PREVALENCE AND DISPERSAL OF PESTIFEROUS CHIRONOMIDAE IN A LAKE FRONT CITY OF CENTRAL FLORIDA[1]

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ABSTRACT. The prevalence and dispersal of Chironomidae in a lake front city of Florida was studied. Daily collections of midges from New Jersey light traps placed at the lake front, and 200 m and 400 m away from the lake were made from January 1980 to December 1981. *Glyptotendipes paripes, Chironomus crassicaudatus* and *C. decorus* were quantitatively important. *Glyptotendipes paripes* formed 79.1 and 37.6% and *C. crassicaudatus* 16.7 and 47.1% of the total adults collected in 1980 and 1981, respectively. On some occasions, each of these two species amounted to 100,000 to 350,000 adults per lake front trap in one night. There was a natural decline of 41% of total chironomids in 1981 compared to 1980. The lake front traps collected 95–100% of *G. paripes* and 88–100% of *C. crassicaudatus*, in 1980. There was a gradual decline of the two species in relation to the increasing distance from the lake. *Chironomus crassicaudatus* seems to be a stronger flyer than *G. paripes*. It occurred in higher proportions than *G. paripes* in the farther traps from the lake.

INTRODUCTION

The frequent massive emergences of chironomid midges from a number of lakes located in urban and suburban areas of central Florida create serious nuisance and economic problems for the nearby residents and business owners. The nature of problems caused by adult midges include severe annoyance, clogging of air conditioning units, soiling of automobiles, drapes, furniture, and laundry, defacing of properties, traffic hazards, suffocation of livestock, and other economic losses to business and industry (Ali 1980). Adult midges are also associated with allergic symptoms (rhinitis, hay fever, asthma, and others) in people (Cranston et al. 1981).

In the last decade, the City of Sanford, Seminole County, FL, has suffered increased annoyance and economic loss due to these pestiferous insects emerging from adjacent Lake Monroe and a man-made water cooling reservoir in the area. According to an economic study[2], an annual loss of 3–4 million dollars for Sanford results from chironomid related problems. The study also revealed that at least ten counties of Florida have midge problems. Reported here is information on the midge species composition, adult dispersal, and prevalence around waterfront businesses and residences in Sanford. Such basic data are essential for the development of control strategies for these pestiferous insects.

MATERIALS AND METHODS

The two sources of midges in the Sanford area are described elsewhere (Ali and Baggs 1982). Lake Monroe has a surface area of ca. 4000 ha and 20 km shoreline. It is supplied by the St. Johns River. The reservoir is located 5–6 km northwest of Sanford and is ca. 450 ha at the surface with a shoreline of 5–6 km. It also is supplied by the river. The City of Sanford borders the southern 5–6 km periphery of the lake.

Eight New Jersey light traps were used to study the prevalence and dispersal of adult midges. These traps were fitted with 60-watt bulbs and were equipped with photo-electric switches. Four of these traps were placed 1–2 km apart from one another, on premises of waterfront businesses and residences, thus covering the southern 5–6 km shoreline of Lake Monroe. For dispersal studies, two traps (2 km apart) were located at residences ca. 200 m away from the lake and another two traps (2 km apart) were placed in a residential area ca. 400 m from the midge source. Each trap was hung 2–3 m above ground level.

Midge collections from the four lake front traps were made daily from January 1980 to December 1981, except for the weekends when a three nights' catch was taken every Monday. The traps 200 m and 400 m away from the lake were monitored from January to December 1980. In the laboratory, adult midges were segregated into species or genera and counted. Samples containing large numbers (>50,000 adults/trap/night) were subsampled by weight but at least 1/16th portion of such large samples was completely counted and identified for the species composition.

RESULTS AND DISCUSSION

Glyptotendipes paripes Edwards, *Chironomus crassicaudatus* Malloch, *Chironomus decorus* Johannsen, *Chironomus carus* Townes, *Chironomus* sp., *Goeldichironomus holoprasinus*

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[1] Florida Agricultural Experiment Stations Journal Series No. 3787.

[2] Economic Impact Statement, 1977. Blind Mosquito (Midge) Task Force, Sanford Chamber of Commerce, Seminole County, FL, U.S.A. 4 pp.

(Goeldi), *Cryptochironomus fulvus* Joh., *Polypedilum halterale* (Coq.), *Parachironomus* sp., *Tanytarsus* spp., *Rheotanytarsus* spp., *Coelotanypus concinnus* (Coq.), *Coelotanypus scapularis* (Loew), *Procladius sublettei* Roback, and *Cricotopus* spp. were collected. A few other midge species of minor quantitative importance also occurred in the collections.

Glyptotendipes paripes and *C. crassicaudatus* occurred throughout the year (Table 1). However, the daily mean number of adults of the former species occurring per trap in 1980 ranged from 3 adults in January to 21,179 adults in July. Similarly, in 1981, this range of *G. paripes* was 5 adults in January to 11,461 in April. During the periods of abundance in 1980 as many as 350,000 adult *G. paripes* accumulated in a lake front trap in one night and in 1981, their maximum occurrence in a trap in one night amounted to 250,000 adults. The daily mean number of *C. crassicaudatus* in 1980 ranged from one adult in February to 9918 adults in June. In the following year, this range of *C. crassicaudatus* was 3 adults in January to 5421 adults in April. During the periods of abundance in June 1980, up to 220,000 adult *C. crassicaudatus* were collected in a lake front trap while in 1981 the maximum number of this species taken in a trap in one night was in March when 136,668 adults occurred. *Glyptotendipes paripes* formed 79.1% of the total adults collected in 1980, followed by *C. crassicaudatus* forming 16.7% of the annual total. However, in 1981, populations of *G. paripes* (37.6%) declined while those of *C. crassicaudatus* (47.1%), and *C. decorus* (9.8%) increased.

Each year, adult populations of all midge species remained very low during the winter months, gradually increasing in March–April and thereafter attaining the maxima during May to November. The monthly distribution of *G. paripes* and *C. crassicaudatus* in the two years is shown in Fig. 1. In 1980, the maximum numbers of the former species occurred in July, while in 1981, the maximum were taken in April. *Chironomus crassicaudatus* peaked in June 1980 and the following year in April and May. In 1981, populations of *G. paripes* declined by 72% in comparison to the previous year. In contrast, populations of *C. crassicaudatus* increased by 39% in 1981 than in 1980. There was a 12-fold increase of *C. decorus* in 1981 (Fig.

Table 1. Adult *Glyptotendipes paripes* and *Chironomus crassicaudatus* collected from New Jersey light traps placed along southern periphery of Lake Monroe, at lake front business and residential locations Sanford, FL, (Jan. 1980–Dec. 1981).

	Monthly mean no. adults/trap/day, and range			
	Glyptotendipes paripes		*Chironomus crassicaudatus*	
	Mean	Range	Mean	Range
		1980		*1980*
January	3	0– 40	4	0– 34
February	5	0– 166	1	0– 11
March	275	2– 6,800	8	1– 140
April	21	1– 140	14	0– 140
May	1,110	2– 15,000	3,131	5– 60,000
June	15,802	4–350,000	9,918	2–220,000
July	21,179	2–290,000	641	1– 15,000
August	13,769	3–350,000	828	6– 25,000
September	4,041	2– 66,667	523	5– 8,000
October	7,886	20–152,510	1,795	4– 25,000
November	7,520	15–180,000	3,077	2– 52,000
December	276	1– 2,640	118	0– 2,160
		1981		*1981*
January	5	0– 20	3	0– 39
February	209	0– 3,400	221	0– 2,214
March	1,892	1– 83,330	3,230	1–136,668
April	11,461	10–241,488	5,421	19–105,967
May	594	2– 10,686	5,363	28– 63,920
June	510	1– 36,980	2,790	5–136,530
July	66	0– 1,740	1,353	1– 26,405
August	41	0– 467	3,168	16–102,000
September	283	0– 3,630	2,365	8– 31,500
October	110	0– 1,870	830	1– 18,480
November	7	0– 52	204	0– 1,826
December	2	0– 11	111	0– 1,500

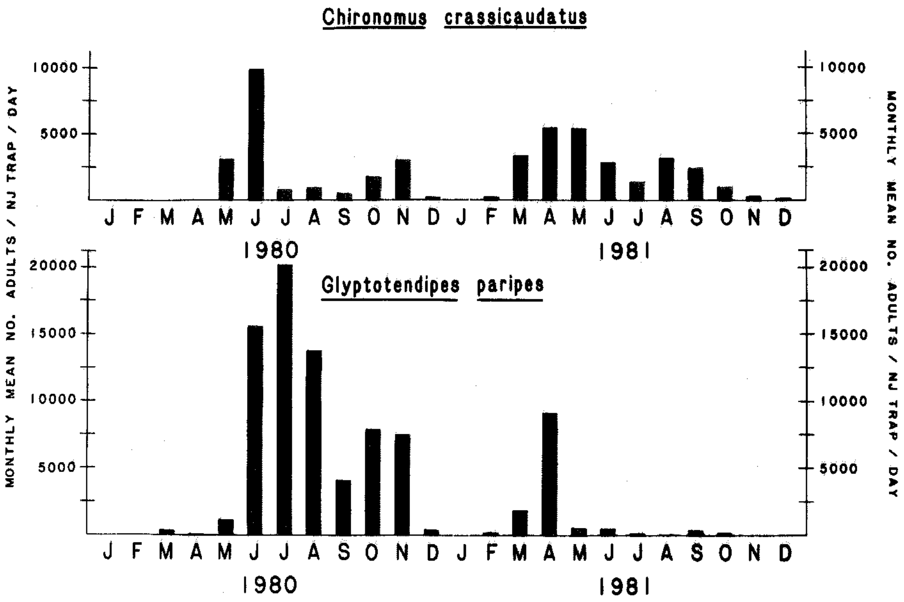

Fig. 1. Monthly distribution of adult *Glyptotendipes paripes* and *Chironomus crassicaudatus* occurring in New Jersey light traps located along lake front, Lake Monroe, Sanford, FL (1980–1981). Monthly mean number of <20 adults per traps per day are not shown.

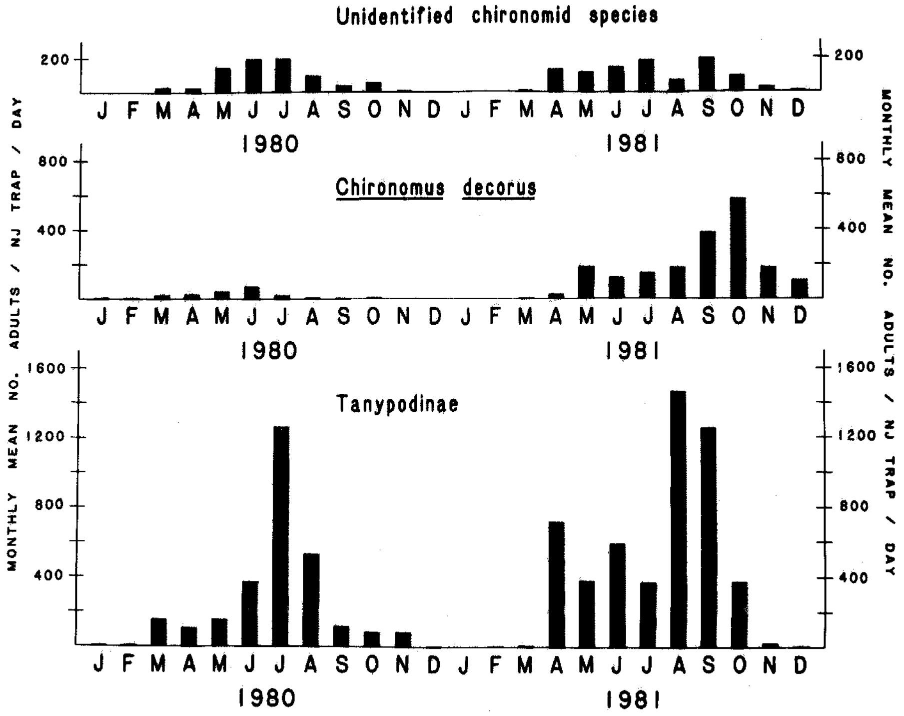

Fig. 2. Monthly distribution of adult *Chironomus decorus,* Tanypodinae, and unidentified other chironomid species occurring in New Jersey light traps located along lake front, Lake Monroe, Sanford, FL (1980–1981). Monthly mean number of <20 adults per traps per day are not shown.

2). Populations of Tanypodinae and other chironomid species also increased slightly in 1981 than in 1980. However, there was a natural decline of 41% of the total chironomid adults in 1981 compared to the previous year and this was primarily due to the reduction of *G. paripes*.

The monthly occurrence of *G. paripes* and *C. crassicaudatus* in the lake front traps and those located 200 and 400 m from the lake is compared in Fig. 3. It is obvious that the traps closest to the midge source collected 95–100% of *G. paripes* throughout 1980, while 88–100% of *C. crassicaudatus* prevailed around the lake front in that year. There was a gradual decline of the two species in relation to the increasing distance from the lake. At times of low emergence (Jan.–April), no adults occurred at the 200 and 400 m distances but as the rate of emergence of the two species increased in May and the subsequent months, the adults dispersed over larger areas. *Chironomus crassicaudatus* seems to be a stronger flyer than *G. paripes* because it occurred in higher proportions in the farther traps from the lake than *G. paripes*. The higher proportions of the two species (especially *G. paripes*) in the distant traps occurring from October to December in comparison with the rest of the year may have been partly caused by the predominantly north to south winds prevailing in the area at that time of the year.

It is evident that *G. paripes*, *C. crassicaudatus*, and *C. decorus* are the three species of midges prevailing in large numbers in and around residential and business premises along the lake front area of Sanford from April to November. The abundance of adults of these species corresponds with their high larval densities supported by Lake Monroe and the reservoir (Ali and Baggs 1982). Apparently, *G. paripes* and *C. crassicaudatus* migrate in smaller proportions 200 and 400 m away from the source but these smaller proportions may amount to several thousand adults per traps per night during the periods of heavy emergence (May–November) when the adult accumulation in a trap exceeds 250,000. At Sanford, most of the businesses located on the lake front have powerful lights which outcompete (in terms of intensity and number) the lights in the residential areas away from the lake, thus under normal weather conditions the lake front area retains a vast majority of the emerging adults. In the absence of the

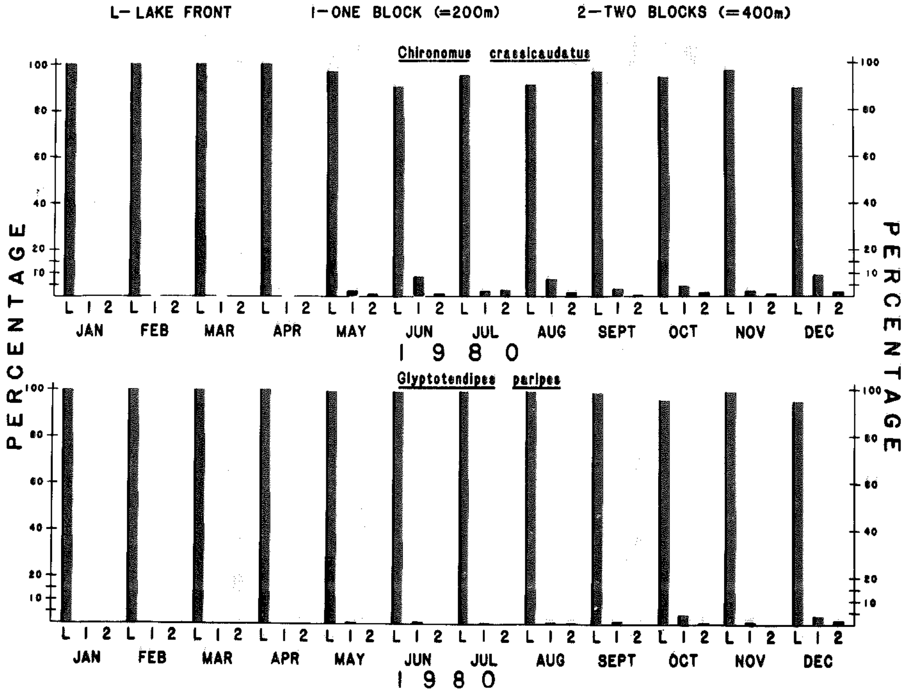

Fig. 3. Monthly occurrence of *Glyptotendipes paripes* and *Chironomus crassicaudatus* in New Jersey light traps located along lake front and in residential area 200 m and 400 m from Lake Monroe, Sanford, FL (1980–1981).

lake front lights, the adults may disperse in greater numbers over larger areas of Sanford than observed in this study.

This study also shows that the quantitative composition of the midge species and the overall productivity of midges may change from year to year. These seasonal changes are caused by a complex interaction of intrinsic and extrinsic factors influencing the midge source. Among these factors, temperature is regarded as the most obvious, affecting seasonal cycles and abundance of some aquatic insects including chironomids (Ali et al. 1977, Elliott 1967). It was shown earlier (Ali and Baggs 1982) that water temperature in Lake Monroe and the reservoir had a positive correlation with density of larval *G. paripes.* However, a number of other factors in the midge larval habitats, such as the seasonal availability of the larval food, the nature and intensity of local oviposition by the emerging adults, presence or absence of natural enemies of midge larvae and pupae, and the prevailing favorable or unfavorable chemical conditions may also determine the larval population size of these pestiferous insects. Laboratory and field studies on the effects of nutrients on the biology and ecology of pest species of midges are presently being conducted to provide information for the eventual development of control strategies.

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