

THE MOSQUITOES OF BURNABY LAKE BRITISH COLUMBIA

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ABSTRACT

Ten species were found in a survey of the mosquitoes of the Burnaby Lake area; they included a small breeding population of *Aedes aloponotum*, a species not recorded in British Columbia since 1919. *Aedes aboriginis* was more numerous and troublesome. *Aedes sierrensis* and *Mansonia perturbans*, which bite both in the open and in houses, were less common, but because they are unaffected by the usual larval control techniques, are potential nuisance species in the area. *Aedes cinereus* and *Culiseta morsitans* were abundant, but the former bit only when disturbed and the latter did not bite humans.

INTRODUCTION

Burnaby Lake, near Vancouver, is the shallow drainage area of a once extensive peat-filled bog that drains slowly into the Fraser River. The general public and naturalists make considerable use of the area which is now a bird sanctuary. A narrow margin of marsh and woodland is preserved as a nature park.

The water level of the lake is controlled by a dam installed in 1923, and until recently the area was inaccessible, so that the mixed woodland and marsh have probably not changed much since 1921 when Hearle (1926) concluded a 3-year survey of the mosquitoes of the lower Fraser valley. However, most of the surrounding forested area within flight range of mosquitoes is now cleared and developed, leaving the lake populations isolated.

METHODS

Immature mosquitoes were collected from breeding sites and adults were sampled from swarms or as they came to bite. When females were numerous, standard counts were made of the number of mosquitoes landing on the front of the trousers between waist and knees, for two 1-min periods separated by 5 min (Agriculture Canada, 1972).

RESULTS

Ten species, representing the five genera of mosquitoes so far found in British Columbia, were collected around the lake. The immature stages that were collected are listed by habitat in Table I. Their biology is described in more detail below.

Anopheles punctipennis (Say): - This species was collected only in the larval stage. It was not numerous compared with other species in the same habitat and was never observed biting or resting under bridges or culverts where I have usually found it in late summer in other areas.

Aedes aboriginis Dyar: - This is the most numerous biting species and the most troublesome to humans. Larvae were found as early as mid-April in clearings and at the margins of the woodland in pools that ranged from the size of a horse's hoofprint to more than 10 m in diameter. Few adults were seen for about two weeks after they had emerged from the pupae. Several swarms of up to 20 males were seen in late May and early June 3-15 m above the ground, at the tips of branches on the lee or north side of broadleaf maples and cottonwoods. Females bit readily from late afternoon to at least an hour after sunset, when observations were discontinued. Females were present in clearings in wooded areas and in gardens at least 1 km from the nearest known breeding site. A landing rate of more than 5/min was measured at sunset in a picnic area about 400 m from a breeding site.

Aedes aloponotum Dyar: - Four large mosquitoes with pale banded tarsi and an orange brown scutum were taken in the late afternoon and evening between May 16th and July 12th, 1977. These proved to be the first specimens of *A. aloponotum* recognized in the province since Hearle's survey (Hearle, 1926). A systematic search in May 1978 of potential breeding sites, upwind of the area where the adults were collected, yielded two pupae associated with many larvae of *A. cinereus* in grass-lined pools 25 m from the main creek that feeds the lake. These were identified at emergence, on May 15th, as *A. aloponotum*. The first adults biting in 1978 were taken on June 3rd, in the same area as those found in 1977.

Aedes cinereus Meigen: - This was the most numerous aedine mosquito encountered. Larvae were dense in open grassy pools at the margin of the woodland and the lake and in shallow pools within the wood in which reedmace and burr-reed were growing. Apart from one reference to a cloud of males found in late afternoon

TABLE 1. Immature mosquitoes found round Burnaby Lake, by habitat.

Habitat	Species	Month	Stage
Ditches:			
outside woodland, sluggish road and railway drainage	<i>Ca. incidens</i>	April - Oct.	E, L, P ²
	<i>C. pipiens</i>	July - Oct.	E, L, P
	<i>An. punctipennis</i>	June - Aug.	L
Woodland pools:			
dead leaf bottom	<i>A. aboriginis</i>	April - May	L, P
peat	<i>Ca. inornata</i>	May - July	L, P
	<i>Ca. morsitans</i>	April - Aug.	L, P
Pools in open:			
dead grass bottom	<i>A. aloponotum</i>	May	P
peat bottom ¹	<i>A. cinereus</i>	April - May	L, P
	<i>Ca. morsitans</i>	April - July	L, P
Stagnant channels:			
connected with lake	<i>Ca. morsitans</i>	April - Aug.	L, P
Lake:			
openings in vegetation mats fringing lake ¹	<i>Ca. morsitans</i>	June - Sept.	L, P

¹These sites were sampled in February, the remainder only between April and October.

²Abbreviations: E, eggs; L, larvae; P, pupae.

(Edwards, 1932). swarming does not appear to have been described in this species. In late May and early June, I observed one large swarm in the same region, on several evenings just after sunset. It consisted of at least 100 males swarming less than 1 m from the ground over horsetails. Females flew into the swarm, often after biting the observer. Mating occurred at a rate between 5 and 10/min. Females did not appear to seek human hosts actively but did not hesitate to bite when disturbed in the afternoon or evening. Adults were only seen in undisturbed flight within about an hour of sunset.

Aedes sierrensis (Ludlow): - Immature stages and their preferred breeding site, i.e. water-filled tree holes, were not found. From about 20 females that bit the observer between June and September, three were caged individually and laid fertile eggs. One male was collected an hour before sunset hovering around the observer, confirming several previous observations that males are attracted to hosts and mate with females as they fly in to bite (Curtis, 1957). During the summer, several females were found biting in the house.

Culex pipiens L.: - Larvae and pupae were found in the open in stagnant drainage ditches, flooded vehicle tracks and artificial containers. Swarms of about ten males were found on several evenings over Douglas spirea bushes at the margin of the lake, from mid June to July. Later in the season this species swarms over the south walls of houses and buildings. No mating was seen in any of the swarms and no females were seen to bite outdoors. Females

of this species enter houses in late August and September and a high proportion appear to take blood meals during the night.

Culiseta incidens (Thomson): - Egg rafts, larvae and pupae were found over a wide area in drainage ditches and in some artificial containers. Adult females were occasionally found under the eaves of houses and garages during the summer and autumn but these did not bite when placed in a tube over the observer's arm. No adult males of this species were found.

Culiseta inornata (Williston): - Larvae and pupae breed in deep pools in shaded woodland. Adults that appeared to be freshly emerged were found resting on moss beside one such pool in May. On two occasions a pair was *in copula*. Females occasionally bit in the woodland but were more numerous and appeared to be more aggressive near the lake.

Culiseta morsitans (Theobald): - This is the most abundant mosquito. Larvae were found in almost every still pool with brown peaty water including pools in floating mats of vegetation at the edge of the lake. No larvae were found in known breeding areas before March, although they overwinter in this stage in Europe (Marshall 1938). Several breeding sites were frozen solid in early January 1978, and the deeper pools were covered with 10 - 20 cm of ice. Despite the abundance of immature stages, only one swarm of males was seen at sunset in late June. About 10 males flew in an extended figure-of-eight about 1 m in a north-south direction among the leaves and branches of a cascara tree 2 m above the ground. Only two

females were taken in flight at the margin of the lake. Neither they nor any reared females could be persuaded to take human blood.

Mansonia perturbans (Walker): - Females bit in the woodland from mid-June to August in the afternoon and evening. Although several dozen clumps of reedmace were uprooted, washed and examined, no immature stages were found. From late June to September, females bit in the evening inside a house 1 km from the lake. No males were seen.

DISCUSSION & CONCLUSIONS

The most significant finding is the rediscovery of *A. alopnotum*. Wood (1977) described how this species was lost in synonymy for some 30 years and points out that Canadian material in the National collection consists of "a few females . . . from the lower Fraser Valley, most in poor condition", none of which was collected since the 1920's. Wood identified two of the females captured while biting in 1977 as *alopnotum* and this prompted a systematic search for its breeding site in 1978. The pupae were collected on May 13th, in a pool about 400 m from where the adults were caught.

The earliest that any female *Aedes* bit was about 2 weeks after the majority had emerged from the breeding sites I sampled. During this period, however, two female *aboriginis* were observed on flowers of wild crabapple. This supports the observations of Service (1972) and others, that in several species, both sexes feed on nectar for a few weeks before the females disperse for blood meals.

Hearle commented (1926) that "during three years . . . very few specimens (of *C. pipiens*) have been collected. It would appear that this species has been introduced comparatively recently". In the 1970's I have found *C. pipiens* as numerous as *Ca. incidens* which it appears to be displacing in artificial and temporary breeding sites.

My observations on the biting habits of *A. aboriginis* and *sierrensis* also differ from Hearle's. He considered that the former was "neither very vicious nor persistent" and that the latter "are timid in approaching human beings". Around Burnaby Lake both species are now bold and persistent in their attacks on man and one wonders if their behaviour may have changed after 50 years of exposure to this relatively new and abundant host.

Of 21 species that Hearle (1926) collected in numbers in the valley, 13 would be expected to occur in the habitats around Burnaby Lake; of these 13, at least nine are still present. It appears that the isolation of the lake has had little effect on the number of species. *Culiseta morsitans* is the only species that Hearle did not collect, and it is surprising that it was so numerous at what appears to be the southern limit of its range (Curtis 1967).

Only *A. aboriginis* appears to be a nuisance around Burnaby Lake, occasionally invading a nearby picnic site with a landing rate of more than 5/min. Repellents seem to be an adequate solution for the public as they are for the naturalists walking the trails in the evening. *A. sierrensis* and *M. perturbans* could be a problem to homeowners in warm and wet summers because both species readily enter houses. Neither is affected by normal larval control procedures and insect screens may be the only effective solution.

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