Faunal Composition and Seasonal Distribution of Tabanid Flies (Diptera, Tabanidae) at Plain and Mountain Pastures in Northern Tochigi, Japan

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In previous studies on Tabanidae, about 100 species have been found in Japan[9]. Of them, 10–20 tabanid species were abundant in grazing pastures, and seemed to be serious pests for livestock[1-6,8,10,13,14].

The injury caused by tabanids may be summarized as follows: The females attack livestock directly and suck blood as much as their own weight or more. They act as vectors of diseases in livestock, such as Bovine Leukosis and Anaplasmosis[7,11]. The attack by tabanids causes unusual diurnal activity of grazing cattle and results in decreased intake of food[5,12,15,17].

The present study was conducted to clarify the faunal composition and seasonal distribution of host-seeking female tabanids at plain and mountain pastures in northern Tochigi.

Study areas

Plain pasture: Surveys on tabanid population were made at an experimental pasture of the National Grassland Research Institute in Nishinasuno, Tochigi. The pasture lies on the flat area of the Nasunogahara Alluvial Fan, about 300 m above the sea. The surface layer of the ground consists of the Nasu volcanic ash soil with vegetation cover. The vegetation is dominated by Red top, Perennial rygrass, and Tall fescue. The pasture is surrounded with tree lines dominated by pine and Japanese ceder. Japanese Black cows and Holstein cows are reared on pasture during the period from May to November. Any pest control has not been made there.

Mountain pasture: The study was done at the Hachirogahara grazing pasture, located in a northern ridge of Mt. Takahara, about 15 km west of Nishinasuno (850–900 m alt.). The pasture with an area of 67 ha is surrounded by mixed forest. Vegetation in the pasture is dominated by Italian ryegrass, and Orchard grass. About 150 Holstein cattle are reared on pasture from mid May to mid October. Spraying chemicals to the cattle was made 2–3 times a month, and to the grassland 3 times a year. Seasonal distribution of air temperature and rain fall at each study area is given in Figs. 1 and 2.

Methods

Plain pasture: A Holstein cow and a Japanese cow were tethered 5 m apart. Tabanids landing on each cow were collected with the insect net for 1 hr, 10:00–11:00 am, at 10-day intervals, from April 17 to November 24, 1978, and April 16 to December 4, 1979.

Mountain pasture: A mosquito net baited with CO_2 gas was used as the fly trap. The trap was suspended on the center of a flat and open site in the pasture (880 m alt.). Trapping was made from 10:00 am to 2:00 pm, twice a month, during the period of May 28–October 17, 1980. The survey was replicated during the period of May 14–September 12,

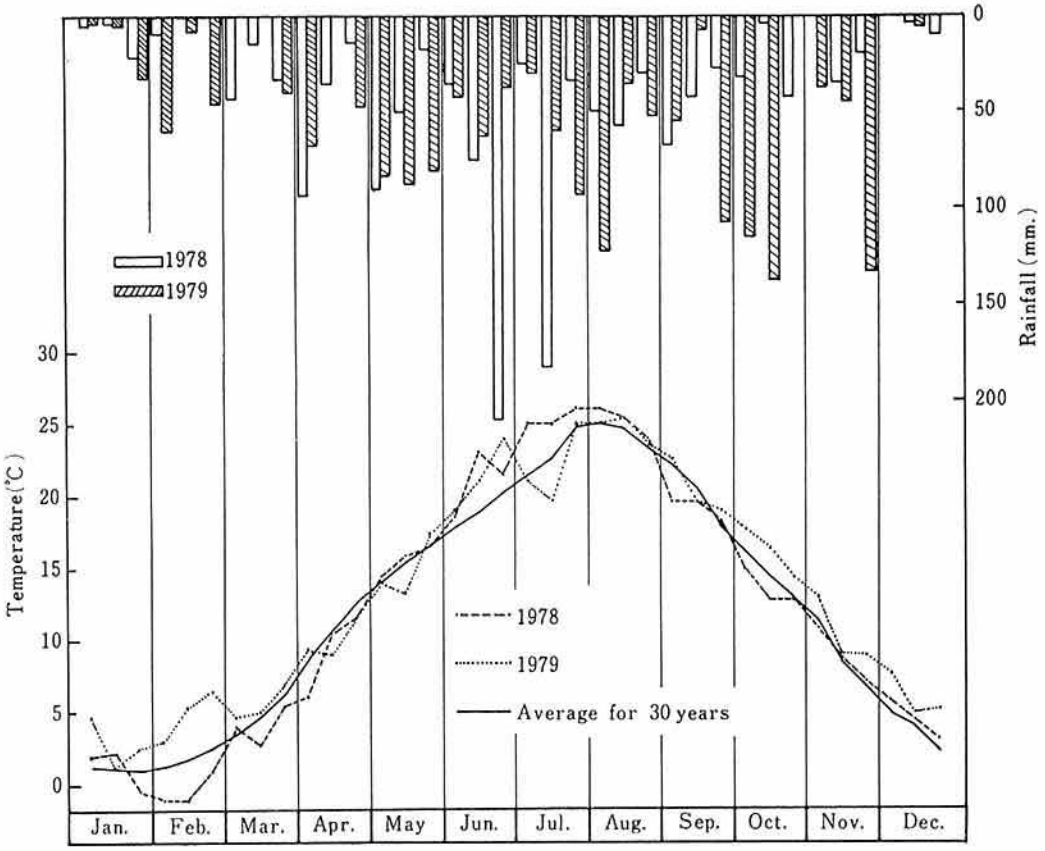

Fig. 1. Mean air temperature and total rainfall in 10-day periods, recorded at National Grassland Research Institute, Nishinasuno, Tochigi[6]

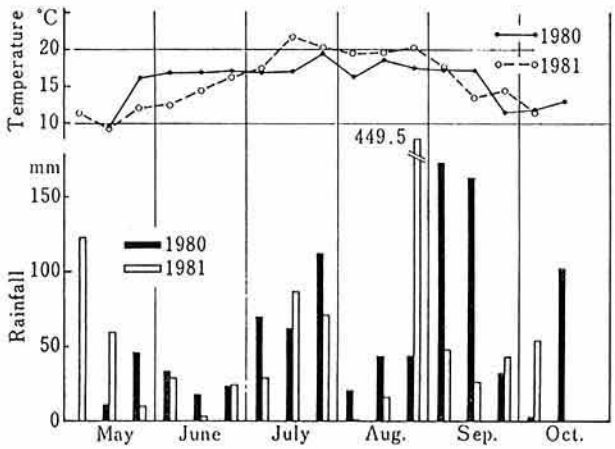

Fig. 2. Mean air temperature and total rainfall in 10-day periods at Hachirogahara pasture[8]

1981. In this case, the trapping was continued for 12–14 hrs a day. Complementary collections were made in both sites.

Results and discussion

1) Faunal composition in plain and mountain pastures

During the study, 2,264 female tabanids which belong to 11 species and 2 genera were captured at the plain pasture (Table 1). Although more tabanids were collected in 1979 than in 1978, faunal composition was quite similar between both years. Among the 11 species, *Tabanus nipponicus* Murdoch et Takahasi was the most abundant and occupied 59.8% of the total specimens. *Atylotus bivittateinus* Takahashi was the second predominant species, occupying 36.8% of the total. The other 9 species comprised only a small portion; each less than 1% of the total capture, except *A. horvathi* (Szilady) which amounted to 1.1%.

In the mountain pasture, the total of 3,802 tabanids composed of 20 species and 6 genera were trapped during 2 active fly seasons (Table 2). The faunal composition was similar between both years. *T. nipponicus* was the most dominant, comprising 74.8% of the total collection, followed by *T. chrysurus* Loew (9.0%) and *T. rufidens* (Bigot) (5.9%). The other 17 species comprised below 2% of the total catches.

Complementary sampling with the CO_2-baited trap was made at the plain pasture in 1982. Eleven species composed of 2 genera were trapped, and the faunal composition was identical with that shown by the sweeping method. Faunal composition of the major tabanids differed between both pastures except for *T. nipponicus* which was the most abundant commonly in both pastures. *A. bivittateinus* was captured in plenty during the season of 1978 and 1979 at the plain pasture, whereas only 2 specimens of this species was found at the mountain pasture. *T. chrysurus*, a major mountain species, comprised only 0.4% of the total catch at the plain pasture.

Table 1. Species and number of tabanid flies collected from cows at a pasture in Nishinasuno, Tochigi

Species	No. of flies			
	1978	1979	Total	%
Tabanus nipponicus	299	1,054	1,353	59.8
Atylotus bivittateinus	272	561	833	36.8
A. horvathi	9	17	26	1.1
T. trigonus	16	2	18	0.8
T. kinoshitai	4	7	11	0.5
T. chrysurus	7	2	9	0.4
T. fulvimedioides	5	1	6	0.3
T. pallidiventris	1	2	3	0.1
T. rufidens	2	0	2	0.1
T. trigeminus	1	1	2	0.1
Hirosia humilis	0	1	1	0.0
Total	616	1,648	2,264	100

After Ito et al. (1982), tabulation partly modified.

Table 2. Species and number of tabanid flies collected by CO_2-baited trap at Hachirogahara pasture, Shiobara, Tochigi

Species	No. of flies			
	1980	1981	Total	%
Tabanus nipponicus	1,824	1,023	2,847	74.8
T. chrysurus	148	195	343	9.0
T. rufidens	96	128	224	5.9
Hybomitra hirticeps	20	56	76	2.0
T. sapporoenus	30	41	71	1.9
Hirosia humilis	25	39	64	1.7
T. kinoshitai	17	35	52	1.4
Chrysops japonicus	19	19	38	1.0
T. trigeminus	9	14	23	0.6
Hy. distinguenda	9	8	17	0.5
T. fulvimedioides	4	8	12	0.3
Hi. sapporensis	8	3	11	0.3
T. monomiensis	7	1	8	0.2
T. chrysurinus	3	3	6	0.2
Isshikia japonica	1	2	3	0.3
Atylotus bivittateinus	0	2	2	
Hi. iyoensis	2	0	2	
C. suavis	0	1	1	
Hy. harai	0	1	1	
T. katoi	1	0	1	
Total	2,223	1,579	3,802	100

After Matsumura & Ito (1985), tabulation partly modified.

2) *Seasonal distribution of active tabanids*

The host-seeking activity of tabanids at the plain pasture started from late June and lasted until mid September in 1979 or until early October in 1978, showing 2 or 3 peaks from July to August (Fig. 3). As shown in Fig. 4, *T. nipponicus* appeared in mid or late June, reached a peak in early July, and decreased sharply in late July. This species was continuously captured until September. *A. bivittateinus* was active in late summer from late June to early October in 1978 or to mid September in 1979 with a peak in August.

In Fig. 4, a tendency that more tabanids were captured from Japanese Black cow than from Holstein cow was observed. It was reported that tabanids prefer the dark colored matter[3,16].

Tabanids were found at the mountain pasture from May to September (Fig. 5). The largest number of species was collected in late July in 1980, or early August in 1981. Although the number of individuals trapped per hr showed a sharp peak in early July, it was mainly caused by the high activity of *T. nipponicus*.

Seasonal distribution of flight activity of each species at the mountain pasture is given in Fig. 6. *T. nipponicus* was trapped during the period from late June to early September with a sharp peak of the flight activity in early July. *C. japonicus* Wiedemann, *H. hirticeps* (Loew), and *T. monomiensis* M.T. were early season species which were active from May to June. *T. katoi* Kono et Takahasi, *H. sapporensis* Shiraki, *A. bivittateinus*, and *H. iyoensis* Shiraki seemed to be rare and late season species which were active only August and/or September. *T. chrysurus* and *T. rufidens* were large-sized species which appeared commonly from July to September.

As described above *T. nipponicus* was the most common and predominant species in both pastures. It was reported that this species was abundant at open grassland of lowland mainly in Tohoku and Hokkaido districts[1-3,13].

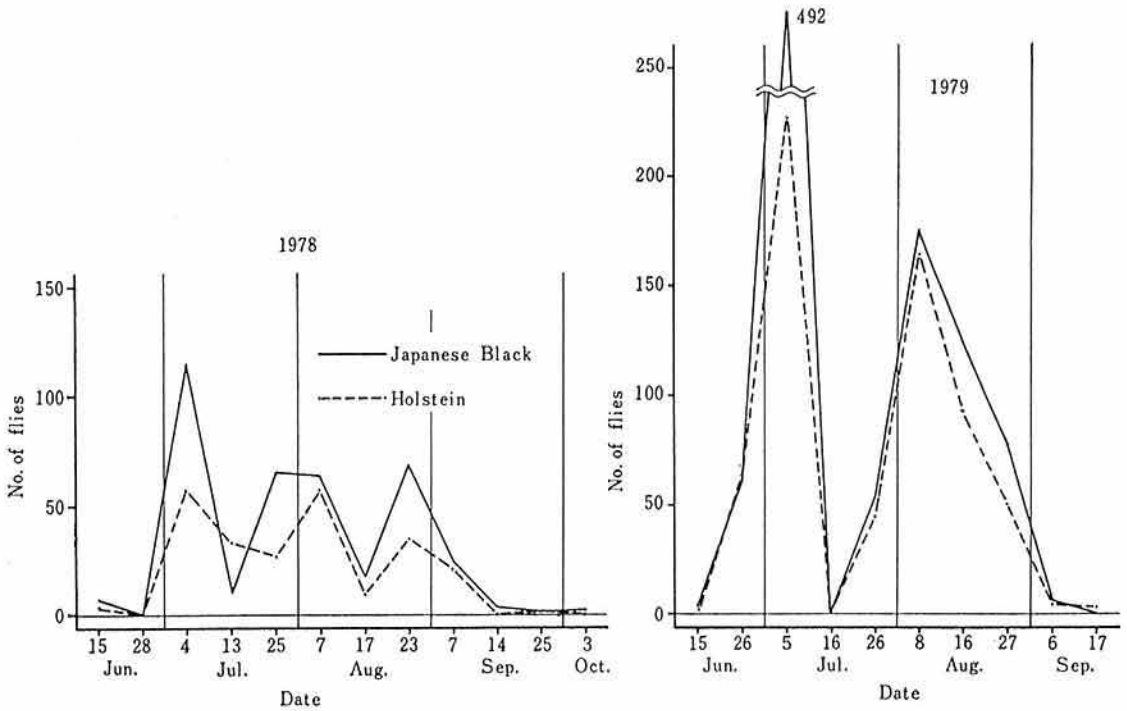

Fig. 3. Seasonal fluctuation of total number of tabanid flies collected from a Japanese Black and a Holstein cow at Nishinasuno[6]

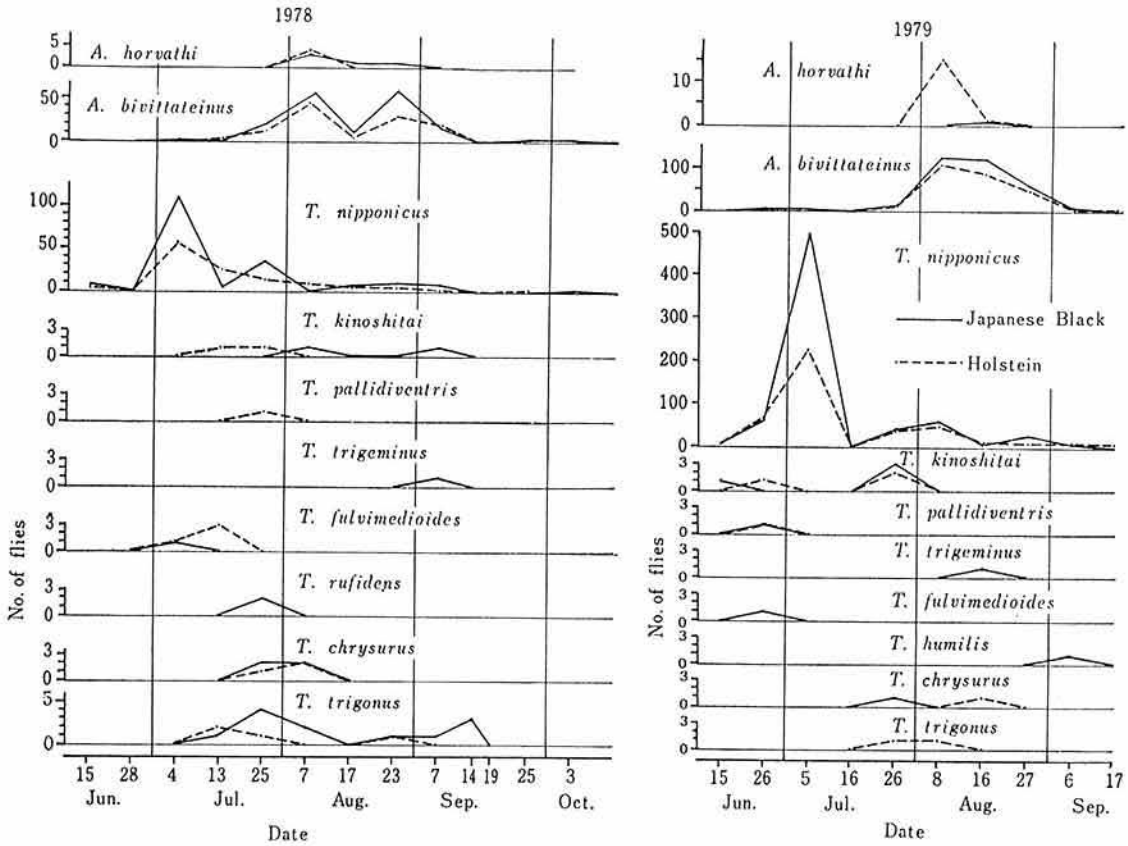

Fig. 4. Seasonal fluctuation in the number of each tabanid species collected from a Japanese Black and a Holstein cow at Nishinasuno[6]

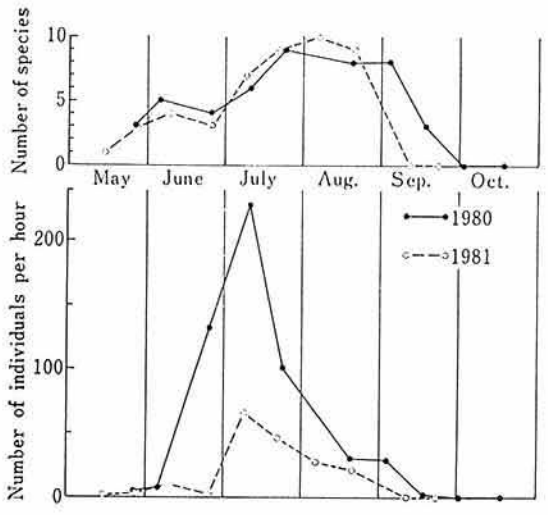

Fig. 5. Seasonal change in the number of species and individuals of tabanid flies collected by CO_2-baited trap at Hachirogahara pasture[8]

On the contrary, *H. humilis* Coquillet was predominant at the mountainous pasture[8]. According to previous reports by some workers, larvae of *T. nipponicus* were found mostly in soils of grazing pastures and fields[3,13]. The soils at relatively dry conditions were considered favorable habitats for this species. *A. bivittateinus* was also found in grassland and field in the larval stage[4]. *T. chrysurus* larvae were found in mud of marsh, mostly along the clear stream[3]. *T. rufidens* larvae have been found in humus soils of woodland[3]. In the present study, 15 larvae of *T. nipponicus* were collected from the upper layer of grassland soil and 6 larvae of *T. chrysurus* were found in the mud of stream at the mountain pasture in May of 1980.

Although the tabanids are able to fly for a long distance from their larval habitat to attack animals for sucking blood, the rich

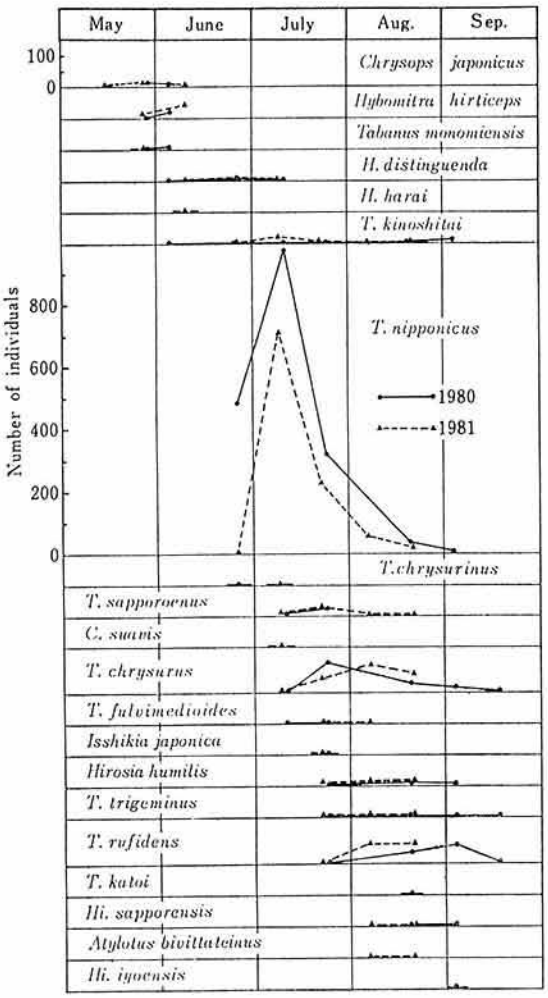

Fig. 6. Seasonal change in the number of individuals of each tabanid species at Hachirogahara pasture[8]

faunal composition at the mountain pasture may reflect more complicated environments than that of the plain pasture. It was therefore concluded that the grazing cattle must be more severely harmed by tabanids on mountain pastures.

Summary

The faunal composition and seasonal changes in the tabanid fly population were investigated at two adjacent pastures: one in the plain and the other in the mountain of northern Tochigi.

The survey was performed during the period of 1978–1981 by sampling with a sweeping net from cattle and/or a mosquito net trap with CO_2-baited.

At the plain pasture, the tabanid fauna comprised 11 species and 2 genera, of which *Tabanus nipponicus* and *Atylotus bivittateinus* were predominant. The former occupied 60% of the total specimens showing a marked peak in early July and the latter 37% with a peak in August.

At the mountain pasture, 21 tabanid species composed of 6 genera were collected in total. Among them, the most dominant species was *T. nipponicus* (75% of the total number), followed by *T. chrysurus* (9%) and *T. rufidens* (6%). They were most active in July to August.

Tabanid faunal composition at mountain pasture seemed to be richer than at plain pasture on account of more diverse environments.

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(Received for publication, October 3, 1986)