

Estimating a Mammal Population

Different populations in any ecosystem interact with each other and the abiotic environment such that a change in the size of a specific population in a community may have effects on other populations in the community. Sometimes, humans introduce a species to an area (intentionally or otherwise) and the results are often difficult to predict. By monitoring populations, biologists can better understand the interactions between native and introduced species to develop ways of managing the populations.

The forest industry in Newfoundland was dealing with major outbreaks of the larch sawfly (*Pristiphora erichsonii*) in 1954 and 1955. The masked shrew (*Sorex cinereus*), one of the smallest mammals in North America and a nearly strict insectivore, was suggested as a candidate for introduction into Newfoundland to control the sawfly population. In 1958, 62 shrews were captured in New Brunswick and released in Newfoundland. Initially the masked shrew population occupied an area of about 14.5 ha, but after five years they were found within a radius of 48 km from the point of initial release and by 1970 were distributed over 80% of the island (about 110,000 km²).

- a) Could a population of masked shrews have evolved in Newfoundland?
- b) Would you expect there to be natural predators of the shrew living in Newfoundland? Explain.

1. In order to monitor the growth of the population, biologists sampled the shrews every year for ten years. Trapping areas (quadrats) measuring 20 m x 20 m were marked off and live traps were placed in pairs at 10 m intervals around the quadrat. In addition, one pair of traps was placed at the center, making a total of 18 traps in all. The traps were baited and left for a three-day period. Any animals caught were marked and then released. This procedure was repeated at the same time for the duration of the study.

c) Rather than measuring an entire population of animals, this technique sampled the population in order to estimate the total population size. Why is this technique often used in field studies?

d) Why were the trapped animals marked?

e) Why were the quadrats the same size, and the traps set at the same time and location each year?

Table 1: Trapping Results for the Masked Shrew, from 4 Quadrats over a 10 year Period

Year	Quadrat				Total	Average
	1	2	3	4		
1	1	1	0	3		
2	1	1	1	2		
3	2	1	0	3		
4	2	1	0	4		
5	3	2	2	4		
6	4	3	2	7		
7	8	4	2	8		
8	9	5	3	11		
9	10	5	4	13		
10	16	8	4	17		

5. Each year the trapping results from the four quadrats were combined and then averaged. The results are given in Table 1.

f) Why were four trapping stations used rather than one?

g) Record the total number of shrews trapped each year, then calculate the average number caught in each quadrat over the 10 years. Add the data to the table.

h) Draw a graph of the average shrew population each year.

- i) Provide an explanation for the growth rate during the first 4 days.
- j) Provide an explanation for the growth rate during days 4 to 10.
- h) Are there any indications of a preferred habitat for the shrews? What factors might account for these differences?
- k) Carrying capacity is defined as the maximum population the environment can sustain indefinitely, given the food, habitat, and water available in that environment. If the researchers continued trapping for an additional 5 years, outline some possible changes in the shrew population they might find.
- m) Imagine that another species of insectivorous shrew were already present in the area of study. Suggest the effect this might have had on the results.
- n) Using the data for year 10, calculate the population density in shrews per hectare.
- o) Although a wide variety of small mammal species is found across the rest of Canada, the meadow vole (*Microtus pennsylvanicus*) is the only species that naturally inhabits Newfoundland. Suggest reasons for the lack of small mammals in Newfoundland and a possible explanation for the presence of the meadow vole in Newfoundland.
- p) Why do we need to be careful before introducing a species to a new habitat?
- p) Is it necessary to know the exact population of a species in order to follow its population changes?