Drosophila Survey of Hokkaido, V. Distribution and Habitats of Drosophilid Flies[1)]

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(With 1 Text-figure)

During the last few years, investigations into the distribution of the genus *Drosophila* have made striking progress in various countries, and a great amount of data have so far been accumulated for North and South America (Patterson 1943, Townsend 1952, Williams and Miller 1952 ,Burla and Pavan 1953, Burla 1954a), Europe — Scotland (Basden 1954), Norway (Basden and Harnden 1956), Finland (Hackman 1954), Netherlands (Sobels, Vlijm and Lever 1954), Switzerland (Burla 1951), France, Spain, Portugal (Burla and Gloor 1952, Hadorn *et al.* 1952) —, West Africa (Burla 1954b), and Australasian Queensland (Mather 1955).

Kikkawa and Peng (1938) seem to be the first to deal with the classification and distribution of the Japanese *Drosophila*; they recorded 27 species mainly from the southern districts of this country. Then some fragmental studies were contributed by a few investigators to this field. Quite recently Okada (1956) has completed a monograph which involves the description of 105 species of Japanese Drosophilidae, together with description of ecological and morphological investigations. The published records from Hokkaido, however, seem to be rather fragmental. Therefore a survey into the distribution of various species of the Drosophilidae has been carried on by the author and his co-workers since 1954, to discover which species occur in Hokkaido and to learn something of thier biology. This has been done at the suggestion and with the encouragement of Professor S. Makino. Preliminary notes have been published in D.I.S. and some other journals (Makino and Kanehisa 1951; Makino, Momma and Takada 1952; Makino, Momma, Takada and Wakahama 1955; Makino, Momma and Wakahama 1956; Mizuno 1952; Momma 1954, 1955, 1956; Momma, Suzuki and Makino 1953; Suzuki 1955; Suzuki, Momma and Makino 1953). The data extending over the years from 1951 to 1956 will be summarized in the present paper, with particular concern to the habitats of Drosophilidae together with their distribu-

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tion in Hokkaido. Hokkaido is the northernmost island of Japan loated at the same latitude as the northern frontier of the Manchurian Subregion near by the south of the Siberian Subregion in Palaearctic Region. There are particular biotopes with heavy pine-forests showing varied climatic and physiographic conditions. Such particular enviromental conditions open an interesting field for the study of the wild population of Drosophilidae.

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Procedure of Collecting Drosophila : Extensive collections were made in the city of Sapporo and many other localities in Hokkaido (Fig. 1). Through the seasons of the years

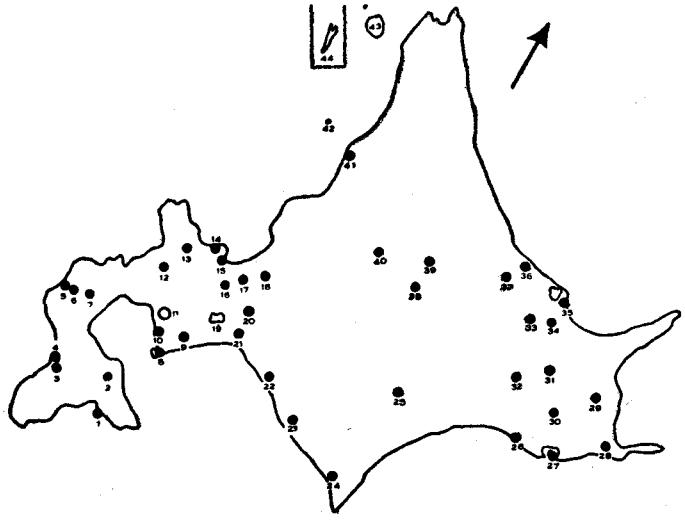

Fig. 1. Localities where collections were made.
1, Hakodate. 2, Ōnuma. 3, Gamushi. 4, Esashi. 5, Setana. 6, Imagane. 7, Hanaishi. 8, Muroran. 9, Noboribetsu. 10, Date-Monbetsu. 11, Tôya. 12, Niseko. 13, Shikaribetsu. 14, Oshoro. 15. Otaru. 16, Jôzankei. 17, Sapporo. 18, Nopporo. 19, Shikotsu. 20, Chitose. 21, Numanohata. 22, Nishi-Mombetsu. 23, Shizunai. 24, Samani. 25, Obihiro. 26, Kushiro. 27, Akkeshi. 28, Atsutoko. 29, Naka-Shibetsu. 30, Shibecha. 31, Teshikaga. 32, Akan. 33, Kitami. 34, Bihoro. 35, Abashiri. 36, Naka-Yûbetsu. 37, Engaru. 38, Taisetsu. 39, Kamikawa. 40, Asahigawa. 41, Kotambetsu. 42, Teuri. 43, Rishiri. 44, Rebun.

1951-1956, monthly trapping and occasional sweeping were done in the University Botanical Garden located in the central part of the city (about 50 ft. above sea level), where many old elm trees flowish constituting a grassy park with heavy bushes along ponds and a stream. Further, many incidental collections were made mainly by trapping at different localities in Hokkaido. A large amount of the flies was collected by the use of traps baited with banana or other fermenting fruits according to the method of Patterson (1943). Large numbers of specimens which show no attraction to such baits were captured by means of net sweepings in various sorts of vegetation. In addition a small number of species was collected by the use of a glass pipe by sucking into it a single fly feeding on vegetation of various kinds.

Results

A total of 40,572 specimens of Drosophilidae have so far been obtained in collection. They represent 55 species (49 known and 6 unidentified) belonging to six genera. The collection records for the period of six years from 1951 to 1956 inclusive are summarized in Table 1.

Most flies of the genus *Drosophila* showed attraction to the fermenting fruits; an exception was the species of the subgenus *Hirtodrosophila*. Among the species lured to the baits, *D. auraria* and *D. nigromaculata* are very predominant in number. The former especially is distributed abundantly in the southern part of Hokkaido, and usually shows the highest frequency in occurrence in Sapporo in July or August at the time of the highest temperature. The latter is the most common species with the most extensive distribution over Hokkaido as a whole. A large number of this species could also be obtained on various kinds of grasses and fungi by employing a net and a glass pipe. *D. bifasciata* is usually common in highland areas of this island, since many specimens were obtained in mountainous regions, such as at Mt. Asahidake, Akan and Bihoro. *D. brachynephros* and *D. testacea* are rather common in Hokkaido. They are also fungi-feeders. The latter species was also found in alpine flora of Mt. Asahidake at an altitude of about 5400 ft. though not abundant. *D. immigrans* is a familiar species, common in neighbourhood of human habitation, not being found in highlands far from villages. *D. lutea* and *D. lacertosa* are common in this island too; the former is to be found around human habitations and the latter in remote thick forests.

A number of flies was collected on different herbs by the net sweeping method, and a vast proportion of the collections was made at various localities neighbouring the city of Sapporo, during a period ranging from June to October in 1953. A total of 2,199 flies thus obtained yielded examples of the following twelve species; *S. disticha* (502 specimens), *apicalis* (70 specimens), *graminum* (1 specimen), *unipunctum* (1 specimen), *D. nipponica* (838 specimens), *nigromaculata* (618 specimens), *auraria* (90 specimens), *brachynephros* (37 specimens), *magnipectinata* (17 specimens), *testacea* (13 specimens), *moriwakii* (10 specimens), and *histrio* (2 specimens). They were caught from many kinds of grasses. Particularly such grasses as *Cryptotaenia*, *Trifolium* and *Polygonum* were attractive to many of

Table 1. Species and number of flies collected so far in Hokkaido

Species	1951*	1952	1953	1954	1955	1956	Total
Amiota alboguttata	—	—	—	1	—	—	1
A. leucostoma	—	—	1	—	—	—	1
A. variegata	6	2	—	16	9	3	36
Amiota sp. I	—	3	—	52	—	3	58
Amiota sp. II	—	—	—	2	—	2	4
Leucophenga maculata / *L. magnipalpis* / *L. quinquemaculipennis*	—	3	19	—	—	—	22
Mycodrosophila japonica	—	2	117	—	—	1	120
M. poecilogastra	—	—	37	—	—	—	37
Chymomyza caudatula / *C. nigrimana*	—	1	1	11	—	—	13
Scaptomyza apicalis	—	—	85	311	8	1	405
S. disticha	—	8	568	786	48	450	1860
S. graminum	14	2	12	207	39	62	336
S. monticola	—	—	—	—	4	—	4
S. polygonia	—	—	1	1	1	—	3
S. unipunctum	—	—	70	8	3	—	81
Drosophila alboralis	—	5	31	3	2	3	44
D. nokogiri	—	14	36	18	—	1	69
D. sexvittata	—	—	444	—	—	10	454
D. trivittata	—	—	370	—	—	—	370
D. histrioides	—	—	110	18	15	535	678
D. busckii	191	69	3	—	491	4	758
D. coracina	8	9	27	22	11	109	186
D. auraria	2615	1903	575	904	2317	2397	10711
D. bifasciata	38	21	919	679	294	1169	3120
D. lutea	3	2	64	11	11	1661	1752
D. magnipectinata	—	—	49	13	20	7	89
D. melanogaster	259	18	33	61	34	2	407
D. nipponica	—	—	905	46	66	4	1021
D. rufa	1	17	43	11	4	—	76
D. suzukii	34	62	2	27	93	122	340
D. (Sophophora) sp. I	—	1	3	2	—	—	6
D. (Sophophora) sp. II	—	—	—	—	1	—	1
D. brachynephros / *D. unispina*	201	128	542	389	185	1364	2809
D. funebris	68	25	194	18	114	17	436
D. histrio	13	—	48	59	40	40	200
D. hydei	8	—	—	10	—	1	19
D. immigrans	396	148	238	25	258	595	1660
D. kuntzei	—	1	3	4	—	—	8
D. lacertosa	61	10	42	246	211	545	1115
D. makinoi	—	—	2	1	—	—	3
D. melanissima	—	—	39	3	—	—	42
D. multispina	—	—	17	1	—	—	18
D. nigromaculata	1079	568	2001	1753	410	2513	8324
D. sordidula	15	28	197	36	17	100	393
D. tenuicauda	—	1	23	—	1	—	25
D. testacea	178	47	368	214	69	1214	2090
D. virilis	56	22	14	11	61	24	188
D. bizonata	—	—	1	7	2	—	10
D. moriwakii	—	—	29	31	11	1	72
D. (Drosophila) sp.	—	6	30	—	—	7	43
Drosophila sp.	2	8	7	32	—	5	54
Total	5246	3134	8320	6050	4850	12972	40572

* Data in 1951 are due to Prof. S. Makino, and Messrs. T. Mizuno and T. Kanehisa.

the species mentioned above.

The collection from various kinds of fungi was performed by the use of a net and a glass pipe. From fourteen kinds of fungi, a total of 1,731 individuals which belong to twenty-two species representing four genera was collected. They are *L. maculata* (5 specimens), *M. japonica* (117 specimens), *poecilogastra* (37 specimens), *S. disticha* (12 specimens), *garminum* (1 specimen), *D: sexvittata* (444 specimens), *trivittata* (370 specimens), *brachynephros* (287 specimens), *funebris* (87 specimens), *nigromaculata* (84 specimens), *testacea* (49 specimens), *immigrans* (29 specimens), *alboralis* (28 specimens), *nipponica* (21 specimens), *melanissima* (19 specimens), *auraria* (12 specimens), *lacertosa* (7 specimens), *coracina* (5 specimens), *lutea* (3 specimens), *histrioides* (110 specimens), and *moriwakii* (4 specimens). It is noticeable that a large number of specimens and species was obtained on *Pleurotus*, *Coprinus* and *Favolus* (*Polypolus*).

Remarks

It is well-known that most species of the genus *Drosophila* exclusive of the subgenus *Hirtodrosophila* are attracted to various fermenting fruits. Such species were collected in a large number by the use of traps baited with fermenting banana in many districts. Some of the genus *Drosophila*, the subgenus *Hirtodrosophiia*, *nipponica* belonging to the subgenus *Sophophora*, and of other genera, though they do not readily come to traps, were caught in great number by the aid of a net or by being sucked up into a glass pipe from many kinds of grasses and fungi. A great amount of these collections was made at various locations neighbouring Sapporo City in 1953 and near Hakodate City in 1954.

Several specimens of the genus *Scaptomyza* and subgenus *Hirtodrosophila* were captured in a certain place at an altitude of about 4000 ft. on Mt. Asahidake by the use of traps and through insignificant sweeping. A small number of flies belonging to *Mycodrosophila* was obtained at several localities, such as Chitose, Kushiro, Akkeshi and Atsutoko by random sweeping. At Bihoro in the northeastern part of this island, a single specimen of *D. nipponica* was attracted to a banana baited trap. It is supposed from the above evidence that the species as mentioned above may be extensively distributed even in the highlands far from villages in Hokkaido.

Summary

Collections of the drosophilid flies were made at various districts of Hokkaido from 1951 to 1956 (Fig. 1), with particular attention to their habitats and distribution. A total of 40,572 flies representing 55 species belonging to six genera was obtained mostly in traps baited with fermenting banana, partially by the aid of a net and a drawing glass pipe (Table 1). The data accumulated over a period of six years are summarized in this paper.

D. auraria and *D. nigromaculata* were found to be most common showing

the most extensive distribution. In highland areas *D. bifasciata* was found to be most dominant among drosophilid flies. Twelve species were collected from various kinds of grasses. Most specimens belonging to the genus *Scaptomyza* and *D. nipponica* have been found on grasses. Fungi are also attractive to many species; twenty-two species were obtained from several kinds of fungi. Species belonging to the genus *Mycodrosophila* and the subgenus *Hirtodrosophila* have mostly been caught from fungi. *D. nigromaculata* was found to be one of the most dominant drosophilids; a great many flies were obtained on various kinds of grasses, fungi and fruits.

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