

Fluctuations in microtine populations in an island area in northern Norway 1958—1981

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On the small marine island of Tranøy, in Troms county, populations of field vole (*Microtus agrestis*) peaked in 1959, 1962, 1966, 1970 and 1974, showing a 3—4-year cycle largely parallel with microtine cycles in the vicinity. The 1978 peak found in many other areas was not, however, apparent on Tranøy, nor on many parts of the large island of Senja situated close to Tranøy. Norwegian lemmings (*Lemmus lemmus*) do not usually occur on Tranøy, but in late autumn 1969 a great many reached the area, probably from Senja. Some lemmings bred in 1970, and then disappeared.

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INTRODUCTION

In arctic and alpine regions many species exhibit so-called cycles. The phenomenon usually observed in a «cyclic» population is a statistically significant tendency for fluctuations in numbers to be repeated at intervals which are more regular than would be expected if they occurred by chance (Watson & Moss 1979). Nothing is suggested about the amplitude of the peaks and lows.

Palmgren (1949) and Cole (1954) suggested that a series of random numbers might show fluctuations little different from those that biologists call cycles. A real periodicity has, however, been well documented in some microtines in northern Eurasia, to some extent also in North America (Krebs & Myers 1974, Stenseth 1977, Finerty 1980).

In Fennoscandia the microtine populations fluctuate in 3—4-year cycles (e.g. Wildhagen 1952, Kalela 1962), and the cycles are most marked in areas with a long period of snow cover (Hansson 1979). Peaks do not always occur, however, in the same year throughout the region (e.g. Myrberget 1973, 1982), and the fluctuations are not always synchronous for all species in the same area (Myrberget 1965, Myllimäki et al. 1977).

In Norway the microtine cycles seem to be least marked in coastal areas (Myrberget 1965, Hansson et al. 1978). One cause may be that these are often areas with little snow (see above). Another reason may be that these areas include islands, and on these, and other isolated locali-

ties, cyclic fluctuations are seldom. Some authors claim that this is because the animals are unable to disperse (Krebs et al. 1969, Tamarin 1978).

This paper describes fluctuations in numbers of microtines on Tranøy, in Troms county, northern Norway, in the period 1958—summer 1981. The purpose is to study whether the microtine populations have cycled on the small marine island, and what species have been involved.

Tranøy is located between the large island of Senja and the mainland. Another problem studied here is whether fluctuations in the microtine populations on Tranøy have occurred in synchrony with those on Senja and those in the rest of Troms county.

STUDY AREA

Tranøy (69°09'N — 17°25'E) comprises 127 ha, and the study area also includes three small islets (area 10 ha). The vegetation and soil are described by Myrberget (1975). The island has one farm of 15 ha. The farm was not in use in 1966—1975.

The distance between Tranøy and the nearest land, Senja, exceeds 1 km on all sides except to the east. Here some small islets, some hundred metres distant, lie between Tranøy and Senja. The waters around these islets are seldom totally covered by ice. Senja is 1590 sq.km in area, the highest mountain stretching about 1000 metres above sea level.

MATERIAL AND METHODS

Tranøy

For 1958—1959, the results are based on subjective estimates from Mr. Olaf Storfjord. In later years I have done ornithological field work on the island from May/June to late July, and in some years also in other months. Dogs were used during most of this field work.

In 1960—1961 we trapped voles in June. It became obvious, however, that the most common species, the field vole (*Microtus agrestis*), tended to reject potato bait in the early growth period of herbs and grasses.

Changes in microtine numbers are based on indirect evidence such as signs of feeding and overwintering, direct observations of animals during field work, catches by dogs and cats, observances in the course of farm work as haymaking, and the breeding of short-eared owls (*Asio flammeus*). Such field signs can be fairly good indicators of vole abundance (e.g. Hansson 1979b).

Table 1. Characteristics of field vole populations in different years on Tranøy. Winter = signs of winter feeding and winter nests. Field = observations during field work, included indications given by the dogs. Farm = observations during farm work, included voles taken by cats. Number of crosses indicates population size. 0 = no or hardly any observations. — = no information.

Year	Winter	Field	Farm
1958	—	—	+
1959	—	—	++
1960	+	0	0
1961	0	+	++
1962	+	+++	+++
1963	++	0	+
1964	0	0	0
1965	0	+	++
1966	+	+++	—
1967	+++	0	—
1968	0	+	—
1969	+	+++	—
1970	+++	++	—
1971	+	0	—
1972	0	+	—
1973	0	+++	—
1974	++	+++	—
1975	+	0	—
1976	0	0	0
1977	0	0	0
1978	0	0	0
1979	0	0	0
1980	0	0	0
1981	+	+	+

Other areas

Reports on autumn populations of wildlife (Game reports) are submitted by the Municipal Wildlife Boards. These give subjective estimates of population levels, classified as «high», «medium» or «low». The reports contain information on Norwegian lemmings (*Lemmus lemmus*) and «voles», that is a group of species also including «mice» (see Myrberget 1965).

On Senja the reports came from the municipalities of Berg, Lenvik, Torsken and Tranøy. Part of Lenvik is located on the mainland, but the Chairman of the Board has been resident on Senja, and the reports are taken to hold good for Senja, unless stated otherwise.

For areas of Troms outside Senja approximately 20 reports were submitted for most years, but there are no reports later than 1978.

RESULTS

Tranøy

Characteristics of the years. — In addition to Table 1 certain details are given:

In the summer 1966 the dogs caught voles in great numbers, up to 36 voles on a four hour trip. In 1969, the dogs took nearly as many voles as in 1966. By accident, two 10 litres paint boxes that had been tried as Barber traps for voles were left behind in the fields the autumn 1969. In May 1970 they were nearly filled with microtines. Most were Norwegian lemmings, some were field voles and some large-toothed redbacked voles (*Clethrionomys rufocanus*). These animals had probably been killed in late autumn 1969. In spring 1970, signs of microtine winter feeding were found practically everywhere. In late June, 3 very young lemmings were observed, and up to the end of July adult lemmings were seen many times during field work. All three microtine species were noted as food for breeding short-eared owls in June-July. The dogs caught quite a few voles, but obviously less than in 1969.

In the spring 1973, only few voles were observed. The number increased rapidly during the summer and was in September/October very high on abandoned meadows. Vole number was also high in 1974. The data do not, however, allow comparison of numbers in late summers 1973 and 1974. The only signs of voles in 1977 refer to a few voles taken by cats.

Short-eared owls nested successfully in 1962, 1966, 1969, 1970 and 1974 (in 1969 three pairs, in other years one pair). One unsuccessful nest was recorded in 1968.

Population fluctuations. — If a «crash» year is defined as a year with hardly any signs of living microtines in May following a year with high numbers, the data indicate the following vole crash years: 1960, 1963, 1967, 1971 and 1975. The vole population in 1977 was not high enough to call 1978 a crash year, out from the given definition.

If a «peak» year is defined as the year preceding the crash year, this gives the following vole peak years: 1959, 1962, 1966, 1970 and 1974. In fact, however, the population in 1969 may have been higher than in the «peak» year 1970. Of these cyclic highs, 1962 was less pronounced than the others. For the period 1958—1975 the data show one 3-year vole cycle and three 4-year cycles, while no cycle occurred in 1976—1981.

The signs of winter grazing and nesting indicated that the vole population decline occurred in late winter in 1967, in late autumn/early winter in 1959 and 1975. It is difficult to ascertain when the population crashed in 1962—63. In 1970 the decline was obviously gradual during the summer, and the population must have crashed sometime in late autumn/early winter.

Species involved. — In total many hundred voles were seen killed by the dogs, all obviously field voles. Judging from the interest of the dogs in catching field voles, the highest numbers occurred in grassland like shore meadows, near to cultivated fields or on abandoned farm land. The very highest numbers observed during the field work were found, however, on the islets, particularly in *Juniperus* meadows.

Large-toothed redbacked voles were only ob-

served in 1969—70, but it cannot be excluded that they occurred in other years. Norwegian lemmings do not normally occur on Tranøy. A great many lemmings invaded the area, however, in 1969, probably from Senja. They bred on Tranøy in 1970, and then disappeared.

Senja

The game reports on voles and lemmings give a confusing picture of the fluctuations in 1958—1964 (Fig. 1). The high lemming population reported in 1961 was not confirmed by personal casual observations. In fact, in a central area (Ånderdalen), small numbers of lemmings were observed each year in the period 1960—1964, and there was probably a very slight peak in the vole population in 1963.

In the period 1965—1976, the following were microtine peak years: 1966, 1970 and 1974. Of these peaks, 1970 was the most conspicuous for lemmings, and the population was probably higher in autumn 1969 than in late summer 1970 (pers.obs.). For 1977—1981, there are too few game reports to allow evaluation of population fluctuations.

Troms

In the following years, over 30 per cent of the game reports estimated the vole populations as «high»: 1958—59, 1963, 1966, 1969—70, 1973—74 and 1977—78. There are no reports for 1979—81. Personal casual observations from inland Troms in 1979 indicated low vole

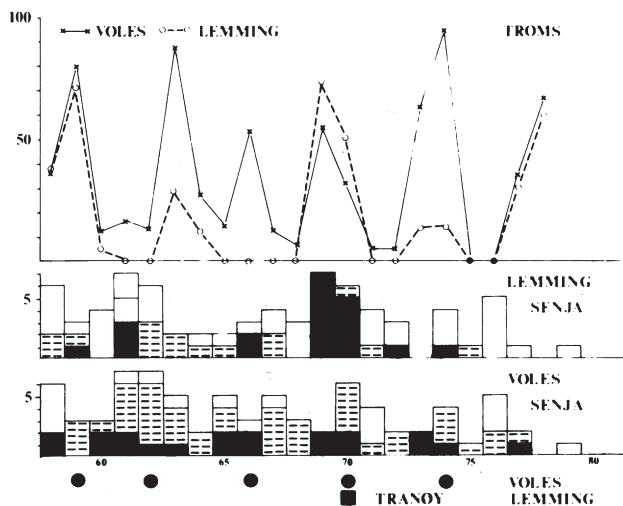


Fig. 1. Population fluctuations in voles and Norwegian lemming 1958—1981. At the bottom, population levels on Tranøy (see text): Circles — voles, squares — lemming. Black symbols — high numbers. Open symbols — increasing numbers. The columns show the number of game reports from Senja stating high (dark), medium (dotted) and low (white) populations of voles and of lemming, respectively. Upper curves show percentage of game reports from Troms county, Senja excepted, stating high populations of voles (unbroken line) and of lemming (broken line).

numbers. This gives the following peak years for voles: 1959, 1963, 1966, 1970, 1974 and 1978. The numbers may, however, have been higher in 1969 than in the peak year 1970. Mean length of interval between peaks was 3.8 years.

Except for 1966, which was not registered as a peak for lemmings, the lemming and vole populations appear to have experienced parallel fluctuations. In the summer 1960, high populations of lemmings were observed, however, in some inland areas with no signs of voles (pers.obs.).

CONCLUSIONS AND DISCUSSION

The game reports comprise only subjective estimates. This is also the case for the field data from Tranøy. However, on the small island the differences between highs and lows were easy to observe during the months of field work undertaken every year. The dogs were of particular help as they were much interested in catching voles. In some years valuable information was also obtained from catches by domestic cats. In all years with reported high numbers of voles in spring, but in no other year, short-eared owls nested successfully, a fact which tends to confirm the estimates of voles (e.g. Hagen 1952).

Comparison with other material

In coastal and inland areas at the southern border of Troms, Hansson et al. (1978) found high vole populations in 1966 and in 1969–70, in the period 1965–1970. At Kilpisjärvi in Finnish Lapland, close to the eastern border of Troms, in the period 1963–78, microtines peaked in 1964, 1969–70, in 1974 and probably in 1978 (Järvinen & Tast 1980). In 1971–1975, there were high field vole populations in 1974 in more areas in northern Norway (Myllymäki et al. 1977). The peak years given by these authors are the same as indicated in game reports from areas of Troms outside Senja, except for the reports from Kilpisjärvi for 1963–1967, which agree more closely with Myrberget's (1973) data on microtine fluctuations in the county of Finnmark.

Trappings on Senja in 1970–1977 indicate peak numbers of field voles in 1974 and high numbers in 1977 (Christiansen 1981). Olsvik and Olsen (1980) give the following «rodent» years for an area on northern Senja in the period 1965–1975: 1966, 1969–70, 1973–74,

where the number in 1969 was higher than in 1970, and in 1974 higher than in 1973. These data show the same variation as indicated in the game reports. Olsvik (pers.comm.) states that, in central and northern Senja, the microtine populations were low but increasing in the period 1975–1981. In some lowland areas near to Tranøy, however, there was a very slight vole peak in 1978 (Myrberget et al. 1981).

Cycles

The data demonstrate what is typical of the microtine 3–4-year cycle in Fennoscandia, that the populations fluctuate largely in synchrony over larger areas, but that local populations may be slightly out of phase, and that not all cycles are noticeable in all localities (e.g. Kalela 1962, Myrberget 1982). The decline or crash in the Tranøy field vole population did not always start in the same season, as also demonstrated in other microtine populations (e.g. Chitty 1955).

On marine islands, microtines do not always cycle (see Introduction). On Tranøy, however, the fluctuations were largely in synchrony with those in other areas in the vicinity. One reason for this may be that Tranøy differs little from other nearby areas, and is not totally isolated: The snow cover is high, and the microtines are able to cross the narrow sounds partly on ice, and probably also by swimming.

Large numbers of lemmings reached Tranøy in 1969, bred and disappeared. Such short-time settlements of lemmings in new areas are well known (Collett 1895, Kalela & Koponen 1971). In this respect the data demonstrate a trait typical for islands: frequent invasions and extinctions of species (MacArthur & Wilson 1967).

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