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AN ATTEMPT AT COMPARING TWO METHODS OF TRAPPING SMALL RODENTS (IN PITFALLS AND LIVE TRAPS)*

The trappability of *Clethrionomys glareolus* (Schreber, 1780) and *Apodemus agrarius* (Pallas, 1771) in four forest habitats was studied. It has been stated that the catches of these two species differed. 70% of *Clethrionomys glareolus* catches were from pitfalls, and 60% of *Apodemus agrarius* from live traps. Both the young individuals of *C. glareolus* and their adults were more frequently caught in pitfalls. After the breeding season, there was almost no difference in trappability of *A. agrarius* by these two types of traps.

The investigations were made near the Field Station of the Institute of Ecology, Polish Academy of Sciences, at Dziekanów Leśny near Warsaw. The study area was covered by forest of the following types: *Pineto-Quercetum*, *Vaccinio myrtilli-Pinetum* subass. *molinietosum*, *Tilio-Carpinetum*, *Carici elongatae-Alnetum* (Traczyk and Traczyk 1965) and occupied an area of 4.8 ha. Wooden live traps (two on each site) were arranged alternately with 70 cm deep metal pitfalls in a grid, the trapping sites of which were 20 m apart. A description of the pitfall used is to be found in the study by Andrzejewski and Wrocławek (1963).

The CMR method (Catch-Mark-Release) was used with oats as bait placed inside the traps and pitfalls. The animals caught were individually marked by amputating the fingers according to the numeration system adopted after

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Andrzejewski and Pielowski (1956) according to Naumov (1951). After checking the numbers, ascertaining sex and approximately assessing age (very young, young, adult) the animals were released on the capture site. A vaginal smear was taken from the females. The traps were checked once daily in the morning. After the first seven captures in which all the traps and

Number of captures of *Clethrionomys glareolus* and *Apodemus agrarius* from different types of catches

Tab. I

Species		The first seven captures in pitfalls and live traps	The second seven captures in pitfalls and live traps	Pitfalls	Live traps	Total number of captures	Percentage
Clethrionomys glareolus	pitfalls	254	226	280		760	70
	live traps	141	60		122	323	30
Apodemus agrarius	pitfalls	6	27	69		102	39
	live traps	43	68		44	155	61

pitfalls were used, captures were made every second day, opening in turn only traps, only pitfalls and then traps and pitfalls together. In all, in addition to the first seven captures, 7 captures were made using only traps, 7 using only pitfalls and 7 using traps and pitfalls together. On days on which the whole trapping area, or only traps or pitfalls were closed, bait was sprinkled in open traps or on the covers of the pitfalls.

The investigations lasted from August 22nd to October 21st 1962. 188 individuals of *Clethrionomys glareolus* (Schreber, 1780) in 1,083 captures and 77 individuals of *Apodemus agrarius* (Pallas, 1771) in 257 captures were recorded. The numbers of captures in different kinds of catches are given in Table I. Distinction was made between ephemeral (one capture) and resident (greater number of captures) individuals (Petrusewicz and Andrzejewski 1962). *Apodemus flavicollis* (Melchior, 1834) also occurred in the study area, but in such a small number (less than 20 individuals) that they were not included in the analysis.

The course taken by variations in numbers of resident animals during the

experiment, calculated on the basis of the Calendar of Captures (CC) (Petrusewicz and Andrzejewski 1962), is shown in Figure 1. This was a pe-

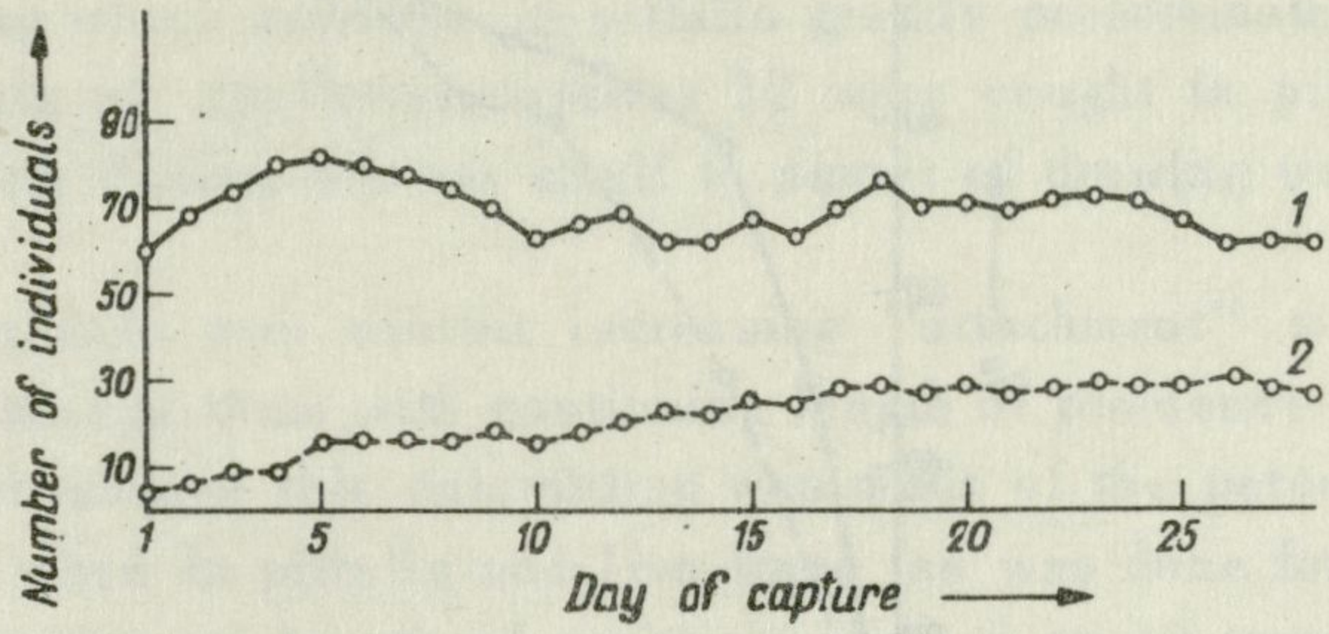

Fig. 1. Variations in numbers of *Clethrionomys glareolus* (*1*) and *Apodemus agrarius* (2)

riod of relative stabilization of numbers in the case of *Clethrionomys glareolus* and for *Apodemus agrarius* a slow increase in numbers until they were established on a level of about 30 individuals. The total list, given jointly for the whole experiment, of captures in pitfalls and traps is given in Table I.

The pitfall, as a simple, reliable trap, easy to use, is fairly frequently used for captures of small mammals (Snigirevskaja 1939, Borowski and Dehnel 1952, Novikov 1953). It has the advantage, in comparison with the live trap, that it can catch several individuals simultaneously, which is particularly important in the case of sites visited by a large number of individuals (Andrzejewski and Wrocławek 1963). In the present experiment the mean number of captures for *Clethrionomys glareolus* was: on the site with the pitfall 12.6 and on that with two live traps 5.4 captures. The corresponding figures for *Apodemus agrarius* were 1.7 and 2.6 captures. The data given in Table I and the mean values given above of captures per site reveal a considerable difference in the trappability of these two species. The great predominance of captures of *Clethrionomys glareolus* in pitfalls and *Apodemus agrarius* in live traps is remarkable.

In order to be able better to compare the degree of trappability of rodents by means of pitfalls and live traps analysis was made of the marking process of the population during the first capture days. A diagram of cumulated percentage of appearance of new individuals (newly marked) for *Clethrionomys glareolus* is given in Figure 2. The marking process takes place far more rapidly when pitfalls are used than when live traps are used. For *Apodemus agrarius* it was not possible to make a similar analysis on account of the small number of new individuals during this period.

During inspections of the trapping surface the fairly frequent encounter of very young individuals and families of bank voles caught together in one

pitfall was remarkable. In 14 cases these were females with several young, the size of which showed that they had only just begun to emerge from the

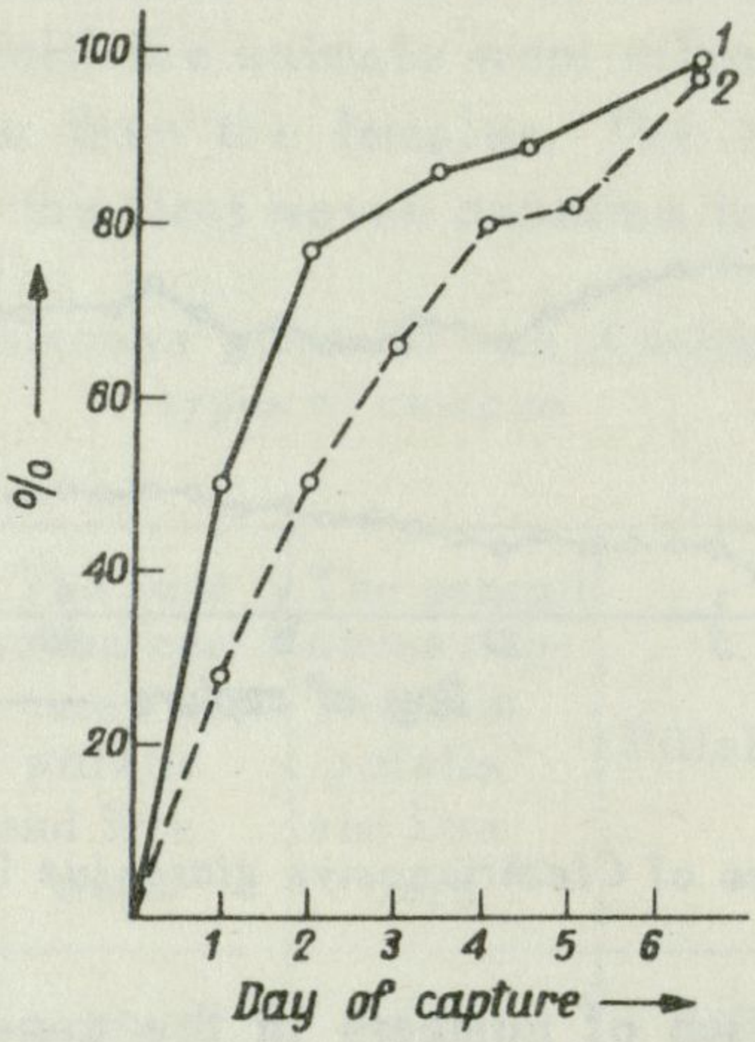

Fig. 2. Cumulative percentage of captures of new individuals of *Clethrionomys glareolus*
1 – pitfalls, *2* – live traps

nest. The fact that such young individuals are almost never found in live traps may be due to their being too light to press the floor down and cause the trap to shut. Adamczewska (1959) also found during captures of *Apodemus flavicollis* that individuals caught in pitfalls are distinguished by lesser measurements than individuals caught in live traps.

If we accept that an individual has chances of being caught every day during trapping with pitfalls, live trap or combined pitfall and live trap (if it happens to be a day when both kinds of trap are in use) it is possible to calculate how many chances it had of being caught during its stay in the area and what percentage of these chances was realized by captures in pitfalls and live traps. An analysis of this kind was made for individuals of *Clethrionomys glareolus* recorded during inspections as very young and young. The percentage of chances of capture which actually took place is 56.4 for young voles in pitfall traps and 22.0 in live traps. The difference in number of captures by pitfall and live trap for this species is also maintained in the case of young individuals. On account of the very small number of individuals recorded as young it was not possible to make a similar analysis for *Apodemus agrarius*.

Assuming that rodents caught once only (ephemeral) are mainly migrants, that is animals unfamiliar with the area or only passing through the area, it may be expected that they will be caught to an equal extent in both kinds of traps, in accordance with the probability of their reaching a site with a pitfall or live trap (with a possible slight predominance in favour of pitfalls as

being more reliable). In the given experiment the number of captures of ephemeral *Clethrionomys glareolus* was: 17 in pitfalls and 14 in live traps, that is, captures agreed with the assumption and differed from those of resident individuals, among which captures in pitfalls greatly predominate. Among ephemeral individuals of *Apodemus agrarius* 12 were caught in pitfalls and 8 in traps – but these figures are too small to permit of drawing conclusions from them.

Resident animals may exhibit increasing "attachment" to a given kind of trap or may change them with continuing length of residence in the trapping area. In order to assess this calculation was made of the percentage of chances of capture taken in pitfalls and live traps (as was done for the young individuals) depending on length of residence from 2 to 10 trappings and from 11 to 19 trappings. The results are given in Table II. *Clethrionomys glareolus* exhibits increase in the percentage of utilized chances of capture in pitfalls with increasing length of residence. In the case of *Apodemus agrarius* the difference in captures is maintained unchanged (more in live traps, less in pitfalls).

Percentage of realized chances depending on the length of residence of *Clethrionomys glareolus* and *Apodemus agrarius*

Tab. II

Species	Length of residence (captures)			
	2–10		11–19	
	pitfalls	live traps	pitfalls	live traps
Clethrionomys glareolus	56	31	60	19
Apodemus agrarius	32	45	20	32

The use of the Calendar of Captures method, which unlike any other method permits of estimating simultaneously the history of the life of the whole population and of each individual during the time the experiment lasts, made it possible to observe that after a period of a very small number of captures of individuals of *Apodemus agrarius* in pitfalls a sudden increase in the number of captures takes place. It was assumed that this may be connected with the end of the breeding season and the consequent change in the animals' behaviour. Analysis of vaginal smears made it possible to establish the date after which there were no sexually active females of either species, then calculation was made of the percentage of utilized chances of being caught in pitfalls and live traps for both species during the breeding season and after its completion (Fig. 3). It was found that while *Clethrionomys glareolus*

exhibits a considerable (statistically significant) predominance of captures in pitfalls during the breeding season and that after the end of this period the

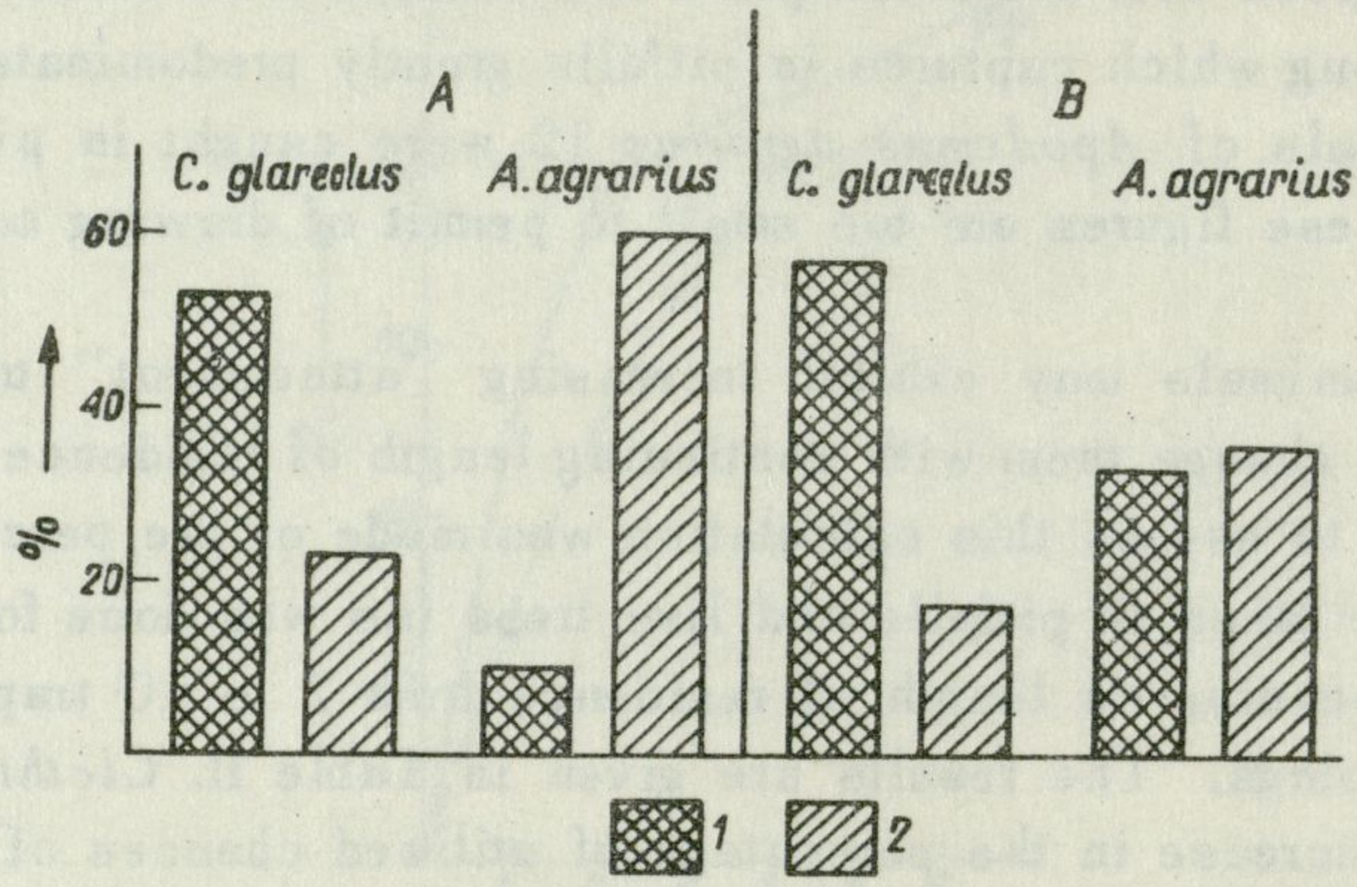

Fig. 3. Realized chances of captures of *Clethrionomys glareolus* and *Apodemus agrarius* in reproduction period (*A*) and period after reproduction (*B*)
1 – pitfalls, *2* – live traps

predominance increases slightly, in the case of *Apodemus agrarius* the way in which individuals of this species are caught in the two kinds of traps alters completely.

During the reproduction period there is an enormous predominance of the percentage of utilized chances of captures in live traps (60% in live traps, 10% in pitfalls; difference statistically significant), while after the end of this period the percentage of utilized chances of captures in pitfalls and live traps is almost identical (33% in pitfalls, 36% in live traps; difference non-significant).

Owing the simultaneous use of pitfalls and live traps in one trapping area it proved possible to observe differences in the capture of different species. It appears that when only pitfalls or only live traps are used it must be remembered that the estimated numbers may be increased or decreased, depending on the way in which the given species reacts to the kind of trap or on the interrelations between the species. Differences found in the captures of the animals before and after the breeding season lead to the assumption that behaviour undergoes a radical change during this period. It is possible that after a period of aggressive relations between the species when the activity of the reproductive glands ceases there is a period of mutual tolerance. This assumption is confirmed by the fact that in the given experiment only 7 joint captures were found during the reproduction period of *Clethrionomys glareolus* and *Apodemus agrarius* in a pitfall, while after the reproduction period 20 such cases were found, that is, almost treble the number.

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PRÓBA PORÓWNANIA DWÓCH METOD POŁOWÓW DROBNYCH GRYZONI (W CYLINDRY I W PUŁAPKI ŻYWOŁOWNE)

Streszczenie

Na powierzchni wynoszącej 4,8 ha rozstawiono pułapki żywołowne na przemian z cylindrami w odległości co 20 m. Stosowano metodę CMR (łowienie, znakowania, wypuszczenie); przynętą był owies. Pułapki były czynne na przemian z cylindrami lub łącznie z nimi. Łowiono głównie osobniki *Clethrionomys glareolus* (Schreber, 1780) i *Apodemus agrarius* (Pallas, 1771).

Wykazano, że istnieją różnice w łowieniu się osobników obu badanych gatunków. Osobniki *C. glareolus* łowiły się w 70% w cylindry a osobniki *A. agrarius* w 60% w pułapki (tab. I). Na podstawie stopnia wyławialności nowych osobników *C. glareolus* w pierwszych dniach połowów stwierdzono istnienie możliwości szybszego oznakowania populacji za pomocą cylindrów niż za pomocą pułapek (fig. 2).

Młode osobniki *C. glareolus* łowiły się – podobnie jak dorosłe – w większym procencie w cylindry, natomiast osobniki efemeryczne tego gatunku łowiły się prawie równomiernie w oba rodzaje pułapek. Stwierdzono różnice w łowieniu się osobników obu gatunków w okresie rozmnażania się i po jego zakończeniu. W okresie rozmnażania się istnieje znaczna przewaga złowień osobników *C. glareolus* w cylindry; *A. agrarius* – w pułapki. Po okresie rozmnażania osobniki *A. agrarius* łowią się prawie w jednakowym procencie w cylindry i w pułapki (fig. 3). Można sądzić, że agresywne stosunki między osobnikami obu gatunków, charakterystyczne dla okresu rozmnażania się, ustępują po jego zakończeniu i następuje okres wzajemnej tolerancji

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