APODE*M*US FLAV*I*COLL*I*S: ESTIMATION OF THE POPULATION NUMBERS

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It is obvious that population numbers of any rodent species vary within the breeding season. To describe such changes quantitatively one has to make estimates of the numbers at least a few times during the breeding season. The usual approach to achieve that goal is to divide the breeding season into short sections (a few days to 2-3 weeks) of trapping combined with individual marking of the caught individuals. Then, either the number the caught individuals (recaptures are rejected) is believed to represent the actual population numbers, or a more elaborated method, like Jolly (1965), is applied to estimate the population size. Both of the above methods assume equal probability of recapture of all individuals present in the population.

In this paper we show data on uneven probability of recapture of the yellow-necked mice present in the population, and suggest a different approach to solve the problem of estimation of this species abundance.

Area and methods

Crabapple Island (NE Poland), of 4 ha in area, located on Bełdany Lake (about 120 m. distant from the nearest mainland shore) was the study site. Its entire area consists of mixed deciduous forest belonging to associations of T*ili*o-C*arpinetum* (over 77% of the area, in more elevated parts). The study period lasted from April 1994 to April 2003. Each year 5 trapping series (each consisted of 7 days of live-trap inspections at 7 a.m. and 7 p.m.) from mid April to October were conducted in 6 weeks intervals. The mice were mostly caught at 7 a.m., as they were night active. Live-traps formed a grid of rows and columns distant 15 m., covering the entire island area. Each trapped individual was marked, sexed, weighed and its reproductive status was assessed using vaginal smears and position of testes.

It is evident that an individual caught in the 1st trap inspection of a trapping series had a chance to be recaptured in any of the next 13 trap inspections, but that caught in the last trap inspection could not be recaptured in the same trapping series. The question thus arises: whether or not an individual marked in a series and not recaptured should be considered dead? The empiric data that we obtained during this study show that there is a significant share of such individuals of the yellow-necked mice that caught and marked in a *t*-series are not recaptured for the 1st time in the same series, but in series *t*+1 (i.e. in the next series), *t*+2 (i.e. they were not caught in *t*+1), *t*+3 (they avoided traps during 2 consecutive trapping series), or even in *t+4*.

Besides, individuals of this species show different trappability (some are caught frequently, and others rarely), that may change in the course of the life.

To estimate population numbers at series *t*, i.e. N_t it is necessary to provide:

C_t - number of individuals caught in series *t*, P_r - probability of capture in series *t* of an individual present in that series, M_t - instantaneous disappearance rate (mortality or emigration) of the individuals present in series *t.*

The 1st of the above 3 parameters does not need explanation. The 2nd one can be obtained

from the proportion: $P_r = r_t /(r_t + r_{t+1} + r_{t+2} + r_{t+3} + ... r_{t+n})$, that is numbers of recaptured in series *t* to sum of numbers recaptured for the 1st time in *t* or in any of the next series. We accept that individuals never recaptured can die, or emigrate, in any time. We can also accept the possibility of leaving the island by a yellow-necked mouse, but we reject return journey to the island after some months spent in the nearby diverse mainland habitats.

Instantaneous disappearance rate of the mice present in series *t* can be assessed from the equation: $M_t = ((\ln C_t - \ln(r_{t>1}))/T$, where: C_t - caught at least one time in series *t*, $r_{t>1}$- sum of recaptured in any series except from *t* (we assume that recaptured in series $t>1$ had to be present in $t+1$), T - time in days between two consecutive trapping series (42 days in the breeding season, and 180 days between October and April next year, approximately). Numbers disappearing during a series were calculated for 3.5 days, that is from the mid to the end of the trapping series.

The population numbers in series *t* can be calculated from the following equation: $N_t = (C_t / P_r) (1 - 3.5 M_t)$

The results of the calculated population numbers were compared with the numbers caught. Trapping series with less than 10 mice caught were not used for this comparison. It has appeared that there is a significant linear correlation between the compared variables, however, estimated population numbers are by 8% higher, on the average, than the numbers caught. The reason is relatively low probability of capture of an individual present in the population.

Bank voles inhabiting the same island behave differently: they exhibit high frequency of recaptures, and there is no individuals that marked in a series *t* are recaptured for the 1st time in series later than *t* or $t+1$. In such a case numbers caught represent population size relatively well: they provide estimates higher by 4.2% than those obtained from Jolly (1965) method.

Population size estimates of A. *flavicollis* – because of low probability of capture – should be based on CMR method and last for a long period.

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