

ATTITUDES AND KNOWLEDGE OF URBAN HOMEOWNERS TOWARDS MOSQUITOES

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ABSTRACT. A survey of residents in the Lake Shores community of the city of Virginia Beach, VA, was conducted to determine their attitudes toward, and their knowledge of mosquitoes. The survey included questions on the occurrence and control of mosquitoes, the number of mosquito bites per night tolerated, and the amount of money spent on backyard control. The survey showed that a majority (53%) of the residents were aware that backyard breeding sites were contributing to the local mosquito problem. Residents favored (54%) chemical control methods over nonchemical (20%), and 70% considered the transmission or spread of disease an important reason for controlling mosquitoes. Seventy-seven percent of those questioned thought that 7 mosquito bites in one night would indicate a mosquito breeding problem in the area. The survey showed that a median of 3 bites/night would be tolerated by the residents. For the Lake Shores community, 6 to 16 mosquitoes trapped/night might be considered an annoyance level threshold.

INTRODUCTION

The changes in density and distribution of people, in economic and social values, and in the financial support for some mosquito control programs require reevaluation and study of all control strategies. While chemical and non-chemical strategies, aimed at the target *pest* are important, consideration should be given to the target *audience*—the residents in the abatement area. The residents' perception of the origin and severity of the problem, their expectations of control, tolerance of bites, and willingness to support chemical and/or non-chemical control methods may be information important to mosquito control commissions.

A basic component of mosquito control programs should be an understanding of the attitudes and knowledge of the abatement-district residents toward the target pests and the current control program. The success of mosquito control programs may depend on evaluating resident appreciation of chemical and non-chemical control methods, and their expectations of a control program. Most of the attempts to evaluate mosquito abatement programs have stressed job proficiency or administration (Hatch et al. 1973, Magu 1981, Gerhardt et al. 1973).

The objectives of our survey were to 1) determine the attitudes and knowledge of mosquitoes and mosquito control programs by residents in an abatement district, and 2) evaluate resident tolerance levels to mosquito bites.

MATERIALS AND METHODS

The survey was conducted in July 1981, in the Lake Shores community, Virginia Beach,

VA (USA). The survey consisted of 18 questions. All survey questions, except the one concerning the number of mosquito bites indicating a mosquito problem, were open-ended, i.e., responses were not chosen from a list offered by the interviewer.

SURVEY METHOD. The survey method consisted of one interviewer questioning individual residents in their homes. Each interview took approximately 6 min to complete. Three interviewers conducted the surveys over a 3-day period. Each quadrant of the Lake Shores subdivision was randomly surveyed. Responses to the questions were recorded on a 2-page survey form. Of the approximately 535 houses in the community, 208 were contacted. The survey questions were pretested in the Shelton Park community of Virginia Beach, and slight adjustments in the phrasing and sequence of questions were made.

SURVEY SITE. The Lake Shores community is in the northern part of the Bayside Borough, adjacent to Lake Smith and the U.S. Navy Little Creek Amphibious Base. This community is entirely residential and representative of an eastern U.S. suburban area. Lake Shores has salt marshes to the north, and freshwater lakes and inlets to the west. The residential area is wooded, providing the potential for treehole mosquitoes and *Culex* spp. breeding in clogged gutters. The results of a backyard survey by the Kempsville-Bayside Mosquito Control Commission in 1978 showed potential mosquito breeding in 40% and actual breeding in 11% of the properties visited. Light trap collections in Lake Shores for 1981 were 60% *Culex* spp., 26% *Aedes* spp., 6% *Anopheles* spp. and the remaining 8% was *Uranotaenia* sp., and *Psorophora* sp.

The Kempsville-Bayside Mosquito Control Commission services the boroughs of Kempsville and Bayside. The service area is approximately 70 sq. miles, with a population of 140,540 and a budget of \$519,000 (1981-82).

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RESULTS AND DISCUSSION

The questions are not presented in the sequence they occurred on the survey form, but are grouped to provide easier discussion of the results.

RESIDENT AND COMMUNITY PROFILE. A group of questions provided background information on the homeowners contacted, and on the Lake Shores community in general.

BACKGROUND INFORMATION. The mean age of the residents surveyed was 47 years, 68% were female and 32% male. The mean number of years residents spent in the community was 13 years, and the type of community they were raised in was nearly equally divided between rural (36%), suburban (31%), and urban (30%). The mean number of hours spent outdoors was 10 hr (median 3 hr) daily. The mean value of the houses owned by residents was \$61,551 (median \$58,060).

This background data indicates that Lake Shores is a stable, middle-class community composed of middle-aged homeowners. The Virginia Real Estate Research Center listed a mean house value of \$63,000 for Virginia Beach (city). The community residents' backgrounds are nearly equally divided between rural, suburban and urban.

The number of hours reported spent outdoors may have been influenced by the resident interviewed. The survey was conducted during the day, consequently the person interviewed may regularly be at home during the day, and may spend more time outdoors than other household members that are daily employed. The median number of hours spent outdoors (3 hr) is probably more representative of the Lake Shores residents.

GENERAL OPINION OF THE MOSQUITO PROBLEM

Q. Is there a mosquito problem in Lake Shores?

A. Yes-55%; No-40%; Not sure-4%.

Q. Has the mosquito problem gotten better, or worse, or the same in the last 5 years?

A. Same-46%; Worse-30%; Better-17%; Not sure-6%.

Q. Do mosquitoes limit the amount of time you spend outside?

A. Yes-58%; No-41%; Not sure-1%.

A narrow majority (55%) of the homeowners questioned considered mosquitoes a problem, and nearly the same percentage (58%) had their time outside limited by mosquitoes. Only 30% of those questioned thought that the mosquito problem had become worse in the last 5 years, while 46% thought the mosquito problem was unchanged. Light trap data for the Lake Shores

community indicate that the number of mosquitoes trapped/night in 1980 was lower than the 1978 and 1977 trap counts (Table 1). However, 76% of the residents questioned considered the mosquito problem unchanged or worse in the last 5 years. Residents seem unable to detect changes in the mosquito population.

Table 1. Light trap data from the Lake Shores Community. (Taken from records of Kempsville-Bayside Mosquito Control Commission).

Date	Mean no. mosquitoes trapped/night
1976	4.9
1977	4.5
1978	21.6
1979	8.2
1980	5.7

KNOWLEDGE OF MOSQUITOES.

Q. Where do you think mosquitoes breed in the Lake Shores area?

A. Standing water off resident's property-33%; Standing water on resident's property-17%; Standing water on and off resident's property-3%; Lake Smith-30%; Other-3%; Not sure-14%.

Q. What do you think is the best way to control mosquitoes?

A. Chemical: Fogging-47%; Larviciding-4%; Larviciding and fogging-3%; Other chemical methods-2%.

Non-chemical: Drainage and elimination of standing water-19%. Other: Drainage and fogging-3%; Other, not sure-22%.

Q. What is the most important reason for controlling mosquitoes?

A. Disease control-44%; Nuisance problems-29%; Both disease and nuisance-26%; Not sure-1%.

A majority (53%) of the residents were aware of the importance of standing water to the mosquito problems in Lake Shores. A small percentage (17%) of the residents thought that mosquitoes could breed in standing water on their property. However, a third (33%) of the residents considered standing water on someone else's property as the mosquito breeding sites.

Many (30%) residents considered Lake Smith as the source of mosquitoes in the community, and 14% of those questioned did not know where mosquitoes breed in the area. Light trap collections in Lake Shores indicate that *Culex* spp. are the predominant (60%) species. In general, *Culex* spp. breed in backyard situations

and not along lake shores; Lake Smith is not a major breeding site for mosquitoes in the Lake Shores community. The results of this question indicate a need for educational programs or literature on mosquito biology and control in the Lake Shores community.

While a majority (53%) of the residents were aware of the importance of standing water (backyard) to the mosquito problem, only 19% considered drainage and elimination of standing water as the best way to control the problem. A majority (56%) of the residents considered fogging, larviciding and other chemical methods as the best way to control mosquitoes.

The Lake Shores residents questioned were aware that mosquitoes are disease vectors, and 70% considered disease control to be an important reason for controlling mosquitoes.

TOLERANCE OF MOSQUITOES

- Q. How many mosquito bites per night would you accept or tolerate in this area?
- A. Mean no. bites/night—8; Median no. bites/night—3.
- Q. How many mosquito bites per night do you think indicates a mosquito problem in the area?
- A. The response to this question is presented in Table 2.

Table 2. Number of mosquito bites per night indicating a mosquito problem.

Response	Percentage response					
	No. bites/night					
	15	10	7	4	2	1
Yes	99	94	7	32	15	13
No	1	6	23	68	85	87

There was not a distinct difference in the mean number (8) of mosquito bites/night tolerated by the Lake Shores residents and the number (4-7) of bites/night that were considered indicative of a mosquito problem in the area. Perhaps the median number (3) of bites/night would be a more accurate measure of the resident's tolerance of mosquito bites. Half of those questioned would tolerate 3 bites or less/night, half would tolerate more than 3. Mosquito control in Lake Shores would have to be directed at reducing the number of bites/night to 3 or less to please 50% of the residents.

The Kempsville-Bayside Mosquito Control Commission regularly uses a certain number of adult female mosquitoes trapped per night per trap location as an indication for supplemental mosquito control (adulticide or larvicide). The current (1981) action threshold is 24, i.e. if 24 or more female mosquitoes/night are trapped, a

spray team is dispatched to that trap location. This threshold number is based on research conducted in New Jersey by Headlee (1932). He concluded that more than 4 bites/night exceeded the human tolerance level for mosquito bites, and a trap catch of 24 female mosquitoes/night was equivalent to a mosquito population that would give 4 bites/night to exposed humans. Headlee (1932) assumed that when a human collected an average of more than 1 mosquito/15 minutes, the density is sufficient to annoy homeowners. He further assumed that there were approximately 3 hr/night of favorable conditions for mosquitoes, and that a light trap could collect at least twice as many mosquitoes as a human collector. A trap catch of 24 mosquitoes/night is approximately 4 bites/hr for the 3 favorable hours/night.

SATISFACTION WITH CONTROL

- Q. Have you ever contacted the Mosquito Commission about mosquito control?
- A. No—91%; Yes—9%.
- Q. Do you think the Mosquito Commission should do more in controlling mosquitoes?
- A. Yes—49%; No—46%; Not sure—5%.
- Q. Would you be willing to pay more in property taxes for better mosquito control?
- A. Yes—49%; No—47%; Not sure—4%.

Nearly half (49%) of the residents surveyed thought the Kempsville-Bayside Mosquito Control Commission should do more in controlling mosquitoes, and 49% were willing to pay higher taxes for better mosquito control. However, only 9% of those questioned had ever contacted the Mosquito Commission. During the survey interviews a number of residents indicated they were unaware that they could request assistance from the Mosquito Commission.

Of the 49% of the residents that thought the Mosquito Commission should do more in controlling mosquitoes, 31% wanted more chemical control (adulticiding, larviciding), 6% wanted more non-chemical control, and 6% wanted more chemical and non-chemical control. Several homeowners requested more backyard mosquito surveys and better resident-education programs.

INSECTICIDE USE

- Q. Do you regularly purchase insecticides to control mosquitoes in your yard?
- A. No—67%; Yes—33%.
- Q. How much do you spend on insecticides for mosquito control each summer?

A. Mean—\$.697 (n = 66); Median—\$.89 (n = 66).

A small percentage (33%) of the residents surveyed regularly purchased insecticides for backyard mosquito control. This is surprising in view of the fact that 55% of those questioned thought there was a mosquito problem in Lake Shores, and 58% said mosquitoes limited the time they spent outdoors, in addition to the fact that many (49%) of the residents favored an increase in property taxes for better mosquito control.

CONCLUSION

The results of this survey provide useful information on the attitudes and knowledge of a "target audience" toward pest mosquitoes, and the mosquito control program provided by a mosquito control commission. While the specific information obtained in the survey is best applied to the Lake Shores community, there are general concepts that are applicable to most communities and mosquito control commissions in eastern U.S. For example, this work shows that a brief survey of community residents can provide information on a target audience's knowledge of mosquitoes, thus influence educational and public relations programs. A survey can provide data on nuisance level for mosquito bites, thus influence the action thresholds, based on mosquitoes trapped/night, for initiating additional control measures.

The residents of Lake Shores indicated that only 8 bites/night would be tolerated, with a median of 3 bites/night. Using Headlee's (1932) formula, a trap catch of 6 to 16 mosquitoes/night should be the threshold used to determine whether additional mosquito control was necessary. Although the Lake Shores community is considered very representative, considering resident's background, age, time spent outdoors, house value, etc., the 6 to 16 mosquitoes/night threshold may not be applicable outside this community. However, a survey of a target audience can provide a basis for such a threshold.

Although the objectives of this survey and the one conducted by Gerhardt et al. (1973) in North Carolina are different, the results of some questions can be compared. Gerhardt et al. (1973) (NC) reported that 69% of the people interviewed were bothered by mosquitoes. In this study (VA) 55% of the people thought

there was a mosquito problem (=bothered by mosquitoes) in Lake Shores. Sixty-six percent (NC) and 63% (VA) of the residents thought the mosquito problem had improved in the last 5 to 15 years. The most interesting similarity in response was to the question regarding the willingness of residents to pay for improved control of mosquitoes and other biting flies. The results were very similar, 43% for NC and 49% for VA, and probably accurately reflect a willingness of public support for programs that improve the quality of life.

Educational programs, providing residents with information on mosquito breeding sites, and backyard control measures, can be beneficial to mosquito control commissions. Light traps and larval sampling provide information on the target pests of mosquito control programs, but no information on the target audience of the program. The success of a mosquito control program depends on understanding both of these targets. The questionnaire and one on one interview method used in the survey presented here provides valuable information on a target audience of the Kempsville-Bayside Mosquito Control Commission. Other mosquito commissions may find this method useful.

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