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PINE VOLES (PITYMYS PINETORUM) AND ORCHARD DAMAGE RESEARCH;
AN OVERVIEW OF THE N.Y. COOP WILDLIFE RESEARCH PROGRAM IN
ANIMAL DAMAGE

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Ross Byers has asked us to describe our pine vole research program in New York and present some of the findings that we have made relative to pine mouse control in the Hudson Valley. I would like to start by saying we very much appreciate the opportunity to meet with growers, extension specialists, private applicators, economists, biologists and members of the chemical industry. I believe meetings such as this are a very necessary part of coordinating research and control efforts. I feel that we have learned much from each other already and stand to profit even more as the meeting progresses.

I would begin by addressing first the comment made yesterday that "New York actually has no pine vole research program." This is both true and untrue. We have not had a continuously active research and management program such as the one in Virginia. We simply have not had the dollar support nor have we had the approval for such a concerted research effort. On the other hand, I can say that for the past seven years we have worked with small mammals in the orchards of the Hudson Valley and much of this work has been aimed at control of the pine mouse and meadow mouse (Microtus pennsylvanicus) in that area.

We began our research effort in 1968 with a project aimed at determining the efficacy of endrin treatment for pine vole control. Grower concerns and a small amount of laboratory data indicated that endrin was no longer as reliable in controlling pine voles as it was in the early sixties. Our initial efforts were twofold. We sought first to determine the existing efficacy of endrin and secondly to evaluate any resistance by pine voles to this chemical control procedure. Unfortunately, this entire endrin research effort was dropped by the Cooperative Research Unit when endrin as well as other persistent chlorinated hydrocarbons were banned for use in New York State about 1969. As an outgrowth of this false start we identified two important needs in the control area. The first of these was to gain basic population information about pine voles and meadow voles in Hudson Valley orchards. And, secondly, we saw the need to gain further information about the economic impact that these orchard pests were having on the growers.

I would like to trace briefly now the kinds of research and types of projects that we have pursued over the past few years (Fig. 1). Firstly, it seemed imperative to gather the type of population data that would allow for an integrated pest control system. To accomplish this, we began studies that would yield age- and time-specific data relative to

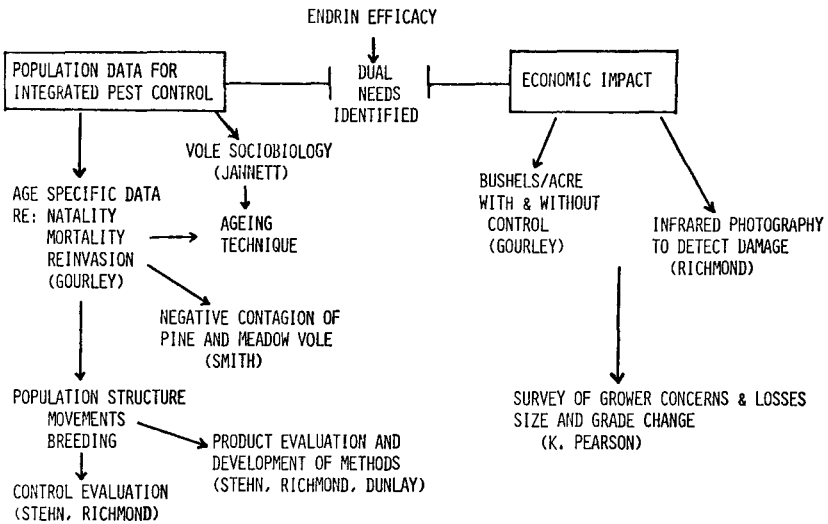


Fig. 1. COOPERATIVE UNIT PINE VOLE RESEARCH PROGRAM

vole birth rates and death rates. Also, in orchards where we caught pine voles for age-specific data we monitored the reinvasion rate of the voles into the trapped-out orchards. In concert with this population study we began a study to develop an ageing technique based on the weight of the eye lens. This technique has now been perfected and is in use by us and others. One outcome of the extensive trapping effort was the discovery that pine voles and meadow voles are not usually found at the same tree. In the jargon of the ecologist there existed a negative contagion between pine voles and meadow voles. Recognizing this we began a research project aimed at learning more about the possibility of using the larger and seemingly dominant meadow vole to control populations of the pine vole. We then proposed to control meadow voles in the usual way with zinc treated corn. We felt that the biological control approach had a great deal of potential in the ultimate management scheme for controlling pine voles. This work has been the subject of a doctoral dissertation by one of our cooperative unit students. Unfortunately careful research into the behaviors and interactions of these two voles in the laboratory environment revealed that the pine vole is actually much more likely to displace the meadow vole in any paired encounters. If this is also true in wild voles the potential for control is nil. We are continuing with some of this work and will expand the effort into a field study but, it appears that the promise that it once held is no longer there.

The efforts to gain age-specific data have resulted in a substantial amount of information about the population structure that can be useful in control efforts. For

example, we have learned a great deal about reinvasion rates of trapped-out areas and have found that when a nearby resident or a residual population exists, the trapped-out area effectively can be repopulated within six months. We have also learned certain new facts about the breeding efforts of pine voles and find that in New York environs the animals are likely to breed all year. If there is a peak in the breeding effort in New York voles it appears to occur in the fall of the year. The data further suggest a natural decline in the population in late winter and spring.

Recently, we have moved into the area of product evaluation and development of methods for control. Our work in these areas has been funded largely by the chemical companies who have new products and are seeking registration for their materials. The results of this product evaluation is the subject of a separate manuscript but details can be gotten by writing to the Research Unit. In brief we have found a number of materials that are quite effective in controlling the numbers of pine voles. There is little point in talking about the specifics of this work now except to say that, when properly applied, we have found both of the new anti-coagulant type baits in several formulations to be generally effective in reducing pine vole numbers. In addition we have measured a reduction in pine vole numbers after treatment with zinc phosphide when the material is placed on apple slices and put under bait stations. Perhaps the most useful idea to come out of our applied research efforts has been the development of the bait station technique. This technique consists of placing a slab of wood or piece of tar paper under the tree and allowing the voles to build their nest and tunnels directly under the cover. Such bait stations facilitate the use of poison baits for control and clearly enhance the control effort. Additional research is needed on method development and product evaluation and we intend to address these problems in the next few years.

The other major information need identified at the time our endrin efforts dwindled was that of measuring the economic impact of orchard mice on the fruit crop. Initially we began with an attempt to simply count the bushels of apples produced per tree from a uniform stand of red delicious trees that had been subjected to pine mouse control in part of the orchard and no control in the other part. The pine voles were controlled in this particular orchard by intensive trapping and in this instance we were certain that there were few and perhaps no pine voles remaining in the orchard that was trapped. Results from two years of monitoring apple production indicated a greater production in total bushels from the 3 acre area where the mice had been removed. In the first year of our measurements there was a difference of 2.5 bushels per tree between the experimental and control portion of the orchard. A crude measure of this loss can be made by multiplying 120 trees by 2.5 bushels and that total by \$9.00 per bushel for red delicious apples. The answer is a crude but staggering \$2,700 loss/yr./3 acres. Subsequent data were much the same but were confounded by harvesting technique.

A modest effort was put into the development of infrared photography techniques to detect orchard damage by pine and meadow voles. This research was part of a coordinated program funded by the Department of Interior's Fish and Wildlife Service and was carried out in Ohio and at the New York Unit. We found that with the use of infrared photography we could readily detect trees that were declining in health but we were unable to determine the cause of individual tree problems. Ground truth information from Hudson Valley orchards indicated that the major detectable symptom of a damaged tree was the pale green and yellowing foliage and this, of course, could be caused either by excess soil moisture, systemic disease or mouse damage.

More recently a survey of grower concerns and estimates of their losses to orchard mice has been carried out by Karen Pearson. The results of that work have been reported at this meeting. Briefly, Karen's work describes the size and grade change in three popular varieties of apples and indicates that there is indeed a significant economic impact of orchard mice on apple production.

Another way of looking at the research program that we have directed toward the mouse control problem is to examine the kinds of financial support that the research unit has had over the last few years (Fig. 2). Beginning in 1968 and

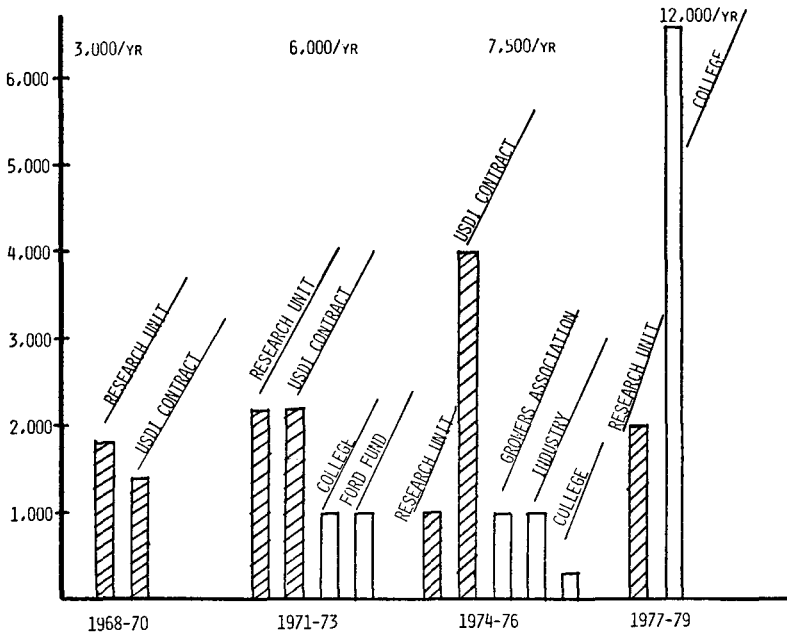


Fig. 2. PINE VOLE RESEARCH FUNDING

continuing up through 1971 the research unit was funded by U.S. Department of Interior contracts for vole ecology and control. This support continued at a low level from 1971 through 1973 and during the latter two years was enhanced by funds from the College of Agriculture at Cornell and a special grant to the university from the Ford Foundation for studies of pest ecology. Operating funds from the Cooperative Research Unit as well as contract money from U.S.D.I. have continued to support a modest research and control program but never exceeding \$7,000 per year. In 1974 and 1975 the Hudson Valley Apple Growers Association, recognizing the severity of their problem, brought together their resources and provided the Cooperative Unit with a \$4,000 grant for evaluation of new products and development of control methods. During these same years the research unit was able to contract for research support from the Velsicol Chemical Corp. and the Chempar Chemical Corp. In 1976-77 the research unit has had very limited funding and my personal role in the research effort has been minimized by new duties taken on in the Cooperative Wildlife Research Unit.

Our future research effort in the area of mouse control will be directed toward the following items: 1) The improvement of timing of existing control procedures. 2) The optimization of bait station usage. 3) The testing of new rodent control products. 4) The manipulation of orchard habitat and ground coverts for mouse control.