

Stickel L F. A comparison of certain methods of measuring ranges of small mammals.  
*J. Mammalogy* 35:1-15, 1954.  
[Patuxent Research Refuge, Laurel, MD]

Different methods of determining size of home range from grid-trapping data are compared in studies of artificial populations, employing different patterns of trap visiting, range shape, and trap spacing. Results are compared with those obtained in field studies of wild rodent populations. [The *SCI*® indicates that this paper has been cited in over 150 publications since 1955.]

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October 15, 1986

During my first employment as a junior biologist conducting food habits analyses at the Patuxent Research Refuge (now Patuxent Wildlife Research Center) of the US Fish and Wildlife Service, the first station director, Arnold L. Nelson, gave each staff biologist the opportunity to spend a little time conducting field studies on the 2,600-acre research area. These studies were to help in ecological evaluation of the area, but also, no doubt, functioned as a morale builder for biologists daily engaged in difficult, demanding, and confining laboratory work.

I undertook to measure the population density of small mammals in different habitats. The state-of-the-art methods recommended to me and prevalent in the literature worried me, especially after preliminary field work. Reading the classic paper by W.H. Burt<sup>1</sup> was a turning point for me in seeing that knowledge of home-range size was the key to measuring population density. My first papers<sup>2-4</sup> em-

ployed these concepts in field evaluations. However, they could give only limited attention to the question of how home ranges could be measured. Furthermore, the importance of knowledge of the home range to habitat evaluation and to understanding animal behavior was becoming increasingly apparent. Advocacy of many different methods of measuring home ranges appeared in the literature. It did not seem possible to evaluate them objectively.

It occurred to me that artificial populations could be used to help in understanding the mechanisms of measuring home ranges. The effects of random trap-visiting, bias toward central traps, trap-spacing, range shape, and other factors could be considered. So grids of traps were inked onto oversize graph paper, and simulated ranges were cut from plastic to be tossed as randomly as possible on the trap-grids. It was a slow, laborious job.

Analysis showed that random captures in artificial populations produced patterns that were similar in many ways to those observed in field studies; the necessity of appropriate trap-spacing in relation to range size became obvious. Some commonly used methods of expressing range size proved to be clearly superior to others. However, the artificial populations could not fully simulate actual populations, where use patterns changed as conditions changed and the "boundaries" of ranges tended to shift continuously or with time. Progress was made, but problems remained.

I suspect that the reasons the paper has been cited frequently rest on the continuing interest in home-range behavior<sup>5</sup> and the continuing difficulty in field evaluations, despite the many advances in observational methodology. The sophisticated techniques that became possible with the use of computers<sup>6</sup> also presented new possibilities for analysis and understanding of home-range characteristics and created a resurgence of interest in home-range behavior and its biological significance.

1. Burt W H. Territoriality and home range concepts as applied to mammals. *J. Mammalogy* 24:346-52, 1943. (Cited 215 times since 1955.)
2. Stickel L F. Experimental analysis of methods for measuring small mammal populations. *J. Wildlife Manage.* 10:150-9, 1946.
3. ———. The source of animals moving into a depopulated area. *J. Mammalogy* 27:301-7, 1946.
4. ———. The trap line as a measure of small mammal populations. *J. Wildlife Manage.* 12:153-61, 1948.
5. ———. Population ecology of house mice in unstable habitats. *J. Anim. Ecol.* 48:871-87, 1979.
6. Jennrich R I & Turner F B. Measurement of non-circular home range. *J. Theor. Biol.* 22:227-37, 1969. (Cited 120 times.)

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