



Urals Ecology Field Camp 1997

Report to The James Rennie Bequest



Lucy Snow & Wendy Spence

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Project report – Investigating the differences in the population structure between the mainland and an island on and around Lake Sytovskoye

L.Snow and W.Spence

INTRODUCTION

The camp we were staying at was on the shore of Lake Sytovskoye, which had a small island, 1-2km sq., in the centre of it. Surrounding the camp was taiga forest, relatively intact although there had been, and still was in some areas, a degree of felling. The island too was wooded but most of this had grown up in the last 50 or so years, as it used to be the site of the house of the communist part leader in the Urals. Now it is overgrown, as the house was burnt down in the '40s. There were some larger trees on it though, and we did see two large Siberian pines, which are quite rare in the area and usually found further east than the Urals. Before we started work, we had a series of lectures about the fauna of the Urals and about the rodent populations in the area.

In the temperate regions there are two life strategies employed by rodents. The first shows a sigmoid growth curve and adult size is reached in about 1 and a half months. The rodents are born in the spring, reproduce within the year, and do not survive winter. They have great potential fecundity, as they can reproduce within a month of leaving the nest and several generations are produced in one season. The second strategy shows a 2 phase growth curve, representing those animals that tend to be born late in the year, so they stop growing once they reach a certain size and over-winter like this. The next spring they start growing rapidly, and reproduce having fewer litters than the other group. It was shown in the 1920s that the two have different physiological rates and growth and maturation rates are dependent on population density and environmental factors such as food availability.

When we carried out the trapping, the reproductive status of the animals was noted and put into 3 classes: 1) reproducing adults - usually the animals that had survived winter, 2) reproducing sub-adults - born this spring and already reproducing, and 3) non reproducing sub-adults - animals born recently, maybe the 2nd generation since the spring who were not yet old enough to reproduce.

Most of the rodents in the area were European and, because the Urals form the geological border between Europe and Asia, there is some overlap in many of the species, but we didn't find this a problem with the rodents.

METHODS

As our project outline stated, we intended to look at the small mammal populations of the area we were studying. On arrival, after introductory talks, it was decided that we would compare the rodent populations on the island with those on the mainland.

The camp was equipped with boats, various types of traps, and a microscope, and we felt quite confident that we could obtain a large enough sample size to make the project worthwhile.

We began by practising using different traps, as there were two available. First we did a small study using snap traps just around the camp. The snap traps killed the animals outright, so the number we could catch was limited by the number of times they were checked. Once traps had been serviced, we took the animals back to the camp where they were weighed and sexed, and we had an opportunity to dissect some of them. The Russian student that was working with us even showed us how to stuff them, something they learn to do at university! This study gave us practice in sexing the animals and identifying them, as there were a number of different species in the area. The main ones though, were bank voles, *Clethrionomys glareolus*, and field mice, *Apodemus sylvaticus*, and a number of shrews which could only be distinguished by dissection. We did catch a striped field mouse, which was a beautiful animal.

The data from this study could not be used in the report as it was not a closed population; as we killed them, more immigrated into the, so we could never get an accurate estimate of the population.

Next we used a home made version of the longworth trap, to compare the populations on the island and mainland. Two sites were chosen. The site on the mainland was a 5 minute walk from the camp, in a relatively undisturbed area of the forest, where there was room for a 10x5 plot. It was easier to find an area on the island.

The plots were 10m by 5m with wooden posts at 1m intervals, so we had 50 traps per plot. The checks were carried out before breakfast (about 8am) every morning and then again in the evening (about 7pm). The traps were baited with fried bread, which was replaced regularly. Each animal caught was weighed, sexed and their reproductive status noted. They were classed as adult, sub adult (reproducing) or sub adult (not reproducing) (see introduction). Finally, they were marked and released. The method we used to mark them was simple and involved cutting off their toes, which apparently caused them no ill effects and, most importantly, did not affect their survival.

RESULTS

Over the whole experiment we only caught two species of rodent (not including a dead shrew). They were: the bank vole, *Clethrionomys glareolus*, and the field mouse, *Apodemus sylvaticus*. Unfortunately, we had very few voles on the mainland - only 6 in total and, of those, only 1 male; this was not really a large enough sample size for statistical tests, so this data was not included in the tests.

To start with, we compared the weights of the different sexes using a t-test, and found that there was not a significant difference between the weights of males and females for any of the species at either site ($P > 0.05$). Next we investigated the effect of reproductive status on the weights using a one way analysis of variance test. Here we did find a correlation.

In both species at both sites (excluding mainland voles) there was a significant difference ($P < 0.01$) between the weights of the different statuses.

Next we tried to estimate the populations at each site using the mark release recapture method. This can give an absolute estimate of the population. If a number of individuals are marked and released, then the proportion of marked animals recaptures, times the number marked initially, will give an estimate of the population. This assumes that all the animals have an equal chance of being caught, and the same individuals are present at the second trapping as were at the first. Of course, this is not possible due to immigration, emigration and death, so this method only gives an estimate of the population.

Using the Peterson method (Lincoln index) equation: $N = Mn/m$

Where: N = original population

M = number marked in first trapping

n = number caught in second trapping

m = number recaptured in second trapping

We calculated the populations as (+/- the standard error):

VOLES: mainland: not possible to calculate, as there were no recaptures.

island: 53 +/- 5

MICE: mainland: 30 +/- 4

island: 66 +/- 8

As can be seen, there is no overlap of the standard errors of the mice populations. Therefore we can conclude that the populations are different at the two sites. If it is assumed that the reason why there were so few voles on the mainland is because there were so few in the area, then the vole populations show the same pattern. The mainland populations are smaller than the island populations.

DISCUSSION

Looking first at the differences in weight of different reproductive statuses, it is apparent that breeding adults are heavier than non-breeding sub adults, which is not surprising. The reasons for this are explained in the introduction. The heaviest group is most likely to contain the animals that were born last autumn (the study was done in the summer) and have over-wintered to breed this year. The next category consists of the animals born this spring that have started reproducing. They have high rates of production but are short lived, and will probably not live past the autumn. Finally, the third group (the non-reproducing sub adults) were born recently, maybe to the reproducing sub adults. They may adopt either of the two strategies. Some will reproduce quickly and die before winter, others may stop growing and reproduce next spring. The two strategies could be classed as K and r strategies, although this usually refers to the strategies of different species. The K strategy animals are long lived and do not reproduce as fast as the r strategists, which have low survival but high productivity.

The weight differences between the groups may arise because the animals have to reach a target weight before they can reproduce. This is lower in the reproducing sub adults because they do not expect to survive the winter and so do not need the energy deposits that the reproducing adults require.

Finally, the populations in the different areas show different densities. This may have to do with the fact that the island is a closed system and, although we were not estimating the population of the whole island, it is still a relatively small area, so immigration and emigration will be lower than on the mainland. Another reason the population on the island is higher may be to do with the number of predators around. On the mainland there are several animals that will eat rodents, including domestic cats which we saw around the camp. On the island there were no obvious predators, other than birds of prey.

An interesting point to make is that we found no adult mice on the mainland. Whether this had to do with the lower population, or simply the time of year, we are not sure. It may be because we had difficulty in telling the statuses apart, and so adults could have been missed. This is a likely reason, as the means of the reproducing sub adults on the mainland were higher than that on the island, where we found 4 adults. It is possible that some adults were recorded as reproducing sub adults and, as the former are generally heavier, this would explain the higher mean. There is nothing we can do about this now though.

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