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SEASONAL ABUNDANCE AND SPECIES DIVERSITY OF ADULT TABANIDAE (DIPTERA) AT LAKE LANSING PARK-NORTH, MICHIGAN

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ABSTRACT

A two year study was undertaken to determine the seasonal abundance and diversity of adult deer flies and horse flies, to compare two methods of sampling (Malaise trap and sweep net), and to estimate attack rates by tabanids on people at Lake Lansing Park-North, Ingham County, Michigan, in 1990 and 1991. Tabanids were sampled using dry ice-baited Malaise traps, and by making overhead sweeps with a standard insect net while hiking a trail. *Hybomitra* spp. (299 individuals of 9 species) peaked in abundance in mid-May to early June in both years. *Chrysops* spp. (11,675 individuals of 14 species) and *Tabanus* spp. (324 individuals of 8 species) peaked in early-to late-July in both study years. Peak abundance for *Chrysops* and *Tabanus* spp. occurred earlier in 1991 than 1990, probably because the spring of 1991 was warmer. There were six new species records for Ingham County. More individual *Hybomitra* and *Tabanus* were taken by Malaise traps (77.3% for *Hybomitra*; 76.2% for *Tabanus*) than by netting (22.7% for *Hybomitra*; 23.8% for *Tabanus*). In contrast, sweep netting yielded more individual *Chrysops* (98.3%) than Malaise traps (1.7%). Tabanid attack rates on people hiking the trail exceeded 1,000 per hour on one occasion each year, at mid-season.

Deer flies and horse flies (Diptera: Tabanidae) comprise an important group of pests of humans and livestock in Michigan. These flies cause a painful bite owing to their blood-feeding habit, and in many areas of Michigan they are very abundant during the summer season, when people visit outdoor recreation areas. The abundance of deer flies and horse flies is undoubtedly due, in part, to the association of the immature stages with wetlands which are common in many areas of Michigan. However, there is very little information on the distribution and abundance of this important group of nuisance insects in the state. Hays (1956) provided county-level information on distribution of tabanids in Michigan and gave anecdotal information on seasonal abundance.

We initiated an investigation of the seasonal abundance and diversity of adult deer flies and horse flies in a county park in south-central Michigan, in 1990 and 1991. The purpose of the study was three-fold: (1) to examine seasonal distribution of different species of Tabanidae, and to compare this information between years; (2) to compare two sampling methods (overhead sweep net and Malaise trap) for diversity and abundance of tabanids; and (3) to estimate attack rates of tabanids on people in a summer recreation area, in order to clarify the role these insects might have as a nuisance factor for park users.

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MATERIALS AND METHODS

Once per week beginning in mid-June until mid-September, 1990, and mid-May until early-September,1991 adult tabanids were collected at Lake Lansing-North County Park, in Ingham County, Michigan. The flies were sampled by two methods: first, Malaise interception traps (one in 1990, two in 1991) were set up and baited with one kilogram of dry ice as a carbon dioxide attractant. The trapping area was a wooded picnic area at the trail head. In 1991, the traps were set up adjacent to each other at the same site. Black buckets were placed at the bottoms of each trap to act as a visual stimulus to supplement the dry ice attractant. For the second sampling method, a collector walked a hiking trail and caught any tabanids that were attracted to him using overhead sweeps with an insect net. Tabanids were then killed in a standard killing jar. The hike took about one and one-half hours, after which the Malaise traps were emptied. Tabanids were identified using keys in Pechuman et al. (1983) and Teskey (1990).

Lake Lansing-North County Park is popular with local residents for a variety of activities in summer and winter. The park is about 410 acres in size, has several wooded picnic areas, and several miles of hiking trails that weave through uplands and wetlands.

Degree-days from 1 March to 28 June, 1990–1991, were calculated with a base temperature of 5.6°C as in Allen (1976), using temperature data from the agricultural experiment station at Michigan State University.

RESULTS AND DISCUSSION

A total of 6,910 tabanids were collected in 1990 and 5,388 tabanids in 1991 for a two-year total of 12,298 individuals. Collections consisted of 31 species in 3 genera (*Chrysops*, *Hybomitra*, and *Tabanus*). This is more than half of the 53 species of Tabanidae that Hays (1956) documented to occur in Michigan. The abundance of different species taken by both sampling methods for both years is shown in Table 1. *Chrysops vittatus* Wiedemann was the most abundant tabanid in all collections, comprising 82.7% of all flies taken in 1990 and 74.0% in 1991. In contrast, Gojmerac and Devenport (1971) found *Chrysops striatus* Osten Sacken to be the dominant tabanid in seasonal collections in southern Wisconsin. In our study, however, *C. striatus* comprised less than 0.1% of all flies collected. Other common deer flies collected were *Chrysops aberrans* Philip, *Chrysops univittatus* Macquart, and *Chrysops frigidus* Osten Sacken, *Chrysops celatus* Pechuman, and *Chrysops sackeni* Hine. Uncommon species were *Chrysops callidus* Osten Sacken, *Chrysops cincticornis* Walker, *Chrysops montanus* Osten Sacken, *Chrysops niger* Macquart, *Chrysops pudicus* Osten Sacken, *Chrysops macquarti* Philip, and *Chrysops indus* Osten Sacken.

Tabanus lineola Fabricius, *Tabanus pumilus* Macquart, and *Tabanus sackeni* Fairchild were the most common *Tabanus* spp. collected, while *Tabanus trimaculatus* Palisot de Beauvois, *Tabanus sparus* Whitney, *Tabanus americanus* Forster, *Tabanus atratus* Fabricius, and *Tabanus fairchildi* Stone were rare in collections. *Hybomitra epistates* Osten Sacken, *Hybomitra lasiophthalma* (Macquart), *Hybomitra illota* (Osten Sacken) were the most common *Hybomitra* spp. in collections, while *Hybomitra frontalis* (Walker), *Hybomitra hinei* (Johnson), *Hybomitra minuscula* (Hine), *Hybomitra pechumani* Teskey & Thomas, *Hybomitra sodalis* (Williston), and *Hybomitra zonalis* (Kirby) were rare in collections.

Although there were no new Michigan state records collected in this study, *C. celatus*, *C. sackeni*, *H. hinei*, *H. minuscula*, *H. pechumani*, and *T. fairchildi* were new records for Ingham County.

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Table 1. Number of each species caught by overhead sweep net and Malaise trap in 1990 and 1991. One Malaise trap was set up in 1990, and two traps were set adjacent to each other in 1991.

Species	1990		1991		Total
	Sweep Net	Malaise Trap	Sweep Net	Malaise Traps*	
Chrysops aberrans	640	27	497	14	1,178
C. callidus	0	0	6	7	13
C. celatus	31	0	107	1	139
C. cincticornis	0	0	4	5	9
C. frigidus	15	34	50	50	149
C. indus	0	0	1	0	1
C. macquarti	1	0	0	0	1
C. montanus	0	0	2	0	2
C. niger	0	0	1	1	2
C. pudicus	2	0	0	0	2
C. sackeni	9	7	35	9	60
C. striatus	5	0	4	0	9
C. univittatus	218	12	173	3	406
C. vittatus	5,705	12	3,971	16	9,704
Total *Chrysops*	6,626	92	4,851	106	11,675
Hybomitra epistates	7	26	33	76	142
H. frontalis	1	0	0	2	3
H. hinei	1	0	2	1	4
H. illota	1	3	6	20	30
H. lasiophthalma	5	15	10	86	116
H. minuscula	1	0	0	0	1
H. pechumani	0	0	0	1	1
H. sodalis	0	0	1	0	1
H. zonalis	0	0	0	1	1
Total *Hybomitra*	16	44	52	187	299
Tabanus americanus	1	0	0	0	1
T. atratus	2	0	0	0	2
T. fairchildi	0	0	0	1	1
T. lineola	8	92	6	89	195
T. pumilus	5	7	34	50	96
T. sparus	2	0	0	0	2
T. sackeni	12	2	6	3	23
T. trimaculatus	0	1	1	2	4
Total *Tabanus*	30	102	47	145	324

*Data represent total of two traps.

The percentage of flies in each genus caught by sweep netting or in Malaise traps is shown in Fig. 1. Two hundred and thirty-eight tabanids (12 species) were collected in the Malaise trap in 1990, while 438 tabanids (21 species) were collected in the two traps set in 1991. A total of 6,672 tabanids (21 species) were collected in 1990 by sweep netting, while 4,950 flies (21 species) were collected by the same method in 1991. *Chrysops* spp. were mainly collected by sweep netting although *C. frigidus* and *C. sackeni* were also taken more evenly by both sampling methods. A higher percentage of the total of *Tabanus* spp. and *Hybomitra* spp. were taken in the Malaise trap, with comparatively fewer taken by sweep netting. Similarly, Tallamy et al. (1976) found that *Tabanus* spp. and *Hybomitra* spp. were taken in greater abundance in Malaise traps versus aerial netting in New Jersey.

The seasonal abundance trends for the 3 genera collected in 1990 and 1991 are shown in Fig. 2. *Hybomitra* spp. were most abundant in late May to early

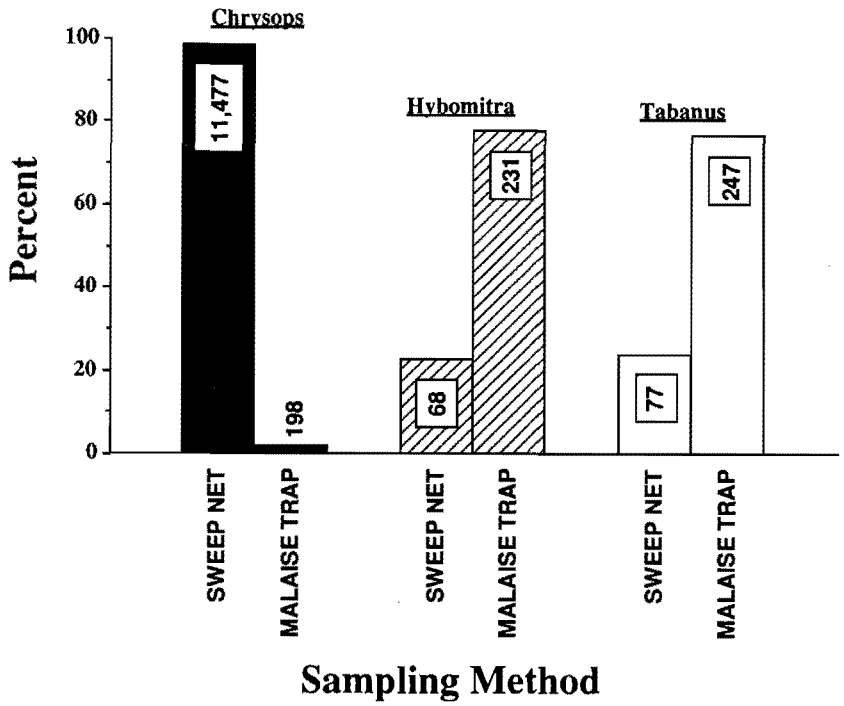

Figure 1. Percentage of individual *Chrysops*, *Hybomitra*, and *Tabanus* caught by sweep net and Malaise traps in 1990 and 1991, with total numbers collected inside the bars.

June in both study years. Both *Chrysops* spp. and *Tabanus* spp. showed unimodal peaks in abundance in mid-summer with declines in numbers by early to mid-September. In 1991, *Chrysops* and *Tabanus* spp. peaked in abundance earlier than in 1990. *Chrysops* spp. peaked 3 weeks earlier and *Tabanus* spp. peaked six weeks earlier in 1991. Degree-day accumulations during spring and early summer (Fig. 3) showed that 1991 was warmer than 1990 by 346 degree-days, possibly explaining the earlier peaks of *Chrysops* spp. and *Tabanus* spp. in 1991. Gojmerac and Devenport (1971) suggested that Tabanidae appear earlier in years that have warmer spring temperatures.

Sweep net collections indicated a peak biting rate on the human hiker of 1,060 tabanids per hour on July 27, 1990, and 1,065 tabanids per hour on 5 July 1991. These data suggest that tabanids could be a major nuisance to people using the park for recreational purposes.

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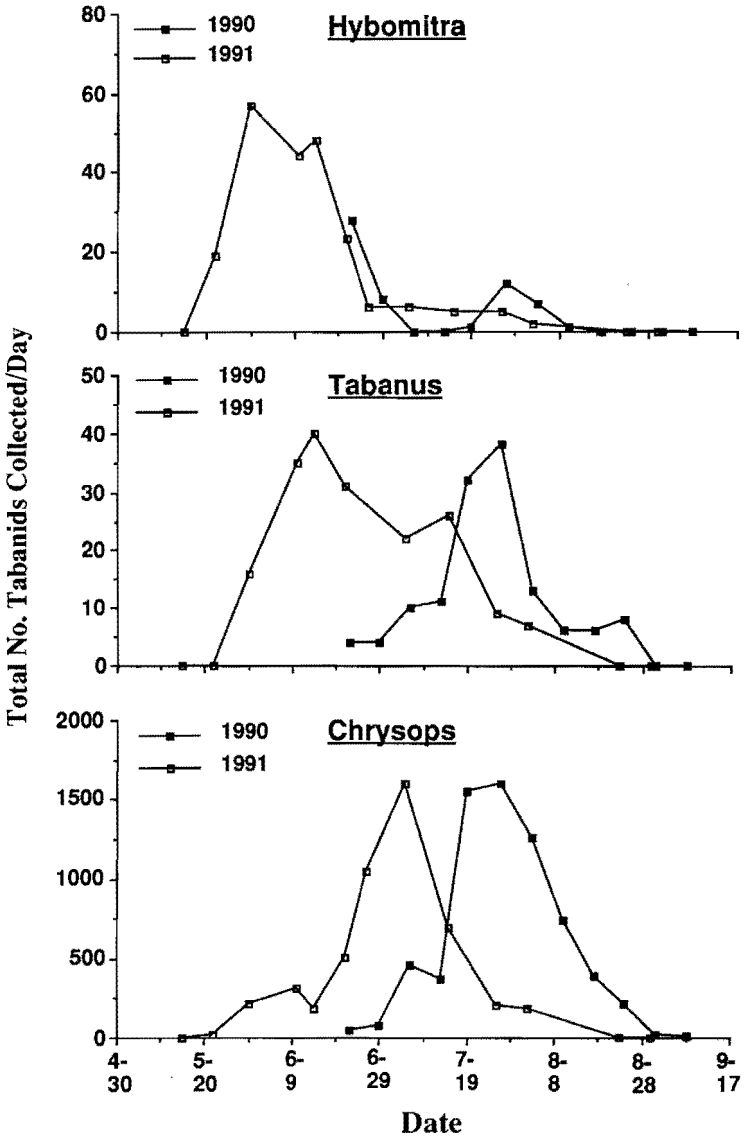

Figure 2. Seasonal abundance of *Chrysops*, *Hybomitra*, and *Tabanus* spp. in 1990 and 1991. Data are total numbers collected by sweep net and Malaise trap per collection day.

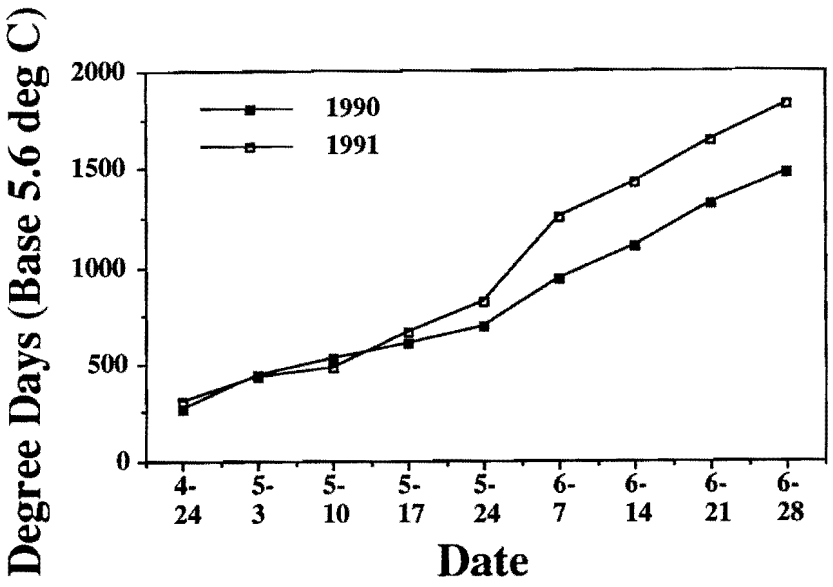

Figure 3. Degree-day accumulation (5.6°C base) from 1 March to 28 June in 1990 and 1991.

tion) for permission to have access to the park. This study was supported by the Agricultural Experiment Station, Michigan State University.

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