Interindividual Influence on Diurnal Rhythms of Activity in Cycling and Noncycling Populations of the Field Vole, *Microtus agrestis* L.

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**Summary.** The effects of interaction among individuals with respect to wheel-running activity has been investigated in two geographically separated populations of the field vole *Microtus agrestis* L. In one of them, a northern cyclically varying population, a strictly nocturnal activity pattern is changed into a more or less short term 24 h pattern under conditions of increased contact among individuals. In the other population, south-Swedish, without population cycles, no such effects were observed. This indicates population differences in response to interindividual contact which might be of importance to the known differences in population dynamics.

**Introduction**

Much of our present knowledge of the behavior of small mammals comes from observations of animals in captivity. This is particularly valid for species like the field vole (*Microtus agrestis*) that spend most of the time in covered runways, and thus are utterly difficult to study in natural habitats. Activity and rhythmicity in different species of rodents have been extensively studied in laboratories using various types of experimental designs (for reviews see Johst, 1967; Büning, 1967). However, only rarely have the effects of interaction between individuals on the different behavioural manifestations been considered. Calhoun (1963) as well as Crowcroft and Rowe (1963) and Bovet (1972) reported an influence of social rank on the distribution of general activity in mice. Fujimoto (1953) observed that male mice showed identical patterns of activity distribution when separated but dissimilar ones when caged together. Contrary to this, Kavanau (1963) found that female mice showed individually varying activity patterns when separated but similar ones when kept together.

It has previously been shown (Rasmuson et al., 1977) that two geographically separated populations of field vole differed in their amounts of activity, both with regard to single individual activity and to group activity. The differences between the two populations were more pronounced for males than for females.
and greater when animals were grouped than when they were single. Breeding experiments showed that this behavioural trait had a genetic background.

The aim of the present study was to investigate whether the two populations also differed in activity distribution and whether contact between individuals affected the activity patterns. An experimental arrangement, which allowed observations of interindividual influence on the circadian patterns of wheel-running activity was used.

**Material and Methods**

The specimens of *Microtus agrestis* used in the present investigation were trapped in Longworth traps at two localities in Sweden, Degernäs near Umeå (N 63, E 21°) and Stensöffa Research Station near Lund (N 55°30', E 13°).

The northern population is a typically fluctuating population with cyclic density fluctuations of great magnitude, while the southern population except for seasonal variations is almost stable (Hanson, 1971a, b). Studies of several allozyme systems (Nygren, in preparation) suggest considerable genetic differences between field voles from the two populations.

The experiments were carried out in a greenhouse under natural light conditions (see legend of Fig. 2). Animals of the southern population were collected in November 1976 and kept in

![Diagram of experimental cage](image)

**Fig. 1.** Plan view of the experimental cage used for recording wheel-running activity. The central walls were changeable to permit the use of two types of walls, one of solid aluminum (thickness 6 mm), the other of perforated perspex (thickness 6 mm, densely spaced holes). The latter allowed auditory, visual, olfactory and physical contact. With the aluminum wall the contact between animals was restricted to an auditory and olfactory one. The walls facing outwards were made of perforated aluminum plate. A lever on the running-wheel activated a micro-switch connected to an event recorder (Esterline-Angus) which registered the beginning and duration of the events. Foodpellets, lettuce, and water—was available ad lib. and nesting material was provided.