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Natal nest location and small mammal tracking with a spool and line technique

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Natal nest location and small mammal tracking with a spool and line technique

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We describe a simple, inexpensive method for tracking small mammals accurately for distances up to 180 m. A small spool of thread is attached to the back of the animal with surgical glue. As the animal moves along, it leaves behind it a trail of thread that can be followed along the route taken and to nest sites. Of 157 lactating meadow voles spooled, we found 62 nests with young. This success rate can probably be doubled by reducing two sources of spooling failure and by spooling a second time within the same trapping session.

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On trouvera ici la description d'une technique simple et peu coûteuse de localisation des petits mammifères dans un rayon pouvant aller jusqu'à 180 m. Un petit rouleau de fil est attaché au dos de l'animal au moyen de colle chirurgicale. À mesure que l'animal se déplace, il laisse derrière lui une traînée de fil qui permet de suivre son parcours et de localiser les nids. L'installation de rouleaux de fils chez 157 femelles nourricières a permis de repérer ainsi 62 nids avec des petits. Le succès de l'opération peut probablement être doublé en réduisant deux sources de problèmes à l'installation et en recommençant l'opération deux fois au cours de la même session de piégeage.

[Traduit par la Revue]

Introduction

A major area of interest in population ecology is the examination of variation in reproductive success within and between the sexes. To do this, one must determine maternity and paternity of young. Maternity is easier to determine, but only in those species where the young accompany the mother or where the nest site or tunnel can be observed. However, in the majority of small mammals that live in dense vegetation at or near the surface of the ground, finding the nests and identifying young with their mother is difficult. At present two main approaches are available: (*i*) using radiotelemetry (Madison 1981; McShea 1985; C. C. K. Boyce, personal communication) by implanting a radiotransmitter intraperitoneally or collaring a lactating female and finding the nests by monitoring the movement locations intensively; the young are then marked directly; (*ii*) using radionuclides (Tamarin et al. 1983) by injecting pregnant and lactating females with various combinations of radionuclides, thus labelling the young with a radioactive fingerprint; the young are subsequently identified with a whole-body gamma counter. Both methods are expensive and require specialized equipment. We have adapted a spool and line method, described originally by Miles et al. (1981) for use on tropical mammals, to locate natal nests of meadow voles (*Microtus pennsylvanicus*).

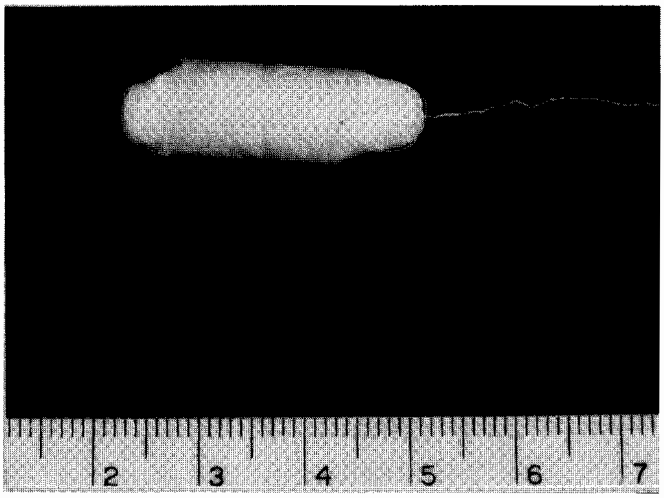

FIG. 1 Picture of a spool with the adhesive case.

Methods

Number 2 quilting spools (40 denier) were purchased from Culver Textile Corporation (525 - 52nd St., West New York, NJ, U.S.A. 07093) at a cost of U.S.$23.46 per kilogram. (Note that the manufacturer cited in Miles et al. (1981) no longer makes these products, nor could we locate any other distributors in England, Canada, or Australia for the size of spool we needed. However, Danfield Limited in England (Moss Industrial Estate, St. Helens Rd., Leigh, Lancashire, WN7 3PF) and their distributors in Australia, Sewing Thread Specialists Group (86–90 Cope St., Redfern, New South Wales 2016) do carry larger spools called cocoon bobbins which may be suitable for larger animals.) Each spool weighs approximately 1.7 g, is cigar-shaped, contains 180 m of two-ply nylon thread (minimum breaking strength approximately 360 g), and comes in white, blue, or red (other colours can be specified at twice the cost). Although we obtained the smallest spool available, thread does come in greater thicknesses and lengths. We still found these spools to be too large for our purposes and therefore unwound excess thread from the outside of the spool until it measured 26 by 8 mm and contained 90–100 m of thread. The spool was then wrapped with adhesive tape (Fig. 1) to prevent the outside from catching on the vegetation.

FIG. 2 Meadow vole with a spooling package on her back.

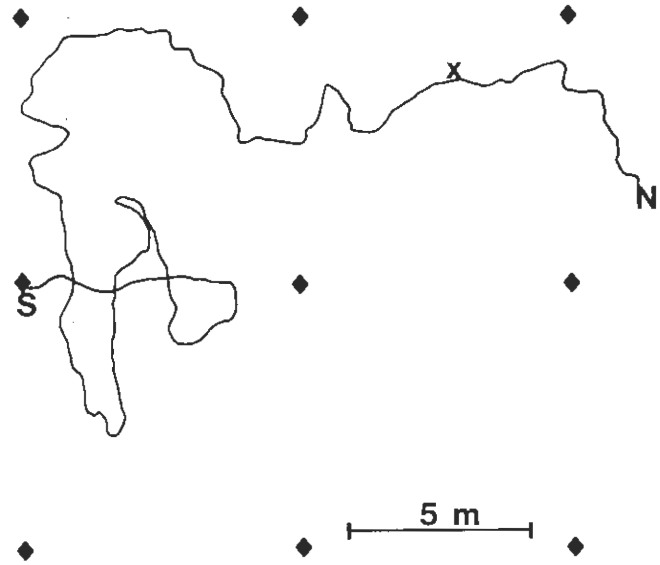

FIG. 3 Path taken by a lactating meadow vole from the trap site (S), to a "false" nest (X), and finally to the natal nest (N). Trap stations on the grid are indicated by a ◆.

Meadow voles were trapped at a field site from April to July 1985 near Toronto, Ontario (for a general description of field methods, see Boonstra and Rodd 1983). When lactating females were captured, a small section of the hair behind the neck and between the shoulders was clipped down to the skin with an electric, cordless, rechargeable hair clipper (Wahl Cordless Pet Trimmer, Harvard Bioscience catalogue No. 52-9719). The spool was attached to the skin with a nonirritating skin bond cement (used for human colostomy patients) (Skin Bond Cement, Howmedica Inc., 11775 Starkey Rd., Largo, FL, U.S.A. 33543). (The company markets a solvent for the glue, but we found it unnecessary.) Animals were not anesthetized. Glue was applied to both the spool and the skin and allowed to become tacky before the two surfaces were joined. Once the spool was secured to its back (Fig. 2), the animal was placed in an empty bucket for a few minutes to allow the glue to set. The thread trailing from the inside of the spool was then firmly attached to the trap cover and the animal was released. Several hours later, we returned to the trap site and followed the thread through the grass to the nest.

Results

Over the course of the study as we were perfecting the technique, we made 157 spooling attempts and found 62 (39.5%) nests with young, all above ground. Reasons for failure were as follows: (*i*) the female wandered more than 90 m before returning to the nest and the spool simply ran out of thread (17 cases); (*ii*) the thread was cut or broke of its own accord (36 cases); (*iii*) the spooling package dropped off and was recovered near the trap, probably because of weak bonding to the skin of the vole (19 cases); and (*iv*) we accidently broke the thread as we followed it (23 cases). By eliminating the latter two sources of spooling failure and having a second try in other cases, we feel our success rate could probably be doubled. We tried the fluorescent dye technique reported by Lemen and Freeman (1985) to increase our success rate, especially in those cases in which the thread broke. However, we were not able to successfully follow voles through dense vegetation, especially after more than 10–20 m from the release point, and therefore abandoned this method in favor of respooling the female.

Figure 3 shows the path taken by a lactating female during a typical successful spooling attempt. Because the string was playing out freely from the center of the spool, there was no resistance, and hence a precise picture was obtained of the animal's movements. Often, as the animal was heading in the general direction of the natal nest, she would go off on a tangent for up to a metre, retrace her steps, and then continue on her way. This was obvious because the thread doubled back on itself. Perhaps this is a way of confusing small predators such as weasels.

In the 138 spooling attempts that resulted in a traceable path, 79 (57%) revealed the presence of one or more "false" nests. Of these, 50 females had more than one such unoccupied nest (mean = 1.5, SE = 0.08, range = 1–4). In spring, the natal nests were constructed of grass and usually had a covering of mud; false nests were constructed only of grass. In summer, both nest types were similar and were constructed only of grass. It was not possible to determine if these "false" nests were being prepared to receive young in a subsequent move or if they were recently abandoned nests from this or a previous litter. Thus females appear to have a number of potential nests at their disposal. MeShea (1985) mentions that when he discovered a natal nest with radiotelemetry and subsequently tried to find the female again in a few days, she had always moved the young, perhaps because of the disturbance of marking the young. In three cases we also found that the female had moved marked young to another nest nearby. In three other cases we found the thread disappearing into an underground tunnel or crack in the ground. In one of these, we found the nest underground and in the other two, the thread reappeared above ground about a metre away.

Discussion

Our spool and line device is comparable to type D of Miles et al. (1981). It improves on that of Miles et al. by being case free (they used a plastic holding case); therefore it weighs and costs less. Our package is also less restrictive and potentially less irritating, in that we substituted surgical glue for their harness of adhesive tape. An added benefit is that our animals do not have to be recaptured to remove the device, whereas theirs did. We found that in almost all cases, females that had been spooled on the 1st day of a trapping session and that were caught again the next day had sloughed off the glue and the adhesive tape enclosing the thread. Thus no special methods had to be employed to remove the glue. These modifications, either with other spooling devices presented in Miles et al. (1981) or with modifications of them, may work well on larger species such as rabbits and hares.

The advantages of this method over the other methods are its low cost (approximately $0.04 per spool), its simplicity, its accuracy, and its speed (about 45–60 s per metre of thread followed). Costs for carrying out radiotelemetry work are in the range of U.S.$5000 to $8000 (two receivers, Yagi antennas, 20–40 transmitters; S. Mihok, personal communication) and for radionuclide work, over U.S.$8500 (approximately the cost of a portable whole-body gamma counter plus $150 for each isotope every time it is needed; R.H. Tamarin, personal communication). Because a continuous record of the exact route taken is available, spooling permits the study of certain aspects of spacing behavior, predator avoidance, and foraging behavior not readily answered with radiotelemetry, which can only provide a series of spot readings of animal location. Once a natal nest is found, both radiotelemetry and spooling can provide similar information on preweanling litter size, sex ratio, and growth rate, on infanticide and nest parasitism (I. T. M. Craine, personal communication). Thus questions involving the heritability of dispersal (Hilborn 1975; Beacham 1979), and philopatry (Greenwood 1980; Dobson 1982), as well as the variation between mothers in reproductive success can be addressed with precision.

The disadvantage of this method is that it is not 100% sucessful for reasons given above. However, it is possible to retrap the females whose nests were not found in the first attempt and try again. It is likely to be less successful for species that nest primarily underground (eg., *M. ochrogaster*; L. L. Getz, personal communication), as the small burrow entrances may cause the spool to be sloughed off. However, the technique will at least identify the location of the burrow system. Some disturbance does occur to the vegetation as it is parted to reveal the presence of the thread. However, during the spring and summer when the grass is actively growing, the grass springs back in a day or two. During the autumn, the disturbed trails remain more obvious for up to a week or more. We do not know what artifacts, if any, result from finding the nest, marking the young, and then replacing them. Radiotelemetry has the same problem.

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ADDENDUM

Since this paper was written, we have devised a better method of wrapping the spool prior to gluing it to the back to the vole. In the paper we used adhesive tape to wrap the spool. However, this year we have experimented with the use of very thin heat shrinkable plastic, and now use it all the time. We use the heat shrinkable plastic manufactured by the 3-M Company, though others such as Tago also make a similar product. This product is used in winter in Canada to seal the inner windows of a house from cold drafts. We cut a thin strip of the plastic (approximately 3-4 cm wide) and wrap it around the spool. By means of a needle stuck through the center of the spool, we hold the spool above the low heat of a gas flame. The plastic shrinks and forms a cocoon around the spool. Care must be taken that the thread from the inside of the spool can still freely play out. This method has the advantage that the glue never comes in contact with the thread.