

men averaged 3.6. This compares with the average of 6.2 of Jankowski and Bickley (1976), but in the present study, half of the positive specimens had re-fed and had released an unknown number of parasites. More consideration should be given to the 3rd-stage infective parasites found in the head and/or mouthparts because these are the only forms capable of development in the dog. These "mature" forms were found in 20, or 50%, of the dissected specimens; the average number per mosquito was 2.6. Five of these 20 specimens had re-fed, and this suggests that if these females had taken a 3rd blood meal they would have been capable of transmitting the heartworm.

In Maryland *Ae. canadensis* is widely distributed, and females are often abundant and pestiferous from mid-April to mid-June depending upon local weather conditions. At some locations, such as the Pocomoke Swamp in Worcester County, adult females may be encountered throughout the summer and early fall. Results of this investigation clearly indicate that transmission of heartworm by *Ae. canadensis* occurs 3 weeks after the 1st blood meal. From a practical standpoint this means that control of, or protection from *Ae. canadensis*, and administration of preventive medication should begin in mid-May in Maryland. *Ae. canadensis* is not a domestic mosquito, but it invades yards and parks in suburban areas.

With the direct proof that *Ae. canadensis* is a vector, the incrimination of other species such as *Ae. vexans*, based on good circumstantial evidence, is more credible.

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THE LIFE CYCLE OF A PROGRAM

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A seed, or sometimes an idea, must germinate for a time before it emerges into a plant or a program. So it was that the mosquito control program in the Little Laramie Valley came into being.

As far back as 1955 the late Rulon Lewis of the USDA Agricultural Research Service said, "I can see the time when you'll be able to control mosquitoes in the valley."

Preparation of the seedbed took years. But six years to germinate?

A Ft. Klamath, Oregon rancher, Francis Bacchi, visited relatives who live in the area in 1970. He said the mosquitoes were as much a problem here as they were in his area. Through a spraying program they were getting excellent control.

This message was relayed to the Albany County Extension Office. We immediately asked for more details and started gathering information. In 1970 we mailed a copy of an article from a magazine telling how "Oregon Cattlemen Slug it Out with Mosquitoes" to several ranchers in the valley.

In the summer of 1971 Extension Entomologist, Everett Spackman, and University of Wyoming Entomologist, Jack Lloyd, and I initiated some attempts at adult mosquito control on beef cattle at the Talbott Ranch on Pahlow Lane. That summer several ranchers estimated their loss at nearly \$25.00 per animal. Writing of mosquito control, Orval Garson said in 1971, "The blessings that could accrue to humans and animals alike with eradication of these pests would be incalculable." Previous to this Spackman, Lloyd, and I had met several times with officials of the City of Laramie and personnel of the Communicable Disease Center in Fort Collins to help develop a practical and efficient control program for urban residents.

In the interval from 1971 I would occasionally "water" that germinating thought with some questions of local ranchers and inquiries of chemical companies.

During the summer of 1975 the germinating thought began to emerge. Edgar Loban, a Little

Laramie rancher, had had enough. In early July, 1975 he called me and said, "What in the world are we going to do about these miserable mosquitoes, or is there anything we can do?" Methods of control are available and would perhaps be satisfactory if applied to a large area, was the reply. A decision was made to invite residents of the area to an informational meeting at the Little Laramie Community Hall July 23. Thirty-two residents attended and heard Spackman, Louis Ogden of U.S. Public Health, and me explain the life cycle of the mosquito, possible control programs, and what control programs were being used in other areas, primarily in Oregon. Emotions sometimes ran rather high during the session. Ranchers were concerned about per acre and total costs, how their acreages would be figured, effectiveness and justification of the costs. A steering committee of five Little Laramie Valley residents was selected to formulate a program — Gary Loban, Wales Wenburg, Bob Zorko, Kit Westbrook, and Steve Kaisler. On July 30 this group met again and began mapping a potential area on which to apply control and visited, via conference phone, with an aerial applicator to determine feasibility.

A group of Big Laramie Valley residents gathered at the Harmony School July 31 where 28 attended and heard about the same report as had been given in the Little Laramie.

On September 18, Cal Butler of Butler Farm Air from the Ft. Klamath, Oregon area visited the Little Laramie Valley, attended a rancher meeting and answered all the questions ranchers asked. Dan Hawkins and Bob Eisele of Hawkins and Powers Aviation of Greybull, Wyoming visited with the members of the group's steering committee. This gave the seed a much needed boost.

On September 24 the ranchers decided to incorporate, elect directors, and initiate area sign-ups. Some 18,000 acres were committed that evening. Directors elected were Garry Loban, Chairman; Wales Wenburg, Vice Chairman; Bob Zorko, Secretary; Kit Westbrook, Treasurer and Steve Kaisler, Weed and Pest Coordinator.

The seed had progressed to emergence!

On November 6 the Little Laramie Mosquito Control Association, Inc. (LLMCA) Board met with area game and fish officials to discuss an environmentally safe mosquito control program. Rancher proposals were acceptable and the directors were encouraged.

The LLMCA directors met with the Albany County Weed and Pest District and asked for some financial support. The district directors were receptive and did give the LLMCA money to help pay phone bills and initiate program planning.

On February 9, 1976 I convened a rancher meeting at the Valley View School in the Little Laramie Valley to explain another idea. An inte-

grated program of forage production with an eye toward maximizing net income of forage and cattle enterprises was suggested. This would involve several University of Wyoming Agriculture people in soil sampling, proper meadow fertilization, water management, efficiency and quality, meadow management, grass varieties, increased quality and tonnage, hay sampling, and recommended supplemental cattle feeding rations. This was the first project of this type attempted by the University of Wyoming in such detail. Mosquito control would be superimposed over the whole program. The idea was accepted wholeheartedly by 11 ranchers in the valley. Albany County Commissioners were asked and agreed to help support the mosquito control program with the use of revenue-sharing funds.

Bid specifications for mosquito control were drawn and sent to aerial applicators. Larval survey started May 3. On May 12 bids were opened and the winning bid was submitted and awarded to Hawkins and Powers Aviation of Greybull, Wyoming.

Ranchers in the Little Laramie were trained in larval survey methods by Spackman in mid-May and monitored larval development after the control program commenced.

Now the thought that had been growing for some 6 years began to bear fruit. Nearly 35,000 acres in the Little Laramie Valley received the first of 2 control treatments in early June. Prior to the 2nd application of control material in late June, the LLMCA directors called an evaluation meeting with the local ranchers expressing their thoughts. Wales Wenburg said, "I'm 100% for it." Kit Westbrook expressed, "It's a real successful project." Edgar Loban said, "There's never been a time out in the field when they bothered me a bit. I haven't found a larva in the last 5 days." When asked if he felt the program was worthwhile, Jim May said, "How in the hell are you going to tell? It's ruined my breeding system! When the cows are bunched on account of bugs! The bulls are really breeding. They've never been bunched this year!" George Crouse and Jack Evers of the Aspenwood Ranch report the mosquito populations, "much fewer than usual." A neighbor reported on the effort in the following manner, "They did a remarkable job."

So, city residents — ranchers are concerned also and are working on the problem of mosquito control. Laramie residents, I'm sure, have reaped some of the benefits of what was a huge program. City Sanitarian and head mosquito fighter for Laramie, Don Forcum, said, "As of now the adults certainly aren't as bad as they were at the same time each of the last 2 years north and west of town."

The 2 applications of control material on approximately 35,000 acres cost those ranchers on the Little Laramie Valley about \$1.50 per irri-

gated acre. Seven of those ranchers had an assessment of over \$1,000.00 with several in excess of \$2,000.00 and on up to over five times those amounts. Those who have cattle in the area anticipate increased gains because of reduced mosquito populations.

Bill Dalles said, "If we can get rid of enough mosquitos so they don't chase me into the house when I should be out irrigating and I can do a better job of irrigating and raise one more bale of hay an acre, it will pay for the program."

Countless hours of time and hundreds of gallons of gas were used by the unpaid LLMCA board members in getting a big job done well.

If and when you stop and ask a cooperating rancher if you can fish on his property, and if he asks for a donation of five dollars or so to help fight mosquitoes; remember about the way it was and think about the way it is now, and that thought that germinated for over 6 years.

ALLEGED "RELUCTANCE" OF BOREAL AEDES AND CULISETA TO TAKE MORE THAN ONE BLOOD MEAL

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McLean (1975) makes the generalization, without supporting data, that in "Arctic America," (defined by him as starting at 53°N), "... virus transmission by *Aedes* and *Culiseta* mosquitoes probably occurs infrequently due to their reluctance to imbibe more than one blood meal during their lifetime," (p. 269). McLintock et al. (1976) refer to "... their well-known reluctance. . . ." (p. 236), citing McLean (1975) as the authority.

If boreal *Aedes* and *Culiseta* are reluctant to take more than one blood meal, parous females would rarely if ever be taken biting, and few would com-

plete more than one gonotrophic cycle, or two in species with autogeny. In studies at George Lake (54°N) I have taken many parous *Cs. alaskaensis* (Ludlow) and *Cs. inornata* (Williston) at bait, mostly cattle (Table 1). *Cs. alaskaensis* is univoltine, and the pars taken in July and August were a year old, and had completed at least 3 gonotrophic cycles. A more detailed account of this study is in preparation. Graham (1969) took parous *Ae. excrucians* and *Ae. punctor* in animal-baited traps at George Lake in August. Both are univoltine species, emerging in May and June. Even on Ellesmere Island at 82°N, *Ae. impiger* and *Ae. nigripes* females completed up to 3 gonotrophic cycles in 2 months, (Corbet and Danks, 1973). In the Ivanovskaya district of the USSR (57°N), females of *Ae. cinereus*, *Ae. cataphylla*, and *Ae. punctor* completed as many as 8 gonotrophic cycles, (review by Detinova, 1968); all 3 species are well-represented in "Arctic America." Autogeny is known in some boreal *Aedes*, but only in the first gonotrophic cycle. *Ae. impiger* and *Ae. nigripes* take blood in the first cycle as well if they can get it (Corbet 1967).

The probability of boreal *Aedes* and *Culiseta* females taking more than one blood meal in their lifetime may indeed be low, and the probability of their transmitting viruses to humans still lower, but this is not due to reluctance on the part of the mosquitoes. Such mistaken generalizations about feeding habits only obscure the gaps in our understanding of the lives of boreal mosquitoes.

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Table 1. Parity rate of *Culiseta* females collected at bait (mostly cattle), George Lake, Alberta, 1973-75.

Month	Number dissected	<i>Cs. alaskaensis</i>		Number dissected	<i>Cs. inornata</i>	
		Parous			Parous	
		No.	%		No.	%
April	53	0	0	0
May	201	101	50	3	3	100
June	114	114	100	61	61	100
July	110	110	100	264	96	36
August	2	2	100	191	89	47