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Commentary

Monogamy in free living *Microtus oeconomus*

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Phenotypic plasticity is characteristic to spacing behaviour of female voles (Viitala 1986, Ims 1987b, Ylönen et al. 1988, Tamarin et al. 1990). The female spacing behaviour affects the male spacing behaviour (Ims 1987a) that is the main cause of the mating structure that may show phenotypic flexibility, too (Tast 1966, Viitala 1977). Ostfeld (1985) predicted that male voles adopt mutual territorial behaviour if females have clumped distribution due to rich food resources, but have overlapping home ranges and apparent promiscuity if females are territorial because of food scarcity. Ims (1987) assumed males to adopt territorial behaviour if females breed in synchrony but to have overlapping home ranges if females breed in asynchrony. Both hypotheses are supported by field evidence (Pusenius & Viitala 1993). An extension of Ostfelds (1985) hypothesis could be that if female territories are isolated from each other in patchy environment males should not have overlapping home ranges but they should be monogamous. North Fennoscandian Microtus species are reported to have apparent one male polygynous, or multimale promiscuous mating structures (Tast 1966, Myllymäki 1971, 1977, Viitala 1977). The promiscuous groups in *Microtus* have been observed in early summer, only (Tast 1966, Viitala 1977, Pusenius & Viitala 1993). Here I report occurrence of monogamy in free living root vole, *M. oeconomus*.

When live trapping rodents throughout the breeding season in birch forest at Kilpisjärvi, Finnish Lapland, in 1967–70 and 1972–74 I managed to capture and mark individually some sexually mature individuals of the root vole during peak phases of cyclic density fluctuation in 1969, 1970 and 1974. In 1969–70 I monitored a two hectare study grid with ten meter trap spacing. In 1972–74 I had a 6.7 ha grid with 10 m trap station intervals and 20 m trap spacing but traps moving so that the grid of captures had 10 m intervals (For more details s. Viitala 1977, 1988). There were 7 sexually mature root voles (one male and two females sedentary) in 1969, 6 (one male and two females sedentary) in 1970 and 25 individuals (four males and four females sedentary) in 1974. An individual was classified as sedentary if it was captured three or more times on the grid. As root vole habitats the small patches of most eutrophic meadow woods and paludified Korpi-woods are tolerable but suboptimal, surrounded by intolerable heath forest. The reproduction rate was low compared with optimal open grassy habitats (Tast 1966).

In August 1969 (Fig. 1) there was one pair and one female that was once visited by a male that was not captured again. The male of the pair was not captured in the area of the female living alone. In summer 1970 (Fig. 1) there were just two sedentary females and one male in succession. The male and one female inhabited the

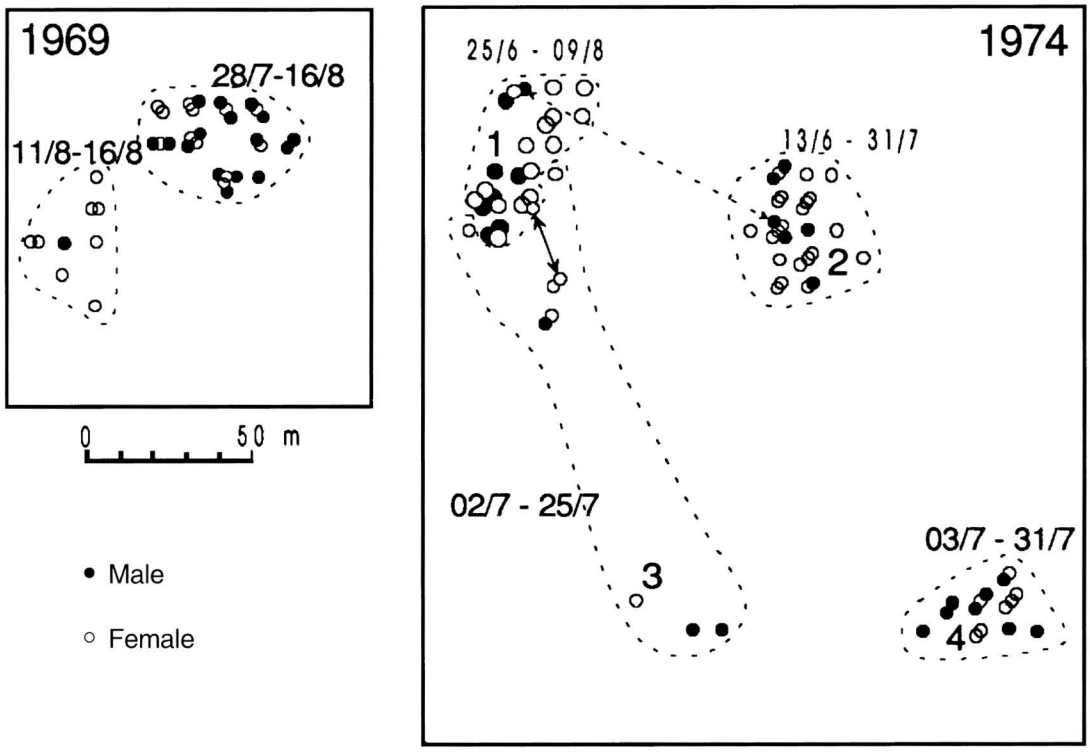

Fig. 1. Parts of the study grids showing all catches of the sexually mature pairs and a single female once visited by one male that was not captured again in summer 1969, and the the captures of the four monogamous pairs of sexually mature root voles in summer 1974. Catches of individuals are indicated by broken line boundaries and arrows. The territories in 1974 are numbered (1–4) and the first and last dates of observation of each pair are given. The grid of observations was with ten meter intervals in each year.

same territory but they were not observed simultaneously. The mortality was high and all vole species declined rapidly during that summer (Viitala 1977). There were four long lasting (a week or more) monogamous pairs in 1974 in isolated territories. Also the females were mutually strictly territorial. Even though two territories in one case were in close contact, there was only one occasion of overlapping between catch sites of females belonging to different pairs. About 70 percent of the captures of an average male were in trap sites visited by one female. Only one male was once captured on a catch site of an other female. Those male catch sites that were not common with its mate were, however, just inside or around the female catch sites. The only breeding structure observed in these circumstances was monogamy. The degree of fidelity was high.

In root vole the mating structures from promiscuous groups to polygyny (Tast 1966) and, as reported here, to monogamy have been observed. It seems that the mating structure depends on habitat, densitys and time of the year. It may not be a strictly species specific pattern. In the case of isolated female territories it would, probably, be too risky for a male to try to visit other females and to give opportunity to sallying foreign males. Because of pregnancy block and induced ovulation caused by a strange male (Clulow & Clarke 1968) it would probably be risky also outside the time of oestrus. In this case the monogamy may be solely the result of suboptimal patchy environment. The best a male can do to optimize fitness in that unfavourable situation is, probably, to protect the single isolated female against other males.

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