Drosophila Survey of Hokkaido, XXV. Some Observations on Summer Diurnal Activity of Drosophilid Flies in Two Localities of Southwestern Hokkaido[1)2)]

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(With 2 Text-figures and 1 Table)

Recently ecological studies of *Drosophila* have attracted the attention of ecologists and geneticists, particularly in concomitance with the development of population genetics. Generally *Drosophila* flies show a considerable variation in diurnal behavior in different seasons and different habitats. Studies along this line have been carried out in the past by many investigators in this field (Dobzhansky and Epling, 1944; Pavan *et al.*, 1950; Kato and Hori, 1952; Hachiya, 1952; Moriwaki *et al.*, 1952; Ishihara, 1955; Nozawa, 1956; Wakahama, 1957; Takada, 1958; Kaneko and Shima, 1962; Lee, 1962).

The present paper reports some accounts of the diurnal behavior observed in two localities in the southwestern part of Hokkaido, in summer of 1964 and 1965.

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Method of Collection: Collections were made from the 21st to the 23rd of July, 1964 in Matsumae by Dr. T. Shima, and from the 3rd to 5th of August, 1965 in Ohnuma by the author. Traps containing fermenting banana pieces to which water suspension of yeast was added. The bait traps were placed in shady sites on the preceding day of collections, about 30–50 cm high above the ground. As the use was made of the following containers: dry-milk cans with a capacity of about 660 ml, and those with about 1,000 ml or more in capacity. Drosophilid flies were collected hourly from 4.00 a.m. to 7.00 p.m. for three consecutive days in each locality. Temperature, humidity, cloud amount and wind class were recorded in each.

Results and Remarks

In Matsumae, a total of 1,423 flies was collected, which were represented by 12 species belonging to 2 genera. In Ohnuma a total of 1,380 flies belonging to 16

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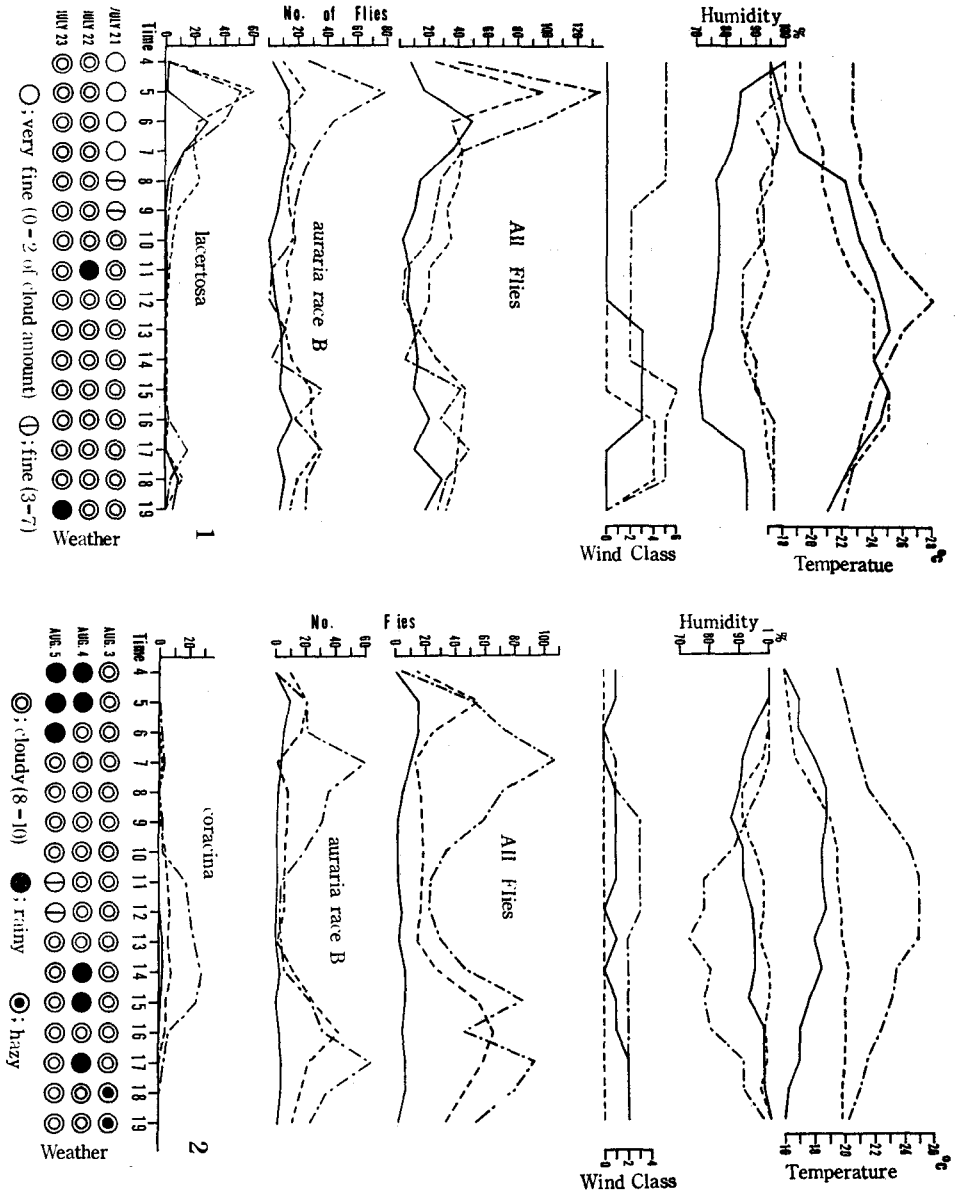
Table 1. Numerical data of drosophilid flies collected in three successive days in Matsumae and Ohnuma

Localities / Years	Matsumae 1964				Ohnuma 1965			
Species	July 21	July 22	July 23	Total	Aug. 3	Aug. 4	Aug. 5	Total
Amiota variegata	—	1	—	1	—	—	—	—
Drosophila coracina	12	10	16	38	5	42	128	175
Drosophila bifasciata	—	—	—	—	—	—	19	19
Drosophila suzukii	—	—	1	1	—	—	—	—
Drosophila lutea	—	—	1	1	—	—	—	—
Drosophila auraria race A	11	35	14	60	12	33	91	136
Drosophila auraria race B	131	287	398	816	34	217	383	634
Drosophila auraria race C	3	1	—	4	2	1	7	10
Drosophila brachynephros	2	3	2	7	4	8	18	30
Drosophila nigromaculata	27	50	27	104	5	9	58	72
Drosophila testacea	3	5	2	10	1	19	55	75
Drosophila histrio	—	—	—	—	—	—	9	9
Drosophila immigrans	—	—	—	—	3	7	15	25
Drosophila pengi	—	—	—	—	—	—	2	2
Drosophila virilis	—	—	—	—	—	—	1	1
Drosophila ezoana	—	2	3	5	—	1	—	1
Drosophila lacertosa	63	173	133	369	2	46	29	77
Drosophila moriwakii	2	2	2	6	1	1	3	5
Drosophila okadai	—	1	—	1	1	1	—	2
Drosophila sordidula	—	—	—	—	6	33	67	106
Drosophila pseudosordidula	—	—	—	—	—	1	—	1
Total	254	570	599	1423	76	419	885	1380

species of the genus *Drosophila* was obtained. They are presented in Table 1. The diurnal activity of the flies, except *D. coracina*, showed clearly bimodality (Figs. 1-2). The biomodal curves were of similar nature to those obtained in Taisetsu and Sapporo by Ishihara (1955). Flies visiting the bait were chiefly in the morning and evening, and quiescent during the daytime. In all cases, except on the 2nd day in Ohnuma, a peak in the morning was higher than that in the evening. *Drosophila lacertosa* showed a prominently high peak in activity at 5.00 or 6.00 a. m., and a small peak at 5.00 or 6.00 p.m. in accordance with the reports of Kaneko and Shima (1962) and Wakahama *et al.* (1963). *Drosophila auraria* race B exhibited generally the highest occurrence ranging from 5.00 to 7.00 a.m. and a small peak from 4.00 to 6.00 p.m. The activity pattern is similar to that observed in Naebutoro (Wakahama *et al.*, 1963) and in Kongju, Korea (Lee, 1962). *Drosophila coracina* showed unimodality in activity with a peak in the daytime in Ohnuma in agreement with the description of Shima (1960). Lee (1962) reported that *D. coracina* was abundant in the afternoon.

In general, the activity of insects inclines to be little affected directly by cloud amount, but rather to be more affected indirectly (Prochnow, 1905–1906;



Figs. 1—2. Graphs diurnal rhythm of activity in drosophilid flies visiting baits, and weather conditions observed in two localities for three successive days; solid lines—the features in the 1st day, dotted lines—those in the 2nd day and chain lines—those in the 3rd day. Wind class was recorded by 12 grades of Beaufort wind scale. 1: Matsumae. 2: Ohnuma.

Uvarov, 1928; Parker, 1930). It has been reported that diurnal rhythm of activity of drosophilid flies depends upon the diurnal cycle of the illumination instensity (Hachiya, 1952; Kato and Hori, 1952; Ishihara, 1955; Takada, 1958). Though any illumination intensity to the activity was not measured, the influence of cloud amount and rain was recognized in the present study. On cloudy days and also days with occasional drizzle rain, the activity in the daytime was not so quiescent as that on fine days.

There are some reports that wind have markedly influence on flying insects (Turner 1920, Rudolfs 1923). Hachiya (1952) observed that the *Drosophila* showed a very low activity all day in which wind retained strong, sometimes as far as over 10 m/sec., except a dawn calm and an evening calm. Ishihara (1955) described that the diurnal activity of *Dorsophila* was affected by wind of more than 5 m/sec. In contrast, no particular influence of wind was recognized on the activity of *Dorsophila* in the present study.

In order of the 1st, the 2nd and the 3rd of the three days, flies visiting banana traps were of increment in number both in Matsumae and Ohnuma (Table 1). Such an increase in their appearence seems to depend mainly on air temperature and relative humidity in the present observation. The most numerous flies visiting the baits at each locality were observed in days of relatively high temperature and humidity. Grahama-Smith (1916, 1919) described that flight activity of the fly was recognized over 10°C, and the optimal temperature for the flight activity was from 20° to 25°C. In this case, it was the optimal range of air temperature on the day when a high activity was observed (Figs. 1–2).

Summary

Diurnal activity of drosophilid flies, observed in Ohnuma and Matsumae in Summer of 1964 and 1965, showed bimodal curves with peaks in the morning and evening. *Drosophila coracina* exhibited a unimodal activity with a peak in the daytime.

High activity was observed on the days within the optimal air temperature from 20° to 25°C.

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