 1952. Evol. gen. Dros.: 24; Okada, 1952. Komai's Shōjōbae no Iden to Jikken: 194; Basden, 1952. Ent. Month. Mag., 88: 201; Okada, 1953. Zool. Mag., 62: 280; Okada, 1954. Japan. Journ. Appl. Zool., 19: 79; Malogolowkin, 1953. Rev. Brasil. Biol., 13: 247; Okada, 1955. Kontyū, 23: 98.

*Drosophila fenestrarum* Meigen, 1830. Syst. Besch., 6: 83 (nec Fallén).

*Drosophila flava* Becker, 1902. Jahresh. Ver. Vaterl. Naturk. Württemb., 59: 58. (nec Fallén).

♂ and ♀: Body about 2.5 mm, yellowish brown to dark brown. Eye red, pubescent. Arista with about 8 branches including a small fork, 2 below it. Palpus with a few prominent setae. Front about half as broad as head width. Carina somewhat sulcate. Cheek about  $1/7$  as broad as the greatest diameter of eye.  $orb_2$  about  $1/4 orb_1$ .  $or_2$  about  $4/5$  vibrissa.  $hu$  2.  $ac$  in 6 rows. Anterior *scut* convergent. Sterno-index about 0.5. Cross distance of *dc* slightly longer than twice the length distance.

Legs with preapicals on all three tibiae; apicals on fore and middle. Wings with C1-bristles 2; C3-bristles on basal  $1/4$ . C-index about 3.4; 4V-index about 1.8; 4C-index about 0.8; 5X-index about 1.3.

Abdominal tergites with black caudal bands, which are interrupted at middle.

Periphallic organs: Hsu (1949) described and figured. Decasternum (Fig. 74 D) with median piece narrowly elongate; lateral pieces semicircular.

Phallic organs: Described and figured by Okada (1955). Generally yellowish brown. Aedeagus rod-like, apically dilated horizontally, and with several serrations on both lateral margins. Novasternum conically projected and with submedian short spines. Anterior parameres fused to novasternum and each with about 2 sensilla apically. Posterior parameres seem to be represented by a distal bow (Burla & Pavan, 1953, or sinuated bow, of Malogolowkin, 1953), which is medially swollen to be a quadrate plate. Ventral fragma broad, rounded at tip.  $p.f.=ab'CdEfgHIkLMN$ .  $PI=1.1$ .

Egg-guides (Fig. 75 A): Lobe yellowish brown, somewhat pointed at tip, and with about 18 marginal and 3 discal yellowish brown teeth. Basal isthmus narrow, dark, and slightly swollen medially.

Internal structures (Fig. 76 A, 78 A): Proximal intestine: C=about 3.0. Rectal papillae: R=2.3-3.5. Malpighian tubes with common stalks rather long, and posterior branches contiguous to each other at tips. Testis pale yellow, with about 2 inner and 2 outer coils. Paragonia elliptical and basally with narrow stalks. Ejaculatory bulb oval, with 2 thick caeca, which are as long as bulb. Ejaculatory apodeme with plate broad, elliptical, pale grey, and stem as long as plate. Parovaria with knobs elliptical. Spermatheca yellowish brown, oval, truncate at base. Ventral receptacle with about 6 coils and one transverse fold.

Specimens examined: In Hokkaido: Wakkanai, VIII '53 F; Akkeshi, VIII '51, VIII '53 (K. Moriwaki); Nakashibetsu, VIII '51 F; Tōbetsu, VIII '53 (Ohba); Nopporo VIII '51 M (Ohba); Sōunkyo, VIII '53 FT; Aizankei, VIII '53 (Ohba); Nishitappu, VIII '53 (K. Moriwaki); Meakan, VIII '53 F (K. Moriwaki). Hakkoda, Aomori Pref., VIII '51 F; Towada, Aomori Pref., VIII '52 F (Yoshida); Kumotoriyama, VI '53 TF; VII '55 F (Kurokawa et al); Nishikomagatake, Nagano Pref., VII '52 F (Kurokawa et al); Tadeshina, Nagano Pref., VIII '54 F.

Previous records from Japan: (Mizuno, 1952) Higashitakasu; (Ohba, 1954) Sōunkyo, Akkeshi, Nopporo, Hakkoda.

Distribution: Hokkaido, Honshu (Tohoku, Kanto, Chubu), Europe, N. America.

Feeding habits: FTM.

Remarks: Inhabiting high mountains in Honshu, high and low lands in Hokkaido. Exceedingly blackish individuals have frequently been collected.

*bizonata* species-group, Tan, Hsu, & Sheng, 1949. Univ. Texas Publ., 4920: 203.

*Drosophila (Drosophila) bizonata* Kikkawa & Peng, 1938 Figs. 74-76, 78.

Japanese name: Futaobi-shōjōbae (Kikkawa & Peng, 1938).

*Drosophila bizonata* Kikkawa & Peng, 1938. Japan. Journ. Zool., 7: 532; Ohba, 1954. Kagaku, 24: 130; Iwamura & Nobuchi, 1954. Journ. Japan. Forest. Soc., 36: 336; Kato, 1954. Sci. Rep. Tohoku Univ., Biol., 20: 267.

*Drosophila (Drosophila) bizonata* Wheeler, 1949. Univ. Texas Publ., 4920: 190; Patterson & Wheeler, 1949. Univ. Texas Publ., 4920: 215; Shōgaki, 1952. Komai's Shōjōbae no Iden to Jikken: 20; Patterson & Stone, 1952. Evol. gen. Dros.: 42; Okada, 1953. Zool. Mag., 62: 280; Okada, 1954. Japan. Journ. Appl. Zool., 19: 79; Okada, 1955. Kontyū, 23: 98.

♂ and ♀: General features as described by Kikkawa & Peng (1938). *hu* 2, subequal. Cross distance of *dc* 2.5 times as long as the length distance. Legs with preapicals on all three tibiae; apicals on fore and middle.

Periphallic organs (Fig. 74 C): Pale brown. Genital arch broad below; heel rectangular; toe rounded and with about 5 black setae; upper margin bare. Clasper with about 12 black teeth arranged in a straight row and about 10 black and yellow marginal setae at lower tip. The row of teeth does not reach the lower tip of clasper. Anal plate with about 45 hairs. Decasternum trapezoid, with upper and lower margins concaved.

Phallic organs: Described and figured by Okada (1955). Aedeagus pale brown, distally much dilated horizontally and apically convex; lateral margins of proximal half finely serrate. Anterior parameres completely fused to novasternum, and each with about 2 sensilla apically. Sinuous bow represents posterior parameres and medially with a large trapezoidal dark brown plate. Novasternum dark brown, apically with convergent long yellowish submedian spines. Ventral fragma round at tip. p.f.=ab/CdEfghIKlMN. PI=0.8.

Egg-guides (Fig. 75 C): Lobe yellowish brown, nearly quadrate at tip; upper margin concave and with about 20 marginal and 3 discal brownish teeth.

Internal structures (Figs. 76 E, 78 C): Proximal intestine: C=3.0. Rectal papillae: R=about 2.5 or more. Malpighian tubes with common atalks short and posterior branches looped completely. Testis white, with about 1.5 inner and 3 outer coils. Paragonia elliptical, weakly folded once. Ejaculatory bulb globular, with 2 slender caeca, which are about twice as long as plate. Spermatheca dark brown, globular. Parovaria with stem slender and knob small and clavate. Ventral receptacle with about 40 kinky coils.

Specimens examined: Sōunkyo, Hokkaido, VIII '53 S; Hakamoriyama, Iwate Pref., X '52 F. In Tokyo: Setagaya, II-V, IX, XI '52-'53 FSL; Suginami, III, XI '51-'52 TF (Ohnishi); Meguro, X-XII '51-'53; Kunitachi, VI '52 G; Kotaira, XI '53 (Saito); Asakawa, III, V-VII '51-'54 FS (Ohba et al); Takamizuyama, IV '53; Takao, V '52 F; Sanjō, VII '53 FM. In Kanagawa Pref., Mizonokuchi, XI '52 FS; Ikuta, XI '51 TS; Yokohama, XII '51 S; Kamakura, XII '51 S; Hatano, V '55 F; Hakone IX '54 (Toda); Aburatsubo, V '51 S; Niihama, Chiba Pref., IV, V '53-'54 L (Toshioka); Ōtsu, Shiga Pref., XI '54 L (Arnand). In Hiroshima Pref.; Miyoshi, X '55 S; Taishakukyo, X '55 F; Tōjō, X '55 S. Susaki, Kōchi Pref., XI '53 S; Matsuyama, Ehime Pref., XI '53 S; Nakakawa, Kōchi Pref., XI '53 S; Dazaifu, Fukuoka Pref., X '55 S; Kujūzan, IX '54 F; Aso, Kumamoto Pref., IX '54 F.

Previous records from Japan: (Kikkawa & peng, 1938) Kyoto, Kobe; (Ohba, 1954) Asakawa; (Iwamura & Nobuchi, 1954) Kyoto; (Kato, 1954) Sendai.

Distribution: Hokkaido, Honshu (Tohoku, Kanto, Chubu, Kinki, Chugoku), Shikoku, Kyushu.

Feeding habits: FSLTMG.

Remarks: Especially abundant in autumn, showing "autumn flush (Basden, 1954)". Iwamura & Nobuchi (1954) reported that the larvae of this species are seriously injurious on pine-mushrooms.

*melanderi* species-group, Hsu, 1949. Univ. Texas Publ., 4920: 190.

*Drosophila (Drosophila) makinoi* sp. nov. Fig. 67.

Japanese name: Miyama-shōjōbae.

*Drosophila* sp. like *pallida* Zetterstedt, Okada, 1954. Journ. Appl. Zool., 19: 79.

Male and female: Body about 3.5 mm, yellowish brown. Head (Fig. 67 A) dark yellowish brown, Eye dark red, finely pilose. Antenna with 2nd joint broad and yellowish brown, 3rd dark brown, Arista with about 7 very short branches including minute fork, one below it. Palpus with a few bristles. Front about 2/5 as broad as head width and with a few *fr*. Cheek yellowish brown, about 1/4 as broad as the greatest diameter of eye. Carina narrow, low, and broad and dark below. Clypeus brownish black. *orb*<sub>2</sub> about 1/3 size of *orb*<sub>1</sub>. *or*<sub>2</sub> minute.

Fig 67

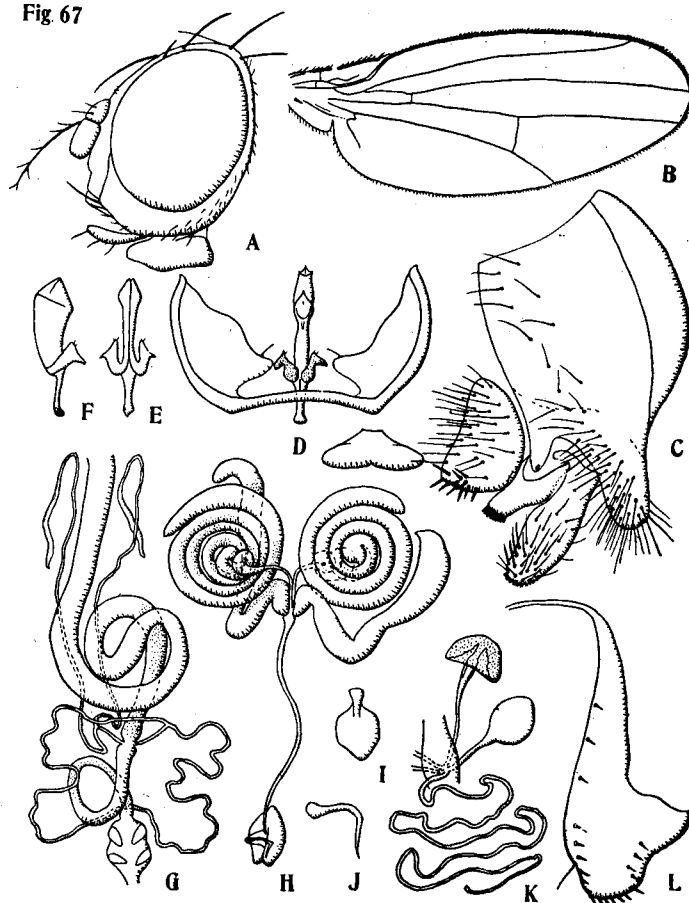


Fig. 67. *Drosophila (Drosophila) makinoi* sp. nov.

A. Head; B. Wing; C. Peripheral organs (lateral aspect); D. Phallic organs (ventral aspect); E. Aedeagus and anterior parameres (dorsal aspect); F. do (lateral aspect); G. Digestive system (ventral aspect); H. Male reproductive organs; I. Ejaculatory apodeme (ventral aspect); J. do. (lateral aspect); K. Female reproductive organs (ventral aspect); L. Egg-guide.

Mesonotum pale brown, with two pairs of obscurely demarcated darker longitudinal stripes: a pair inside *dc* lines, and a pair outside *dc* lines, inside pair often confluent to large extent, outside pair interrupted at sutures. Scutellum dark brown at middle. Thoracic pleura dark brown. *hu* 2, long and subequal. *ac* in 6 rows. Cross distance of *dc* about twice the length distance. Sterno-index about 0.8.

Legs yellowish brown, proximal 3 joints of fore tarsi ventrally with long blackish hairs. Preapicals on all three tibiae; apicals on fore and middle. Wings (Fig. 67 B) hyaline, veins yellow; posterior crossveins faintly clouded. C-index about 3.3; 4 V-index about 1.5; 4 C-index about 0.7; 5 X-index about 2.1. C1-bristles 2; C3-bristles on basal 1/3. Halteres white.

Abdominal tergites yellowish brown, each with narrow caudal black band, which is narrowly interrupted at middle, reaching anterior margin laterally. Abdominal sternites pale brown, quadrate, and longer than broad.

Peripheral organs (Fig. 67 C): Genital arch broad and black, narrowly pointed and pale yellow below; upper portion with about 10 short hairs; lower portion with about 45 long hairs. Claspers 2, lower one brown, rod-like, and with about 30 stout recurved setae. Upper clasper smaller, darker than lower one, longer than broad, and with about 9 black teeth on outer margin. Anal plate oval, brown, truncate below, and with about 40 hairs as well as about 20 short but strong setae below. Decasternum dark brown and flattened triangularly.

Phallic organs (Fig. 67 D-F): Aedeagus minute, yellowish brown, and apically swollen and paler. Anterior paramere minute, black, separated from novasternum, and apically with a few sensilla. Posterior parameres seem to be absent. Novasternum with minute submedian spines. Ventral fragma quadrate, about twice as broad as long, and with blackish ridge. p.f.=aBCdEfg<sub>0</sub>-HIklMn. PI=about 2.0.

Egg-guides (Fig. 67 L) : Lobe yellowish brown, with tip quadrate, upper margin much swollen, and with about 17 marginal and 4 discal black teeth. Basal isthmus rather long and narrow.

Internal structures (Fig. 67 G-K) : Proximal intestine :  $C=2.0$ . Rectal papillae :  $R=2.3$ . Malpighian tubes with common stalks short and the posterior branches contiguous to each other at tips. Testis orange yellow, with about 2 inner and 3 outer coils. Paragonia long, folded thrice. Ejaculatory bulb oval, apically bifid, but without caeca. Ejaculatory apodeme with plate pale brown, broad, and fusiform; stem as long as plate. Spermatheca hemispherical and pale yellowish grey. Parovaria with knob rounded. Ventral receptacle transversely folded about 5 times.

Holotype : ♂, Kurotake, Hokkaido, 10 VIII '53 F (Ohba et al).

Allotopotype : ♀, collected together with holotype.

Paratypes : 1 ♂ and 12 ♀♀, Kurotake, Hokkaido, 10 VIII '53 FS (Ohba et al); Aizankei, Hokkaido, 8 VIII '53 F (Ohba); Yatsugatake, Nagano Pref., 1 ♀, 26 VIII '52, 2 ♂♂ and 1 ♀, 11 VIII '53 F (Kurokawa).

Distribution : Hokkaido, Honshu (Chubu). Shikoku(?).

Feeding habits : FS.

Remarks : One male specimen collected by the author in Nanokawa, Kōchi Pref., 6 XI '53, by sweeping, seems to be referred to this species.

Relationships : Closely allied to *D. (D.) pallida* Zetterstedt, from Europe, differing from which in having broader upper clasper, apically non-divided aedeagus, and paler and broader egg-guides. The present species as well as *D. (D.) pallida* Zetterstedt are evidently belonging to the *melanderi* species-group, showing their periphallic organs characteristic to that group.

The species name is contributed to Prof. Dr. S. Makino, Hokkaido University. Under his kind help the present species as well as numerous other species has been collected in Hokkaido.

### Ungrouped species near *D. (D.) histrio* Meigen

$orb_2$  minute or smaller, about  $1/3-1/5$  size of  $orb_3$ .  $or_2$  as long as vibrissa. Palpus with a few prominent setae. Sterno-index about 0.5-0.6. Posterior parameres or sinuous bow absent. Inclusive of *D. (D.)* sp. of *quinaria* section and *D. (D.) histrio* Meigen.

#### *Drosophila (Drosophila)* sp. of *quinaria* section Fig. 68.

Japanese name : Magatama-shōjōbae.

*Drosophila (Drosophila) histrio* group I, Okada, 1953. Zool. Mag., 62: 285.

♂ and ♀ : General features are to be described by Okada and Kurokawa (1956).

Periphallic organs (Fig. 68 C) : To be described and figured by Okada & Kurokawa (1956).

Phallic organs (Fig. 68 D-G) : To be described and figured by Okada & Kurokawa (1956).  
p.f.=aBCdEfg<sub>0</sub>HIklmn. PI=about 3.0.

Egg-guides (Fig. 68 H) : To be described and figured by Okada & Kurokawa (1956).

Internal structures (Fig. 68 I-L) :  $C=3.0$ . Rectal papillae :  $R=2.0$ . Other features will be described by Okada & Kurokawa (1956).

Specimens examined : In Tokyo : Setagaya, III '53 S; Meguro, X '53 S, VI '52 F (Ohba); Asakawa, V '51 F (Moriwaki et al), X '51 F (Ohba), IV '52 S, III '53 F (Ohba), V '53 FS; Kumotoriyama, VII '53 S. Aburatsubo, Kanagawa Pref., V '51 S; Nishikomagatake, Nagano Pref., VII '52 S; Anjō, Aichi Pref., VI-VII '54 F (Nozawa); Susaki, Kōchi Pref., IX '53 S; Asozan, Kumamoto Pref., IX '54 F; Kujūzan, Ōita Pref., IX '54 F. These records are some details of what will be reported by Okada & Kurokawa (1956).

Distribution : Honshu (Kanto, Chubu), Shikoku, Kyushu.

Feeding habits : SF.

#### *Drosophila (Drosophila) histrio* Meigen, 1830 Figs. 74-76, 78.

Japanese name : Ezo-shōjōbae (Kikkawa & Peng, 1938).

*Drosophila histrio* Meigen, 1830. Syst. Besch., 6: 85; Sturtevant, 1921. Carn. Inst. Publ., 301: 126; Duda, 1924. Arch. Naturg., 90 A (3): 217; Duda, 1924. Ent. Medd., 14: 285; Séguy, 1934. Faune de Fr., 28: 385; Duda, 1935. Die Fliegen, 58 g: 85; Kikkawa & Peng, 1938. Japan. Journ. Zool., 7: 544; Mizuno, 1952. Paper. Res. Genet., 3: 51; Ohba, 1954. Kagaku, 24: 130; Suzuki, 1955. Zool. Mag., 64: 44; Ishihara, 1955. Zool. Mag., 64: 85.

*Drosophila (Drosophila) histrio* Sturtevant, 1942. Univ. Texas Publ., 4213: 30; Hsu, 1949. Univ. Texas Publ., 4920: 116; Wheeler, 1949. Univ. Texas Publ., 4920: 180; Tan, Hsu, & Sheng, 1949. Univ. Texas Publ., 4920: 205; Patterson & Stone, 1952. Evol. gen. Dros.: 78; Shōgaki, 1952. Komai's Shōjōbae no Iden to Jikken: 21; Burla, 1951. Rev. Suis. Zool., 58: 121; Okada, 1953. Zool. Mag., 62: 285; Okada, 1954. Japan. Journ. Appl. Zool., 19: 79; Okada, 1955. Kontyū, 23: 98.

Fig 68

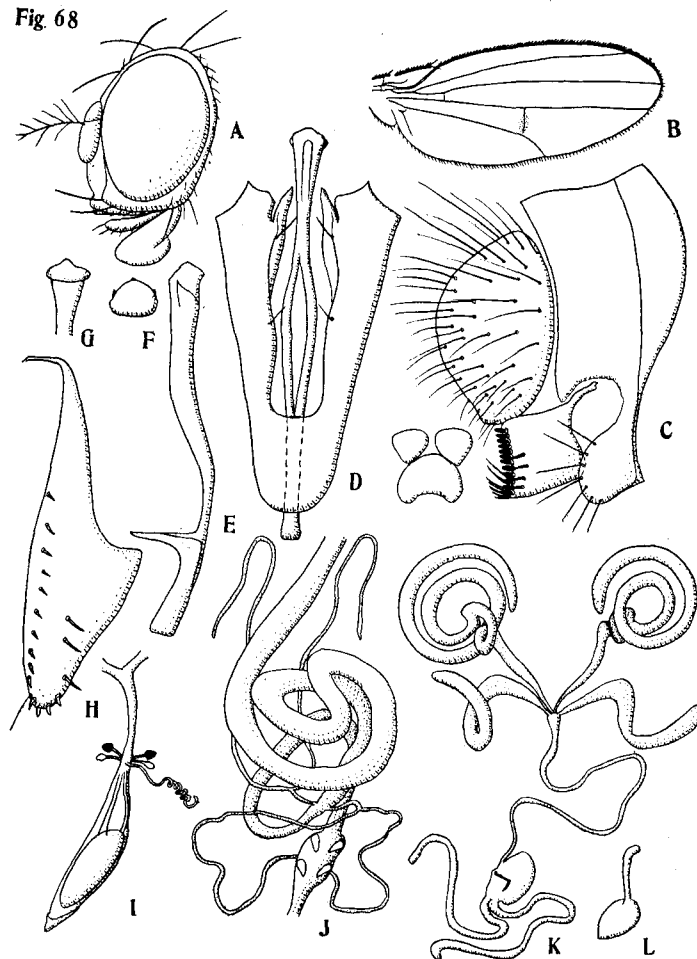


Fig. 68. *Drosophila (Drosophila)* sp. of *quinaria* section.

A. Head; B. Wing; C. Peripheral phallic organs (lateral aspect); D. Phallic organs (ventral aspect); E. Aedeagus (lateral aspect); F. Tip of aedeagus (caudal aspect); G. do. (dorsal aspect); H. Egg-guide; I. Female reproductive organs, with an egg in uterus (ventral aspect); J. Digestive system (ventral aspect); K. Male reproductive organs; L. Ejaculatory apodeme (ventral aspect).

♂ and ♀: *hu* 2, equal. Cross distance of *dc* slightly larger than the length distance. Anterior *scut* convergent. Preapicals on all three tibiae; apicals prominent on middle. Wings with C1-bristles 2, lower longer; C3-bristles on basal about 1/3. Other features as described by Kikkawa & Peng (1938).

Peripheral phallic organs: Described and figured by Hsu (1949). Decasternvm (Fig. 74 E) with lateral pieces small, triangular, median piece absent.

Phallic organs: Described and figured by Okada (1955). Aedeagus yellowish orange, apically swollen and dark brown, subapically pubescent, basally curved ventrad rectangularly, and apically with a pair of small finger-like ventrally directed process. Anterior parameres minute, separated from novasternum, and each with about 2 sensilla apically. Posterior parameres absent. Submedian spines prominent. Ventral fragma quadrate, longer than broad, and with median notch widen at bottom. *p. f.* = aBcdEfg<sub>0</sub>HIklmn. *PI* = 1.2.

Egg-guides (Fig. 75 D): Lobe brown, broadly round at tip, and with about 16 marginal and 3 discal yellowish brown teeth.

Internal structures (Fig. 76 G, 78 E): Proximal intestine: C = about 3.5. Rectal papillae: R = about 3.0. Testis with about 2 inner and 3 outer coils. Paragonia folded 1.5 times. Ejaculatory bulb oval, broader below, and with a pair of curved caeca which are as long as bulb itself. Ejaculatory apodeme with plate elongate, elliptical, twice as long as stem. Spermatheca pale yellow and globular. Parovaria with knob globular. Ventral receptacle with about 30 (?) kinky coils.

Specimens examined: In Hokkaido: Akkeshi, VIII '51 F (Moriwaki et al), VIII '53 (K. Moriwaki); Attoko, VIII '51 F; Tōbetsu, VIII '51 F; Kurotake, VIII '53 F; Nishitappu, VIII '53 F

(K. Moriwaki); Nopporo, VII '53 F (Ohba). Hakkōda, Aomori Pref., VII '51 F; Towada, Aomori Pref., VIII '52 F (Yoshida); Hakamoriyama, Iwate Pref., X '52 F; Kumotoriyama, Tokyo, VI '52 T; Sengataki, Nagano Pref., IX '50 F (H. Ono); Yatsugatake, Nagano Pref., VIII '53 F (Kurokawa).

Previous records from Japan: (Kikkawa & Peng, 1938) Sapporo, Kōfu; (Mizuno, 1952) Sapporo; (Ohba, 1954) Akkeshi, Yatsugatake, Kumotoriyama; (Suzuki, 1955) Sapporo; (Ishihara, 1955) Sapporo, Daisetsuzan.

Distribution: Hokkaido, Honshu (Tohoku, Kanto, Chubu), China, Europe.

Feeding habits: FT.

### Ungrouped species resembling *D. (D.) grandis* Kikkawa & Peng

Yellowish brown species, thoracic pleura with blackish patch or stripes.  $or_2$  minute.  $orb_2$  less than  $1/3 orb_1$ . Anal plate separated from genital arch. Posterior parameres or sinuous bow absent.

#### *Drosophila (Drosophila) grandis* Kikkawa & Peng, 1938 Figs. 74, 76, 78.

Japanese name: Munaguro-shōjōbae (Kikkawa & Peng, 1938).

*Drosophila grandis* Kikkawa & Peng, 1938. Japan. Journ. Zool., 7: 543.

*Drosophila (Drosophila) grandis* Sturtevant, 1942. Univ. Texas Publ., 4213: 31; Wheeler, 1949. Univ. Texas Publ., 4920: 186; Patterson & Stone, 1952. Evol. gen. Dros., 34: 71; Shōgaki, 1952. Komai's Shōjōbae no Iden to Jikken: 21; Okada, 1953. Zool. Mag., 62: 280.

♂ and ♀: Eyes with very thick blackish piles. Cross distance of *dc* about half the length distance. *hu* 2, lower one longer. Legs with preapicals on all three tibiae; apicals on fore and middle. Wings with C1-bristle only one; C3-bristles on basal  $2/3$ .

Periphallic organs (Fig. 74 A): Genital arch brownish black, lower half pale yellowish orange; heel round and toe pointed; upper portion with about 9 hairs; lower portion with about 5 hairs. Clasper pale yellowish orange, with about 10 black teeth arranged in a row; the row occupies lower  $2/3$  of distal margin of clasper; upper  $1/3$  of the distal margin bare and roundly convexed. Anal plate brownish black, with about 30 hairs, and separated from genital arch. Decasternum with lateral pieces pale brown, contiguous to each other, and pubescent at sides; median piece paler and apically narrowing.

Phallic organs: Aedeagus thick, orange brown, slightly pointed apically, serrated at distal half on ventral margin, and with a pair of incisions near middle of ventral margin. Anterior paramere fused to novasternum, broad, pubescent, and with about 3 apical sensilla. Submedian spines about 2 pairs, short, and located near the lateral corners of novasternum. Ventral fragma quadrate, dark brown, and broader than long.  $p.f. = ab'CdEfg,Hiklmn$ .  $PI = \text{about } 2.0$ .

Egg-guides: Lobe yellowish grey, broad basally and narrowly pointed at tip, with upper and lower margins nearly straight, and with about 13 marginal and one discal brownish yellow teeth. Basal isthmus dark brown, narrow, and long.

Internal structures (Fig. 76 D, 78 B): Proximal intestine:  $C = \text{about } 3.0$ . Rectal papillae:  $R = 2.0$ . Malpighian tubes with common stalks comparatively long; posterior branches fused to each other at tips. Testis brownish black, with about one inner and 2.5 outer coils. Seminal vesicle thick. Paragonia once folded. Ejaculatory bulb globular, with a pair of very long slender caeca which are about 5 times as long as bulb itself. Ejaculatory apodeme minute, with very slender yellowish brown plate and short stem. Spermatheca black, hemispherical, and small. Parovaria with half elliptical head. Ventral receptacle transversely folded about 5 times.

Specimens examined: Asakawa, Tokyo, VI '51, VI, X '52 F (Ohba), III '53 F (Ohba).

Previous records: (Kikkawa & Peng, 1938) Kōfu, Kyoto.

Distribution: Honshu (Kanto, Chubu, Kinki).

Feeding habits: F.

Remarks: The specimens examined show a considerable degree of variation in the black patches of mesonotum, thoracic pleura, and of mesonotum. Pleural bands are complete or interrupted. Abdominal black cross bands on 2-4 T clearly or obscurely interrupted at middle. The present species has often been referred to the *polychaeta* species-group (Sturtevant, 1942; Wheeler, 1949; Patterson & Wheeler, 1949) of the *virilis* section, but so far as the present author is aware, this species has anal plate separated from genital arch, and *dc* usually no more than 2 pairs, and thus it is treated here as an ungrouped species of the *quinaria* section.

#### *Drosophila (Drosophila) acutissima* sp. nov. Fig. 69.

Japanese name: Togari-shōjōbae.

Fig 69

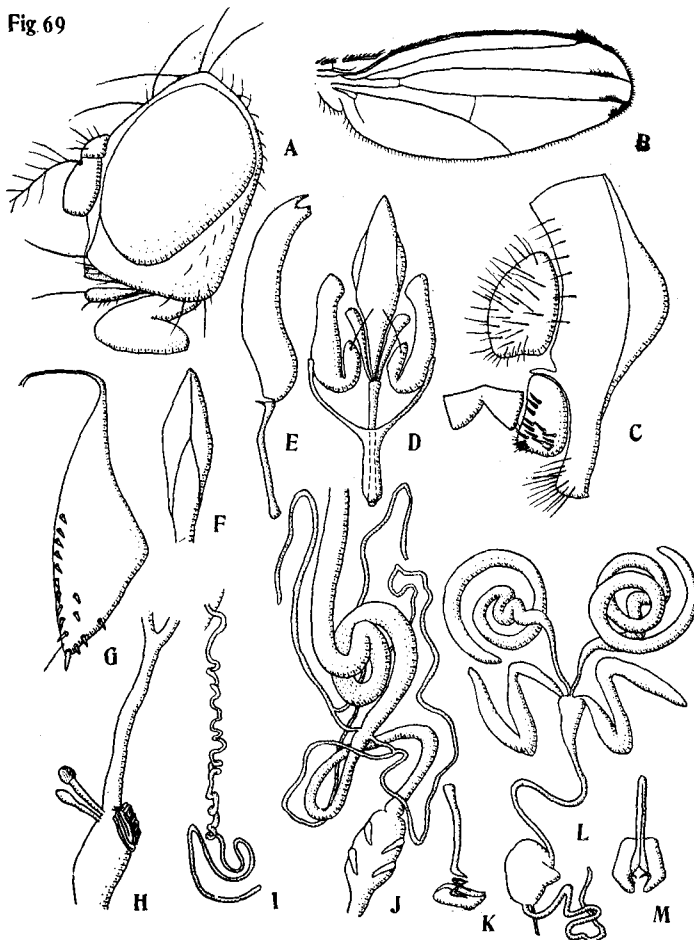


Fig. 69. *Drosophila (Drosophila) acutissima* sp. nov.

A. Head; B. Wing; C. Peripheral organs (lateral aspect); D. Phallic organs (ventral aspect); E. Aedeagus (lateral aspect); F. Tip of aedeagus (dorsal aspect); G. Egg-guide; H. Female reproductive organs (lateral aspect); I. Ventral receptacle; J. Digestive system (ventral aspect); K. Ejaculatory apodeme (lateral aspect); L. Male reproductive organs (ventral aspect); M. Ejaculatory apodeme (anteroventral aspect).

♂ and ♀: Body yellowish brown, about 2.4-2.7 mm. Head (Fig. 69 A): eyes brilliant red, rather small, and with reddish piles. Antenna with 2nd joint yellowish brown, 3rd broad and darker. Arista with about 8-9 branches including a small fork, 2 below it. Palpus brownish black, with only one prominent long apical bristle.  $orb_2$  minute, about  $1/5 orb_1$ . Only one exceeding long *or*. Ocellar triangle small and black. Periorbits yellowish brown, setigerous in front of  $orb_3$ . Front dark brown, anteriorly paler, about half as broad as head width, and with irregularly arranged *fr*. Clypeus dark brown. Carina greyish brown, somewhat narrow and high. Face black at the insertions of *or*.

Mesonotum and scutellum dark yellowish brown, somewhat pollinose. Thoracic pleura brown, and with 3 broad black longitudinal bands. Sterno-index about 0.5. *hu* 2, lower longer. *ac* in 6 rows. Cross distance of *dc* about twice the length distance. Anterior *scut* distinctly divergent.

Legs yellowish grey; preapicals on all three tibiae; apicals on fore and middle. Halteres pale yellowish grey. Wings (Fig. 69 B) slightly fuscous along *costa*. Crossveins weakly clouded; C-index about 3.0; 4V-index about 2.0; 4C-index about 0.9; 5X-index about 2.0. C1-bristles 2; C3-bristles on basal about  $2/5-1/2$ .

Abdominal tergites brownish black, pollinose, anterior half and posterior margin of each T being slightly paler. Sternites greyish brown.

Peripheral organs (Fig. 69 C): Genital arch elongate, tapering and truncate below; upper half black and with about 7 hairs; lower half pale yellow and with about 12 hairs near apex. Clasper ovoid, truncate below, and with about 7 more or less irregularly arranged primary teeth as well as about 7 secondary teeth. Anal plate oval, broadly truncate below, yellowish brown and



hairy, and separated from genital arch. Lower tip of anal plate is brownish and thickly haired. Decasternum yellowish orange; lateral pieces large, triangular, and contiguous to each other; median piece apparently bifid.

Phallic organs (Fig. 69 D-F): Aedeagus orange yellow, fusiform at ventral aspect; apically bifid in lateral view. Anterior paramere rod-like, clavate, and without sensilla. Posterior parameres absent. Novasternal plate J-shaped and with a large submedian spine. Ventral fragma narrow, Y-shaped, and brownish black. p.f.=aBCdEf<sub>g</sub>HIkIMn'. PI=about 1.6.

Egg-guides (Fig. 69 G): Lobe acute-triangularly pointed apically, pale yellowish brown, and with about 13-15 marginal and 2 discal orange brown teeth, apical marginal tooth being longest. Submedian hair located near apex of lobe. Basal isthmus narrow and rather long.

Internal structures (Fig. 69 H-M): Proximal intestine: C=1.5-2.0. Rectal papillae: R=2.5. Malpighian tubes with common stalks short, posterior branches fused to each other at tips. Seminal vesicle rather thick. Paragonia folded about 1.5 times. Ejaculatory bulb with only one long caecum, which is about 4 times as long as bulb itself. Ejaculatory apodeme with plate pale yellow and pentagonal, and stem brown, slender, and geniculated at the insertion of the plate. Spermatheca pale yellowish brown, globular, and small. Parovaria with fusiform tip. Ventral receptacle with about 12 kinky coils and 2 apical transverse folds.

Holotype: ♂, Meguro, Tokyo, 29 XI '51 S (Okada).

Allotopotype: ♀, 16 XI '52 S (Okada).

Paratopotypes: 3 ♂♂, 16 XI '51 S; 2 ♂♂, 29 XI '51; 1 ♀, 28 XI '52; 1 ♂ and 1 ♀, 11 X '53 S.

Other specimens examined: In Tokyo, Suginami, XI '51 T (Ohnishi); Setagaya, X '52 S, V '53 S, I '54 M; Kotaira, VI '54 S (Saito); Asakawa, II '53 F (Ohba); Kamakura, Kanagawa Pref., XI '52 S; Hôshionsen, Gumma Pref., IX '53 S (Matsudaira); Yatsugatake, Nagano Pref., VII '51; Kyoto, XI '54 L (Arnaud); Tôjô, Hiroshima Pref., X '55 S; Yubara, Okayama Pref., X '55 F; Omogô, Ehime Pref., XI '53 S; Susaki, Kôchi Pref., XI '53 S.

Distribution: Honshu (Kanto, Chubu, Kinki, Chugoku), Shikoku.

Feeding habits: STMFL.

Relationships: Resembles the fore-going species, *D. (D.) grandis* Kikkawa & Peng, differing from which in smaller body size, shorter *orb*<sub>2</sub>, longer apical bristles of palpi, and larger C-index. Also somewhat resembles *D. macularis* Villeneuve, from Europe, in the thoracic pleural patches, being quite different from which in wing venation and abdominal patterns. The closest relative is the succeeding species, *D. (D.) tenuicauda* sp. nov. (see under that species). The specific name is due to the shape of egg-guide.

### *Drosophila (Drosophila) tenuicauda* sp. nov. Fig. 70.

Japanese name: Tsubame-shôjôbae.

*Drosophila (Drosophila)* sp. III, like *D. grandis*, Okada, 1955. Zool. Mag., 64: 107.

♂ and ♀: Body about 2.5-3 mm, yellowish brown. Head (Fig. 70 A): eyes dark red, with greyish red piles. Antenna with 2nd joint yellowish brown, 3rd darker, and broader. Arista with about 9 branches including a small fork, 2 below it. Ocellar triangle black. Periorbits yellowish grey. Front yellowish grey, anteriorly darker, about half as broad as head width, and with a few *fr*. Cheek yellowish grey, about 3/10 as broad as the greatest diameter of eye. Clypeus yellowish grey. Face yellow, black at the insertion of *or*. *orb*<sub>2</sub> minute, about 1/6 *orb*<sub>1</sub>, situated outside *orb*<sub>3</sub>. *or*<sub>2</sub> minute, vibrissa very long. Palpus yellow and narrow, with a quite long terminal and a shorter median setae.

Mesonotum and scutellum pale greyish brown. Thoracic pleura brownish black, interrupted by 2 longitudinal irregular pale stripes. *hu* 2, *ac* in 6 rows. Cross distance of *dc* about twice or slightly less the length distance. Anterior *scut* convergent. Sterno-index about 0.5.

Legs pale yellowish grey. Preapicals on all three tibiae; apicals on fore and middle. Halteres yellowish white. Wings (Fig. 70 B) yellow. C-index about 2.7 or slightly less; 4V-index about 2.4; 4C-index about 1.2; 5X-index about 2.7; C1-bristles 2; C3-bristles on basal 1/4.

Abdominal tergites yellowish grey, with broad black medially interrupted or non-interrupted caudal band on each tergite. These bands are curved forward to reach anterior margin at sides.

Periphalllic organs (Fig. 70 C): Genital arch pale yellow, tapering below, apically orange brown and truncate, and with about 8 upper and 8 lower marginal hairs. Clasper semicircular, with about 9 black teeth arranged in a row, which occupies median part of distal margin of clasper. Secondary teeth about 16, scattered on the surface of clasper. Anal plate oval, pale

yellow, with about 15 hairs, and separated from genital arch. Decasternum pale yellowish brown, broad, and inversely V-shaped.

Phallic organs (Fig. 70 D,E): Aedeagus pale brown, slender, straight, and apically flattened horizontally and elliptical. Anterior paramere (?) orange brown, elongate, half as long as aedeagus, and separated from novasternum, and without sensilla. Posterior parameres absent. Ventral fragma narrow triangular, about twice as long as broad. Novasternum with apical submedian spines and sensilla-like short hairs. p.f.=aBcd'EF?g<sub>0</sub>HiklMN. PI=1.3.

Egg-guides (Fig. 70 F): Lobe orange brown, triangularly and rather acutely pointed, with about 12 marginal and 5 discal dark orange teeth. Subterminal hair near the apex of lobe. Basal isthmus narrow and long.

Internal structures (Fig. 70 G-K): Proximal intestine twice coiled. Rectal papillae: R=3.0. Malpighian tubes with common stalks very long and branches short; posterior branches fused to each other at tips, but not surround gonads. Testis yellowish white and with about one inner and 2.5 outer coils. Seminal vesicle distally much swollen and elliptical. Paragonia folded once. Ejaculatory bulb without caeca; ejaculatory apodeme quadrate, pale yellow, stem darker and about twice as long as plate. Spermatheca globular, pale yellowish brown or brown. Parovaria with large oval tips. Ventral receptacle short and with about 5 transverse folds.

Holotype: ♂, Attoko, Hokkaido, 15 VIII '51 S (Okada).

Allotype: ♀, Kogesawa, Tokyo, 5 V '51 S (Okada).

Paratypes: 1 ♀, Kogesawa, 5 V '51 S; 1 ♀, Setagaya, Tokyo, 30 XI '51 S; 1 ♀, Mukôgaoka, Kanagawa Pref., 25 XI '53 S; 3 ♂♂ and 1 ♀, Nopporo, Hokkaido, VIII '53 (Suzuki).

Other specimens examined: Akkeshi, Hokkaido, VIII '51 T; Sôunkyo, Hokkaido, VIII '53 SL; Tôjô, Hiroshima Pref., X '55 S.

Fig70

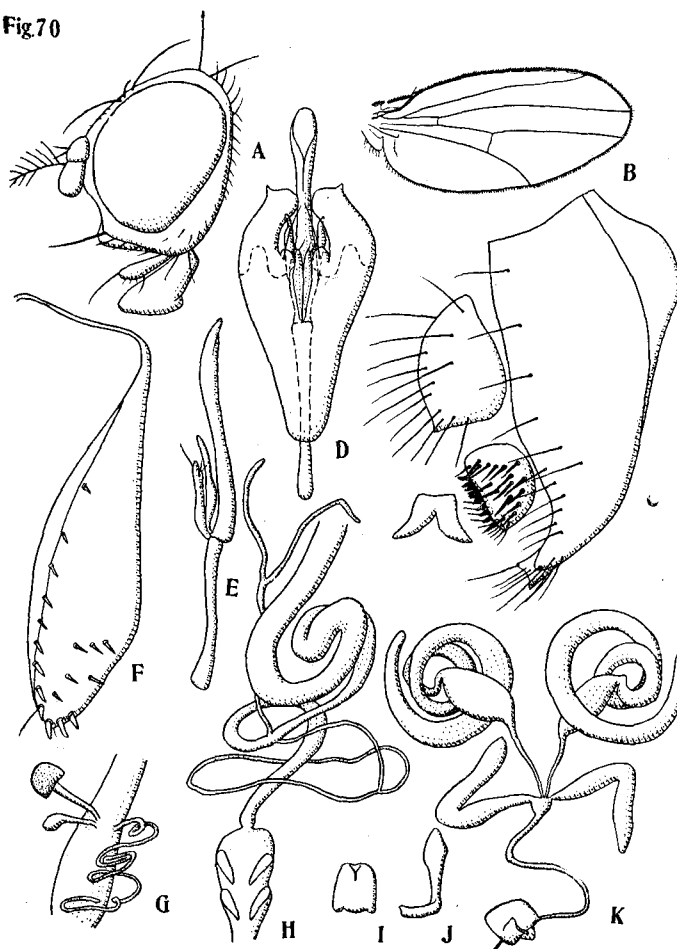


Fig. 70. *Drosophila (Drosophila) tenuicauda* sp. nov.

A. Head; B. Wing; C. Periphallallic organs (lateral aspect); D. Phallic organs (ventral aspect); E. do. part (lateral aspect); F. Egg-guide; G. Female reproductive organs (lateral aspect); H. Digestive system (ventral aspect); I. Ejaculatory apodeme (ventral aspect); J. do. (lateral aspect); K. Male reproductive organs.

Distribution: Hokkaido, Honshu (Kanto, Chugoku).

Feeding habits: SML.

Relationships: Closely resembles the fore-going species, *D. (D.) acutissima* sp. nov., especially in having minute  $orb_2$ , quite long vibrissa as well as apical palpal bristle, and in triangularly pointed egg-guide, but differs from it in the smaller range of C3-bristles, well defined abdominal bands (if bands are obscure, abdomen is not blackish), less sharply pointed egg-guides, and broader ventral fragma.

Remarks: The present species seems to be divisible in two types: (1) body smaller and abdominal bands on 2-5 T widely interrupted at middle; (2) body larger and abdominal bands on 3-5 T non-interrupted. In some other cases the abdominal bands are becoming obscure. This species resembles *D. (D.) acutissima* in ecological natures of being scarcely attracted at fruit traps, difficult for laboratory breeding, and occurring in colder seasons.

*funebria* species-group, Sturtevant, 1942. Univ. Texas Publ., 4213: 31.

Three Japanese species are referable to this group: *D. (D.) funebria* Fabricius, *D. (D.) multispina* sp. nov., *D. (D.) maculinotata* sp. nov.

*Drosophila (Drosophila) funebria* Fabricius, 1787. Fig. 74-76, 78.

Japanese name: Suji-shōjōbae (Kikkawa & Peng, 1938), Koge-shōjōbae (Komai, 1948), Obi-shōjōbae (Matsumura, 1931). *Musca funebria* Fabricius, 1787. Mant. Ins., 2: 345.

*Drosophila funebria* Becker, 1908. Mitt. Zool. Mus. Berlin, 4: 155; Bezzi, 1908. Bull. Soc. Ent. Ital., 4: 190; Sturtevant, 1921. Carn. Inst. Publ., 301: 84; Duda, 1924. Ent. Med., 14: 278; Duda, 1924. Arch. Naturg., 90 A (3): 214; Duda, 1925. Arch. Naturg., 91 A (3): 147; Séguy, 1934. Faune de Fr., 28: 384; Matsumura, 1931. 6000 Illus. Ins. Japan.: 367; Kikkawa & Peng, 1938. Japan. Journ. Zool., 7: 542; Azuma, 1939. Trans. Kansai Ent. Soc., 8: 33; Duda, 1935. Die Fliegen, 58 G: 82; Stalker & Spencer, 1939. Ann. Ent. Soc. Amer., 32: 107; Duda, 1940. Ann. Mus. Nat. Hung., 33: 46; Mizuno, 1952. Paper. Res. Genet., 3: 51; Suzuki, 1955. Zool. Mag., 64: 46; Ishihara, 1955. Zool. Mag., 64: 85.

*Drosophila (Drosophila) funebria* Sturtevant, 1942. Univ. Texas Publ., 4213: 31; Patterson, 1943. Univ. Texas Publ., 4313: 110; Hsu, 1949. Univ. Texas Publ., 4920: 103; Wheeler, 1949. Univ. Texas Publ., 4920: 180; Basden, 1952. Ent. Month. Mag., 88: 200; Patterson & Stone, 1952. Evol. gen. Dros.: 27; Burla, 1952. Rev. Suis. Zool., 58: 13; Shōgaki, 1952. Komai's Shōjōbae no Iden to Jikken: 20; Okada, 1953. Zool. Mag., 62: 285; Malogolowkin, 1953. Rev. Brasil. Biol., 13: 246; Okada, 1955. Kontyū, 23: 98.

♂ and ♀: General features as described by Patterson (1943), Kikkawa & Peng (1938).

Periphallic organs: Described and figured by Stalker & Spencer (1938), Hsu (1949). Decasternum (Fig. 74 F) with lateral pieces rod-like, contiguous to each other, and laterally narrowing.

Phallic organs: Described and figured by Okada (1955). Aedeagus orange brown, slender, nearly straight, subbasally swollen, apically shortly divided, and subapically with a small claw on venter. Novasternum greyish brown, oval, and with a short pair of submedian spines. Anterior parameres obscure. Posterior parameres absent. Ventral fragma grey, oval, and longer than broad.  $p.f. = aBCdEfg_0HIkl'mn$ .  $PI = 2.6$ .

Egg-guides (Fig. 75 E): Described and figured by Stalker and Spencer, 1939. Lobe yellow, broad, apically rounded, and with about 22 marginal and 7 discal orange yellow teeth. Basal isthmus short and straight.

Internal structures (Figs. 76 F, 78 H): Proximal intestine:  $C = 3.0$ . Rectal papillae:  $R = 3.0$ . Malpighian tubes with common stalks rather short, posterior branches fused to each other at tips. Ejaculatory apodeme with plate oval, apically narrowing and truncate, and stem black and as long as plate. Spermatheca lamp-shaped, pale greyish brown. Other structures of male and female reproductive organs as described by Patterson (1943).

Specimens examined: In Hokkaido: Akkeshi, VIII '51; Attoko, VIII '51; Wakkanai, VIII '53; Sapporo, VIII '53 F; Nishitappu, VIII '53 F (K. Moriwaki).

Previous records from Japan: (Matsumura, 1931) Hokkaido, prevalent in Sapporo; (Kikkawa & Peng, 1938) Otaru, Sapporo; (Mizuno, 1952) Sapporo, Ohyachi, Takasu, Obihiro, Akkeshi; (Suzuki, 1955) Sapporo; (Ishihara, 1955) Sapporo.

Distribution: Hokkaido, Saghalin, Europe, N. America, Africa, Australia.

Feeding habits: F.

*Drosophila (Drosophila) multispina* sp. nov. Fig. 71.

Japanese name: Igakuri-shōjōbae.

♂ and ♀: Body about 2.6 mm, brown to dark brown, with black medially narrowly interrupted caudal band on each T. Head (Fig. 71 A); eyes dark red, very finely pilose. Antenna with 2nd

joint brown, 3rd dark yellowish brown. Palpus slender, yellowish brown, and with a few rather short bristles. Arista with about 10 branches including a small fork, 3 below it. Ocellar triangle and periorbits brown. Front brown, about half as broad as head-width, and with *fr* irregularly arranged. Clypeus dark brown. Carina yellowish brown, narrow, and long. Cheek yellowish brown, black above, about 1/4 as broad as the greatest diameter of eye. *orb*<sub>2</sub> about 1/3 length of *orb*<sub>1</sub>.

Fig. 71

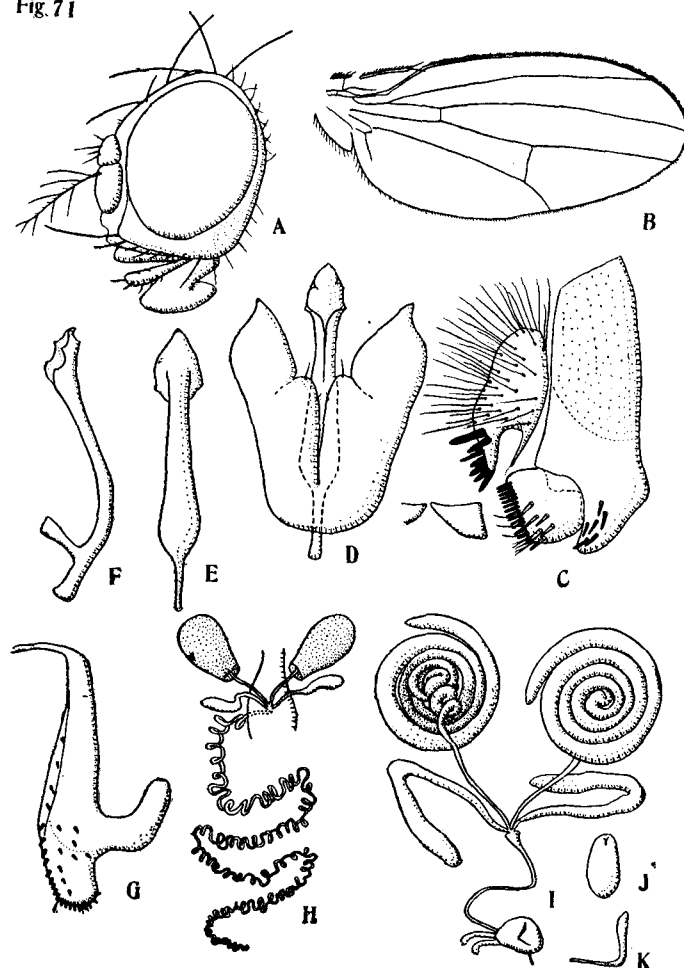


Fig. 71. *Drosophila (Drosophila) multispina* sp. nov.

A. Head; B. Wing; C. Peripheralhallic organs (lateral aspect); D. Phallic organs (ventral aspect); E. Aedeagus (dorsal aspect); F. do. (lateral aspect); G. Egg-guide; H. Female reproductive organs (dorsal aspect); I. Male reproductive organs (ventral aspect); J. Ejaculatory apodeme (ventral aspect); K. do. (lateral aspect).

Mesonotum and scutellum brown. Thoracic pleura darker brown. *hu* 2, subequal or upper one longer. *ac* in 8 rows. Cross distance of *dc* about half the length distance. Sterno-index about 0.8.

Legs brownish black. Preapicals on all three tibiae; apicals on middle. Wings (Fig. 71 B) hyaline, crossveins clear. C-index about 3.6; 4 V-index about 1.5; 4 C-index about 0.7; 5 X-index about 1.0. C1-bristles 2; C3-bristles on basal 2/5-1/2. Halteres white.

Abdominal tergites dark brown, and with black caudal bands obscurely interrupted at middle. Abdominal sternites quadrate, yellowish grey.

Peripheralhallic organs (Fig. 71 C): Genital arch brown, darker at tip; high and rectangular; toe narrowing apically and directed ventrad; upper caudal margin bare; lower caudal margin with about 7 stout teeth-like bristles. Anal plate brown, separated from genital arch, with about 40 hairs, and ventrally narrowing and with about 7 very stout black teeth. Clasper quadrate, with about 13 teeth arranged in a row on the outer margin, and with about 7 stout brown secondary teeth. Decasternum with lateral pieces narrow fusiform, and contiguous to each other.

Phallic organs (Fig. 71 D-F): Aedeagus yellowish orange, narrow, nearly straight, apically oval and pointed in ventral aspect, and with 2 pairs of serrations. Anterior paramere fused to novasternum and with an apical sensillum. Novasternum with a pair of short submedian spines.

Ventral fragma quadrate, pale brown, and longer than broad. p.f.=ab'CdEfg<sub>0</sub>Hiklmn. PI=5.0.

Egg-guides (Fig. 71 G): Lobe brownish black, apically black and somewhat quadrate; upper margin with a large anteriorly curved submedian process, and with about 22 marginal and 9 discal yellowish brown teeth. Basal isthmus narrow, rather long, and straight.

Internal structures (Fig. 71 H-K): Proximal intestine: C=2.5. Rectal papillae: R=about 3.0. Malpighian tubes with common stalks short and posterior branches probably fused to each other at tips. Testis with about 5 inner and 4 outer coils. Seminal vesicle narrow. Paragona folded once. Ejaculatory bulb oval, with a pair of caeca, which are about 1.5 times as long as the bulb. Ejaculatory apodeme with elliptical pale yellowish plate and a narrow stem, which is as long as plate. Spermatheca elongate oval, basally narrowing, and pale brown. Parovaria with narrow heads. Ventral receptacle with about 60 coils.

Holotype: ♂, Sapporo, Hokkaido, 19 VIII '53 (Suzuki), collected from the tree hole of elm.

Allotopotype: ♀, collected together with holotype.

Paratypes: 1 ♂ and 1 ♀, Sapporo, collected together with holotype (Suzuki); 4 ♀♀, 10 X '53 M (Suzuki), 1 ♀, 13 VII '53 M (Suzuki), Sapporo, Hokkaido; 1 ♂ and 2 ♀♀, Nishitappu, Hokkaido, 22 VIII '53 F (K. Moriwaki).

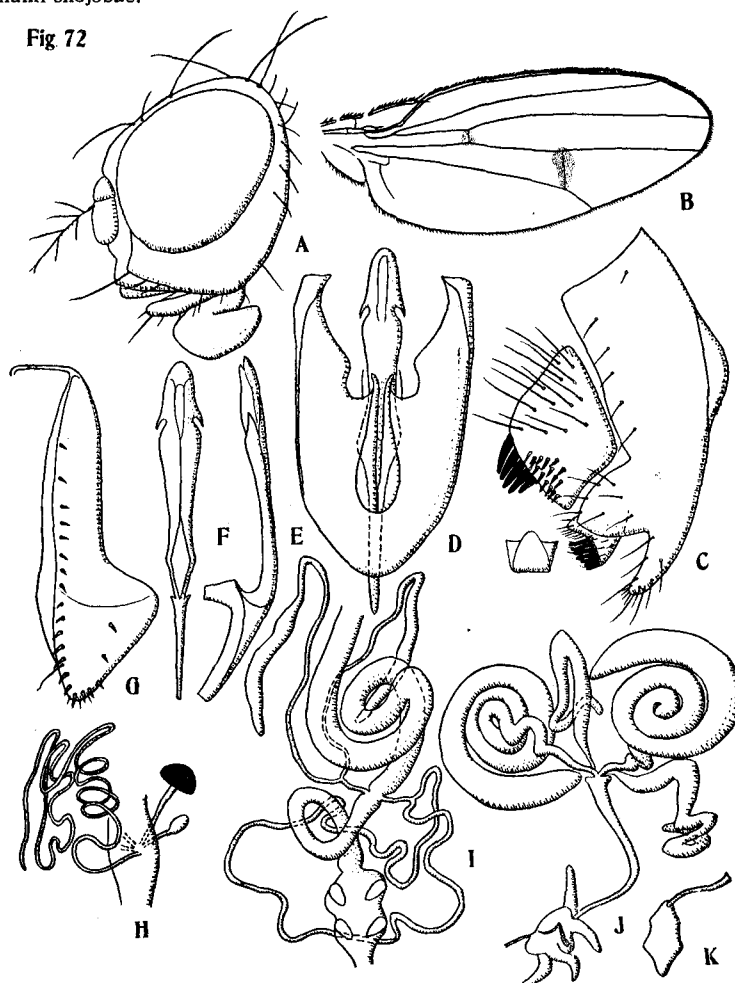
Distribution: Hokkaido.

Feeding habits: MF.

Relationships: Closely allied to *D. (D.) funebris* (Fabricius), differing from which in the anal plate definitely narrowing below (the character unique among the *funebris* group), aedeagus with 4 serrations apically, and in the egg-guide with large dorsal processes.

***Drosophila (Drosophila) maculinotata* sp. nov. Fig. 72.**

Japanese name: Ayanami-shōjōbae.



**Fig. 72. *Drosophila (Drosophila) maculinotata* sp. nov.**

A. Head; B. Wing; C. Periphallic organs (lateral aspect); D. Phallic organs (ventral aspect); E. Aedeagus (lateral aspect); F. do. (dorsal aspect); G. Egg-guide; H. Female reproductive organs (ventral aspect); I. Digestive system (ventral aspect); J. Male reproductive organs; K. Ejaculatory apodeme (ventral aspect).

♂ and ♀: Body about 3.5 mm, black and slender species with comparatively large wings. Head (Fig. 72 A) black. Antenna dark brown, 2nd joint paler. Arista with about 6-7 branches including a small fork, 2-3 below it. Palpus dark brown, with rough piles. Ocellar triangle and periorbits brownish black. Face reddish brown. Clypeus black. Front black, about half as broad as head width, and with a few *fr* arranged in 2 rows. Cheek reddish brown, about half as broad as the greatest diameter of eye. Carina high, narrow, black, lower half orange brown not reaching lower margin of face. *orb*<sub>2</sub> about half size of *orb*<sub>3</sub>. *or*<sub>2</sub> weak, about 2/3 vibrissa.

Mesonotum blackish grey, with dark irregular stripes along median longitudinal line, *dc* lines, lateral sutures, and above humerus. Thoracic pleura black. *hu* one long and a few short. *ac* in 6 rows. Cross distance of *dc* about twice the length distance. Anterior *scut* parallel. Sterno-index about 0.5.

Legs brownish black, femur black. Preapicals on all three tibiae; apicals on middle. Wings (Fig. 72 B) large, crossveins clouded. C-index about 4.1; 4 V-index about 1.6; 4 C-index about 0.7; 5 X-index about 1.0. C1-bristles 2; C3-bristles on basal about 1/3. Halteres white.

Abdomen entirely black. Sternites broad.

Periphallic organs (Fig. 72 C): Genital arch brownish black, apically narrowing and curved caudad, and with a large conical process at the insertion of clasper; upper portion with about 8 hairs; lower portion with about 25 hairs. Clasper orange brown, slightly longer than broad, and with about 8 large black teeth on the inner apical margin arranged in a row, and about 25 black hairs. Anal plate brownish black, nearly triangular, separated from genital arch, and with about 30 black hairs on upper half, 5 huge medially curved black teeth caudomedially, and about 15 stout short black teeth arranged in about 3 rows below. Decasternum black and trilobed.

Phallic organs (Fig. 72 D-F): Aedeagus orange brown, horizontally flattened, apically rounded, and subapically with a lateral recurrent claw on each side. Anterior paramere fused to novasternum, and with several sensilla on the pointed apex. Novasternum with submedian spines small and inserted on apical concaved margin. Ventral fragma rounded at tip, about twice as long as broad. Vertical rod of aedeagus short but thick and blackish. Apodeme of aedeagus also blackish. *p.f.* = aBCdEfg<sub>0</sub>HIklmn. *PI* = 1.3.

Egg-guides (Fig. 72 G): Lobe dark brown, upper margin beyond middle swollen upward, apically pointed, and exceedingly darken on apical 1/3, and with about 20 marginal and 2 discal narrow dark brown teeth.

Internal structures (Fig. 72 H-J): Proximal intestine: *C* = 2.0. Rectal papillae: *R* = 2.0. Posterior Malpighian tubes fused to each other at tips, common stalks short. Testis pale crimson, with about 2 inner and 3 outer coils. Seminal vesicle narrow. Paragonia twice folded. Ejaculatory bulb oval, with 2 pairs of thick caeca, which are as long as bulb itself. Ejaculatory apodeme with plate black, rhombic or hexagonal, and apically curved downward, and with stem slender and as long as plate. Spermatheca black and hemispherical. Parovaria minute. Ventral receptacle with about 10 short folds.

Holotype: ♂, Nishikomagatake, Nagano Pref., 22-24 VII '52 F (Kurokawa).

Allotopotype: ♀, collected together with holotype.

Paratypes: 2 ♂♂, collected together with holotype; 11 ♂♂ and 2 ♀♀, Yatsugatake, Nagano Pref., 26 VII '52 SF; 1 ♂, *ibid.*, 10-12 VIII '53 F (Kurokawa).

Other specimens examined: Kumotoriyama, Tokyo, 2 VI '52; Senjōdake, Nagano Pref., VII '53 (Kitagawa & Ono); Hakamoriyama, Iwate Pref., X '52 F.

Distribution: Honshu (Tohoku, Kanto, Chubu).

Feeding habits: FS.

Relationships: Alike the species of *repleta* group, it has black spots on mesonotum, but differs in having anal plate separated from genital arch. Belongs to *funebri* group, having huge teeth on the anal plate, characteristic to that group, but the arrangement of the teeth is different from that of any other species of the group.

*immigrans* species-group, Sturtevant, 1942. Univ. Texas Publ., 4213: 32.

A row of short stout bristles on the inner surface of fore femur is characteristic of the present group, similar structure occurs, however, also in some species of *tripunctata* group—*D. (D.) campestris* Burla, *D. (D.) mediotriata* Duda, *D. (D.) mesostigma* Frota Pessoa. According to Frota Pessoa (1954), the latter group differs from *immigrans* group in having sinuous bow of phallic organs. The Japanese representatives of this group are *D. (D.) immigrans* Sturtevant, *D.*

(*D.*) *komaii* Kikkawa & Peng, *D. (D.)* sp. of *immigrans* group, and *D. (D.) virgata* Tan, Hsu, & Sheng.

***Drosophila (Drosophila) immigrans* Sturtevant, 1921. Figs. 74-76, 78.**

Japanese name: Oshōjōbae (Kikkawa & Peng, 1938).

*Drosophila immigrans* Sturtevant, 1921. Carn. Inst. Publ., 301: 83; Malloch, 1923. Proc. Linn. Soc. N.S. Wales, 48: 617; Chino, 1927. Zool. Mag., 39: 473; Curran, 1932. Medd. Zool. Oslo, 30: 355; Chino & Kikkawa, 1934. Shōjōbae no Iden to Jikkenho: 7; Séguy, 1934. Faune de Fr., 28: 385; Spencer, 1940. Ohio Journ. Sci., 40: 345; Kato & Hori, 1952. Sci. Rep. Tohoku Univ., Biol., 19: 231; Mizuno, 1952. Papers Res. Genet., 3: 51; Ohba, 1954. Kagaku, 24: 130; Kato & Hori, 1954. Kontyū, 20: 44; Kato, 1954. Sci. Rep. Tohoku Univ., Biol., 20: 267; Hering, 1954. Bull. Zool. Nomencl., 9: 343; Suzuki, 1955. Zool. Mag., 64: 46; Ishihara, 1955. Zool. Mag., 64: 85.

*Drosophila (Spinulophila) immigrans* Sturtevant, 1927. Phil. Journ. Sci., 32: 367; Peng, 1937. Annot. Zool. Japon., 16: 22; Kikkawa & Peng, 1938. Japan. Journ. Zool., 7: 524.

*Drosophila (Acanthophila) immigrans* Duda, 1924. Ann. Mus. Nat. Hung., 22: 200; Duda, 1935. Die Fliegen, 58 g: 54.

*Drosophila (Drosophila) immigrans* Sturtevant, 1942. Univ. Texas Publ., 4213: 32; Patterson, 1943. Univ. Texas Publ., 4313: 180; Patterson & Mainland, 1955. Univ. Texas Publ., 4445: 46; Hsu, 1949. Univ. Texas Publ., 4920: 111; Wheeler, 1949. Univ. Texas Publ., 4920: 187; Tan, Hsu, & Sheng, 1949. Univ. Texas Publ., 4920: 201; Burla, 1951. Rev. Suis. Zool., 58: 119; Basden, 1952. Ent. Month. Mag., 88: 201; Patterson & Stone, 1952. Evol. gen. Dros.: 39; Shōgaki, 1952. Komai's Shōjōbae no Iden to Jikken: 17; Okada, 1953. Zool. Mag., 62: 285; Okada, 1954. Japan. Journ. Appl. Zool., 19: 519; Malogolowkin, 1953. Rev. Brasil. Biol., 13: 246; Okada, 1955. Sci. Result. Japan. Exped., Nepal Himalaya, 1: 390; Okada, 1955. Kontyū, 23: 98.

*Drosophila tripunctata* Sturtevant, 1918. Bull. Amer. Mus. Nat. Hist., 38: 445; Becker, 1908. Mitt. Zool. Mus. Berlin, 4: 155 (nec *tripunctata* Loew).

*Drosophila (Spinulophila) tripunctata* Duda, 1924. Arch. Naturg., 90 A (3): 210, 246; Duda, 1924. Ent. Medd., 64: 262.

*Drosophila browni* Hutton, 1901 (teste Harrison, 1952. Proc. Roy. Soc. N.Z., 79: 514; Basden, 1954. Bull. Zool. Nomencl., 9: 343).

*Drosophila cilifemur* Villeneuve, 1913 (teste Sturtevant, 1927).

♂ and ♀: General features as described by Patterson (1943), Kikkawa & Peng (1938).

Periphallic organs: Figured by Kikkawa & Peng (1938). Figured and described by Hsu (1949), Malogolowkin (1955). Decasternum (Fig. 74 G) dark brown, V-shaped.

Phallic organs: Figured and described by Malogolowkin (1953), Okada (1955). Aedeagus yellowish grey, apically pointed in lateral aspect, obtuse in ventral view, and subapically with a two-jointed long flap which seems to be correspondent to the posterior parameres. Anterior paramere fused to novasternum and apically with fine sensilla. Novasternum deeply notched and with short submedian spines. Ventral fragma apically narrowing and quadrate, and much longer than broad.  $p.f. = aBCdEfghIklmn$ .  $PI = 1.1$ .

Egg-guides (Fig. 75 G): Lobe yellowish orange, apically pointed, and with about 20 marginal and 5 discal orange brown teeth. Basal isthmus very short and narrow.

Internal structures (Fig. 76 H, 78 G): Proximal intestine:  $C \approx$  about 2.5. Rectal papillae:  $R \approx$  about 3.0. Ejaculatory bulb elongate oval, and with a pair of long caeca, which are about 2.5 times as long as bulb itself. Ejaculatory plate oval, with tip narrowing, stem longer than plate.

Specimens examined: Abundant almost everywhere in Japan. In Hokkaido: Akkeshi, Nakashibetsu, Wakkanai, Nopporo, Sapporo. Hakamoriyama, Iwate Pref.; Sendai, Miyagi Pref. In Tokyo: Setagaya, Meguro, Suginami (Ohnishi), Aoyama (Toda), Asakawa, Kotaira (Saito), Kunitachi, Kumotoriyama (Moriwaki et al.), Miyakejima (Udagawa). In Kanagawa Pref., Mizonokuchi, Mukōgaoka, Ikuta, Shichiseimura, Aburatsubo, Kamakura, Hakone. Niihama, Gyōtoku, Chiba Pref. (Toshioka); Kinugawa, Gumma Pref. (Moriwaki & Yoshida); Shinkazawa, Gumma Pref. (Toda); Shōjiko, Shizuoka Pref. (Kasaki); Mitsuhama, Shizuoka Pref. (Toda). In Nagano Pref.: Komoro Usuitōge (Kurokawa), Kisofukushima, Tadeshina, Yatsugatake (Kurokawa). Kurama, Kyoto Pref.: Taishakukyo, Hiroshima Pref.; Susaki, Kōchi Pref.; Nanokawa, Kōchi Pref.; Omogō, Ehime Pref.; Hikosan, Fukuoka Pref. (Ohba); Hida, Ōita Pref. (Ohba); Yakushima, Kagoshima Pref. (Kurosawa).

Previous records from Japan: (Kikkawa & Peng, 1938) Teshikaga, Sendai, Sado, Niigata, Kamisuwa, Kōfu, Gotenba, Shizuoka, Shimoda, Yaizu, Gifu, Nagoya, Kyoto, Tsu, Kukasho, Ashiya, Kobe, Tottori, Ōki, Kurashiki, Hiroshima, Matsuyama, Kōchi, Ōita, Tomioka, (Katō & Hori, 1952) Sendai; (Shōgaki, 1952) Kyoto, Kirigamine, Shigakōgen, Tokusawa, Kisofukushima; (Ohba, 1954) Akkeshi, Kumotoriyama, Asakawa, Yatsugatake; (Suzuki, 1955) Sapporo; (Katō, 1954) Sendai; (Ishihara, 1955) Sapporo.

Distribution: Hokkaido, Honshu (Tohoku, Kanto, Chubu, Kinki, Chugoku), Shikoku, Kyushu, Orbis Terrarum.

Feeding habits: FSTLM.

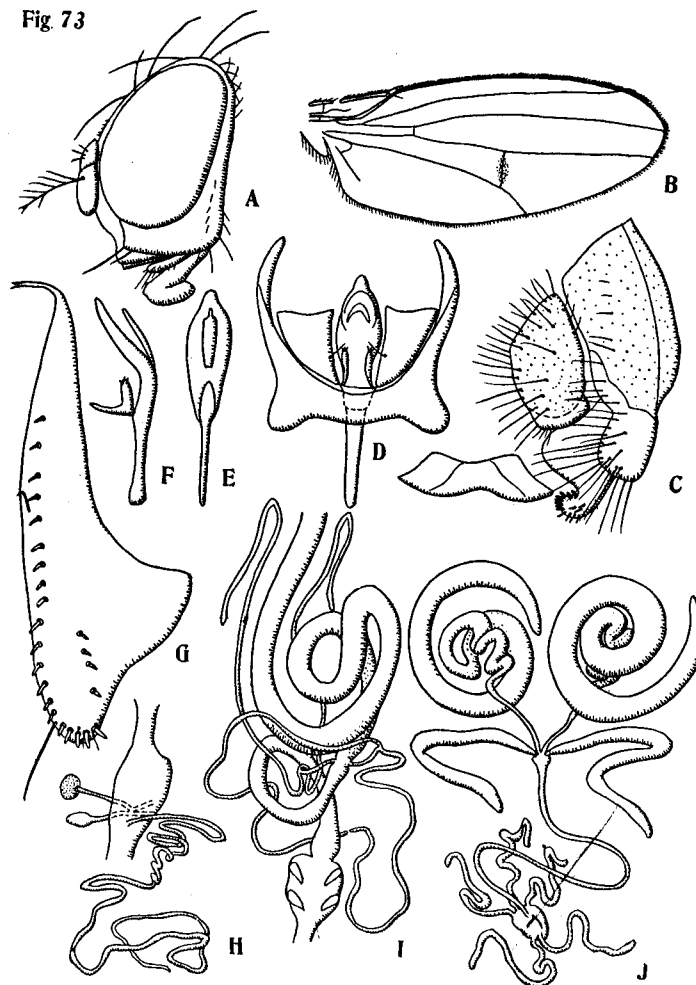
***Drosophila (Drosophila)* sp. of *immigrans* group.** Fig. 73.

Japanese name: Makio-shōjōbae.

*Drosophila (Drosophila)* sp. *immigrans* group I, Okada, 1953. Zool. Mag., 62: 285; Okada, 1954. Japan. Journ. Zool. 19: 79; Okada, 1955. Kontyū, 23: 98.

*Drosophila* sp., *immigrans* group I, Ohba, 1954. Kagaku, 24: 130.

Fig 73



**Fig. 73. *Drosophila (Drosophila)* sp. of *immigrans* group.**

A. Head; B. Wing; C. Periphallallic organs (lateral aspect); D. Phallic organs (ventral aspect); E. Aedeagus (ventral aspect); F. do., with anterior paramere (lateral aspect); G. Egg-guide; H. Female reproductive organs (ventral aspect); I. Digestive system (ventral aspect); J. Male reproductive organs.

♂ and ♀: General features are to be described by Okada and Kurokawa (1956).

Periphallallic organs (Fig. 73 C): To be described and figured by Okada & Kurokawa (1956).

Phallic organs (Fig. 73 D-F): Described and figured by Okada (1955); to be described by Okada & Kurokawa (1956). p.f.=aBCdEfghIklmn. PI=1.6.

Egg-guides (Fig. 73 G): To be described by Okada & Kurokawa (1956).

Internal structures (Fig. 73 H-J): Proximal intestine: C=2.0. Rectal papillae: R=1.8. Other features as will be described by Okada & Kurokawa (1956).

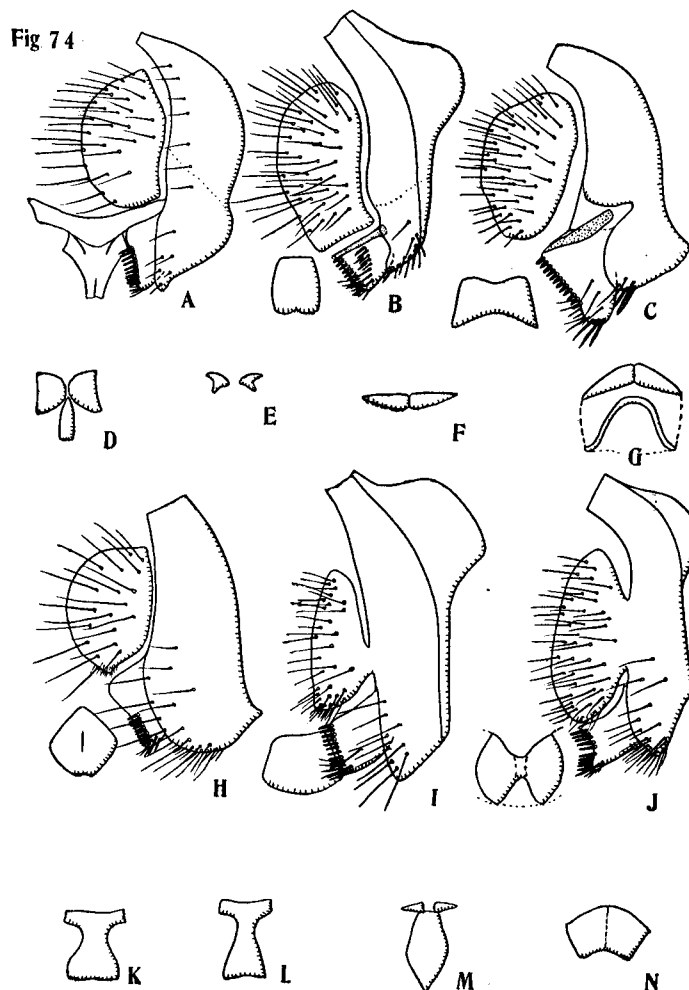
Specimens examined: In Tokyo: Setagaya, IV, V, XI, '51; V, XI, XII '52; IV '53 FG; Suginami, XI, XII '51 T (Ohnishi); Meguro, IV '51; Asakawa, V '51; IV, V, X '52 (Ohba et al); II '53 (Ohba); III '54 F (Kurokawa); Kotaira, XI, XII '53; IV '54 S (Saito); Kumotoriyama, VII '52; VII '53 MT; VII '54 FS (Moriwaki et al). Hakone, Kanagawa Pref., VIII '53 (Toda); Hōshi-osen, Gumma Pref., IX '53 S (Matsudaira); Shinkazawa, Gumma Pref., VII '54 F (Toda); Niihama, Chiba Pref., '53 L (Toshioka); Gyōtoku, Chiba Pref., V '54 L (Toshioka). In Nagano Pref.: Hoppo, VIII '52 F (Ohnishi); Senjōdake, VII '53 F (Kitagawa & Ono); Yatsugatake, VIII '53 F ((Kurokawa); Tadeshina, VII '54 FT; Norikuradake, VIII '54 F (Nozawa); Matsuyama, Ehime Pref., III '56 F (Morikawa); Kujūzan, Ōita Pref., IX '54 F.



Previous records from Japan: (Ohba, 1954) Yatsugatake.

Distribution: Honshu (Tohoku, Kanto, Chubu), Shikoku, Kyushu.

Feeding habits: FTMSGSL.



**Fig. 74.** Peripheralhallic organs (lateral aspect) with decastrum (A-C, H-J), or decastrum alone (D-G, K-N) of several species of the subgenus *Drosophila*.

A. *Drosophila (Drosophila) grandis* Kikkawa & Peng; B. *D. (D.) nigromaculata* Kikkawa & Peng; C. *D. (D.) bizonata* Kikkawa & Peng; D. *D. (D.) testacea* van Roser; E. *D. (D.) histrio* Meigen; F. *D. (D.) funebris* (Fabricius); G. *D. (D.) immigrans* Sturtevant; H. *D. (D.) virgata* Tan, Hsu, & Sheng; I. *D. (D.) melanissima* of Kikkawa & Peng; J. *D. (D.) sordidula* Kikkawa & Peng; K. *D. (D.) virilis* Sturtevant; L. *D. (D.) littoralis* Meigen, from Switzerland; M. *D. (D.) subtilis* Kikkawa & Peng; N. *D. (D.) hydei* Sturtevant.

***Drosophila (Drosophila) virgata* Tan, Hsu, & Sheng, 1949. Figs. 74-76, 78.**

Japanese name: Dandara-shōjōbae.

*Drosophila (Drosophila) virgata* Tan, Hsu, & Sheng, 1949. Univ. Texas Publ., 4920: 203; Wheeler, 1949. Univ. Texas Publ., 4920: 187; Okada, 1953. Zool. Mag., 62: 285; Patterson & Stone, 1952. Evol. gen. Dros.: 39; Okada, 1955. Kontyû, 25: 98.

♂ and ♀: Body about 3.0-3.5 mm. Eyes red, with fine piles. Antenna yellow, 3rd joint darker. Arista with about 11 branches including a small fork, 2 or 3 below it. Palpus dark brown, with a long and a few shorter setae.  $orb_2$  about  $2/5$  size of  $orb_1$ .  $or_2$  over half size of vibrissa. Ocellar triangle small, black. Periorbits yellow. Front yellow, with anteriorly convergent paired narrow black stripes. Face yellowish white. Carina yellow, high, and black below. Cheek yellowish white, over  $1/5$  as broad as the greatest diameter of eye.

Mesonotum yellow, with 5 black longitudinal stripes. Scutellum yellowish brown, with a pair of dark longitudinal posteriorly convergent stripes. Thoracic pleura yellow, with 2 dark longitudinal stripes, Sterno-index about 0.8.

Legs yellow, fore femur with a row of spinules on the inner surface, showing characteristics

of the group. Each femur with a black submedian ring; each tibia with 2 similar rings. Preapicals on all three tibiae; apicals on middle. Wings clear, crossveins clouded. C-index about 3.9; 4V-index about 1.4; 4C-index about 0.6; 5X-index about 1.2. C1-bristles 2; C3-bristles on basal 1/5. Halteres yellowish white, black basally. *hu* 2, subequal. *ac* in 6 rows. Cross distance of *dc* about twice the length distance. Anterior *scut* divergent.

Abdominal tergites yellow, each with medially interrupted black caudal band which is laterally curved forward, and with a black spot on each side. Sternites pale grey and quadrate.

Periphallic organs (Fig. 74 H): Genital arch yellow, with toe evenly rounded, and heel triangularly pointed; upper portion with a few hairs below; lower portion with about 10 hairs. Clasper yellowish grey, broad but short, upper half distally convexed and bare; lower half straight and with a row of about 10 black teeth. Anal plate large, ovoid, yellowish white, and with about 35 hairs; lower tip with about 10 short stout setae. Decasternum pale brown, median piece broad and triangular, lateral pieces small and rod-shaped.

Phallic organs: Described and figured by Okada (1955). Aedeagus orange brown, slender, apically pointed, and with numerous fine serrations on the ventral margin near middle. Anterior paramere broad and fused to novasternum, apically pubescent and with a few sensilla. Novasternal plate broad, triangular, with submedian spine on inner margin. Ventral fragma oval, and slightly longer than broad. Posterior parameres absent. *p. f.* = aBCdEfg<sub>0</sub>HIklmn. PI=2.2.

Egg-guides (Fig. 75 F): Lobe rather narrow, yellow narrowly rounded at tip, and with about 18 marginal and 4 discal yellowish teeth, ultimate marginal tooth being longest. Basal isthmus short and narrow.

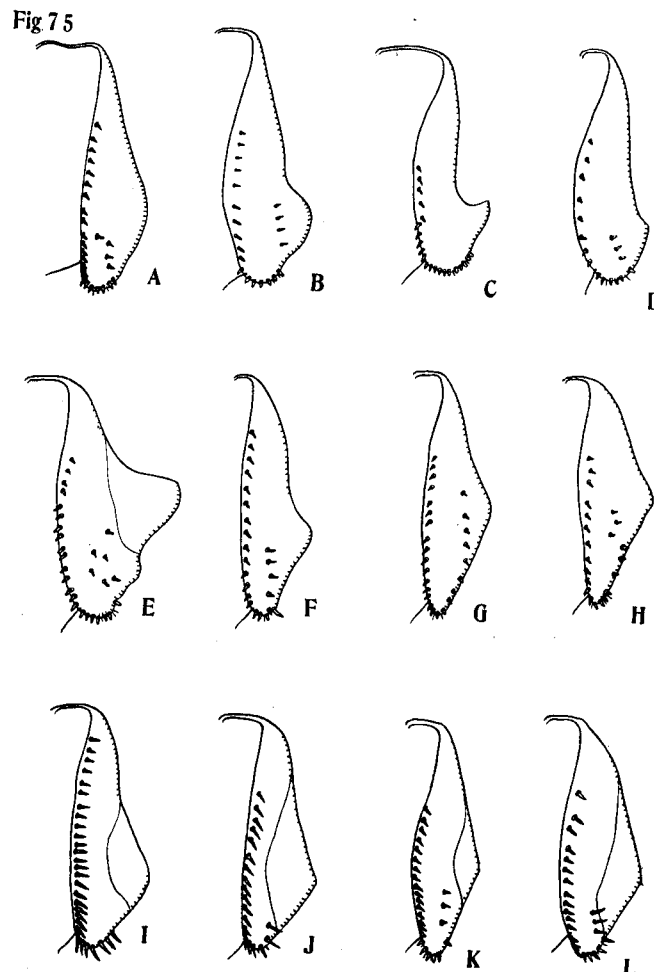


Fig. 75. Egg-guide of various species of the subgenus *Drosophila*.

A. *Drosophila (Drosophila) testacea* van Roser; B. *D. (D.) nigromaculata* Kikkawa & Peng; C. *D. (D.) bizonata* Kikkawa & Peng; D. *D. (D.) histrio* Meigen; E. *D. (D.) funebris* (Fabricius); F. *D. (D.) virgata* Tan, Hsu & Sheng; G. *D. (D.) immigrans* Sturtevant; H. *D. (D.) komaii* Kikkawa & Peng; I. *D. (D.) subtilis* Kikkawa & Peng; J. *D. (D.) virilis* Sturtevant; K. *D. (D.) sordidula* Kikkawa & Peng; L. *D. (D.) melanissima* of Kikkawa & Peng.

Internal structures (Figs. 76 C, 78 F): Proximal intestine:  $C=2.0$ ; rectal papillae:  $R=3.0$ . Testis whitish and with one inner and 3 outer coils. Seminal vesicle narrow. Paragonia elongate and folded about twice. Ejaculatory bulb elliptical and with 4 slender long caeca. Ejaculatory apodeme with plate narrow, oval, apically pointed, and stem as long as plate. Spermatheca, hemispherical, and pale brown. Parovaria with round heads. Ventral receptacle with 4 small coils and 2.5 long transverse folds.

Specimens examined: Hakamoriyama, Iwate Pref., X '52 F; Azumayama, '54 S (Kotake). In Tokyo: Setagaya, VII '51 F; Meguro, XI '51 S; Suginami, VII '51 T (Ohnishi); Kotaira, VIII '53 (Saito); Asakawa, VIII '51 (Ohba); Kumotoriyama, VII '53 F (Moriwaki et al). Kamakura, Kanagawa Pref., I '52 S; Hakone, Kanagawa Pref., IX '54 (Toda); Tadeshina, Nagano Pref., VIII '54 T; Anjō, Aichi Pref., I '53 (Nozawa); Ōsugito, Kyoto Pref., X '52 (Ōshima); Miyoshi, Hiroshima Pref., X '55 F; Susaki, Kōchi Pref., XI '53 S; Dazaifu, Fukuoka Pref., X '55; Kujūzan, Ōita Pref., IX '54 F.

Distribution: Honshu (Tohoku, Kanto, Chubu, Kinki, Chugoku), Shikoku, Kyushu, China.

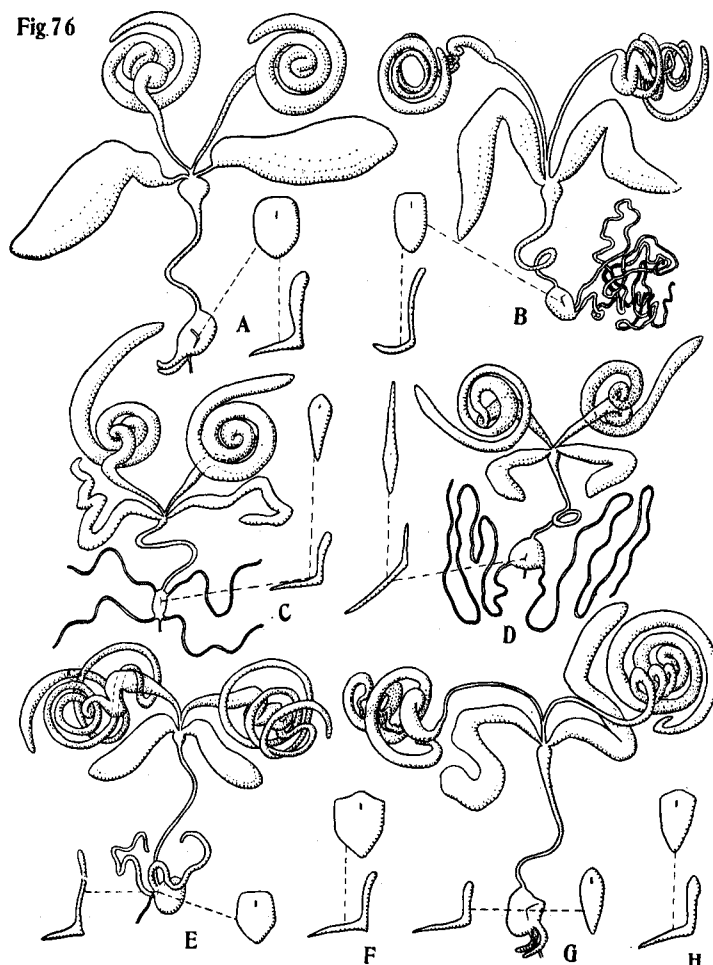
Feeding habits: STFG.

Remarks: Strictly coincides with Chinese form described by Tan, Hsu, & Sheng (1949). *D. (D.) annulipes* Duda seems to be identical with the present species, although definite identification is difficult.

***Drosophila (Drosophila) komaii* Kikkawa & Peng, 1938.**

Japanese name: Aka-shōjōbae (Kikkawa & Peng, 1938).

*Drosophila komaii* Kikkawa & Peng, 1938. Japan. Journ. Zool., 7: 525.



**Fig. 76.** Male reproductive organs of several species of the *quinaria* section of the subgenus *Drosophila*.

A. *Drosophila (Drosophila) testacea* van Roser; B. *D. (D.) nigromaculata* Kikkawa & Peng; C. *D. (D.) virgata* Tan, Hsu & Sheng; D. *D. (D.) grandis* Kikkawa & Peng; E. *D. (D.) bizonata* Kikkawa & Peng; F. *D. (D.) funebris* (Fabricius); G. *D. (D.) histrio* Meigen; H. *D. (D.) immigrans* Sturtevant.

*Drosophila (Drosophila) komaii* Sturtevant, 1942. Univ. Texas Publ., 4213: 32; Wheeler, 1949. Univ. Texas Publ., 4920: 187; Patterson & Wheeler, 1949. Univ. Texas Publ., 4920: 214; Patterson & Stone, 1952. Evol. gen. Dros.: 39; Shōgaki, 1952. Komai's shōjōba no Iden to Jikken: 21.

♂ and ♀: *hu* 2. Cross distance of *dc* about  $\frac{3}{7}$  the length distance. C1-bristle one, C3-bristles on basal  $\frac{3}{5}$ . Other features as described by Kikkawa & Peng (1938).

Egg-guides (Fig. 75 H): Lobe pale yellowish grey, narrowly pointed apically and with about 19 marginal and 3 discal small yellow teeth. Upper and lower margins of lobe nearly straight distally. Basal isthmus very short and pale brown, about  $\frac{1}{7}$  as long as lobe itself.

Specimens examined: Only one female from Taipei, Formosa, X '51 L (Barnett).

Previous records: (Kikkawa & Peng, 1938) Amami-ōshima, Ishigakijima, Taipei, Shinchiku.

Distribution: Amami-ōshima, Ryukyu, Formosa.

Feeding habits: FL.

*virilis* section, Hsu, 1949. Univ. Texas Publ., 4920: 123.

Anal plate partially fused to genital arch, except in *subtilis* group. Aedeagus laterally flattened at least apically and apparently bilobed at least partially. Anterior parameres usually minute.

Japanese representatives of this section belong to *subtilis*, *melanica*, *virilis*, *robusta*, and *rep-leta* species-groups, with an exceptional case, *D. (D.) daruma* sp. nov., which is referable to none of the known species-group.

*subtilis* species-group, Okada, 1953. Zool. Mag., 62: 280.

Wings with costa prominently swollen at the end of the 1st costal section. Genital arch angulated at heel. Anal plate separated from genital arch. Anterior parameres large and basally with sensilla. Submedian spines of novasterum about 6. Egg with 4 filaments. Closely allied to the subgenus *Paradrosophila*. Includes single species, *D. (D.) subtilis* Kikkawa & Peng.

*Drosophila (Drosophila) subtilis* Kikkawa & Peng Figs. 74, 75, 77, 78.

Japanese name: Susubane-shōjō-bae (Kikkawa & Peng, 1938).

*Drosophila subtilis* Kikkawa & Peng, 1938. Japan. Journ. Zool., 7: 541.

*Drosophila (Drosophila) subtilis* Hsu, 1949. Univ. Texas Publ., 4920: 116; Tan, Hsu, & Sheng, 1949. Univ. Texas Publ., 4920: 206; Patterson & Stone, 1952. Evol. gen. Dros.: 79; Shōgaki, 1952. Komai's Shōjōbae no Iden to Jikken: 20; Okada, 1953. Zool. Mag., 62: 280; Okada, 1955. Kontyū, 23: 98.

♂ and ♀: Ocellar triangle black. Periorbits brownish black, paler at the insertion of orbitals. Front reddish brown, with a very few *fr. hu* 2, subequal. Cross distance of *dc* about 1.4 times the length distance. Legs with preapicals on all three tibiae; apicals on middle. wings with C1-bristles 2; C3-bristles on basal half to  $\frac{3}{5}$ . Other features as described by Kikkawa & Peng (1938).

Periphallic organs: Described and figured by Hsu (1949). Decasternum (Fig. 74 M) with median piece large, oval, yellowish white, and pointed at tip, and with lateral pieces brown and laterally narrowing.

Phallic organs: Described and figured by Okada (1955). Aedeagus yellowish orange, apparently bifid, and medially swollen in side view. Vertical rod not developed. Anterior parameres large and long, apically swollen, basally inserted on novasternum, and basally with several sensilla. Ventral fragma nearly quadrate, slightly broader than long. p.f.=ABCDef'g<sub>0</sub>HIKLMN. PI=1.1.

Egg-guides (Fig. 75 I): Lobe orange yellow, elongate, narrowly subquadrate at tip, and with about 22-28 orange brown comparatively long and pointed teeth which are thickly arranged. Discal teeth absent.

Internal structures (Figs. 77 A, 78 I): Proximal intestine: C=2.0-2.5. Rectal papillae: R=2.0-2.4. Malpighian tubes with common stalks rather short, and posterior branches closely apposed to each other at tips. Testis figured by Kikkawa & Peng, 1938; dark orange brown, and with about 0.5 inner and 2 outer coils. Seminal vesicles narrow, and basally fused to each other. Paragonia narrow, slender, and weakly folded once. Ejaculatory bulb oval, without caeca; ejaculatory apodeme with plate oval and pointed. Spermatheca black and hemispherical. Parovaria with elliptical tips. Ventral receptacle very short and transversely folded only once.

Specimens examined: In Tokyo: Setagaya, VIII, XII '51 TF; VI '52 T; IV '53 F (Toda et al); Suginami (Ohnishi), VI-VIII, XI '51 T; III '53 T; IV, VII '53 T; Aoyama, X '52 F (Toda);

Kunitachi, VI, VII, IX '52 T; Kumotoriyama, VIII '53 F; Asakawa, IX '51 F (Ohba); Shi:hisei-mura VI '52 T. Ikuta, Kanagawa Pref., XI '51 T; Hikosan, Fukuoka Pref., XI '51 F (Ohba).

Previous records from Japan: (Kikkawa & Peng, 1938) Gotenba, Shimoda, Kyoto, Kobe.

Distribution: Honshu (Kanto, Chubu, Kinki), Kyushu, China.

Feeding habits: TF.

Remarks: Egg with 4 filaments, which are frequently split up into 2 or 3 branches apically, just alike in *D. (D.) melanissima* Sturtevant, of N. America. See under *D. (D.) lacertosa* sp. nov. in this article.

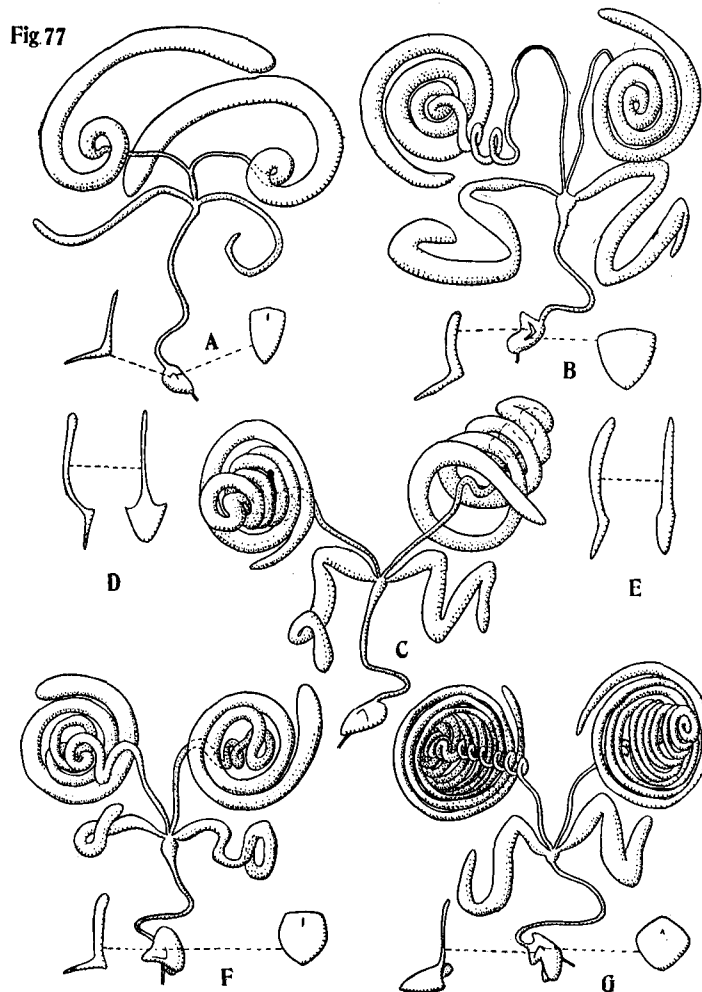


Fig. 77. Male reproductive organs of several species of the *virilis* section of the subgenus *Drosophila*.

A. *Drosophila (Drosophila) subtilis* Kikkawa & Peng; B. *D. (D.) melanissima* of Kikkawa & Peng; C. *D. (D.) virilis* Sturtevant; D. do., ejaculatory apodeme; E. *D. (D.) littoralis* Meigen, from Switzerland, ejaculatory apodeme; F. *D. (D.) sordidula* Kikkawa & Peng; G. *D. (D.) hydei* Sturtevant.

*melanica* species-group, Sturtevant, 1942. Univ. Texas Publ., 4213:31.

Only one species of this group is known from Japan.

*Drosophila (Drosophila) melanissima* of Kikkawa & Peng Figs. 74, 75, 77, 78.

Japanese name: Karasu-shōjōbae (Kikkawa & Peng, 1938).

*Drosophila melanissima* Kikkawa & Peng, 1938. Japan. Journ. Zool., 7: 538 (nec *melanissima* Sturtevant).

*Drosophila (Drosophila) melanissima* Sturtevant, 1942. Univ. Texas Publ., 4213: 31; Wheeler, 1949. Univ. Texas Publ., 4920: 185; Patterson & Wheeler, 1949. Univ. Texas Publ., 4920: 214; Patterson & Stone, 1952. Evol. gen. Dros.:34; Shōgaki, 1952. Komai's Shōjōbae no Iden to Jikken: 20; Okada, 1935. Zool. Mag., 62: 280; Okada, 1955. Kontyū, 23: 98.

♂ and ♀: General features as described by Kikkawa & Peng (1938).

Periphallic organs (Fig. 74 I): To be described by Okada & Kurokawa (1956).

Phallic organs: Described and figured by Okada (1955), to be described by Okada & Kurokawa (1956). p.f.=ABCdEf<sub>0</sub>g<sub>0</sub>HIkLMN. PI=1.0.

Egg-guides (Fig. 75 L): To be described and figured by Okada & Kurokawa (1956).

Internal structures (Figs. 77 B, 78 K): C=3.0. R=3.0. Other details as will be described by Okada & Kurokawa (1956).

Specimens examined: Akkeshi, Hokkaido, VIII '51; Suginami, Tokyo, VIII '51 T (Ohnishi); Setagaya, Tokyo, VII '51 T; Asakawa, Tokyo, II '53 (Ohba); Daimonjiyama, Kyoto, X '52 (Ôshima).

Previous records: (Kikkawa & Peng, 1938) Kyoto, Kobe.

Distribution: Hokkaido, Honshu (Kanto, Kinki).

Feeding habits: T.

Remarks: Eggs and puparia are to be described by Okada & Kurokawa (1956).

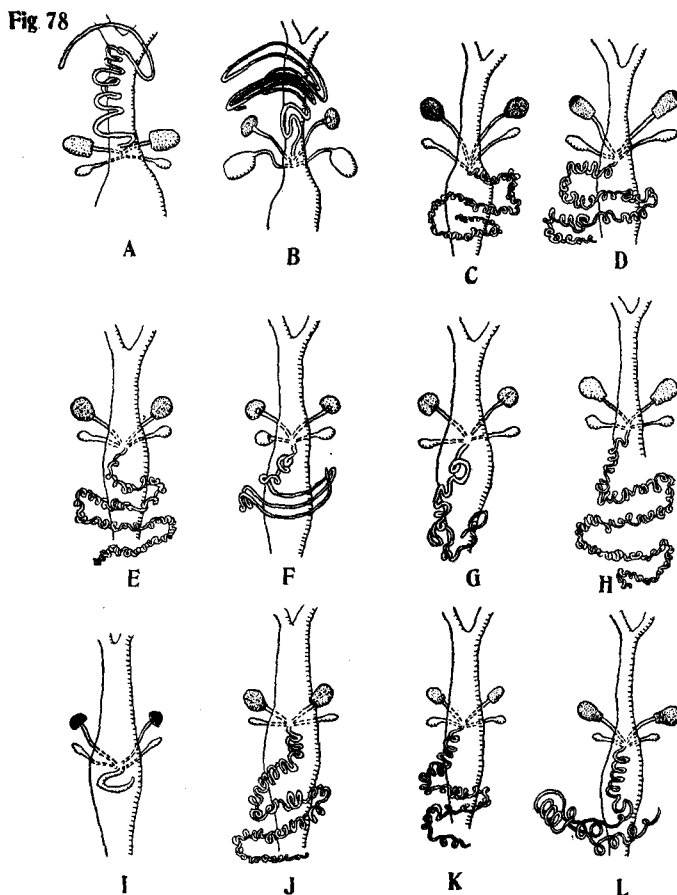


Fig. 78. Female reproductive organs of various species of the subgenus *Drosophila* (ventral aspects).

A. *Drosophila* (*Drosophila*) *testacea* van Roser; B. *D. (D.) grandis* Kikkawa & Peng; C. *D. (D.) bizonata* Kikkawa & Peng; D. *D. (D.) nigromaculata* Kikkawa & Peng; E. *D. (D.) histrio* Meigen; F. *D. (D.) virgata* Tan, Hsu & Sheng; G. *D. (D.) immigrans* Sturtevant; H. *D. (D.) funebris* (Fabricius); I. *D. (D.) subtilis* Kikkawa & Peng; J. *D. (D.) virilis* Sturtevant; K. *D. (D.) melanissima* of Kikkawa & Peng; L. *D. (D.) sordidula* Kikkawa & Peng.

*virilis* species-group, Sturtevant, 1942. Univ. Texas Publ., 4213:30.

*D. (D.) virilis* Sturtevant is unique representative from Japan.

*Drosophila* (*Drosophila*) *virilis* Sturtevant, 1916. Figs. 74, 75, 77, 78.

Japanese name: Kuro-shōjōbae (Chino, 1929; Esaki, 1932).

*Drosophila virilis* Sturtevant, 1916. Ann. Ent. Soc., Amer., 9: 330; Sturtevant, 1921. Carn. Inst. Publ., 301: 97; Chino, 1927. Zool. Mag., 39: 473; Chino, 1929. Japan. Journ. Genet., 4: 117; Esaki, 1932. Iconogr. Insect. Japon.: 28; Chino & Kikkawa, 1934. Shōjōbae no Iden to Jikkenho: 7; Chino, 1936. Japan. Journ. Genet., 11: 191; Peng, 1937. Annot. Zool. Japon., 16: 20; Kikkawa & Peng, 1938. Japan. Journ. Zool., 7: 540; Mizuno, 1952. Papers Coord. Comit. Res. Genet., 3: 51; Takada, 1952. Kagaku, 22: 541.

*Drosophila (Drosophila) virilis* Sturtevant, 1942. Univ. Texas Publ., 4213: 30; Patterson, 1943. Univ. Texas Publ., 4313: 98; Patterson & Mainland, 1944. Univ. Texas Publ., 4445: 34; Hsu, 1949. Univ. Texas Publ., 4920: 102; Wheeler, 1949. Univ. Texas Publ., 4920: 180; Tan, Hsu, & Sheng, 1949. Univ. Texas Publ., 4920: 199; Patterson & Stone, 1952. Evol. gen. Dros.: 24; Shōgaki, 1952. Komai's Shōjōbae no Iden to Jikken, 15: 20; Malogolowkin, 1953. Rev. Brasil. Biol., 13: 246; Okada, 1953. Zool. Mag., 62: 285; Okada, 1955. Kontyū, 23: 98.

♂ and ♀: General features as described by Patterson (1943), Kikkawa & Peng (1938).

Periphallic organs: Described and figured by Hsu (1949), Malogolowkin (1953). Decasternum (Fig. 74 K) with median piece pale yellowish grey, quadrate, distally broaden, and apically somewhat concave, and with lateral pieces narrow, yellowish orange (see remarks).

Phallic organs: Described and figured by Malogolowkin (1953), Okada (1955). Aedeagus pale brown, large fusiform, apically with short paired processes, and dorsomedially very finely pubescent. Anterior paramere small, pale brownish grey, fused to novasternum, which is dark brown and pubescent and with a pair of short submedian spines. Ventral fragma pale grey, proximally narrowing, nearly as long as broad, and apically rounded. p.f.=a'Bc'dEf<sub>g</sub>HIklm'n'. PI=1.2.

Egg-guides (Fig. 75 J): Lobe orange brown, mediodorsally swollen, obtusely pointed at tip, and with about 20 marginal and one discal pointed dark brown teeth. Basal isthmus orange brown and short.

Internal structures (Fig. 77 C, 78 J): Proximal intestine: C=2.0. Rectal papillae: R=about 2.0. Malpighian tubes with common stalks short, posterior branches fused to each other at tips. Paragonia folded about twice. Spermatheca large and oval. Ejaculatory bulb oval, plate pale yellow, small, and triangular, and with stem brownish black, gently curved, and much longer than the plate. Parovaria with narrow elliptical heads. Other internal structures as described by Patterson (1943).

Specimens examined: In Hokkaido: Wakkanai, VIII '53 F; Tōbetsu, VIII '51 F; Nakashibetsu, VIII '51 F; Shiota, VII '52 (Takada); Sapporo, VIII '53 G. Suginami, Tokyo, XI '51, XI '51 F (Ohnishi).

Previous records from Japan: (Chino, 1936) Akkeshi, Sapporo, Hirosaki, Akita, Sendai, Niigata, Tokyo, Nagano, Kanazawa, Nagoya, Tsu, Kyoto, Himeji, Tottori, Hiroshima, Moji, Matsuyama, Kōchi, Fukuoka, Yanagawa, Miyazaki, Kagoshima; (Kikkawa & Peng, 1938) Rebunto, Teshikaga, Kamikawa, Innai, Kōfu, Gotenba, Gifu, Ayabe, Kitazato, Kukashō, Shijōnawate, Kōbe, Tokuyama, Saga, Waifu, Miyanojō; (Ōmachi, 1951) Mie; (Mizuno, 1952) Ōyachi, Imagane, Takasu, Akkeshi, Sapporo; (Takada, 1952) Otaru, Sapporo.

Distribution: Hokkaido, Honshu (Tohoku, Kanto, Chubu, Kinki, Chugoku), Shikoku, Kyushu, Korea, Saghalin, China, N. America, S. America, Europe.

Feeding habits: FG.

Remarks: Very rarely met with the present species in the suburbs of Tokyo. Dr. Chino discovered this species for the first time in Japan at Kamisuwa, Nagano Pref., in 1924 (Chino, 1936). The present author examined a male from Yonc Dunc Po, Korea, collected by Capt. Bullock, 17 VII '54 G.

### Ungrouped species near *D. (D.) virilis* Sturtevant

#### *Drosophila (Drosophila) daruma* sp. nov. Fig. 79.

Japanese name Daruma-shōjōbae.

♂ & ♀: Body dark brown. about 2.5 mm in length. Head (Fig. 79 A) brownish black. Eye dark red, with thick piles. Antenna dark yellowish brown. Arista with about 10 branches including a small fork, 2 below it. Palpus greyish brown, rounded at tip, and with numerous strong bristles. Ocellar triangle dark brown. Periorbits dark brown. Front dark brown, with numerous *fr*, and about 1/2.2 as broad as head width. Clypeus brownish black. Cheek about 3/10 as broad as the greatest diameter of eye. Carina high, narrow, and long. Occiput brown. *orb*<sub>2</sub> about 1/3 size of *orb*<sub>1</sub>; *or*<sub>2</sub> about 1/3 size of vibrissa.

Mesonotum dark brown, with a diffuse dark median longitudinal stripe which is broaden caudally. Scutellum yellowish brown. Thoracic pleura brownish black. *hu* 2, upper longer. *ac* in 8 rows. Cross distance of *dc* about 1/2 the length distance. Anterior *scut* slightly convergent. Sterno-index about 0.8.

Legs yellowish brown, fore tarsus with several erect hairs on front margin. Fore metatarsus longer than the succeeding two tarsal joints taken together. Preapicals on all three tibiae; apicals on middle. Wings (Fig. 79 B) hyaline, crossveins clear. C-index about 1.9; 4 V-index about 2.2; 4 C-index about 1.4; 5 X-index about 1.3 (female) to 1.8 (male). C1-bristles 2; C3-bristles

on basal 5/6. Halteres yellowish white.

Abdominal tergites entirely black. Abdominal sternites grey.

Periphallic organs (Fig. 79 C): Genital arch pale brown, darker at lower sides, comparatively narrow, and without heel; upper portion almost bare; lower portion with about 20 hairs. Clasper small, apparently contiguous to anal plate, and with about 5 black long teeth below. Anal plate brown, narrowly fused to genital arch at middle, large, oval, pointed below, and with about 45 long and 15 apical short hairs. Decasternum small and arched.

Phallic organs (Fig. 79 D, E): Aedeagus greyish brown, large, oblong, and rather flattened horizontally. Anterior parameres minute, oval, dark brown, and without sensilla. Posterior parameres absent. Novasternum apically flat, and without median notch and submedian spines. Ventral fragma greyish brown, quadrate, and distinctly broader than long. p.f.=aBCdEf<sub>g</sub>Hiklmn. PI=1.9.

Egg-guides (Fig. 79 F): Lobe yellowish grey, narrowly pointed apically, with upper margin medially swollen, and with about 15 marginal and 3 discal long pointed yellowish grey teeth, ultimate marginal one being largest. Basal isthmus narrow, black, long, and over 1/5 length of lobe.

Internal structures (Fig. 79 G): Proximal intestine: C=4.0 or more. Rectal papillae: R=1.5. Malpighian tube with common stalks short, branches very long, and posterior branches are fused to each other at tips. Testis orange brown, with about 2 inner and 2 outer coils. Seminal vesicle distally broaden. Paragonia folded 1.5 times. Ejaculatory bulb globular, and with stem longer than plate. Spermatheca large, globular, and hyaline. Parovaria with heads oval. Ventral receptacle with about 10 loose coils.

Fig 79

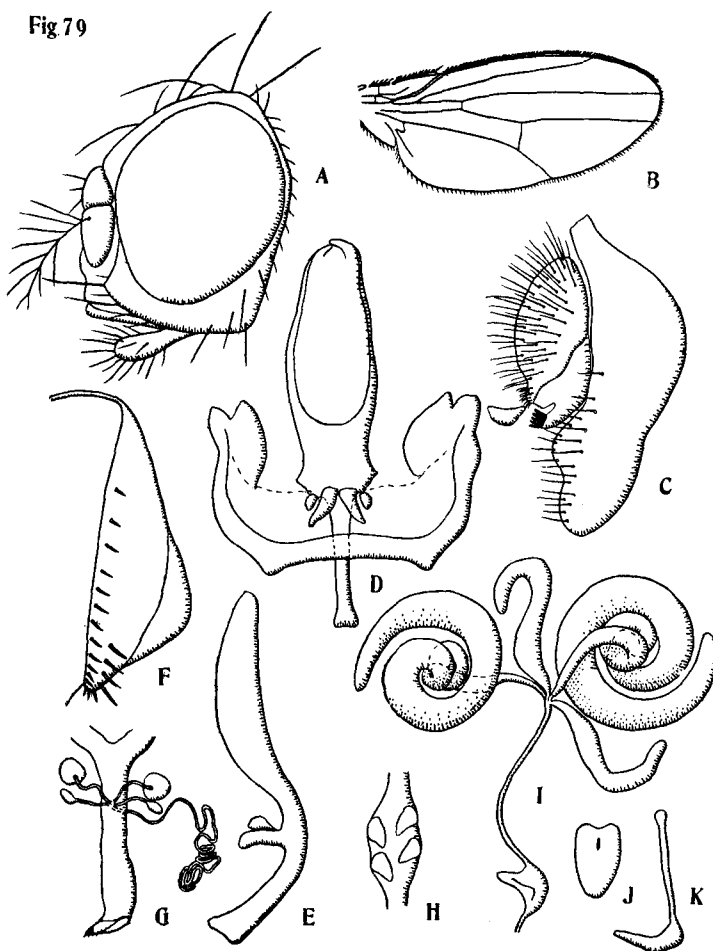


Fig. 79. *Drosophila (Drosophila) daruma* sp. nov.

A. Head; B. Wing; C. Periphallic organs (lateral aspect); D. Phallic organs (ventral aspect); E. Aedeagus and anterior paramere (lateral aspect); F. Egg-guide; G. Female reproductive organs (dorsal aspect); H. Rectal papillae; I. Male reproductive organs; J. Ejaculatory apodeme (ventral aspect); K. do. (lateral aspect).



Holotype: ♂, Aoshima, Miyazaki pref. (Main coast), 23 IX '54 F (Okada).

Allotopotype: ♀, collected together with holotype.

Paratypes: 1 ♂ and 2 ♀♀, Aoshima, collected together with holotype; 2 ♂♂ and 1 ♀, Kiri-shimayama, 22 IX '54 F; 1 ♀, Bōtyu, Kumamoto Pref., IX '54 in a house.

Distribution: Kyushu.

Feeding habits: F (S?).

Relationships: Somewhat resembles *D. nigricolor* de Meijère, from Java, but differs from it in having longer carina, arista with more branches, and body much larger. Close to *virilis* group, but differs in having convergent anterior scut and clear posterior crossveins. This species is unusual in the subgenus *Drosophila* in having clasper joined to anal plate, and spermatheca entirely hyaline. Named after its swollen appearance.

***robusta*** species-group, Sturtevant, 1942. Univ. Texas Publ., 4213:31

Japanese species referable to this group are *D. (D.) sordidula* Kikkawa & Peng, *D. (D.) lacertosa* sp. nov. and *D. (D.)* sp. of *robusta* group II.

***Drosophila (Drosophila) sordidula*** Kikkawa & Peng, 1938 Figs. 74, 75, 77, 78.

Japanese name: Okuro-shōjōbae (Kikkawa & Peng, 1938).

*Drosophila sordidula* Kikkawa & Peng, 1938. Japan. Journ. Zool., 7: 539; Mizuno, 1952. Papers Res. Genet., 3: 51; Kato & Hori, 1952. Sci. Rep. Tohoku Univ. Biol., 19: 231; Kato, 1954. Sci. Rep. Tohoku Univ. Biol., 20: 267 (?); Ishihara, 1955. Zool. Mag., 64: 85.

*Drosophila (Drosophila) sordidula* Sturtevant, 1942. Univ. Texas Publ., 4213: 31; Wheeler, 1949. Univ. Texas Publ., 4920: 195; Shōgaki, 1952. Komai's Shōjōbae no Iden to Jikken: 20; Okada, 1953. Zool. Mag., 62: 285; Okada, 1955. Univ. Texas Publ., 64: 107; Okada, 1955. Kontyū, 23: 98.

♂ and ♀: *hu* 2, long. Cross distance of *dc* about 1.8 times the length distance. Anterior *scut* parallel. Legs with preapicals on all three tibiae; apicals prominent on middle. Wings with C1-bristles 2, large, and subequal in size; C3-bristles on basal 1/2–2/5. Other features as described by Kikkawa & Peng (1938).

Periphallic organs (Fig. 74 J): Figured by Kikkawa & Peng (1938). Genital arch brownish black, narrowing below; lower half with anterior and posterior margins symmetrically convex, and with about 25 hairs; upper portion with about 5 hairs. Clasper quadrate, yellowish brown, medially dark, and with about 10 black long teeth arranged in a deeply concave row, often medially interrupted. Anal plate fusiform, brownish black, and with about 40 hairs. Decasternum thick and V-shaped.

Phallic organs: Described and figured by Okada (1955). Aedeagus orange grey, large, elliptical in ventral view, and rhombic in lateral view. Anterior parameres minute, separated from novasternum, and without sensilla. Novasternum broad, orange grey, and without submedian spines. Ventral fragma quadrate, brownish black, and with triple angles. p.f.=a'BCdEf<sub>0g</sub>HikLmn. PI=2.1.

Egg-guides (Fig. 75 K): Lobe narrow, long, fusiform, yellowish orange, obtusely pointed at tip, and with about 22 marginal and 3 discal yellowish orange short teeth, ultimate marginal one being as long as penultimate.

Internal structures (Figs. 77 F, 78 L): Proximal intestine: C=about 3.0. Rectal papillae: R=2.8. Malpighian tubes with common stalks very long, and branches short, posterior branches fused to each other at tips. Testis reddish orange, with about 2 inner and 3 outer coils. Paragonia slender, about twice folded. Seminal vesicle slender. Ejaculatory bulb with 4 short diverticula, ejaculatory apodeme with plate oval, and stem much longer than plate. Spermatheca brown, oval, proximally narrowing, and with fine transverse wrinkles basally. Parovaria small, apically truncate. Ventral receptacle with about 20–28 kinky coils.

Specimens examined: In Hokkaido: Akkeshi, VIII '53 F (K. Moriwaki); Tōbetsu, VIII '51; Sapporo, VIII '51 (Kanehisa); Towada, Aomori Pref., pupae, VIII '52 (Yoshida); Hakkoda, Aomori Pref., VIII '51 F; Hakamoriyama, Iwate Pref., X '52 F. In Tokyo: Setagaya, VII, IX '52 LF; Suginami, VII '51 (Ohnishi); Kotaira, I '54 S (Saito), Kugayama, V '52 F; Asakawa, V '52 F (Ohba); Kumotoriyama, VI '52 TF, VII '53 F; Kunitachi, larvae, VI '52 F; Kisofukushima, Nagano Pref., VII '52; Komayu, Nagano Pref., VII '52; Yatsugatake, VII '52.

Previous records from Japan: (Kikkawa & Peng, 1938) Sapporo, Akita, Innai, Sado, Kamisuwa, Gotenba, Kyoto; (Mizuno, 1952) Higashitakasu; (Kato, 1954) ? Sendai; (Ishihara, 1955) Sapporo.

Distribution: Hokkaido, Honshu (Tohoku, Kanto, Chubu, Kinki), Korea.

Feeding habits: FTSL.

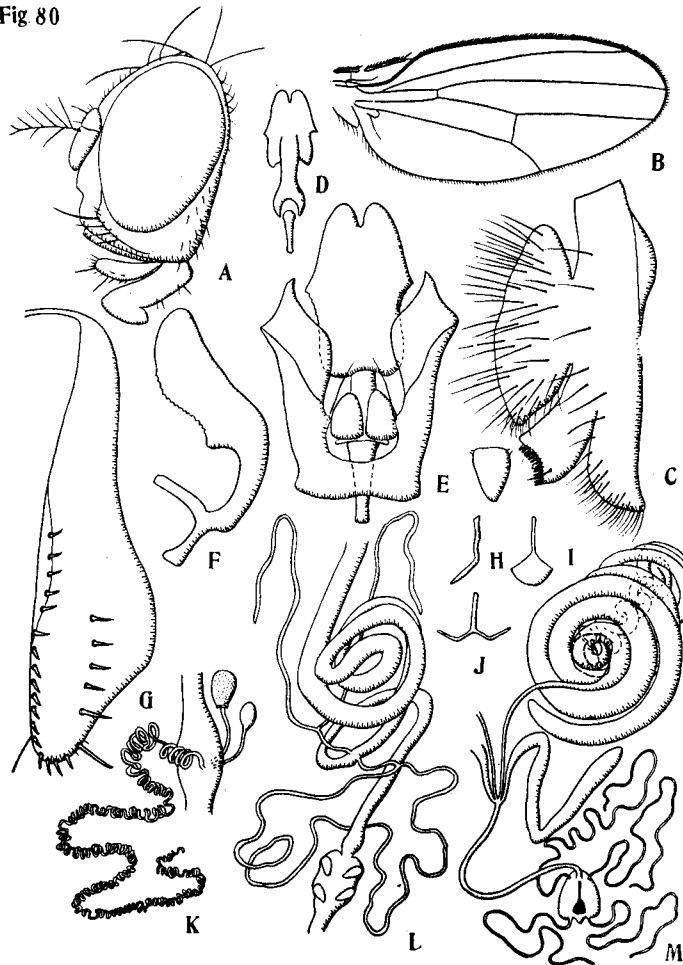
Remarks: The larvae were found breeding in tree-bloods, at Kunitachi, Tokyo, together with the larvae of *D. (D.) subtilis* Kikkawa & Peng.

***Drosophila (Drosophila) lacertosa* sp. nov. Fig. 80.**

Japanese name: Tobikuro-shōjōkae.

*Drosophila (Drosophila)* sp., *robusta* group I, Okada, 1953. Zool. Mag., 62: 285; Ohba, 1954. Kagaku, 24: 120; Okada, 1955. Zool. Mag., 64: 107; Okada, 1955. Kontyū, 23: 98.

Fig 80



**Fig. 80. *Drosophila (Drosophila) lacertosa* sp. nov.**

A. Head; B. Wing; C. Periphallallic organs (lateral aspect); D. Aedeagus (dorsal aspect); E. Phallic organs (ventral aspect); F. Aedeagus (lateral aspect); G. Egg-guide; H. Ejaculatory apodeme (lateral aspect); I. do. (ventral aspect); J. do. (cephalic aspect); K. Female reproductive organs (lateral aspect); L. Digestive system (ventral aspect); M. Male reproductive organs (ventral aspect).

♂ and ♀: Body large, dark brown, about 4 mm in length. Head (Fig. 80 A). Antenna dark brown. Arista with about 10 branches including a fork, 2-3 below it. Palpus greyish yellow, thick at middle, and with 2 long and several shorter bristles. Eyes dark reddish brown, with brown piles.  $orb_2$  about  $1/4 orb_1$ ,  $1/3 orb_3$ .  $or_2$  weak, about  $2/3$  size of vibrissa. Ocellar triangle large and black. Periorbits black, paler at the insertion of bristles. Clypeus black. Carina yellowish brown and high. Front dark brown, about half as broad as head width, and with a paired rows of *fr*. Cheek dark brown, about  $1/3.3$  as broad as the greatest diameter of eye.

Mesonotum dark brownish black, with 2 pairs of obscure paler longitudinal stripes. Scutellum greyish brown, somewhat pollinose. Thoracic pleura black. *hu* 2, *ac* in 6 rows. Cross distance of *dc* about twice the length distance. Anterior *scut* somewhat convergent. Sterno-index about 0.7.

Legs dark brown, preapicals on all three tibiae; apicals on fore and middle. Wings (Fig. 80 B) slightly fuscous; crossveins clear. C-index about 3.5-4.0; 4V-index about 1.7; 4C-index about 0.7; 5X-index about 1.5. C1-bristles 2; C3-bristles on basal  $3/5-3/4$ . Halteres white.

Abdominal tergites dark brown, and with black caudal bands, which are narrowing at middle.

Periphallalic organs (Fig. 80 C): Genital arch black, paler below; lower half with anterior margin slightly concave and posterior margin convexed; upper margin with about 6 hairs; lower margin with about 25 hairs. Clasper pale brown, quadrate, slightly concave on distal margin, and with about 12 black teeth arranged in a shallowly concave row, occupying entire length of its distal margin. Anal plate large, fusiform, brownish black, and contiguous to genital arch at middle, and with about 55 hairs. Decasternum pale yellowish and oval.

Phallic organs (Fig. 80 D-F): Described and figured by Okada (1955). Aedeagus orange, brownish basally, broaden and ventrally curved at distal half, basally bilobed, and apically incised and with about 15 fine serrations on ventral margins. Anterior parameres small, oval, and without sensilla. Novasternum deeply notched and with submedian spines on the inner margin. Ventral fragma dark brown and quadrate.  $p.f.=a'b'CdEfg_0HikLmn$ .  $PI=2.4$ .

Egg-guides (Fig. 80 G): Lobe reddish brown, narrowly rounded at tip, and with about 20 marginal and 4 discal orange brown pointed teeth, ultimate marginal tooth being longer than the penultimate. Basal isthmus short and narrow.

Internal structures (Fig. 80 H-M): Proximal intestine:  $C=3.0$  Rectal papillae:  $R=2.0$ . Malpighian tubes with common stalks short and branches long, posterior branches fused at tips with each other. Testis pale orange, with about 4 inner and 10 outer coils. Seminal vesicles slender. Paragonia slender, folded about 1.5 times. Ejaculatory bulb with 4 narrow long caeca, which are more than twice the length of bulb. Ejaculatory apodeme with plate yellowish white and fan-shaped, and stem blackish and slightly longer than plate. Spermatheca elongate oval, dark brown, and with narrow orifice. Parovaria with elliptical heads. Ventral receptacle with about 70-120 kinky coils.

Holotype: ♂, Hakamoriyama, Iwate Pref., 6 X '52 F (Okada).

Allotopotype; ♀, collected together with holotype.

Paratypes: 8 ♂♂ and 23 ♀♀, collected together with holotype; 5 ♂♂ and 4 ♀♀, Abashiri, Hokkaido, 18 VIII '51 F (Okada).

Other specimens examined: In Hokkaido, Akkeshi, VIII '53 F (K. Moriwaki); VIII '51 (Moriwaki et al); Wakkanai, VIII '53 F; Nishitappu, VIII '53 F (K. Moriwaki); Nopporo, VIII '53. In Tokyo: Setagaya, IV, V '51 GF, III '52 F, IV, V, '53 SF (Toda et al), V '54 L; Meguro, V '51; Suginami, IV '52 F (Ohnishi); Kunitachi, VI '52 T; Kotaira, VIII '53 (Saito), IV '54 S (Saito); Asakawa, IX '51 F (Ohba); Kumotoriyama, VII '53 F, VII '55 (Kurokawa et al). Kinugawa, Tochigi Pref., VIII '53 F (Moriwaki & Yoshida); Hôshionsen, Gumma Pref., IV '53 S (Matsudaira); Yatsugatake, Nagano Pref., VII '52 (Kurokawa); Chausuyama, Nagano Pref., VI '54 F (Nozawa); Anjo, Aichi Pref., I (?) '53 (Nozawa); Tadeshina, Nagano Pref., VII '54 FT; Miyoshi, Hiroshima Pref., X '55 F; Taishakukyo, Hiroshima Pref., X '55 F; Nanokawa, Kôchi Pref., IX '54; Kujûzan, Oita Pref., IX '54 F; Soki, Miyazaki Pref., IX '54 F (in a room).

Distribution: Hokkaido, Honshu (Tohoku, Kanto, Chubu, Chugoku), Shikoku, Kyushu.

Feeding habits: FSTGL.

Relationships: Closely allied to the fore-going species, *D. (D.) sordidula* Kikkawa & Peng, differing from which in having larger 5X-index, wider range of C3-bristles, shorter common stalks of Malpighian tubes, and longer  $or_2$ , as well as in the details of male and female genital organs, as indicated in the keys. It also resembles *D. (D.) cheda* Tan, Hsu, & Sheng, and *D. (D.) pullata* Tan, Hsu, & Sheng, both from China, but differs from them in the shape of genital arch.

### *Drosophila (Drosophila) sp. of robusta group II. Fig. 81.*

Japanese name: Kiboshi-shôjôbae.

*Drosophila (Drosophila) sp., robusta group II*, Okada, 1953. Zool. Mag., 62: 285; Okada, 1955. Zool. Mag., 64: 107.

*Drosophila (Drosophila) sp. of robusta group*, Momma, 1954. Journ. Fac. Sci. Hokkaido Univ., VI, 12: 205.

*Drosophila sp., robusta group II*, Ohba, 1954. Kagaku, 24: 130; Ishihara, 1955. Zool. Mag., 64: 91.

♂ and ♀: General features as are to be described by Okada & Kurokawa (1956).

Periphallalic organs (Fig. 81 C): To be described and figured by Okada & Kurokawa (1956).

Phallic organs (Fig. 81 D, E): To be described and figured by Okada & Kurokawa (1956).  $p.f.=ab'CdEfg_0HikLmn$ .  $PI=1.2$ .

Egg-guides (Fig. 81 F): To be described and figured by Okada & Kurokawa (1956).

Internal structures (Fig. 81 G-M):  $C=3.0$ .  $R=2.0$ . Other structures as will be described by Okada & Kurokawa (1956).

Specimens examined: In Hokkaido: Akkeshi, VIII '51 F, VIII '53 (Moriwaki et al); Aizankei,

VIII '53 F (Ohba); Sōunkyo, VIII '53 FT; Kumotoriyama, Tokyo, VII '53 F, VII '55 F (Kurokawa et al); Taishakukyo, Hiroshima Pref., X '55.

Previous records: (Ishihara, 1955) Daisetsuzan; (Ohba, 1954) Sōunkyo, Kumotoriyama.

Distribution: Hokkaido, Honshu (Kanto, Chugoku).

Feeding habits: FT.

Remarks: Egg and puparium will be described by Okada & Kurokawa (1956), chromosome description was made by Momma (1955) and is to be done also by Okada & Kurokawa (1956).

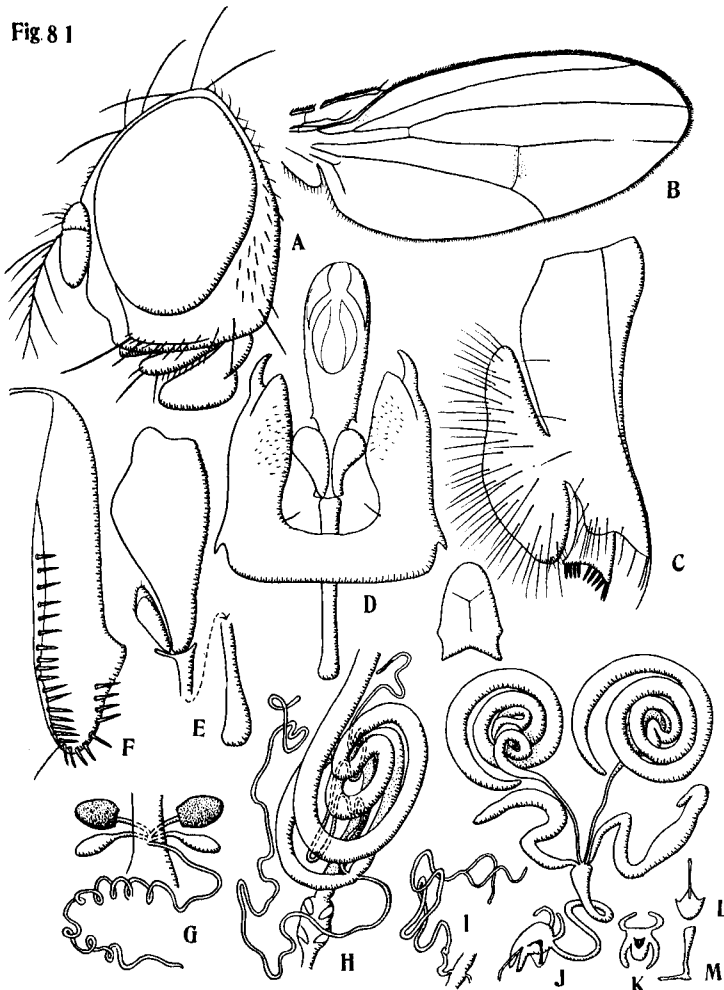


Fig. 81. *Drosophila (Drosophila)* sp. of *robusta* group II.

A. Head; B. Wing; C. Periphallic organs (lateral aspect); D. Phallic organs (ventral aspect); E. Aedeagus with anterior paramere (lateral aspect); F. Egg-guide; G. Female reproductive organs (ventral aspect); H. Digestive system (ventral aspect); I. Anterior Malpighian tube; J. Male reproductive organs (ventral aspect); K. Ejaculatory bulb (ventral aspect); L. Ejaculatory apodeme (ventrocaudal aspect); M. do. (lateral aspect).

*repleta* species-group, Sturtevant, 1942. Univ. Texas Publ., 4213:31.

Included here are three Japanese species, 2 of which are cosmopolitan forms, and remaining one is a new species.

***Drosophila (Drosophila) repleta* Wollaston, 1858.**

Japanese name: Madara-shōjōbae (Kikkawa & Peng, 1938).

*Drosophila repleta* Wollaston, 1858. Ann. Mag. Nat. Hist., 41: 117; Becker, 1908. Mitt. Zool. Mus. Berl., 4: 155; Knab, 1912. Psyche, 19: 106; Sturtevant, 1921. Carn. Inst. Publ., 301: 99; Sturtevant, 1923. Amer. Mus. Novit., 76: 2; Malloch, 1923. Proc. Linn. Soc. N.S. Wales, 78: 616; Duda, 1923. Ann. Mus. Nat. Hung., 20: 57; Duda, 1924. Ent. Medd., 14: 299; Duda, 1924. Arch. Naturg., 90 A (3): 3; Duda, 1925. Arch. Naturg., 91 A (3): 168; Duda, 1929. Konowia, 8: 49; Séguy, 1934. Faune de Fr., 28: 388; Duda, 1935. Die Fliegen, 58 g: 94; Kikkawa & Peng, 1938. Japan. Journ. Zool., 7: 544; Colyer, 1954. Ent. Month. Mag., 90: 98.

*Drosophila (Drosophila) repleta* Sturtevant, 1942. Univ. Texas Publ. 4213: 31; Patterson, 1943. Univ. Texas Publ., 4313: 117; Hsu, 1949. Univ. Texas Publ., 4920: 105; Wheeler, 1949. Univ. Texas Publ., 4920: 182; Burla, 1951. Rev. Suis. Zool., 58: 115; Shōgaki, 1952. Komai's Shōjōbae no Iden to Jikken: 21; Patterson & Stone, 1952. Evol. gen.

Dros.: 30; Malogolowkin, 1953. Rev. Brasil. Biol. 13: 246; Burla, 1954. Rev. Suis. Zool., 61: 180.  
*Drosophila punctulata* Loew, 1862. Berl. Ent. Zeit., 6: 282.  
*Drosophila adspersa* Miki, 1886. Wien. Ent. Zeit., 5: 328.

♂ and ♀: General features described by Patterson (1943), Kikkawa & Peng (1938).

Periphallic organs: Figured by Kikkawa & Peng (1938). Figured and described by Hsu (1949), and also by Malogolowkin (1953). Decasternum pale brown, broad, and quadrate.

Phallic organs: Described and figured by Malogolowkin (1953). p.f. = aBCdEfg<sub>0</sub>Hiklmn. PI = about 2.7.

Egg-guides: Lobe orange brown, distally tapering, pointed apically, upper and lower margins straight, and with about 25 marginal and 5 discal orange brown comparatively short teeth. Basal isthmus brown, short, and narrow.

Internal structures: Described by Patterson (1943). Ejaculatory apodeme with plate quadrate and ventrally concave, and with stem longer than plate, narrow, and sinuated.

Previous records from Japan: (Kikkawa & Peng, 1938) Tokyo, Ōsaka, Amami-Ōshima, Naha etc.; (Moriwaki, 1937, in DIS) Shibuya, Meguro, Ginza, in Tokyo.

Specimens examined: The present author could not examine Japanese specimens. Above description was made from European specimens, which has been presented by Prof. Buzzati-Traverso.

Distribution: Honshu (Kanto, Kinki), Ryukyu, Formosa, widely distributed in the world.

Remarks: Sturtevant (1946) found the type of this species from Madeira, preserved in the British Museum, to represent certain other species, probably *D. (D.) buzzatii* Patterson & Wheeler, but he thinks it best to retain the name *repleta*.

### *Drosophila (Drosophila) hydei* Sturtevant, 1921. Figs. 74, 77.

Japanese name: Kasuri-shōjōbae (new name); Hyomon-shōjōbae (Chino & Kikkawa, 1934).

*Drosophila hydei* Sturtevant, 1921. Carn. Inst. Publ., 301: 101; Malloch, 1923. Proc. Linn. Soc. N.S. Wales, 78: 616; Sturtevant, 1927. Phil. Journ. Sci., 32: 372; Chino & Kikkawa, 1934. Shōjōbae no Iden to Jikkenho: 7; Colyer, 1952. Ent. Month. Mag., 90: 98; Takada, Momma, & Nakahara, 1953. Zool. Mag., 68: 120.

*Drosophila (Drosophila) hydei* Sturtevant, 1942. Univ. Texas Publ., 4213: 31; Patterson, 1943. Univ. Texas Publ., 4313: 126; Hsu, 1949. Univ. Texas Publ., 4920: 104; Wheeler, 1949. Univ. Texas Publ., 4920: 182; Burla, 1951. Rev. Suis. Zool., 58: 116; Malogolowkin, 1951. Rev. Brasil. Biol., 11: 431; Basden, 1953. Ent. Month. Mag., 86: 201; Patterson & Stone, 1952. Evol. gen. Dros.: 30; Okada, 1952. Komai's Shōjōbae no Iden to Jikken: 198 (table); Okada, 1955. Kontyū, 23: 98.

♂ and ♀: Body greyish brown. Eyes reddish brown, with piles. Arista with about 7 branches including a small fork, 2 below it. Palpus with a few prominent setae. Ocellar triangle brown, periorbits paler. Front with broad, V-shaped black patch. Face yellow. Carina slightly sulcate. Cheek yellow, about 1/4 as broad as the greatest diameter of eye. *orb*<sub>2</sub> about 1/3 size of *orb*<sub>1</sub>, *or*<sub>2</sub> about 1/3 vibrissa.

Mesonotum pale brown, with black spots scattering at the bases of inserted bristles and hairs. Scutellum pale brown, with V-shaped black stripes. *hu* 3, long. *ac* in 8 rows. Anterior *scut* convergent. Cross distance of *dc* about half the length distance.

Legs with preapicals on all three tibiae; apicals on middle. Fore tarsus of male with exceedingly long upright hairs on the posterior surface. Wings hyaline, crossveins clear. C-index about 3.0-3.3. 4V-index about 1.7; 4C-index about 0.9; 5X-index about 1.2; C1-bristles 2; C3-bristles on basal about half.

Abdominal tergites brown, with broad black band on caudal margin of each tergite, interrupted at middle, and laterally broaden to reach the anterior margin. Sometimes obscure pale spot appears in each of lateral black areas.

Periphallic organs: Described and figured by Hsu (1949). Decasternum (Fig. 74 N) pale brown, quadrate, and slightly concave on distal margin.

Phallic organs: Described and figured by Okada (1955). Aedeagus orange brown, bilobed at basal half, apically rounded in ventral view, and with a pair of large strongly recurved spurs near the apex of ventral surface. Anterior paramere short, fused to novasternum, projected caudad, and located at the bottom of broad deep median notch of novasternum, and, more over, provided with a strong sensillum. Novasternum with paired submedian spines at the bottom of notch. Ventral fragma distally rounded. p.f. = a'BCdEfg<sub>0</sub>HikLmn. PI = 1.7.

Egg-guides: Lobe yellowish orange, apically narrowing and obtusely pointed, and with about 20 marginal and 4 discal short yellowish orange teeth. Basal isthmus very short.

Internal structures (Fig. 77 G): Proximal intestine: C = 2.0-2.5. Rectal papillae: R = 2.0-3.0. Malpighian tubes with common stalks short, and branches long, posterior branches fused to each

other at tips. Male and female reproductive organs are described and figured by Patterson, 1943. Testis with about 7 inner and 12 outer coils. Seminal vesicles slender. Paragonia folded 1.5 times. Ejaculatory bulb bilobed distally, ejaculatory apodeme with plate triangular, and pale, and with stem slender and black. Spermatheca yellowish grey, small and hemispherical, only slightly thicker than the end of stalk, which is very long and proximally tapering. Parovaria with elliptical heads. Ventral receptacle with more than 150 kinky coils.

Specimens examined: Shioya, Hokkaido, VII '52 (Takada). In Tokyo: Setagaya, IV-XII '51 **GSFLT**; III, V-VIII, X, XI '52 **FG**; III, IV, IX-XI '53 **TFG** (Moriwaki et al); Suginami, V, VII, XI '51 **TF**; V, VII '52 **T** (Ohnishi); Meguro, IV '51; Aoyama, X '52 **F** (Toda); Kotaira, VII-VIII, XI '53 (Saito); Inokashira, V '54 **G** (Mori); Hachijōshima, VII '51 (Kato); Kamakura, Kanagawa Pref., VI '51 **F**; Niihama, Chiba Pref., VI '53 **L** as well as from dead body of a duck (Toshioka); Mishima, Shizuoka Pref., VIII '51 (Watanabe); Anjō, Aichi Pref., I '53 (Nozawa).

Previous records from Japan: (Chino & Kikkawa, 1934) Ryukyu; (Takada, Momma, & Nakahara, 1953) Hokkaido; (Okada, 1955) Tokyo.

Distribution: Hokkaido, Honshu (Kanto, Chubu), Ryukyu, Formosa, Europe, N. America, S. America, Africa, Australia.

Feeding habits: **GFSLT**.

Remarks: This species seems to have become established rather recently in Japan, as it was not reported by Kikkawa & Peng (1938), although they cited this species in comparison with *D. (D.) repleta* Wollaston. It is of relatively recent introduction also in N. America, according to Sturtevant (1946).

***Drosophila (Drosophila) chinoi* sp. nov. Fig. 82.**

Japanese name: Chino-shōjōbae.

*Drosodhila (Drosophila) hayashii* (non. nud.) Patterson & Wheeler, Univ. Texas Publ., 4920: 229; Okada, 1952. Komai's Shōjōbae no Iden to Jikken: 194; Okada, 1953. Zool. Mag., 62: 285.

*Drosophila (Drosophila)* sp., *repleta* group I, Okada, 1955. Kontyū, 23: 98.

♂ and ♀: Body brownish black, with greyish patches, and about 3 mm in length. Head (Fig. 82 A) with occiput black. Eye dark red, with black piles. Antenna with 2nd joint grey, 3rd black or dark grey. Arista black, basal joint yellow, and with about 7 branches including a small fork, 2 below it. Palpus yellowish brown, blunt at tip, and with one long subterminal as well as one shorter submedian setae. Ocellar triangle black and large. Periorbits yellowish brown. Carina yellowish brown, high, and narrowing above. Front reddish brown, about half as broad as the head width, and with *fr.* Clypeus black. Cheek yellowish grey, about 1/5 as broad as the greatest diameter of eye. *orb*<sub>2</sub> about 2/5 size of *orb*<sub>3</sub>, *or*<sub>2</sub> weak, about 1/3 size of vibrissa.

Mesonotum greyish brown, mat, and with 3 pairs of longitudinal irregular black patches covering bases of hairs and bristles: a pair of patches each on, inside, and outside *dc*-lines, outside pair being interrupted into several irregular patches. Scutellum grey, pollinose, and with a pair of black patches. *hu* 2. *ac* in 8 rows. Cross distance of *dc* nearly as long as length distance. Anterior *scut* convergent. Sterno-index about 0.7.

Legs grey, proximal 2 tarsal joints of male fore legs much shortened and thickened, and with numerous short brownish black hairs. Tibiae medially paler. Preapicals on all three tibiae, apicals on fore and middle. Wings (Fig. 82 B) hyaline, crossveins clear. C-index about 2.9; 4V-index about 1.7; 4C-index about 1.0; 5X-index about 1.1; C1-bristles 2; C3-bristles on basal 2/5 to 1/2. Halteres white.

Abdominal tergites with broad black medially interrupted caudal bands, or often entirely black, and with yellow spot on each lateral end of 2-4 T. Sternites grey, laterally brown.

Periphallic organs (Fig. 82 C): Genital arch black, yellow below, apically narrowing and curved caudad embracing the base of clasper. Clasper quadrate, with about 10 black teeth arranged in a row, medial teeth longer than peripheral ones. Upper margin of genital arch with about 8 hairs, lower margin with about 7. Anal plate black, large, elliptical, fused to genital arch at short length, and with about 35 hairs. Decasternum pale brown, with lateral pieces broad and rhombic, and median piece Y-shaped and contiguous to the lateral ones.

Phallic organs (Fig. 82 D,E): Described and figured by Okada (1955). Aedeagus dark brown, apically orange brown and deeply bifid, curved S-like, and with number of minute conical processes at the middle of ventral surface. Anterior paramere small, triangular, and with several hairy sensilla. Submedian spines inserted at the apex of novasternal plates, which are quadrate. Ventral fragma black, quadrate, and longer than broad. p.f.=a'BCdEfg<sub>0</sub>HikLmn. PI=1.7.

Egg-guides (Fig. 82 F): Lobe orange brown, obtusely pointed at tip, and with about 18 marginal and 3 discal yellowish brown teeth, discal teeth long and pointed. Basal isthmus narrow and respectively long.

Internal structures (Fig. 82 G-J): Proximal intestine:  $C=2.0-2.5$ . Rectal papillae:  $R=$ about 1.7. Malpighian tubes with common stalks short, and posterior branches fused to each other at tips. Testis pale yellow, with about 3.5 inner and 4.5 outer coils, inner coils being yellowish orange. Seminal vesicle slender. Paragonia folded 1.5 times. Ejaculatory bulb with a pair of extraordinarily long filiform caeca, which are about 13 times as long as bulb itself. Ejaculatory apodeme with plate pale brown, elliptical, and roundly projected apically, and with stem blackish and about as long plate. Spermatheca semielliptical, widest at base, and blackish at tip. Parovaria with round tips. Ventral receptacle loosely and irregularly looped, entangled in a massive fatty bodies.

Holotype: ♂, Setagaya, Tokyo, 27 V '52 T (Okada).

Allotopotype: ♀, collected together with holotype.

Paratypes: 3 ♂♂ and 1 ♀, Setagaya, Tokyo, collected together with holotype; 18 ♂♂ and 3 ♀♀, Suginami, Tokyo, 9-15 VI '51 T (Ohnishi).

Other specimens examined: In Tokyo: Setagaya, VI, VII '51 FT; IV, V '53 FS (Toda); Suginami, VIII, XI '51 T (Ohnishi); IV '52 T (Ohnishi); Meguro, VI '51 T; Kotaira, XI '53 S (Saito); Asakawa, V '52 F (Ohba). Shinkazawa, Gumma Pref., VII '54 F (Toda); Tadeshina, Nagano Pref., VII '54 S; Yatsugatake, Nagano Pref., VII '52 F (Kurokawa).

Distribution: Honshu (Kanto, Chubu).

Feeding habits: TFS.

Fig 82

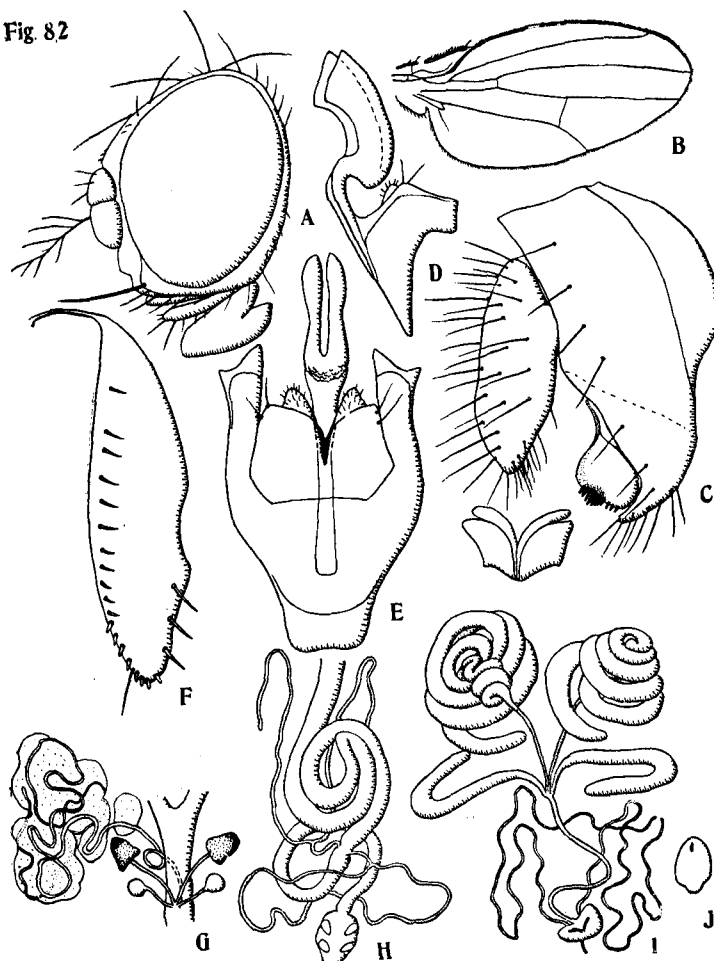


Fig. 82. *Drosophila (Drosophila) chinoi* sp. nov.

A. Head; B. Wing; C. Periphallallic organs (lateral aspect); D. Phallic organs, part (lateral aspect); E. Phallic organs (ventral aspect); F. Egg-guide; G. Female reproductive organs (dorsal aspect); H. Digestive system (ventral aspect); I. Male reproductive organs (dorsal aspect); J. Ejaculatory apodeme (ventral aspect).

Relationships: Allied to *D. (D.) hydei* Sturtevant, distinguishable from which in having reddish orange front, extensively confluent mesonotal dark patches, narrowly protruded genital arch, aedeagus without long recurved spurs, and in egg-guides provided with long discal teeth.

Remarks: Egg with 4 slender filaments. Pupa with posterior spiracles divergent, horn index being about 0.2. This species was already recorded from Japan under the name *D. hayashii*, as a stock from the Botanical Institute of Tokyo University (1948, DIS, 22: 64). This stock is probably originated from samples collected by Dr. M. Chino at a wine factory of Shiojiri, Nagano Pref., in 1946 (according to Dr. Chino's private information given to Assist. Prof. M. Ôgaki, of Naniwa University).

#### IV. Analysis of the phallic formulae

The phallic organs of the drosophilid flies have recently been investigated in details by a number of authors from various standpoints with diverse sorts of materials, e.g. from standpoint of intraspecific speciation by Cordeiro (1952) within *D. (S.) willistoni* Sturtevant, by Okada (1954) within *D. (S.) auraria* Peng, from standpoint of interspecific speciation or discriminating sibling species by Frolova & Astaurov (1930) in *obscura* group, by Rizki (1951) in *obscura* group, by Burla et al (1953) in *willistoni* group, by Burla (1954) in *montium* subgroup of *melanogaster* group, and from standpoint of general or comparative morphology by Pomini (1940) in *obscura* group, by Malogolowkin (1948, 1952, 1953) in *D. (S.) ananassae* Doleschall, *willistoni* group, and subgenus *Drosophila*, by Burla & Pavan (1953) in *calloptera* group, by Breuer & Pavan (1954) in *dreyfusi* group, and by Okada (1953, 1954, 1955) in Drosophilidae (regarding phallic formulae), *melanogaster* group, and subgenus *Drosophila*.

The phallic organs seem to be more directly associated with the problem of mechanical isolation than the periphallid organs as well as any of the external or internal organs other than the male genitalia do, probably involving exceedingly differentiated elements of zoonomic\* importance, despite the mechanical isolation tends to be subject to less attention nowadays. The analysis of the phallic formulae within the subgenera *Sophophora* and *Drosophila* (Okada, 1954, 1955) are, indeed, resulted to be well agreed with the systematic arrangements of the respective subgenera, alleged by Sturtevant (1939, 1940, 1942) and Hsu (1949) with regards of various characters (involving not only external but internal and chromosomal structures, as well as ecological natures and early stages) and periphallid organs, respectively. Extensively coincident results are obtained in estimating systematic position of the *immigrans* group independently by Malogolowkin (1953) based on male genitalia as a whole and by the present author (1955) regarding periphallid organs, their estimations being, however, quite diverse from that reached by Sturtevant (1942) and Hsu (1949).

The present attempt is to find if similar analysis of the phallic formulae as undertaken by the author (1954, 1955) be successfully applicable for the comparison of the systematic groups higher than subgenera. The interrelations of these groups have been scarcely clarified.

A list will be obtained if the phallic formulae (p.f., see Chapter I), which have been given under the description of species, are put together. From this list will be devised the second list which is shown below, in which the phallic formula of each of the systematic groups higher than species is given. Every item of the formula of certain group shows an average value of corresponding items determined for all the examined species of that group. For example, an average of the first item of a certain group will be determined as "a", if the group contains 6 examined species which show "a'", "a", "A", "a", "a", and "a'", respectively. If precisely calculated, these 6 letters are evaluated as 0.5, 1.0, 0.0, 1.0, 1.0, and 0.5, respectively, and they average 0.67, which is approximately expressible as "a'".

\* Uchida (1955) divided Systematic zoology into zoonomy and zoography.

systematic groups	number of sp. examined		p.f. (phallic formula)												d.i. (divergency index)	
Cryptochaetidae	1	a'	B	C	d <sub>0</sub>	E	f <sub>0</sub>	g <sub>0</sub>	H	I	k	L	m	n	9.5	
genus <i>Cryptochaetum</i>																
Aulacigastridae	1	A	B	C	d	E	f <sub>0</sub>	g	H	i	K	l	M	N	6.0	
genus <i>Aulacigaster</i>																



systematic groups	number of sp. examined	p.f. (phallic formula)													d.i. (divergency index)
Diastatidae genus <i>Diastata</i>	2	a	B	C	D	E	f	g	H	i'	k	l'	m	N	6.0
Drosophilidae	96	a	B	C	d'	E	f	g	H	i	k	l'	m'	n'	7.0
Steganinae	14	a	B	C	D	E	f'	g	H	i	k	l'	m'	n'	6.0
genus <i>Protostegana</i>	1	A	B	C	D	e	F	g	H	i	k	L	M	N	4.0
genus <i>Stegana</i>	1	a	b'	C	d <sub>0</sub>	E	f <sub>0</sub>	g	H	i	K	l	m'	N	9.0
genus <i>Amiota</i>	2	a'	B	C	D	E	f'	G	H	i	k	l'	m'	n'	4.5
subgenus <i>Amiota</i>	1	A	B	C	D	E	f	g	H	i	k	L	M	N	4.0
subgenus <i>Phortica</i>	1	a	B	C	D	E	f	g	H	i	k	l	M	n	7.0
genus <i>Leucophenga</i>	10	a	B	c	D	E	F	g	h	i	k	l'	M	n	7.5
subgenus <i>Trichiaspiphenga</i>	1	a	B	C	D	E	f <sub>0</sub>	g	H	i	k	l	m'	n	8.5
subgenus <i>Leucophenga</i>	9	a	B	c	D	E	F	g	h'	i	k	l'	M	n	7.0
Drosophilinae	82	a	B	C	d	E	f	g <sub>0</sub>	H	i'	k	l'	m'	n'	7.0
genus <i>Microdrosophila</i>	2	a	B	c'	d	E	f <sub>0</sub>	g	H	i	k	l'	m'	n'	9.0
subgenus <i>Microdrosophila</i>	1	a	B	c	d	E	f <sub>0</sub>	g	H	i	k	l'	m	n	10.5
subgenus <i>Incisurifrons</i>	1	a	B	C	d	E	f <sub>0</sub>	g <sub>0</sub>	H	i	k	l'	M	N	8.5
genus <i>Mycodrosophila</i>	7	a	B	C	d	E	f <sub>0</sub>	g <sub>0</sub>	H	I	k	l'	m	n	9.5
genus <i>Dettopsomyia</i>	1	a	B	C	d	E	f <sub>0</sub>	g <sub>0</sub>	H	I	k	l	m	n	10.0
genus <i>Liodrosophila</i>	2	a'	B	C	d	E	f	g <sub>0</sub>	H	I	k	L	m'	n'	6.5
genus <i>Chymomyza</i>	3	a'	B	C	d'	E	f	g	H	i	k'	l'	m	n	7.0
genus <i>Scaptomyza</i>	6	a'	B	C	d	e	f	g <sub>0</sub>	H	i	k	L	m	n'	8.0
genus <i>Drosophila</i>	61	a'	B	C	d'	E	f	g	H	I	k'	l'	m'	n'	5.0
subgenus <i>Hirtodrosophila</i>	8	a	B	C	d	E	f	g	H	I	k	l	m'	n	7.5
subgenus <i>Paradrosophila</i>	2	A	B	c'	D	E	F	g'	H	I	K	L	M	N	1.0
subgenus <i>Dorsilopha</i>	1	a	B	C	d	E	f	g <sub>0</sub>	H	I	k	l	m	n	9.0
subgenus <i>Sophophora</i>	19	A	B	C	D	E	f	G	H	I	K	L	M	N	1.0
subgenus <i>Drosophila</i>	31	a	B	C	d	E	f'	g <sub>0</sub>	H	I	k	l'	m'	n'	7.0

The divergency index (d.i., Okada, 1953, 1954), which is a sum of given values of letters in a phallic formula (large letter is evaluated at 0, small letter at 1.0, small letter with a dash at 0.5, and small letter with attached <sub>0</sub> at 2.0), indicates a relative degree to show how far a species or a group is divergent from a species of the *obscura* group, which is thought to be the simplest species among the genus *Drosophila*, having p.f. ABCDEFGHIKLMN. The d.i. of each systematic group is listed above. The more strict and absolute comparison may, however, be attained by adopting the difference value (d.v., Okada, 1954), which takes a value from 0 to 14, according to the degree of dissimilarity between certain two species or groups higher than species, with respect to 14 items of the characters corresponding to 14 letters of phallic formula. The ideas similar to d.v. have already been introduced by Sturtevant and Malogolowkin. Sturtevant (1942) listed the "ranges of difference" between every two subgenera of the genus *Drosophila* regarding 33 chosen characters, and Malogolowkin (1953) calculated values of "similarities" between every two species-groups of the subgenus *Drosophila*, with regard to 62 characters of male genitalia, choosing, as a rule, "the species that bears the name of its group as representative of that group". Sturtevant's method may be best not to convey false impression of numerical figures, but to calculate average value of the "range of differences" would be convenient for comparison. Malogolowkin's method is quite appropriate to get definite figures of estimating similarities, but to refer to as many species as possible would bring further reliable comparison.

The present application of d.v. may be more or less successful for elimination of certain deficiencies involved in the methods of the both authors, because the d.v. between certain two groups shows an average value calculated from the phallic formulae of whole of the examined species belong to the two groups in question.

The d.v. between each two of the families and subfamilies of Drosophilidae are as shown in the following table (also see Fig. 83 A).

families and subfamilies	species examined	Cryptochaetidae	Aulacigastridae	Diastatidae	Drosophilidae	Steganinae	Drosophilinae
Cryptochaetidae	1	0.0	7.5	5.5	5.5	7.5	4.5
Aulacigastridae	1	7.5	0.0	6.0	5.0	6.0	5.0
Diastatidae	2	6.5	6.0	0.0	2.0	2.0	2.0
Drosophilidae	96	5.5	5.0	2.0	0.0	4.0	2.0
{Steganinae	14	7.5	6.0	2.0	4.0	0.0	2.0
{Drosophilinae	82	5.5	5.0	2.0	2.0	2.0	0.0

The smallest value of d.v. is obtained between Drosophilidae and Diastatidae (2.0) and also between Drosophilinae and Steganinae (2.0); the largest between Cryptochaetidae and Aulacigastridae (7.5), and also between Cryptochaetidae and Steganinae (7.5).

Likewise the d.v. obtained between each two of genera and subgenera will be given below (Fig. 83 B-E).

genera of Steganinae	<i>Protostegana</i>	<i>Stegana</i>	<i>Amiota</i>	<i>Leucophenga</i>
<i>Protostegana</i>	0.0	9.0	4.5	5.5
<i>Stegana</i>	9.0	0.0	7.5	9.5
<i>Amiota</i>	4.5	7.5	0.0	5.0
<i>Leucophenga</i>	5.5	9.5	5.0	0.0

Fig. 83

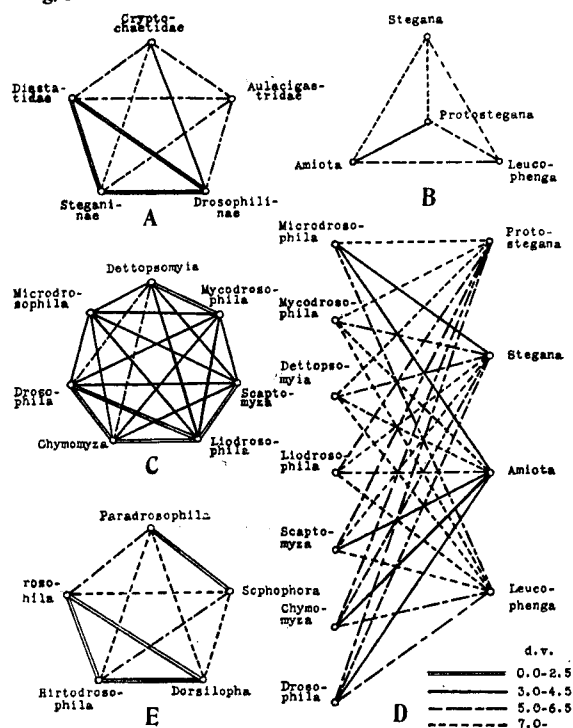


Fig. 83. Interrelations between systematic groups with regard to the divergency values (d.v.).

A. Interrelations between families and subfamilies; B. between genera of Steganinae; C. between genera of Drosophilinae; D. between genera of Steganinae as Compared with those of Drosophilinae; E. between subgenera of the genus *Drosophila*.

The remotest intergeneric relationship is proved to be present between *Stegana* and *Leucophenga* (9.5), the nearest between *Protostegana* and *Amiota* as well as between *Protostegana* and *Leucophenga*. *Stegana* is resulted to be slightly nearer to *Amiota* than to *Leucophenga*, and *Amiota* to be nearer to *Leucophenga* than to *Stegana*. This result is somewhat different from Malloch's interpretation (1923), that *Stegana* is nearer to *Leucophenga* than to *Amiota*, although the difference does not affect the disposition of *Leucophenga* into Steganinae (see Chapter III).

The intergeneric d.v. within Drosophilinae (Fig. 83 C) are as tabulated below.

genera of Drosophilinae	<i>Microdrosophila</i>	<i>Mycodrosophila</i>	<i>Dettopsomyia</i>	<i>Liodrosophila</i>	<i>Chymomyza</i>	<i>Scaptomyza</i>	<i>Drosophila</i>
<i>Microdrosophila</i>	0.0	3.5	4.0	4.5	4.0	4.0	4.0
<i>Mycodrosophila</i>	3.5	0.0	0.5	3.0	4.5	3.5	4.5
<i>Dettopsomyia</i>	4.0	0.5	0.0	3.5	5.0	4.0	5.0
<i>Liodrosophila</i>	4.5	3.0	3.5	0.0	4.5	1.5	2.5
<i>Chymomyza</i>	4.0	4.5	5.0	4.5	0.0	3.0	2.0
<i>Scaptomyza</i>	4.0	3.5	4.0	1.5	3.0	0.0	4.0
<i>Drosophila</i>	4.0	4.5	5.0	2.5	2.0	4.0	0.0

With regard of d.v., *Microdrosophila* is moderately remote from each of the other genera of the subfamily (3.5-4.0); *Mycodrosophila* is nearest to *Dettopsomyia* (0.5) and then to *Liodrosophila* (3.0); *Liodrosophila* is nearest to *Scaptomyza* (1.5) and to *Drosophila* (2.5); *Chymomyza* is nearest to *Drosophila* (2.0) and *Scaptomyza* (3.0); *Drosophila* is nearer to *Chymomyza* (2.0) and *Liodrosophila* (2.5) than to *Scaptomyza* (4.0).

The intergeneric divergence within Drosophilinae (1.5-5.0) is lesser in degree than that within Steganinae (5.5-8.5).

The d.v. between each couple of intersubfamilial genera are listed below (see Fig. 83 D).

Drosophilinae Steganinae	<i>Microdrosophila</i>	<i>Mycodrosophila</i>	<i>Dettopsomyia</i>	<i>Liodrosophila</i>	<i>Chymomyza</i>	<i>Scaptomyza</i>	<i>Drosophila</i>
<i>Protostegana</i>	7.0	9.5	10.0	6.5	6.0	6.0	6.0
<i>Stegana</i>	4.0	6.5	6.0	7.5	6.0	7.0	6.0
<i>Amiota</i>	4.0	7.0	7.5	5.0	3.5	4.5	3.5
<i>Leucophenga</i>	5.5	8.0	8.5	8.0	5.5	7.5	6.5

The highest divergency is observed between *Protostegana* and *Dettopsomyia* (d.v.=10.0), the lowest between *Amiota* and *Drosophila* or *Chymomyza* (3.5). *Microdrosophila* is as nearer to *Stegana* than to most of the genera of Drosophilinae. *Amiota* is nearer to *Chymomyza* and *Drosophila* than to *Stegana* and *Leucophenga*; showing a case in which the d.v. between intrasubfamilial genera is larger than the d.v. between intersubfamilial genera.

The d.v. between subgenera (Fig. 83 E) are 3.0 between *Phortica* and *Amiota* s. str. in the genus *Amiota*, 4.5 between *Leucophenga* s. str. and *Trichiaspiphenga* in the genus *Leucophenga*, and 4.0 between *Microdrosophila* s. str. and *Incisurifrons* in the genus *Microdrosophila*. The interrelations between each couple of subgenera within the genus *Drosophila* in regard to d.v. are as shown below.

subgenera of <i>Drosophila</i>	<i>Hirtodrosophila</i>	<i>Paradrosophila</i>	<i>Dorsilopha</i>	<i>Sophophora</i>	<i>Drosophila</i>
<i>Hirtodrosophila</i>	0.0	7.5	1.5	6.5	2.5
<i>Paradrosophila</i>	7.5	0.0	9.0	2.0	6.0
<i>Dorsilopha</i>	1.5	9.0	0.0	8.0	2.0
<i>Sophophora</i>	6.5	2.0	8.0	0.0	7.0
<i>Drosophila</i>	2.5	6.0	2.0	7.0	0.0

From the above table it is considered that the 5 subgenera of the genus *Drosophila* fall in two groups, *Paradrosophila* and *Sophophora* in one group, and *Hirtodrosophila*, *Dorsilopha*, and *Drosophila* s. str. in another; the d.v. between intragroup subgenera being ranged 2.0 and 1.5-2.5 for the two groups respectively, while the d.v. between intergroup subgenera being ranged 6.0-9.0. *D. (D.) subtilis* Kikkawa & Peng, which shows p.f.=ABCDEF'g<sub>0</sub>HIKLMN and d.i.=2.5, is in closer relationships with the subgenera *Paradrosophila* (d.v.=2.5) and *Sophophora* (d.v.=2.5) than with its own subgenus *Drosophila* s. str. (d.v.=5.5), indicating its role of a bridge between the two groups in the genus *Drosophila*.

## V. A note on the distribution and feeding habits

Among 109 known Japanese species in total, of Drosophilidae and allied families enlisted here 55 species are proved to be endemic to Japan. From Hokkaido 52 species have been collected, and 24 of which are endemic to Japan; of the latter 3 are endemic to Hokkaido. In Honshu 85 species have been found 40 of which are endemic to Japan, including 13 species which are known to be distributed in Honshu alone. 80 and 49 species are recorded from Kanto and Chubu districts, respectively, including 6 and 2 species so far found in the respective localities alone. From Tohoku, Kinki, and Chugoku districts are known 27, 27, and 25 respectively, including no species endemic to the respective districts. 31 (16 are endemic to Japan and 2 of which are endemic to that place) species are known from Shikoku; 38 (19 and 8) from Kyushu; and 9 (1 and 1) from Ryukyu islands. These figures will considerably be emended after the more exhaustive surveys in various localities are carried out, especially in Tohoku and Chugoku districts as well as the southern parts of Japan.

41 species found in Japan are assorted to be common to the Palaearctic, 25 to the Oriental, 13 to the Australian, 16 to the Ethiopian, 16 to the Nearctic, and 8 to the Neotropical regions. *Mycodrosophila* and *Drosophila* (*Hirtodrosophila*) are likely to include endemic forms to a great percentage, 8 out of 9 species or 89 %, in each genus. On the contrary, *Chymomyza*, *Scaptomyza*, and *D. (Sophophora)* are the groups with the smaller percentages of the endemic ones, 30 % or less in each case, the smallest in fact, provided the genera represented by less than 5 species be put out of consideration. About 60 %, 19 out of 30 species, in *D. (Drosophila)* are endemic to Japan, this percentage is over twice that in *D. (Sophophora)* (26 %). All of the 8 Japanese species common to the Neotropical region belong to *Drosophila*, and they are known to inhabit "orbis terrarum". *Drosophila* and *Amiota* include Japanese species which are also recorded from the Australian region, *Cryptochaetum*, *Leucophenga*, *Scaptomyza*, and *Drosophila* from the Ethiopian region, *Aulacigaster*, *Stegana*, *Amiota*, *Chymomyza*, *Scaptomyza*, and *Drosophila* from the Nearctic region, as well. It is natural that a great number of genera have species common to Japan and the Oriental region, there being 10 of them. 11 of the genera found in Japan have species in reality widely distributed in the whole Palaearctic region.

	distribution														collecting methods or feeding habits														
	Hokkaido	Tohoku	Kanto	Chubu	Kinki	Chugoku	Shikoku	Kyushu	Ogasawara	Rhukyu	S. Asia	China	Korea	Saghalien & Siberia	Manchuria	Europe	Africa	N. America	S. America	Australia	Micronesia	F (fruits)	S (sweeping)	G (garbage)	L (light)	T (tree-blood)	M (fungi)	E (human eye)	
<i>Cryptochaetum grandicorne</i>	:	:	○	○	○	○	:	○	:	:	:	:	:	:	:	○	○	:	:	:	:	:	:	:	:	○	:	:	○
<i>Aulacigaster leucopeza</i>	○	:	:	:	:	:	:	:	:	:	○	:	:	:	:	○	:	○	:	:	:	:	:	:	○	:	:	:	:
<i>Diastata vagans</i>	:	:	:	○	:	:	:	:	:	○	:	:	:	:	:	○	:	:	:	:	:	:	○	:	:	:	:	:	:
<i>D. ussurica</i>	:	:	:	○	:	○	:	:	:	:	:	:	○	:	:	:	:	:	:	:	:	:	:	○	:	:	:	:	:
<i>Protostegana</i> sp. from Taba	:	:	:	○	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	○	:	:	:	:	:
<i>P. kanoi</i>	:	:	:	:	:	:	:	:	:	○	:	:	:	:	:	:	:	:	:	:	:	:	:	○	:	:	:	:	:
<i>Stegana coleoptrata</i>	○	:	○	:	:	:	:	:	:	:	:	:	:	:	:	○	:	○	:	:	:	:	:	○	:	:	○	:	:
<i>Amiota alboguttata</i>	○	:	○	:	:	:	:	:	:	:	○	:	:	:	:	○	:	○	:	○	:	:	:	○	:	:	:	○	○
<i>A. variegata</i>	○	○	○	○	○	○	○	○	:	:	○	○	:	:	:	○	:	:	:	:	:	:	○	○	:	:	○	○	○
<i>Leucophenga argentosa</i>	:	:	○	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	○	○	:	○	○	:	:
<i>L. magnipalpis</i>	○	:	○	:	:	:	○	○	:	:	○	:	:	:	:	:	:	:	:	:	:	:	:	○	:	:	:	:	:

	distribution																			collecting methods or feeding habits								
	Hokkaido	Honshu							S. Asia	China	Korea	Saghalien & Siberia	Manchuria	Europe	Africa	N. America	S. America	Australia	Micronesia	F(fruits)	S(Sweeping)	G(garbage)	L(light)	T(tree-blood)	M(fungi)	E(human eye)		
		Tohoku	Kanto	Chubu	Kinki	Chugoku	Shikoku	Kyushu																			Ogasawara	Rhuku
<i>L. guttiventris</i>	:	:	○	:	:	:	:	:	:	○	:	:	:	:	○	:	:	:	:	:	:	○	○	:	:	:	:	
<i>L. angusta</i>	:	:	○	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:		
<i>L. subpollinosa</i>	:	:	○	:	:	:	:	:	:	○	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:		
<i>L. concilia</i>	:	:	○	:	:	:	○	:	:	:	:	:	:	:	○	:	:	:	:	:	:	○	○	:	:	:	:	
<i>L. maculata</i>	○	:	○	:	:	:	○	:	:	:	:	:	:	○	:	:	:	:	:	:	:	:	○	:	:	○	:	
<i>L. quinquemaculipennis</i>	○	:	:	○	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	○	:	:	:	:	
<i>L. quadripunctata</i>	:	:	○	:	:	:	:	:	:	○	:	:	:	:	:	:	:	:	:	:	:	○	:	:	:	:	:	
<i>L. interrupta</i>	:	:	:	:	:	:	:	○	:	○	:	:	:	:	:	:	:	:	:	:	:	:	:	:	○	:	:	
<i>L. ornatipennis</i>	:	:	○	:	:	:	:	:	:	○	:	:	:	:	:	:	:	:	:	:	:	:	○	:	:	:	:	
<i>Hypselothylea</i>	:	:	○	:	:	:	:	:	:	○	:	:	:	:	:	:	:	:	:	:	:	:	:	○	:	:	:	
<i>breviscutellata</i>	:	:	○	:	:	:	:	:	:	○	:	:	:	:	:	:	:	:	:	:	:	:	○	:	:	:	:	
<i>Microdrosophila</i>	:	:	○	:	:	:	○	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	○	○	:	:	:	
<i>purpurata</i>	:	:	○	:	:	:	○	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	○	○	:	:	:	
<i>M. congesta</i>	:	:	○	○	:	:	:	:	:	○	:	:	:	:	○	:	:	○	:	:	○	○	○	○	:	:	:	
<i>Mycodrosophila</i>	○	○	○	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	○	:	:	
<i>japonica</i>	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	○	:	:	
<i>M. shikokuana</i>	:	:	:	:	:	:	○	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	○	:	:	
<i>M. sp. from</i>	:	:	:	:	:	:	○	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	○	:	:	
<i>Kirishimayama</i>	:	:	:	:	:	:	○	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	○	:	:	
<i>M. takachihonis</i>	:	:	:	:	:	:	○	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	○	:	:	
<i>M. splendida</i>	:	:	:	:	:	:	○	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	○	:	:	
<i>M. basalis</i>	:	:	○	:	:	:	○	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	○	:	:	
<i>M. poecilogastra</i>	○	○	○	:	:	:	○	:	:	:	:	:	○	:	:	:	:	:	:	:	:	:	:	○	:	:	:	
<i>M. setipalpis</i>	:	:	:	:	:	:	○	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	○	:	:	:	
<i>M. palmata</i>	:	:	○	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	○	:	:	
<i>Dettopsomyia</i>	:	:	○	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	○	:	:	
<i>argentifrons</i>	:	:	○	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	○	:	○	:	
<i>Liodrosophila aerea</i>	:	:	○	:	○	○	○	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	○	○	:	○	:	
<i>L. bicolor</i>	:	:	:	:	:	:	○	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	○	:	:	:	
<i>Chymomyza costata</i>	:	:	○	:	:	:	:	:	:	:	:	:	:	○	:	:	:	:	:	:	:	:	:	○	:	:	:	
<i>C. nigrimana</i>	○	:	:	○	:	:	:	:	:	:	:	:	:	○	:	○	:	:	:	:	:	○	○	:	○	:	:	
<i>C. caudatula</i>	○	:	:	:	:	:	:	:	:	:	:	:	:	○	:	○	:	:	:	:	:	○	○	:	○	:	:	
<i>C. atrimana</i>	:	:	○	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	○	:	:	:	:	
<i>C. obscura</i>	:	(Hondo)							:	○	:	:	:	:	:	:	:	:	:	:	:	:	(?)				:	:
<i>C. japonica</i>	:	:	:	○	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	○	:	:	
<i>Scaptomyza disticha</i>	○	○	○	○	:	○	:	:	:	:	:	:	:	○	○	○	:	:	:	:	:	○	○	○	○	:	○	
<i>S. apicalis</i>	○	:	○	:	:	:	:	:	:	:	:	:	:	○	○	:	:	:	:	:	:	:	○	:	○	:	:	
<i>S. monticola</i>	○	:	○	○	:	:	:	:	:	:	:	:	:	○	○	:	:	:	:	:	:	○	○	○	○	:	:	
<i>S. graminum</i>	○	:	○	○	○	:	:	:	:	○	:	:	:	○	○	○	:	:	:	:	:	:	○	○	○	:	:	
<i>S. polygonia</i>	○	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	○	○	:	:	
<i>S. unipunctum</i>	○	:	:	:	:	:	:	:	:	:	:	:	:	:	○	:	:	:	:	:	:	:	○	:	:	:	:	
<i>Drosophila(Hirtodros.)</i>	○	:	○	:	:	:	○	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	○	:	:	
<i>alboralis</i>	○	○	○	○	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	○	:	:	
<i>D. (H.) sexvittata</i>	○	○	○	○	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	○	:	:	○	:	:	
<i>D. (H.) trivittata</i>	○	:	:	:	○	:	:	:	:	:	○	:	:	:	○	:	:	:	:	:	:	:	:	:	○	:	:	

	distribution													collecting methods or feeding habits												
	Hokkaido	Honshu					Ogasawara	Rhukyu	S. Asia	China	Korea	Saghalien & Siberia	Manchuria	Europe	Africa	N. America	S. America	Australia	Micronesia	F (fruits)	S (sweeping)	G (garbage)	L (light)	T (tree-blood)	M (fungi)	E (human eye)
<i>D. (H.) omogoensis</i>	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
<i>D. (H.) quadrivittata</i>	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
<i>D. (H.) nokogiri</i>	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
<i>D. (H.) sp. like histrio</i>	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
<i>D. (H.) asozana</i>	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
<i>D. (H.) denticeps</i>	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
<i>D. (Dorsilopha) busckii</i>	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
<i>D. (Paradrosophila) coracina</i>	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
<i>D. (P.) rufifrons</i>	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
<i>D. (P.) puncticeps</i>	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
<i>D. (Sophophora) alpina</i>	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
<i>D. (S.) bifasciata</i>	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
<i>D. (S.) sp. cf. helvetica</i>	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
<i>D. (S.) suzukii</i>	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
<i>D. (S.) pulchrella</i>	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
<i>D. (S.) unipectinata</i>	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
<i>D. (S.) lutea</i>	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
<i>D. (S.) takahashii</i>	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
<i>D. (S.) melanogaster</i>	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
<i>D. (S.) simulans</i>	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
<i>D. (S.) ficusphila</i>	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
<i>D. (S.) nipponica</i>	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
<i>D. (S.) magnipectinata</i>	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
<i>D. (S.) sp. like magnipectinata</i>	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
<i>D. (S.) ananassae</i>	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
<i>D. (S.) bipectinata</i>	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
<i>D. (S.) kikkawai</i>	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
<i>D. (S.) auraria</i>	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
<i>D. (S.) rufa</i>	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
<i>D. (Drosophila) brachynephros</i>	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
<i>D. (D.) angularis</i>	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
<i>D. (D.) unispina</i>	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
<i>D. (D.) nigromaculata</i>	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
<i>D. (D.) kuntzei</i>	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
<i>D. (D.) testacea</i>	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
<i>D. (D.) bizonata</i>	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
<i>D. (D.) makinoi</i>	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
<i>D. (D.) sp. of quinaria section</i>	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:

	distribution																collecting methods or feeding habits											
	Hokkaido	Honshu						S. Asia	China	Korea	Saghalien & Siberia	Manchuria	Europe	Africa	N. America	S. America	Australia	Micronesia	F (fruits)	S (sweeping)	G (garbage)	L (light)	T (tree-blood)	M (fungi)	E (human eye)			
<i>D. (D.) histrio</i>	○	○	○	○	:	:	:	:	:	:	:	○	:	:	:	:	:	:	○	:	:	:	:	:	:			
<i>D. (D.) grandis</i>	:	:	○	○	○	:	:	:	:	:	:	:	:	:	:	:	:	:	○	:	:	:	:	:	:			
<i>D. (D.) acutissima</i>	:	:	○	○	○	○	○	:	:	:	:	:	:	:	:	:	:	:	○	:	:	○	○	○	:			
<i>D. (D.) tenuicauda</i>	○	:	○	:	:	○	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	○	○	○	:			
<i>D. (D.) funebris</i>	○	:	:	:	:	:	:	:	:	:	○	:	○	○	○	○	○	○	○	:	:	:	:	:	:			
<i>D. (D.) multispina</i>	○	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	○	:	:	:	○	○	:			
<i>D. (D.) maculinotata</i>	:	○	○	○	:	:	:	:	:	:	:	:	:	:	:	:	:	:	○	○	:	:	:	:	:			
<i>D. (D.) immigrans</i>	○	○	○	○	○	○	○	○	:	:	○	○	:	○	○	○	○	○	○	○	○	○	○	○	:			
<i>D. (D.)</i> sp. of <i>immigrans</i> group	:	○	○	○	:	:	○	○	:	:	:	:	:	:	:	:	:	:	○	○	○	○	○	○	:			
<i>D. (D.) virgata</i>	:	○	○	○	○	○	○	○	:	:	:	○	:	:	:	:	:	:	○	○	○	:	○	○	:			
<i>D. (D.) komaii</i>	:	:	:	:	:	:	:	:	○	○	:	:	:	:	:	:	:	:	○	:	:	○	:	:	:			
<i>D. (D.) subtilis</i>	:	:	○	○	○	:	:	○	:	:	○	:	:	:	:	:	:	:	○	:	:	○	:	:	:			
<i>D. (D.) malanissima</i> of Kikkawa & Peng	○	:	○	:	○	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	○	:	:	:			
<i>D. (D.) virilis</i>	○	○	○	○	○	○	○	○	:	?	○	○	:	○	○	○	:	:	○	:	○	:	:	:	:			
<i>D. (D.) daruma</i>	:	:	:	:	:	:	:	○	:	:	:	:	:	:	:	:	:	:	○	:	:	:	:	:	:			
<i>D. (D.) sordidula</i>	○	○	○	○	○	:	:	:	:	:	○	:	:	:	:	:	:	:	○	○	:	○	○	:	:			
<i>D. (D.) lacertosa</i>	○	○	○	○	:	○	○	○	:	:	:	:	:	:	:	:	:	:	○	○	○	○	○	:	:			
<i>D. (D.)</i> sp. of <i>robusta</i> group, II	○	:	○	:	:	○	:	:	:	:	:	:	:	:	:	:	:	:	○	:	:	:	○	:	:			
<i>D. (D.) repleta</i>	:	:	○	:	○	:	:	:	○	○	:	:	○	○	○	○	○	:	○	:	:	:	:	:	:			
<i>D. (D.) hydei</i>	○	:	○	○	:	:	:	:	:	:	:	:	○	○	○	○	○	:	○	○	○	○	○	:	:			
<i>D. (D.) chinoi</i>	:	:	○	○	:	:	:	:	:	:	:	:	:	:	:	:	:	:	○	○	:	:	○	:	:			
Total number of species	52	27	80	49	27	25	31	38	3	9	25	18	6	2	7	29	16	17	8	11	4	66	64	22	26	35	27	3
Number of spp. endemic to the locality	3	0	6	2	0	0	2	8	0	1																		

	number of Japanese species*	distribution										collecting methods or feeding habits								
		Hokkaido	Honshu	Shikoku	Kyushu	Ogasawara	Rhukyu	Oriental	Palaeartic	Ethiopian	Nearctic	Neotropical	Australian	F (fruits)	S (sweeping)	G (garbage)	L (light)	T (tree-blood)	M (fungi)	E (human eye)
<i>Cryptochaetum</i>	1 (0)	:	1 (0)	:	1 (0)	:	:	:	1	1	:	:	:	:	:	:	1 (0)	:	:	1 (0)
<i>Aulacigaster</i>	1 (0)	1 (0)	:	:	:	:	:	1	1	:	1	:	:	:	1 (0)	:	:	:	:	:
<i>Diastata</i>	2 (0)	:	2 (0)	:	:	:	1 (0)	:	2	:	:	:	:	1 (0)	1 (0)	:	:	:	:	:
<i>Protostegana</i>	2 (2)	:	1 (1)	:	:	:	1 (1)	:	:	:	:	:	:	:	2 (2)	:	:	:	:	:

	number of Japanese species*	distribution										collecting methods or feeding habits								
		Hokkaido	Honshu	Shikoku	Kyushu	Ogasawara	Rhukyu	Oriental	Palaeartic	Ethiopian	Nearctic	Neotropical	Australian	F (fruits)	S (sweeping)	G (garbage)	L (light)	T (tree-blood)	M (fungi)	E (human eye)
<i>Stegana</i>	1 (0)	1 (0)	1 (0)	:	:	:	:	:	1	:	1	:	:	:	1 (0)	:	:	1 (0)	:	:
<i>Amiota</i>	2 (0)	2 (0)	2 (0)	1 (0)	1 (0)	:	:	2	2	:	1	:	1	1 (0)	2 (0)	:	:	1 (0)	:	2 (0)
<i>Leucophenga</i>	11 (4)	3 (1)	10 (4)	3 (1)	2 (1)	:	:	6	1	2	:	:	:	4 (3)	9 (4)	:	1 (1)	1 (1)	2 (1)	:
<i>Hypselothylea</i>	1 (0)	:	1 (0)	:	:	:	:	1	:	:	:	:	:	:	:	1 (0)	:	:	:	:
<i>Microdrosophila</i>	2 (1)	:	2 (1)	1 (1)	:	:	:	1	1	:	:	:	1	1 (0)	2 (1)	1 (0)	:	:	:	:
<i>Mycodrosophila</i>	9 (8)	2 (1)	3 (2)	1 (1)	6 (5)	:	:	:	1	:	:	:	:	:	:	:	:	1 (1)	8 (7)	:
<i>Dettosomyia</i>	1 (1)	:	1 (1)	:	:	:	:	:	:	:	:	:	:	:	1 (1)	:	1 (1)	:	:	:
<i>Liodrosophila</i>	2 (2)	:	1 (1)	1 (1)	2 (2)	:	:	:	:	:	:	:	:	1 (1)	2 (2)	:	1 (1)	1 (1)	:	:
<i>Chymomyza</i>	6 (2)	2 (0)	6 (2)	:	:	:	:	1	3	:	2	:	:	2 (0)	3 (1)	1 (0)	:	3 (1)	:	:
<i>Scaptomyza</i>	6 (2)	6 (2)	4 (1)	:	:	3 (0)	:	1	3	4	2	:	:	3 (1)	6 (2)	2 (1)	4 (1)	2 (1)	1 (0)	:
<i>Drosophila</i>	62 (33)	35 (20)	50 (27)	24 (12)	26 (11)	3 (0)	7 (0)	12	25	9	9	8	11	53 (24)	34 (23)	16 (5)	18 (7)	25 (11)	16 (13)	:
<i>D. (Hirtodrosophila)</i>	9 (8)	5 (4)	7 (6)	3 (2)	2 (2)	:	:	1	1	:	:	:	:	4 (4)	4 (4)	:	:	1 (1)	7 (6)	:
<i>D. (Dorsilopha)</i>	1 (0)	1 (0)	1 (0)	:	1 (0)	:	:	1	1	1	1	1	1	1 (0)	1 (0)	1 (0)	1 (0)	1 (0)	:	:
<i>D. (Paradrosophila)</i>	3 (1)	1 (0)	3 (1)	:	1 (0)	:	:	:	2	:	:	:	:	2 (0)	2 (1)	1 (0)	1 (0)	2 (0)	:	:
<i>D. (Sophophora)</i>	19 (6)	9 (4)	13 (4)	10 (2)	11 (2)	3 (0)	5 (0)	7	10	3	3	3	6	18 (4)	10 (5)	7 (1)	7 (2)	5 (1)	1 (1)	:
<i>D. (Drosophila)</i>	30 (18)	19 (12)	26 (16)	11 (8)	11 (7)	:	2 (0)	3	11	5	5	4	4	28 (16)	17 (13)	7 (4)	9 (5)	16 (9)	8 (6)	:
Total	109 (55)	52 (24)	85 (40)	31 (16)	38 (19)	3 (0)	9 (1)	25	41	16	16	8	13	66 (29)	64 (36)	22 (7)	26 (11)	35 (16)	27 (20)	3 (0)

\* ( ): number of species endemic to Japan.

The feeding habits of the adult drosophilid flies are more or less closely associated with their dwelling places, though the dissociation may sometimes be pronounced especially in the more active species having wider flying ranges, as in the cases of fruit-feeders. Extreme cases of intimate association may be represented by the fungus-feeders, which are easily found resting on fungi, but are rarely caught by sweeping bushes with insect nets even at the close vicinity of fungi. The sweeping is, however, frequently proved to be successful in finding rare species, whose feeding habits are obscure. The light-trapping seems to have no relation with the feeding habit, but there is indirect association between feeding habits and light-trapping, because of the facts that the most of the species caught at the light-traps are the so-called domestic species, closely related to garbages and fermentated fruits. Thus the author enumerates 7 different kinds of collecting methods as the standards of analysing the feeding habits: F, S, G, L, T, M, and E (see introduction and tables above).

It is summarized that out of 109 total species collected 66 species (about 60%) have been obtained at fruit-traps, 64 (59%) by sweeping, 35 (33%) at tree-bloods, 22 (20%) in garbages, 26 (24%) at light-traps, 27 (25%) from fungi, and 3 (3%) about human eyes. Besides, 3 species have been found associated with flowers (*Amiota variegata*, *Leucophenga maculata*, *Scaptomyza monticola*).

The ranges of the feeding habits in terms of the 7 collecting methods differs from species to



species and may vary in consequence of further collection. The widest range thus far experienced occupies 6 out of 7 methods (FTMSGSL) and is shown by only two species, *D. (D.) bizonata* Kikkawa & Peng and *D. (D.)* sp. of *immigrans* group, which may represent an extreme case of omnivorous or eurybiont species. The 2nd category, covering 5 methods, includes 11 species: 8 of FSLGT-combination, 2 of FSLTM, and one of FSLMG, all involving FSL-elements, but only one MG-and two MT-combinations, and none of MTG-combination. 10 species are ranged in 4 methods: 5 FSLT, 2 FSGT, one FSLM, one FSLG, and one FSTE, in which MG-and MT-combinations do not appear. 11 species fall in the next category of covering 3 methods: 4 FST, 3 FSM, 2 FSG, and each one of FTM and SLM, but none of MG-; 29 species in the 5th, showing various couples of combinations: 8 FS, 5 FT, 2 FM, each two of FG, SL, ST, FL, SM, SG, and each one of SE and LE, but none of MG. The last category includes an extreme case of apparently paurovorous or stenobiont representatives of single method, and in total of 45 species are involved here: 14 F, 14 S, 12 M, 3 T, and 2 G. The 12 species obtained only at the fungi seem to be monophagous in an extreme pureness, these are 2 species of *Leucophenga*, 7 of *Mycodrosophila*, and 3 of *Drosophila* (*Hirtodrosophila*).

Out of 15 genera, 10 have been ascertained to include species captured by sweeping, 7 each at fruit-traps and on tree-bloods, respectively, 6 at light-traps, 5 in garbages, 4 on fungi, and 2 around human eyes.

Among 55 species endemic to Japan, 29 have been trapped at fruits (44 % of the total species trapped at fruits), 36 by sweeping (56 % of the total species collected by the corresponding method), 20 at fungi (74 %), 16 on the tree-bloods (46 %), 11 at light (42 %), 7 in garbage (32 %), and none about human eyes (0 %). The result proves at least that the collection at fungi brings in the endemic species comparatively more often than any of the other finding methods does.

The fungus-feeders have been proved by the author (1953, 1954) to be highly specialized in the phallic organs (PI larger), proximal intestine (C larger), rectal papillae (R larger), as well as Malpighian tubes (posterior tubes apically fused or closely apposed to each other), as compared to the garbage- and fruit-feeders. The terms "fungus feeder" and "fruit feeder" applied here mean the drosophilid flies which are intimately associated with fungi and fruits respectively, and the classification requires to take into consideration the order or degree of the each element of the 7 feeding habits, except in the case of monophagy. In this meaning the fungus-feeders are usually mono- or oligophagous in feeding habits, and at the same time endemic in distribution, as stated above. These two ecological factors turn out to be connected to the morphological specialities. The garbage- and fruit-feeders, on the contrary, tend to occupy the wider geographical areas, having the higher disseminating ability associated with their domestic habits, and are proved to be less specialized in organization (cf. Okada, 1953-5).

## VI. A list of species of Drosophilidae and allied families of Japan

Listed here are a total of 109 Japanese species of Drosophilidae and its allies, arranged after the current system. They belong to 15 genera of 4 families, including 37 new and 8 unnamed species as well as nearly 30 species which are newly recorded from Japan.

	(Page)
Family Cryptochaetidae	8
Genus <i>Cryptochaetum</i> Rondani, 1875	8
<i>Cryptochaetum grandicorne</i> Rondani, 1875	9
Family Aulacigastridae	10
Genus <i>Aulacigaster</i> Macqart, 1835	10
<i>Aulacigaster leucopez</i> (Meigen, 1830)	10
Family Diastatidae	12
Genus <i>Diastata</i> Meigen, 1830	12
<i>Diastata vagans</i> Loew, 1864	12
<i>Diastata ussuriica</i> Duda, 1934	12

Family Drosophilidae	13
Subfamily Steganinae	14
Genus <i>Protostegana</i> Hendel, 1920	14
<i>Protostegana kanoi</i> sp. nov.	14
<i>Protostegana</i> sp. from Taba	16
Genus <i>Stegana</i> Meigen, 1830	17
<i>Stegana coleoptrata</i> (Scopoli, 1763)	17
Genus <i>Amiota</i> Loew, 1862	18
Subgenus <i>Amiota</i> Loew, 1862	19
<i>Amiota</i> ( <i>Amiota</i> ) <i>alboguttata</i> (Whalberg, 1838)	19
Subgenus <i>Phortica</i> Schiner, 1862	20
<i>Amiota</i> ( <i>Phortica</i> ) <i>variegata</i> (Fallén, 1823)	20
Genus <i>Leucophenga</i> Mik, 1886	22
Subgenus <i>Trichiaspiphenga</i> Duda, 1924	24
<i>Lecophegga</i> ( <i>Trichiaspiphenga</i> ) <i>argentosa</i> sp. nov.	24
Subgenus <i>Leucophenga</i> Mik, 1886	25
<i>Leucophenga</i> ( <i>Leucophenga</i> ) <i>magnipalpis</i> Duda, 1924	25
<i>Leucophenga</i> ( <i>Leucophenga</i> ) <i>guttiventris</i> (de Meijère, 1911)	27
<i>Leucophenga</i> ( <i>Leucophenga</i> ) <i>angusta</i> sp. nov.	28
<i>Leucophenga</i> ( <i>Leucophenga</i> ) <i>subpollinosa</i> de Meijère, 1914	30
<i>Leucophenga</i> ( <i>Leucophenga</i> ) <i>concilia</i> sp. nov.	30
<i>Leucophenga</i> ( <i>Leucophenga</i> ) <i>maculata</i> (Dufour, 1839)	32
<i>Leucophenga</i> ( <i>Leucophenga</i> ) <i>quinguemaculipennis</i> sp. nov.	33
<i>Leucophenga</i> ( <i>Leucophenga</i> ) <i>quadripunctata</i> (de Meijère, 1908)	34
<i>Leucophenga</i> ( <i>Leucophenga</i> ) <i>interrupta</i> Duda, 1924	36
<i>Leucophenga</i> ( <i>Leucophenga</i> ) <i>ornatipennis</i> de Meijère, 1914	37
Subfamily Drosophilinae	38
Genus <i>Hypselothyrea</i> de Meijère, 1906	38
<i>Hypselothyrea breviscutellata</i> Duda, 1928	38
Genus <i>Microdrosophila</i> Malloch, 1921	39
Subgenus <i>Microdrosophila</i> Malloch, 1921	40
<i>Microdrosophila</i> ( <i>Microdrosophila</i> ) <i>purpurata</i> sp. nov.	40
Subgenus <i>Incisurifrons</i> Duda, 1924	41
<i>Microdrosophila</i> ( <i>Incisurifrons</i> ) <i>congesta</i> (Zetterstedt, 1847)	41
Genus <i>Mycodrosophila</i> Oldenberg, 1914	43
<i>Mycodrosophila japonica</i> sp. nov.	44
<i>Mycodrosophila shikokuana</i> sp. nov.	45
<i>Mycodrosophila</i> sp. from Kirishimayama	46
<i>Mycodrosophila takachihonis</i> sp. nov.	47
<i>Mycodrosophila splendida</i> sp. nov.	48
<i>Mycodrosophila basalis</i> sp. nov.	50
<i>Mycodrosophila poecilogastra</i> (Loew, 1874)	51
<i>Mycodrosophila setipalpis</i> sp. nov.	53
<i>Mycodrosophila palmata</i> sp. nov.	54
Genus <i>Dettopsomyia</i> Lamb, 1914.	55
<i>Dettopsomyia argentifrons</i> sp. nov.	55
Genus <i>Liodrosophila</i> Duda, 1922	57
<i>Liodrosophila aerea</i> sp. nov.	57
<i>Liodrosophila bicolor</i> sp. nov.	59
Genus <i>Chymomyza</i> Czerny, 1903	60
<i>Chymomyza costata</i> (Zetterstedt, 1888)	60
<i>Chymomyza nigrimana</i> (Meigen, 1830)	61
<i>Chymomyza caudatula</i> Oldenberg, 1914	62
<i>Chymomyza atrimana</i> sp. nov.	65
<i>Chymomyza obscura</i> (de Meijère, 1911)	65

<i>Chymomyza japonica</i> sp. nov.	65
Genus <i>Scaptomyza</i> Hardy, 1843	67
<i>Scaptomyza disticha</i> (Duda, 1921)	68
<i>Scaptomyza apicalis</i> Hardy, 1849	69
<i>Scaptomyza monticola</i> sp. nov.	71
<i>Scaptomyza graminum</i> (Fallén 1823)	73
<i>Scaptomyza polygonia</i> sp. nov.	74
<i>Scaptomyza unipunctum</i> (Zetterstedt, 1847)	75
Genus <i>Drosophila</i> Fallén	76
Subgenus <i>Hirtodrosophila</i> Duda, 1924	76
<i>Drosophila</i> ( <i>Hirtodrosophila</i> ) <i>alboralis</i> Momma & Takada, 1954	78
<i>Drosophila</i> ( <i>Hirtodrosophila</i> ) <i>sexvittata</i> sp. nov.	78
<i>Drosophila</i> ( <i>Hirtodrosophila</i> ) <i>trivittata</i> Strobl, 1893	80
<i>Drosophila</i> ( <i>Hirtodrosophila</i> ) <i>omogoensis</i> sp. nov.	82
<i>Drosophila</i> ( <i>Hirtodrosophila</i> ) <i>quadrivittata</i> sp. nov.	83
<i>Drosophila</i> ( <i>Hirtodrosophila</i> ) <i>nokogiri</i> sp. nov.	84
<i>Drosophila</i> ( <i>Hirtodrosophila</i> ) sp. like <i>histris</i>	87
<i>Drosophila</i> ( <i>Hirtodrosophila</i> ) <i>asozana</i> sp. nov.	87
<i>Drosophila</i> ( <i>Hirtodrosophila</i> ) <i>denticeps</i> Okada & Sasakawa, 1956	88
Subgenus <i>Dorsilopha</i> Sturtevant, 1939	89
<i>Drosophila</i> ( <i>Dorsilopha</i> ) <i>busckii</i> Coquillett, 1901	89
Subgenus <i>Paradrosophila</i> Duda, 1924	91
<i>Drosophila</i> ( <i>Paradrosophila</i> ) <i>coracina</i> Kikkawa & Peng, 1938	92
<i>Drosophila</i> ( <i>Paradrosophila</i> ) <i>rufifrons</i> Loew, 1873	93
<i>Drosophila</i> ( <i>Paradrosophila</i> ) <i>puncticeps</i> sp. nov.	94
Subgenus <i>Sophophora</i> Sturtevant, 1939	95
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<i>Drosophila</i> ( <i>Sophophora</i> ) <i>bifasciata</i> Pomini, 1940	101
<i>affinis</i> species-subgroup Patterson & Wheeler, 1949	104
<i>Drosophila</i> ( <i>Sophophora</i> ) sp. cf. <i>helvetica</i> Burla, 1948	104
<i>melanogaster</i> species-group Sturtevant, 1942	105
<i>suzukii</i> series Okada, 1954	105
<i>suzukii</i> species-subgroup Hsu, 1949	105
<i>Drosophila</i> ( <i>Sophophora</i> ) <i>suzukii</i> (Matsumura, 1931)	105
<i>Drosophila</i> ( <i>Sophophora</i> ) <i>pulchrella</i> Tan, Hsu, & Sheng, 1949	106
<i>Drosophila</i> ( <i>Sophophora</i> ) <i>unipectinata</i> Duda, 1924	107
<i>melanogaster</i> series Okada, 1954	108
<i>takahashii</i> species-subgroup Hsu, 1949	108
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<i>Drosophila</i> ( <i>Sophophora</i> ) <i>takahashii</i> Sturtevant, 1927	109
<i>melanogaster</i> species-subgroup Hsu, 1949	110
<i>Drosophila</i> ( <i>Sophophora</i> ) <i>melanogaster</i> Meigen, 1830	110
<i>Drosophila</i> ( <i>Sophora</i> ) <i>simulans</i> Sturtevant, 1914	111
<i>ficuspila</i> species-subgroup Okada, 1954	111
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<i>montium</i> series Okada, 1954	112
<i>nipponica</i> species-subgroup Okada, 1954	112
<i>Drosophila</i> ( <i>Sophophora</i> ) <i>nipponica</i> Kikkawa & Peng, 1938	112
<i>Drosophila</i> ( <i>Sophophora</i> ) <i>magnipectinata</i> sp. nov.	113
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<i>ananassae</i> species-subgroup Hsu, 1949	116
<i>Drosophila</i> ( <i>Sophophora</i> ) <i>ananassae</i> Doleschall, 1856	116
<i>Drosophila</i> ( <i>Sophophora</i> ) <i>biplectinata</i> Duda, 1923	117
<i>montium</i> species-subgroup Hsu, 1949	118
<i>Drosophila</i> ( <i>Sophophora</i> ) <i>kikkawai</i> Burla, 1954	118

<i>Drosophila</i> ( <i>Sophophora</i> ) <i>auraria</i> Peng, 1937	119
<i>Drosophila</i> ( <i>Sophophora</i> ) <i>rufa</i> Kikkawa & Peng, 1938	121
Subgenus <i>Drosophila</i> Fallén, 1823	121
<i>quinaria</i> section Hsu, 1949	126
<i>quinaria</i> species-group Sturtevant, 1942	126
<i>Drosophila</i> ( <i>Drosophila</i> ) <i>brachynephros</i> sp. nov.	126
<i>Drosophila</i> ( <i>Drosophila</i> ) <i>angularis</i> sp. nov.	128
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<i>Drosophila</i> ( <i>Drosophila</i> ) <i>nigromaculata</i> Kikkawa & Peng, 1938	131
<i>Drosophila</i> ( <i>Drosophila</i> ) <i>kuntzei</i> Duda, 1924	132
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<i>Drosophila</i> ( <i>Drosophila</i> ) <i>testacea</i> van Roser, 1940	134
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<i>Drosophila</i> ( <i>Drosophila</i> ) sp. of <i>quinaria</i> section	137
<i>Drosophila</i> ( <i>Drosophila</i> ) <i>histrio</i> Meigen, 1830	137
ungrouped species near <i>grandis</i> Kikkawa & Peng	139
<i>Drosophila</i> ( <i>Drosophila</i> ) <i>grandis</i> Kikkawa & Peng, 1938	139
<i>Drosophila</i> ( <i>Drosophila</i> ) <i>acutissima</i> sp. nov.	139
<i>Drosophila</i> ( <i>Drosophila</i> ) <i>tenuicauda</i> sp. nov.	141
<i>funebis</i> species-group Sturtevant, 1942	143
<i>Drosophila</i> ( <i>Drosophila</i> ) <i>funebis</i> (Fabricius, 1787)	143
<i>Drosophila</i> ( <i>Drosophila</i> ) <i>multispina</i> sp. nov.	143
<i>Drosophila</i> ( <i>Drosophila</i> ) <i>maculinotata</i> sp. nov.	145
<i>immigrans</i> species-group Sturtevant, 1942	146
<i>Drosophila</i> ( <i>Drosophila</i> ) <i>immigrans</i> Sturtevant, 1921	147
<i>Drosophila</i> ( <i>Drosophila</i> ) sp. of <i>immigrans</i> group	148
<i>Drosophila</i> ( <i>Drosophila</i> ) <i>virgata</i> Tan, Hsu, & Sheng, 1949	149
<i>Drosophila</i> ( <i>Drosophila</i> ) <i>komaii</i> Kikkawa & Peng, 1938	151
<i>virilis</i> Section Hsu, 1949	152
<i>subtilis</i> species-group Okada, nov.	152
<i>Drosophila</i> ( <i>Drosophila</i> ) <i>subtilis</i> Kikkawa & Peng, 1938	152
<i>melanica</i> species-group Sturtevant, 1942	153
<i>Drosophila</i> ( <i>Drosophila</i> ) <i>melanissima</i> of Kikkawa & Peng, 1938	153
<i>virilis</i> species-group Sturtevant, 1942	154
<i>Drosophila</i> ( <i>Drosophila</i> ) <i>virilis</i> Sturtevant, 1916	154
ungrouped species near <i>virilis</i> Sturtevant	155
<i>Drosophila</i> ( <i>Drosophila</i> ) <i>daruma</i> sp. nov.	155
<i>robusta</i> species-group Sturtevant, 1942	157
<i>Drosophila</i> ( <i>Drosophila</i> ) <i>sordidula</i> Kikkawa & Peng, 1938	157
<i>Drosophila</i> ( <i>Drosophila</i> ) <i>lacertosa</i> sp. nov.	158
<i>Drosophila</i> ( <i>Drosophila</i> ) sp. of <i>robusta</i> group, II.	159
<i>repleta</i> species-group	160
<i>Drosophila</i> ( <i>Drosophila</i> ) <i>repleta</i> Wollaston, 1858	160
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## VII. Summary

1. As the Japanese members of the Drosophilidae and the allied families (Cryptochaetidae, Aulacigastridae, Diastatidae), are recorded here in total of 109 species belonging to 15 genera including 37 new and 8 unnamed species as well as nearly 30 species which are newly recorded from Japan.

2. A historical review of taxonomic and faunistic studies thus far contributed upon the Japanese species is made briefly.
3. The external and internal features of adult flies, the collection and distribution data, as well as the adult feeding habits of these species are described.
4. Four different forms of keys, with regard to, 1) general features, 2) periphallid organs, 3) phallic organs, and 4) egg-guides, are given to discriminate families, subfamilies, genera, species-groups, species-subgroups, and species.
5. Analytical studies are attempted in respect of geographical distribution and adult feeding habits.
6. Interrelations among the systematic groups higher than species-groups are discussed in view of the phallic formulae.
7. A list of Japanese species arranged after the current system is given.

## VIII. Bibliography

- Basden, E.B. 1952. Some *Drosophilidae* (Diptera) of the British Isles, *Ent. Month. Mag.*, 88: 200-201.
- Basden, E.B. 1954. Comment on the proposed validation under the plenary powers of "*immigrans*" Sturtevant, 1921, as published in the combination "*Drosophila immigrans*" (Class Insecta, Order Diptera), *Bull. Zool. Nomencl.*, 9: 343-344.
- Basden, E.B. 1954. The distribution and biology of *Drosophilidae* (Diptera) in Scotland, including a new species of "*Drosophila*", *Trans. Royal Soc. Edinburgh*, 72: 603-654.
- Becker, Th. 1908. Dipteren der Kanarischen Inseln, *Mitt. Zool. Mus.*, 4: 1-180.
- Becker, Th. 1908. Dipteren der Insel Madeira, *Mitt. Zool. Mus.*, 4: 181-206.
- Borror, D.J. & DeLong, W.M., 1955. An introduction to the study of insect, New York.
- Breuer, M.E. & Pavan, C., 1954. Genitalia masculina de "*Drosophila*" do grupo "*dreyfusi*" (Diptera), *Rev. Brazil. Biol.*, 14: 465-475.
- Brues, C.T. & Melander, A.L., 1932. Classification of insects, *Bull. Mus. Comp. Zool. Harvard*, 73: 1-672.
- Burla, H. 1948. Die Gattung *Drosophila* in der Schweiz., *Rev. Suisse. de Zool.*, 55: 272-279.
- Burla, H. 1951. Systematik, Verbreitung und Oekologie der *Drosophila*-arten der Schweiz, *Rev. Suisse. de Zool.*, 58: 23-175.
- Burla, H. 1954. Distinction between four species of *melanogaster* group, "*Drosophila séguyi*", "*D. montium*", "*D. kikkawai*" sp. n. and "*D. auraria*" (*Drosophilidae*, Diptera), *Rev. Brazil. Biol.*, 14: 41-54.
- Burla, H. 1954. Zur Kenntniss der *Drosophiliden* der Elfenbeinküste, *Rev. Suisse. Zool.*, 61: 1-218.
- Burla, H. & Pavan, C. 1953. The "*Calloptera*" group of species (*Drosophila*, Diptera), *Rev. Brazil. Biol.*, 13: 291-314.
- Burla, H., daCunha, A.B., Cordeiro, A.R., Dobzhansky, Th., Malogolowkin, D. & Pavan, C. 1949. The *willistoni* group of sibling species of *Drosophila*, *Evolution*, 3: 300-314.
- Buzzati-Traverso, A. 1943. Morphologia, Citologia e Biologia di due nuove specie di *Drosophila*, *Ist. Lomb. Sci. et Lett. Rendite. Sci.*, 77: 1-13.
- Buzzati-Traverso, A. 1953. The *obscura* group of the genus *Drosophila*, *Advances in Genetics*, 7: 47-92.
- Chino, M. 1927. Genetic study of Japanese *Drosophila*, *Zool. Mag.*, 39: 472-476 (in Japanese).
- Chino, M. 1929. Genetic study of *Drosophila virilis*, *Japan. Journ. Genet.*, 4: 117-131 (in Japanese).
- Chino, M. 1936. The genetics of *Drosophila virilis*, *Japan. Journ. Genet.*, 12: 189-210 (in Japanese).
- Chino, M. & Kikkawa, H. 1934. Shôjôbae no Iden to Jikkenho (Genetics and experimental methods of *Drosophila*), Tokyo (in Japanese).
- Clausen, C.P. 1940. Entomophagous insects, 688 pp., N. Y.
- Collin, J.E. 1952. Notes on some *Drosophilidae* (Dipt.) including five additional British species, two of them new species, *Ent. Month. Mag.*, 88: 197-199.
- Collin, J.E. 1953. On the British species of *Scaptomyza* Hardy and *Parascaptomyza* Duda, *Entomologist*, 86: 148-151.
- Colyer, C.N. 1954. *D. repleta* Wollaston (Dipt. *Drosophilidae*): a further British record and a correction, *Ent. Month. Mag.*, 90: 98.

- Coquillett, D.W. 1898. Report on a collection of Japanese Diptera, presented to the U.S. National Museum by the Imperial University of Tokyo, Proc. U.S. National Mus., 2: 301-340.
- Curran, C.H. 1932. The Norwegian Zoological expedition to the Galapagos Islands 1925, conducted by Alf. Wollebaeck, IV Diptera, Med. Zool. Mus. Oslo, no. 30: 347-366.
- Czerny, L. 1903. Über *Drosophila costata* und *fuscimana* Zett., Zeitschr. f. syst. Hym. u. Dipt., 3: 198-201.
- de Castro, L.E. 1953. Estudo Comparativo das Cerdas Cuneiformes das Pernas dos Drosophilideos (Diptera), Rev. Brazil. Biol., 13: 363-368.
- de Meijère, J.C.H. 1906. Über einige Indo-Australische Dipteren des Ungarischen National Museums, bez. des Naturhistorischen Museums zu Genua, Ann. Mus. Nation. Hung., 4: 193-194.
- de Meijère, J.C.H. 1911. Südostasiatische Dipteren, VI. Tijd. v. Ent., 54: 258-432.
- de Meijère, J.C.H. 1916. Studien über südostasiatische Dipteren, XI, Tijd. v. Ent., 59: 184-213.
- Demerec, M. 1950. Biology of *Drosophila*, New York.
- Dobzhansky, Th. 1937, 1941, 1951. Genetics and the origin of species.
- Dobzhansky, Th. & Pavan, C., 1943. Studies on Brazilian species of *Drosophila*, Bol. Facul. Fil. Ciên e let., Univ. S. Paulo, no. 36, Biol. Geral, no. 4: 7-72.
- Duda, O. 1923. Die orientalischen und australischen Drosophiliden-Arten (Dipteren) des ungarischen National-Museums zu Budapest, Ann. Mus. Nation. Hung., 20: 24-59.
- Duda, O. 1924. Beitrag zur Systematik der Drosophiliden unter besonderer Berücksichtigung der paläarktischen u. orientalischen Arten (Dipteren). Arch. f. Naturg., 90 A (3): 172-234.
- Duda, O. 1924. Die Drosophiliden (Dipteren) des deutschen entomologischen Institutes der Kaiser Wilhelm-Gesellschaft (früh. Deutsches Entomolog. Mus.) aus H. Sauter's Ausbeute. Arch. f. Naturg., 90 A (3) 235-259.
- Duda, O. 1924. Revision der europäischen Arten der Gattung *Drosophila* Fallén (Dipt.), Ent. Medd., 14: 246-313.
- Duda, O. 1928. Beitrag zur Kenntnis der südostasiatischen Drosophilidengattung *Hypselothyrea* de Meijère (Dipt.), Annal. Mus. Nation. Hung., 25: 79-90.
- Duda, O. 1929. Fauna Buruana, Diptera, Acalyptrata, Treubia, 7: 415-422.
- Duda, O. 1929. Die Ausbeute der deutschen Chao-Expedition 1925-26 (Diptera). VI. Sepsidae, VII. Piophilidae, VIII. Cypselidae, IX, Drosophilidae und X. Chloropidae, Konowia, 8: 33-50.
- Duda, O. 1931. Chloropidae, Drosophilidae, Dipterologischer Beitrag zu der von H.J. Feuerborn, F. Ruttner und Thienemann im Jahre 1928 und 1929 nach Java, Sumatra und Bali unternommenen Limnologischen Forschungsreise, Arch. f. Hydrobiol., Suppl. 9: 192-198.
- Duda, O. 1934-5. Aulacogastridae, Diastatidae und Drosophilidae in Lindner's Die Fliegen der paläarktischen Region, 58 c: 1-5; e: 1-18; g: 1-118.
- Duda, O. 1936. Weitere neue afrikanische und orientalische akalyptrate Musciden (Dipt.) des British Museum, Ann. Mag., Nat. Hist., (10) 18: 337-351.
- Duda, O. 1939. Revision der Afrikanischen Drosophiliden (Diptera) I, Ann. Mus. Nat. Hung., 32: 1-57.
- Duda, O. 1940. Revision der Afrikanischen Drosophiliden (Diptera) II., Ann. Mus. Nat. Hung., 33: 19-53.
- Dyson-Hudson V.R. (Demerec), 1954. Key to the British species of *Drosophila* of the *obscura* species group, Journ. Hered., 52: 555-561.
- Enderlein, G. Zweiflügler, Die Tierwelt Mitteleuropas, 4 (2) Ins. 3, Abt. XVI, 1-259.
- Esaki, T. 1930. Zoological nomenclature, in Iwanami's Seibutsugaku-koza, 41 pp., Tokyo (in Japanese).
- Esaki, T. 1939. Guide to the taxonomic zoology, in Seibutsugaku Jikkenho-koza, 70 pp., Tokyo (in Japanese).
- Esaki, T. et al. 1932, 1950. Nippon Konchu Zukan (Iconographia Insectorum Japonicorum), original and revised editions, Tokyo (in Japanese).
- Freire-Maia, N. 1949. Balanced polymorphism in *Drosophila montium*, Evolution, 3: 98.
- Frolova, S.L., & Astaurov, B.L. 1930. Die Chromosomengarnitur als systematisches Merkmal (Eine vergleichende Untersuchung der russischen und amerikanischen *Drosophila obscura* Fall.), Zeits. Zellf. mikr. Anat., 10: 201-213.
- Frota-Pessoa O. 1954. Revision of the *tripunctata* group of *Drosophila* with description of fifteen new species (Drosophilidae, Diptera), Arquiv. do Mus. Paranaense Curitiba, 10: 253-330.

- Handlirsch, A. 1925. Systematische Übersicht, in Schröder's Handbuch der Entomologie, Jena.
- Harrison, R.A. 1952. New Zealand Drosophilidae, Trans. Proc. Roy. Soc. New Zealand, 79: 514.
- Hendel, Fr. 1920. Zwei europäischen Dipterengattungen, Wien. ent. Zeit., 38: 53-56.
- Hendel, Fr. 1922. Die paläarktischen Musciden, acalyptraten, nach Familien und Gattungen, Kownowia, 1: 145-160, 253-265.
- Hendel, Fr. 1928. Über die minierenden europäischen *Scaptomyza*-Arten und ihre Biologie (Diptera), Zool. Anz., 76: 289-302.
- Hendel, Fr. 1928. Zwei Flügler oder Diptera, II. Allgemeiner Teil, in Die Tierwelt Deutschlands und der angrenzenden Meeresteile nach ihren Merkmalen und nach ihrer Lebensweise.
- Hering, E.M. 1940. Neue Acalyptraten aus Manchukuo, Arb. morph. taxon. Ent. Berlin, 7: 288-295.
- Hering, E.M. 1954. Support for the application to validate the name "*immigrans*" Sruetevant, 1921, as published in the combination "*Drosophila immigrans*" Bull. Zool. Nomencl., 9: 344.
- Herting, B. 1953. Revision zwei europäischer *Drosophila*-Arten, Beitr. Ent., 3: 166-168.
- Hsu, T.C. 1949. The external genital apparatus of male Drosophilidae in relation to systematics, Univ. Texas Publ., 4920: 80-142.
- Ishihara, T. 1955. Some aspects on the diurnal feeding behavior of *Drosophila* observed on Mt. Asahi, Zool. Mag., 64: 90-93 (in Japanese with English résumé).
- Ishihara, T. 1955. A preliminary study on diurnal activity of *Drosophila* in Hokkaido, Zool. Mag., 64: 84-89.
- Iwamura, M. & Nobuchi, A. 1954. The injurious insects of Japanese pine mushroom, III. The injurious fauna and their control, Journ. Japan. Forest. Soc., 36: 335-339 (in Japanese with English résumé).
- Kanzawa, T. 1934. Studies on a fruit-fly, *Drosophila* sp., Kontyû, 8: 302-303 (in Japanese).
- Kanzawa, T. 1934. Studies on a fruit-fly, *Drosophila suzukii* (preliminary report), Rep. Yamanashi Agric. Stat., 24 pp. (in Japanese).
- Kanzawa, T. 1939. Studies on a fruit-fly, *Drosophila suzukii*, Rep. Yamanashi Agric. Stat., 49 pp. (in Japanese).
- Kato, M. & Hori, K. 1952. Studies on the associative ecology of insects, V. Synecological analysis of *Drosophila* association in Sendai, Japan, Sci. Rep. Tohoku Univ., 4. ser., 19: 231-237.
- Kato, M. & Hori, K. 1954. Synecological analysis of *Drosophila* association in Sendai, Japan, Kontyû, 20: 44 (in Japanese).
- Kikkawa, H. 1936. Two races of *Drosophila montium* (A preliminary note), Japan. Journ. Genet., 12: 137-142.
- Kikkawa, H. & Peng, F.T. 1938. *Drosophila* species of Japan and adjacent localities, Japan. Journ. Zool., 7: 507-552.
- Knab, F. 1912. *Drosophila repleta*, Psyche, 19: 106-108.
- Knab, F. 1914. On the genus *Cryptochaetum*, Insec. Insci. Menst., 2: 33-36.
- Koizumi, K. 1952. Eye-flies at Okayama, Kurashiki Konchû Dôkôkai Kaiho, 1: 2-8 (in Japanese).
- Koizumi, K. 1954. *Cryptochaetum grandicorne* and *Amiota variegata* as an eye-fly in Japan (Diptera, Acalyptera), Kontyû, 20: 25 (in Japanese).
- Komai, T. 1952. Shôjôbae no Iden to Jikken (Genetics and experiments of *Drosophila*), Tokyo, 205 pp. (in Japanese).
- Komai, T. 1950. Evolution theory with respect to Japanese materials, Tokyo (in Japanese).
- Komai, T. & Sakai, K. 1956. Syûdan-Idengaku (Population Genetics), Tokyo (in Japanese with English résumé).
- Kurisaki, M., 1925. On the scientific name and the biology of the Japanese vinegar-fly, Bulteno Scienca de la Fakultato Terkultura, Kejusu Imperia Universitato, 1: 274-284 (in Japanese, with English résumé).
- Kurisaki, M., 1926. On the scientific name and the biology of the Japanese vinegar-fly, Zool. Mag., 38: 263 (in Japanese).
- Kurokawa, H. 1952. Sexual isolation between two types of *Drosophila auraria* Peng, Japan, Journ. Genet., 27: 225 (in Japanese).
- Kurokawa, H. 1956. Comparative studies on some characteristics of three races of *Drosophila auraria*, Annot. Zool. Japon. (in press).
- Kuwana, I. 1922. Studies on Japanese Monophlebinae, Contribution I. The genus *Warajicoccus*, Dept. Agr. & Comm. Imp. Plant Quar. St. Bull., 1: 1-58.

- Kuwana, I. 1922. Studies on Japanese Monophlebinae, Contribution II. The genus *Icerya*, Dept. Agr. & Comm. Imp. Plant Quar. St. Bull., 2: 1-43.
- Lamb, C.B. 1914. Reports of the Percy Sladen Trust Expedition, Diptera, Trans. Linn. Soc., London, 2 ser., 16: 307-372.
- Malloch, J.R. 1921. Some notes on Drosophilidae (Diptera) Ent. News, 32: 311-312.
- Malloch, J.R. 1923. Notes on Australian Diptera with descriptions, Proc. Linn. Soc., N.S. Wales, 48: 601-622.
- Malloch, J.R. 1924. Descriptions of neotropical two-winged flies of the family Drosophilidae, Proc. U.S. Nat. Mus., 66 (3) 2540: 51-61.
- Malloch, J.R. 1924. Two Drosophilidae from Coimbatore, Mem. Dept. Agric. in India, 8: 1-11.
- Malloch, J.R. 1934. Insects of Samoa and other Samoan terrestrial Arthropoda, Part VI. Diptera, Fasc. 8, pp. 267-328, Drosophilidae, Ephydriidae, Sphaeroceridae, and Milichiidae.
- Malogolowkin, C. 1948. Sobre a genitália dos Drosophilideos (Diptera): II. *Drosophila ananassae*, Rev. Brazil. Biol., 11: 431-434.
- Malogolowkin, C. 1952. Sobre a genitália dos "Drosophilidae" (Diptera): III. Grupo *willistoni* do genero "*Drosophila*", Rev. Brazil. Biol., 12: 79-96.
- Malogolowkin, C. 1951. Drosophilideos colhidos na Bahia, com descricao de uma espécie nova (Diptera), Rev. Brasil., Biol., 11: 431-434.
- Malogolowkin, C. 1953. Sobre a genitália dos Drosophilideos. IV. A genitália masculina no subgenero "*Drosophila*" (Diptera, Drosophilidae), Rev. Brazil. Biol., 13: 245-264.
- Marumo, N. 1925. Key to families of Japanese insects (in Japanese).
- Matsumura, S. 1906. List of Japanese injurious insects, 52 pp., Tokyo (in Japanese).
- Matsumura, S. 1915. Dai-nippon gaichu zensho (Manual of Japanese injurious insects), Vol. II (in Japanese).
- Matsumura, S. 1931. 6000 illustrated insects of Japan Empire, Tokyo (in Japanese).
- Meigen, J.W. 1860. Systematische Beschreibung der bekannten europäischen zweiflügeligen Insekten. 6.
- Mizuno, T. 1952. A note on the genetical survey of *Drosophila* in Hokkaido, Papers from the Coordinating Comit. for Res. in Genet., 3: 51-55 (in Japanese with English résumé).
- Momma, E. 1954. *Drosophila* survey of Hokkaido, II. Chromosomes of seven wild species, Journ. Fac. Sci. Hokkaido Univ., Zool., VI, 12: 200-208.
- Momma, E. & Takada, H. 1954. *Drosophila* survey of Hokkaido, I. Description of a new species, *Drosophila alboralis* sp. nov. (subgenus *Hirtodrosophila*), Annot. zool., Japon., 27: 97-101.
- Moriwaki, D. 1934. Mutant characters in a species of *Drosophila*, Japan. Journ. Genet., 9: 164-168 (in Japanese with English résumé).
- Moriwaki, D. 1935. Some mutant characters in *D. ananassae*, Genetica, 17: 32-46.
- Moriwaki, D. 1936. The behaviour of Plexate, a mutant gene of *Drosophila ananasse*, Japan. Journ. Genet., 12: 183-188.
- Moriwaki, D. 1952. Salivary chromosomes of *Drosophila bifasciata* in Japan (a preliminary note), Japan. Journ. Genet., 27: 224 (in Japanese).
- Moriwaki, D. & Okada, T. 1952. Variations of peg-like bristles on egg-guid in *Drosophila ananassae*, Annot. zool. Japon., 25: 212-217.
- Moriwaki, D., Okada, T., Ohba, S. & Kurokawa, H. 1952. *Drosophila* species belonging to the "obscura" group found in Japan, Zool. Mag., 61: 283-287 (in Japanese with English résumé).
- Moriwaki, D. & Kitagawa, O. 1955. Salivary gland chromosomes of *Drosophila bifasciata*, Cytologia, 20: 247-257.
- Nakayama, S. & Okamoto, D. 1940. Catalogue of the insects injurious upon fruit trees in Korea, Annal. Agric. Exp. St. Government General of Chosen, 12: 195-247 (in Japanese).
- Nawa, U. 1915. On the family Muscidae, Ins. World, 24: 264-267 (in Japanese).
- Ohba, S. 1934. Oecology of *Drosophila* population, Kagaku (Science), 24: 128-134 (in Japanese).
- Ohira, J. 1952. Insects feeding on dried human feces, Shin-konchû, 5 (3): 10-15. (in Japanese)
- Okada, T. 1950. Pictorial key to species of Japanese Drosophilidae, Iden, 5: 26-30 (in Japanese).
- Okada, T. 1952. Key to Japanese species of the family Drosophilidae, in Komai's Shôjôbae no Iden to Jikken, Tokyo.
- Okada, T. 1953. Comparative morphology of the drosophilid flies III. The "Phallosomal Index" and its relation with systematics, Zool. Mag., 62: 278-283 (in Japanese with English résumé).
- Okada, T. 1953. Comparative morphology of the drosophilid flies IV. The "Phallosomal Index" of



- the closely allied species, in relation to their geographical distribution and the adult food-habits, Zool. Mag., 62:284-287 (in Japanese with English résumé).
- Okada, T. 1953. Comparative morphology of the egg-guides of the drosophilid flies, Zool. Mag., 68:120 (in Japanese).
- Okada, T. 1954. Comparative morphology of the drosophilid flies I. Phallic organs of the *melanogaster* species group, Kontyû, 22:36-46.
- Okada, T. 1954. Comparative morphology of the drosophilid flies V. Convolution of the proximal intestine in adult flies, Zool. Mag., 63:257-261 (in Japanese with English résumé).
- Okada, T. 1954. Comparative morphology of the drosophilid flies VI. Rectal papillae, their number, arrangement and shape, Zool. Mag., 63:257-265 (in Japanese with English résumé).
- Okada, T. 1954. Fungus feeding drosophilid flies in Japan, Journ. Appl. Zool., 19:78-82 (in Japanese with English résumé).
- Okada, T. 1955. Comparative morphology of the drosophilid flies II. Phallic organs of the subgenus *Drosophila*, Kontyû, 23:97-104.
- Okada, T. 1955. Comparative morphology of the drosophilid flies VII. The Malpighian tubes of the adult flies, Zool. Mag., 64:108-112 (in Japanese with English résumé).
- Okada, T. 1955. Fauna and flora of Nepal Himalaya: *Drosophila*, Sci. result. Japan. Exped. to Nepal Himalaya, 1952-1953, 1:387-390.
- Okada, T. Kurokawa, H. 1956. Note on some new or little known species of Drosophilidae in Japan, Kontyû (in press).
- Okada, T. & Sasakawa, M. 1956. Leaf-mining species of Drosophilidae (Diptera), Akitu (Trans. Kyoto Ent. soc.), 5:25-28.
- Oldenberg, L. 1914. Beitrag zur Kenntnis der europäischen Drosophiliden, Arch. f. Naturg., 80 A (2):11-42.
- Ômachi, F. et al. 1951. Annotated list of animals and plants of Mie Prefecture, Japan, VII Insecta, 52 pp., Mie.
- Ôshima, C. 1953. Balanced polymorphism in the populations of living matters, Seibutsu Shinka, 1:15-26 (in Japanese with English résumé).
- Patterson, J. T. 1943. The Drosophilidae of the Southwest, Univ. of Texas Publ., 4313:7-214.
- Patterson, J. T. & Mainland, G. B. 1944. The Drosophilidae of Mexico, Univ. of Texas Publ., 4445:1-101.
- Patterson, J. T. & Stone, W. S. 1952. Evolution in the genus *Drosophila*, New York.
- Patterson, J. T. & Wagner, R. P. 1943. Geographical distribution of species of the subgenera *Hirtodrosophila* and *Drosophila*, in the United States and Mexico, Univ. of Texas Publ., 4313:217-281.
- Patterson, J. T. & Wheeler, M. R. 1942. Description of new species of the subgenera *Hirtodrosophila* and *Drosophila*, Univ. of Texas Publ., 4213:67-109.
- Patterson J. T. & Wheeler, M. R. 1949. Catalogue of described species belonging to the genus *Drosophila*, with observation on their geographical distribution, Univ. Texas Publ., 4920:207-233.
- Pavan, C. & da Cunha, A. B. 1947. Espécies Brasileiras de *Drosophila*, Biol. Facul. Filos. Ciên. e Letr., 86, Biol. Geral., 7:3-46.
- Peng, F. T. 1937. On some species of *Drosophila* from China, Annot. Zool. Japon., 16:20-27.
- Pomini, F. P. 1940. Contributi alla conoscenza delle *Drosophila* europee, I. Descrizione de alcune specie riferibili al gruppo *obscura*, Boll. Ist. Ent. Univ. Bologna, 12:145-164.
- Rizki, T. M. 1951. Morphological differences between two sibling species, *Drosophila pseudoobscura* and *Drosophila persimilis*, Proc. Nat. Acad. Sci., 37:156-159.
- Salles, H. 1948. Sobre a genitália dos Drosophilideos (Diptera): I. *Drosophila melanogaster* e *D. simulans*, Summ. Brasil. Biol., 1:311-383.
- Séguy, E. 1932. Contribution a l' etude des mouches phytophages de l' Europe Occidentale, I, Encycl. Entom., B II, 7:167-242.
- Séguy, E. 1934. Diptera (Brachycères), Faune de France, 28:832 pp., Paris.
- Séguy, E. 1951. Ordre des Diptères, in Traite de Zoologie, Insectes superieures et Hemipteroides, 10 (1):449-744.
- Shiraki, T. 1911. Catalogue of injurious insects of Formosa, Taihoku.
- Shiraki, T. 1954. Classification of insects, Tokyo.
- Snodgrass, R. E. 1935. Principles of insect morphology, New York and London.

- Sobels, F. H., Vlijm, L. & Lever, J. 1954. The distribution of the genus *Drosophila* in the Netherlands, Arch. Neerland Zool., 10 (4) : 357-375.
- Spencer, W. P. 1940. On the biology of *Drosophila immigrans* Sturtevant, with special reference to the genetic structure of populations, Ohio Journ. Sci., 40 : 345-361.
- Stalker, H. D. 1945. On the biology and genetics of *Scaptomyza graminum* Fall. (Diptera, Drosophilidae), Genetics, 30 : 266-277.
- Stalker, H. D. & Spencer, W. P. 1939. Four new species of *Drosophila*, with notes on the *funnebris* group, Ann. Ent. Soc. Amer., 32 : 105-112.
- Strasburger, E. 1935. *Drosophila melanogaster* Meig., Eine Einführung in den Bau und die Entwicklung, Berlin.
- Sturtevant, A. H. 1919. A new species closely resembling *Drosophila melanogaster*, Psyche, 26 : 153-155.
- Sturtevant, A. H. 1921. The North American species of *Drosophila*, Carn. Inst. Wash. Publ., 301 : 1-141.
- Sturtevant, A. H. 1923. New species and notes on synonymy and distribution of Muscidae Acalypteratae, Amer. Mus. Novit., 76 : 1-12.
- Sturtevant, A. H. 1927. Philippine and other oriental Drosophilidae, Philip. Journ. Sci., 32 : 361-374.
- Sturtevant, A. H. 1939. On the subdivision of the genus *Drosophila*, Proc. Nat. Acad. Sci., 25 : 137-141.
- Sturtevant, A. H. 1940. Genetic data on *Drosophila affinis*, with a discussion of the relationships in the subgenus *Sophophora*, Genetics, 25 : 337-353.
- Sturtevant, A. H. 1942. The classification of the genus *Drosophila*, with descriptions of nine new species, Univ. of Texas Publ., 4213 : 5-51.
- Sturtevant, A. H. 1946. On the dot chromosomes of *Drosophila repleta* and *D. hydei*, Genetics, 31 : 259-268.
- Sturtevant, A. H. & Novitsky, E. 1941. The homologies of the chromosomal elements in the genus *Drosophila*, Genetics, 26 : 157-541.
- Suzuki, K. 1955. A field survey of drosophilids which feed and breed on plants, Zool. Mag., 64 : 44-49 (in Japanese with English résumé).
- Suzuki, M. 1915. A list of prepared specimens in Hanazono Entomological Laboratory, Kyoto, 90 pp. (in Japanese).
- Takada, H. 1952. Geographical variations in the wing indices of the drosophilid flies, Kagaku (Science), 22 : 540-541 (in Japanese).
- Takada, H. 1954. Two types of *D. auraria*, with special regard to the difference in distribution by altitude, Japan. Journ. Genet., 29 : 109-113 (in Japanese with English résumé).
- Takada, H., Momma, E. & Nakahara, H., 1953. Drosophilid flies of Hokkaido and their distribution (Preliminary report), Zool. Mag., 68 : 120 (in Japanese).
- Tan, C. C., Hsu, T. C. & Sheng, T. C. 1949. Known *Drosophila* species in China with descriptions of twelve new species, Univ. of Texas Publ., 4920 : 196-206.
- Thorpe, W. H. 1930. The biology, post-embryonic development, and economic importance of *Cryptochaetum iceryae*, parasitic on *Icerya purchasi*, Proc. Zool. Soc. Lond., 1930 : 938-969.
- Tokunaga, M. 1943. Iyô Konchûgaku (Medical entomology), Vol. II, Tokyo.
- Uchida, T. 1951. Conspectus of systematic zoology, Kiso-kagaku, 28 : 1-11 (in Japanese).
- Uchida, T. 1955. Manual for studying systematic zoology, Nakayama's Seibutsugaku-jikkenho-kôza, Tokyo.
- Uchiike, T. 1925. Insects injurious on cherry, Ins. World, 29 : 407-409 (in Japanese).
- Wakahama, K. 1956. *Drosophila* survey in Hokkaido III. Some flies new to *Drosophila* fauna of Hokkaido, Annot. Zool. Japon., 29 : 116-120.
- Wheeler, M. R. 1949. The subgenus *Pholadoris* (*Drosophila*) with descriptions of two new species, Univ. of Texas Publ., 4920 : 143-156.
- Wheeler, M. R. 1949. Taxonomic studies on the Drosophilidae, Univ. of Texas Publ., 4920 : 157-195.
- Wheeler, M. R. 1949. The two "varieties" of *Drosophila montium*, Evolution, 3 : 268.
- Wheeler, M. R. 1952. The Drosophilidae of the Nearctic Region, exclusive of the genus *Drosophila*, Univ. of Texas Publ., 5204 : 162-218.
- Wheeler, M. R. 1954. Taxonomic studies on American Drosophilidae, Univ. of Texas Publ., 5422 :

### Reports appeared in the "Drosophila Information Service"

- Basden, E. B. 1955. A conspecificity of *Parascaptomyza disticha* (Duda) and "*Scaptomyza graminum*" (auctt), 29:103.
- Burla, H. 1953. What is called *D. montium* today is not identical with the type specimen, 27:86.
- Ishihara, T., Momma, E., & Makino, S. 1953. Diurnal activity of some *Drosophila* species, 27:95.
- Makino, S. 1949. The geographic variation of some species of *Drosophila* in Hokkaido, 23:94.
- Makino, S. & Kanehisa, T. 1951. A preliminary survey of the geographical distribution of *Drosophila* in Hokkaido, 25:110-111.
- Makino, S. & Kanehisa, T. 1951. A monthly survey of *Drosophila* in city of Sapporo, Hokkaido, 25:111.
- Makino, S. & Mizuno, T. 1950. Distribution of some *Drosophila* species in Hokkaido, 24:86.
- Makino, S., Momma, E., & Takada, H. 1952. Observed distribution of *Drosophila* species in relation to altitude on Mt. Asahidake, Hokkaido, Japan., 26:109.
- Makino, S., Momma, E., Takada, H., & Ishihara, T. 1952. Species of *Drosophila* so far collected in Hokkaido, Japan (1952), by localities, 26:109.
- Makino, S., Momma, E., & Wakahama, K. 1954. Diurnal activity of *D. auraria*, 28:133.
- Makino, S. & Takada, H. 1951. Monthly survey of *Drosophila* in the vicinity of Otaru City, Hokkaido, 25:111.
- Makino, S., Momma, E., Takada, H., & Wakahama, K. 1955. Drosophilidae collected in Hokkaido, 29:134-135.
- Mather, W. B. 1954. The genus *Drosophila* in Queensland, 28:133-134 (proposal of *coracina* and other species-groups).
- Momma, E. 1955. Some predominant species of *Drosophila* in Hokkaido, 29:140.
- Momma, E., Suzuki, K., & Makino, S. 1953. Drosophilidae feeding and breeding on fungi, 27:103-104.
- Momma, E. & Wakahama, K. 1955. Seasonal behavior of Drosophilidae at Sapporo, 29:141.
- Moriwaki, D. 1937. *Drosophila repleta* found in Tokyo, 8:79-80.
- Moriwaki, D., Okada, T., & Kurokawa, H. 1952. Two types of *D. auraria*, 26:112.
- Moriwaki, D., Okada, T., Ohba, S., & Kurokawa, H. 1951. *Drosophila* species belonging to the "*obscura*" group found in Japan, 25:116.
- Moriwaki, D., Okada, T., Ohba, S., & Kurokawa, H. 1953. Further information on *Drosophila* species belonging to the "*obscura*" group found in Japan, 27:104.
- Okada, T. 1953. Comparative morphology of the rectal papillae of drosophilid flies, 27:109.
- Okada, T. 1953. Convolution of the mid-intestines of adult drosophilid flies, 27:109.
- Okada, T. 1954. Comparative morphology of the Malpighian tubes of adult drosophilid flies, 28:150.
- Prevosti, A. 1953. Two newly introduced species of *Drosophila* found in Europe, 27:110 (record of *D. (S.) ananassae* from Europe).
- Suzuki, K., Momma, E., & Makino, S. 1953. Species of Drosophilidae living on plants, 27:113.
- Takada, T., Makino, S., Momma, E., & Suzuki, K. 1953. Two rare species of *Drosophila* from Hokkaido, 27:114.
- Takada, H. & Makino, S. 1952. Two different types of *D. auraria* and their habitats, 26:123.
- Toyofuku, Y. & Momma, E. 1955. A cloudy pattern of wings of *D. nigromaculata*, 29:170.

### Addenda

- Mather, W. B. 1955. The genus *Drosophila* (Diptera) in Eastern Queensland, I. Taxonomy, Australian Journ. Zool., 3:545-582.