University of Nebraska - Lincoln
DigitalCommons@University of Nebraska - Lincoln

Great Plains Wildlife Damage Control Workshop Proceedings | Wildlife Damage Management, Internet Center for

2-9-1997

MOLE CENSUS TECHNIQUES

Richard M. Poche
Genesis Laboratories, Inc.

Follow this and additional works at: http://digitalcommons.unl.edu/gpwdcwp

Part of the Environmental Health and Protection Commons

Poche, Richard M., "MOLE CENSUS TECHNIQUES" (1997). *Great Plains Wildlife Damage Control Workshop Proceedings.* Paper 375.
http://digitalcommons.unl.edu/gpwdcwp/375

This Article is brought to you for free and open access by the Wildlife Damage Management, Internet Center for at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Great Plains Wildlife Damage Control Workshop Proceedings by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

MOLE CENSUS TECHNIQUES

RICHARD M. POCHÉ, Genesis Laboratories, Inc., P.O. Box 270696, Fort Collins, CO 80525-0696

Abstract: Effective mole control is often difficult to achieve. Various types of traps, baits, and fumigants have been developed over the years to reduce mole damage to lawns, golf courses, and other areas. Two studies were conducted in the St. Louis, Missouri area to field test products currently registered by the EPA for mole control. Reliable census methods are required to determine efficacy. The best method used was the hole punch method. It consisted of punching 1.9-2.5 cm diameter holes (using a blunt end broom stick) into the top of a mole shallow tunnel. The punched holes were examined 48 hours later. If a live mole remained within the tunnel system, the holes were neatly plugged by the mole with fresh soil.

Pages 114-116 *in* C. D. Lee and S.E. Hygnstrom, eds. Thirteenth Great Plains Wildl. Damage Control Workshop Proc., Published by Kansas State University Agricultural Experiment Station and Cooperative Extension Service.

Key Words: Eastern mole, hole punch method, *Scalopus aquaticus*

Although moles feed on damaging insects and grubs from lawns and gardens, their burrowing behavior can damage lawns, parks, flower beds, and gardens. (Henderson 1994). Moles are considered a pest in much of the eastern and central U.S. and along the west coast (Marsh 1962; Yates and Petersen 1982). Activity through mound building and tunneling close to the ground surface can reduce forage production by 10-50%. Studies by Leftwich (1972) showed that the eastern mole (*Scalopus aquaticus*) abundant in agricultural areas of Missouri.

Moles damage is more aesthetic than a direct adverse economic impact. Golf courses, however, may experience damage by the push piles or mounds left on the greens or fairway that might require repair. The feeder tunnels near the surface often are noticeable as ridges and signs of mole activity.

Trapping is generally considered the most effective means of mole control, however, the process is expensive and time consuming (Marsh 1982). Previous unpublished studies by Genesis Laboratories, utilized fumigants and grain baits in attempts to reduce mole numbers, neither of which was sufficiently effective. Moles are insectivores with the diet comprised principally of earthworms, white grubs, and insects, thus making bait acceptance difficult.

As part of several studies, field efficacy data of EPA registered mole control products were required during recent data call-ins. As a result Genesis Laboratories, Inc. was contracted to conduct product performance tests to ensure product reliability (Subdivision G). Information presented herein were obtained from two studies conducted in Missouri in efforts to control the eastern mole.

METHODS

Study Site

This study was conducted in St. Louis, Missouri, on ten golf courses. The common and wide ranging eastern mole was selected as the test species in census method development. A survey of all golf courses in the greater St. Louis area was conducted and those with notable mole activity were selected. Site maps of each golf course were completed and showed the location of

individual mole tunnel systems.

Census Techniques

Attempts were made to locate a minimum of 20 active mole tunnel systems on each golf course selected. Golf courses chosen were divided into a treatment and control section, having 10 active mole tunnel systems served as controls, and 10 as treatment systems. The distance between distinct mole tunnel systems was a minimum of 100 m.

Three indirect methods for monitoring mole activity were used in this study. These included hole punching, tunnel collapse, and open tunnel methods. The hole punching technique involved using the blunt end of a broom stick or dowel from 1.9-2.5 cm in diameter. The stick was used to punch into the roof of a shallow tunnel system. Approximately one hole was punched for every 10 m of linear shallow tunnel. For the most part, if a mole inhabited a tunnel systems, open holes were repaired by moles, within 24 hours. To compensate for possible longer tunnel system and moles perhaps being in tunnels well beneath the ground surface, holes were checked after 48 hours and observations made. A plugged hole was scored as positive and an unplugged one was noted as negative activity. If any hole along the entire tunnel network was closed, the system was supporting a live mole and scored positive.

The second method involved collapsing the tunnel system by stomping the shallow tunnels with the heel of the shoe or a stick about 15-30 cm along the tunnel. This procedure is similar to setting a harpoon trap, in which the tunnel is stomped and collapsed while the trap is set over the constricted burrow. If the mole reconnected the collapsed portion of the tunnel, the activity was recorded as positive, meaning that a live mole inhabited the system. A negative record was taken if no repair was made. Systems that were not active in the pre-treatment census were excluded from the post-treatment count. Tunnels were collapsed at intervals of approximately 10 m.

A third method used was the open burrow method. This involved digging into a surface tunnel and tearing open the tunnel for approximately 0.25 m and ensuring the openings to the tunnels were clear of dirt and debris. The openings were checked 48 hours later. This method was scored as with the other two. If either end of the tunnel was plugged by the mole, data were recorded as positive, indicating a live mole inhabited the tunnel.

With the three census techniques used, the location of the hole punched, collapsed, or opened was recorded on a plot map and marked with either plastic flagging material or encircled with lime.

Live moles were collected and maintained in 40 L glass aquariums for observations in the laboratory. Hand capture was used and involved a technician sit motionless on a chair near the end of a fresh feeder tunnel in the early morning, from daybreak to about 0730 hrs. It was an absolute requirement that the technician not move. Any movement on the surface by a person or animal would alert the mole and it would cease from digging or feeding activity. The technician then carefully watched for movements near the end of the tunnels as the mole extended its tunnel and fed on worms or grubs. As soon as movement was detected the technical ran to the spot and stuck a shovel in the tunnel about one meter behind the mole in order to block the tunnel and prevent escape. The tunnel beyond the shovel was quickly dug up by hand and the mole was placed into a 20 L plastic bucket.

Captive moles were fed canned cat food or pelleted bait and mortality observed over a two week period. No fumigants were tested in the laboratory.

RESULTS AND DISCUSSION

The hole punch method proved to be the simplest and most reliable method used in censusing mole activity. If an adult mole occupied the tunnel system when the holes were punched, the openings were neatly repaired by moles within 24 hours. It was

easily detected by the color of fresh dirt packed into the original opening. This was the only reliable method for mole systems that had numerous push piles but few surface feeder tunnels. For these, the marked tunnels were most often with the stick near the center of the push piles. The opened holes may have enabled moles to detect changes in the tunnel air characteristics conducive for optimum survival. Factors such as changes in humidity and temperature may prompt moles to efficiently repair holes in the tunnel roof.

The collapsed burrow census method was not as reliable. Tunnels near the surface but in hard ground were difficult to collapse. In addition, moles occasionally did not repair the collapsed tunnels.

The open burrow method proved to be ineffective. Moles often plugged the tunnels, but out of sight and some distance from the opening. This procedure was quickly abandoned during the first study.

Moles are very aggressive mammals and will effectively kill any small vertebrate, such as deer mice or voles, that may enter into their tunnel system. When maintaining moles in a laboratory setting, no more than one adult mole should be placed in each aquarium, since the eastern mole is very aggressive.

Radio telemetry was not considered during these studies. Attachment of a radio collar to moles, having stubby necks, would be inadvisable, since the collars would probably slide off within a short period of time. Subcutaneous placement of transmitters may be of consideration, however could not be used in field testing anticoagulants. Research into the use of a safe anesthetic, such as metafane, would have to be conducted. To attain sufficient numbers of moles for efficacy studies would require significant stuff and hours of field work.

Although the EPA Subdivision G guidelines for product performance require two reliable census techniques in conducting field efficacy studies with vertebrate control agents, one good method is available for use, that being the hole punch method, and should be considered sufficient. It is fast and reliable and will enable the researcher or homeowner to determine if a live mole inhabits a tunnel system within several days.

It was possible to maintain moles in captivity using canned cat food. We kept moles in the aquariums for over two weeks. Hazen (pers. commun.) maintained captive moles in California for three months on similar canned foods. None of the four moles exposed to pelleted baits consumed sufficient material to induce mortality. The appearance and texture of a grain-based pellet was not readily accepted by captive moles.

LITERATURE CITED

Henderson, F.R. 1994. Moles. Pges. D-51-63 *in* S.E. Hygnstrom, R.M. Timm, and D. E. Larson, eds. Prevention and control of wildlife damage, Univ. of Nebraska Coop. Ext., Lincoln, NE.

Leftwich, B.H. 1972. Population dynamics and behavior of the eastern mole (*Scalopus aquaticus*) Machrinoides. Ph.D. Dissert., University of Missouri, Columbia, MO. 91 pp.

Marsh, R.E. 1962. Mole control. The Bulletin, Department of Agriculture. State of California, 51(3):149-152.

Yates, T.L. and R.J. Pedersen. 1982. Moles. Pages. 37-51 *in* J. Chapman and G. Feldhammer, eds. Wild mammals of North America, John Hopkins Univ. Press, Baltimore, MD.