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### On a Relation Between the Number of Traps in a Point of Catch and Trappability of Small Rodents <sup>1)</sup>

[With 3 Tables & 2 Figs.]

Points of catch of small rodents of different number of traps (1—7) were spaced in a shape of a network on the area of several hectares. Simple proportion between the number of captures in a point and the number of traps set in it has been found with a slight trend towards decrease of trappability in points of a larger number of traps.

#### I. INTRODUCTION

Acquirement of high average trappability of animals inhabiting a sampling area is an essential factor in the investigation on small rodents. By the term trappability we mean here the percentage of animals captured in one catch in relation to all animals inhabiting a sampling area as well as the frequency of the catch of the same individuals.

The acquirement of high trappability depends among others on the density of traps set on a sampling area. High density of traps can be obtained by: (1) setting traps in small distance one from another (making the grid adequately thick), (2) setting several traps in each point of a correspondingly more spread grid.

It can be teoretically anticipated that the first way ought to create more possibilities of meeting a trap by each individual, especially in conditions of random penetration of the area by animals. However, according to the investigation carried out by Olszewski (1963, 1967) small rodents move along defined passways, so the rule of maximal dispersion of traps not necessarily involves maximal trappability. Similarly, clamping distribution of small rodents (Andrzejewski &

<sup>1)</sup> This study was carried out under the rodent project of the International Biological Programme in Poland.

Głogowska, 1962; Bujalska & Ryszkowski, 1964) can affect on increase of trappability in this system of spacing traps. A longer way to be covered by a worker setting and controlling traps as well as increased treading and damaging of the surrounding connected with these activities are additional limitations of this way of spacing traps.

That is why the method of catch by spacing several traps in one point seems to be worth of analysis. A question arises: To what extent can the trappability of small rodents be increased by multiplying traps in one point, and what increase is still effective. The answer to this question is the aim of this paper.

## II. AREA AND METHOD

To investigate this problem, data collected between 1959 and 1963 in Kampinos National Park near the Field Station of Institute of Ecology, Polish Academy of Science at Dziekanów Leśny have been used as well as data collected in 1964, 1965 on a 4-hectare island on the lake Beldany (district of Olsztyn). The sampling area was covered by deciduous forest. Altogether 13 observations were carried out.

In all these experiments life traps with oats baits were used and captured animals were marked with individual numbers and released at a spot of catch. Traps were checked every 12 hours. Points of catch with traps set were spaced in the form of a grid,  $15 \times 15$  m. Dimension of sampling areas was different (Table 1).

**Table 1.**  
Number of points and size of sampling areas.

Experiment	Number of points	Area in hectares
K.N.P.*) 1959 (4 series)	105	2.36
K.N.P. 1963 (1 series)	60	1.00
The island 1964, 1965 (8 series)	140	3.15

\*) Kampinos National Park.

In order to define the relation between the number of captures and the number of traps in each point of catch, 1 to 7 traps were set in each point.

In 1959, four systems of trap spacing were used on four sampling areas. On the first sampling area one or two traps were set in one point alternately; on the second area, one two or three in one point, by turns; on the third one — one, two, three or four in one point, by turns; on the fourth one, five, six or seven in a point, by turns.

Number of traps was changed in each point every day what helped to eliminate the interference of mosaic shape of the area and different density of small rodents in various parts of the area.

On the island 1, 2 or 3 traps were set alternately in 150 points, and similarly to the experiments described above, number of traps in each point was changed by rotation.

The way of spacing traps in Kampinos National Park was different. Here, 3 traps were set in each point in the form of a triangle, 1 m. apart from one another.



Number of exposed traps was changed every 12 hours by blocking 1 or 2 traps in each point. In this way, one trap was set in each point of the area at one examination, 2 traps at another, 3 traps at another, and then again one trap etc.

Consequently, in Kampinos National Park in 1959, and on the island in 1964 and 1965, the total number of exposed traps was the same every day, only the number of traps in each point being different. In 1963, however, the total number of working traps was changed at each examination on the whole area.

On the sampling areas Bank vole, *Clethrionomys glareolus* (Schreber, 1730), was represented numerously, Striped field mouse, *Apodemus agrarius* (Pallas, 1771) and yellow-necked mouse, *Apodemus flavicollis* (Melchior, 1834) a little less numerously. In 1963 in Kampinos National Park, *Apodemus flavicollis* was not found and on the island in 1965 *Apodemus agrarius* was missing. On the island in 1964 only *Clethrionomys glareolus* was to be found.

Approximately, on the basis of the number of captured animals, it can be assumed that the highest density of rodents was on the island in 1964 and 1965, the smallest in Kampinos National Park in 1963.

### III. RESULTS

Let us assume that the number of captures in one point of catch is proportional to the number of traps being set in this point. For example, if the traps are set alternately 1, 2 or 3 in a point, the total number of

**Table 2.**

Comparison of teoretical (T) and empirical (E) number of captures in 1, 2, 3 traps in a point.

Experiment	Number of traps in a point:						Significance of difference between T and E
	1		2		3		
	T	E	T	E	T	E	
K.N.P. 1959 series 2	30.5	< 38	61.0	< 67	91.5	> 78	—
K.N.P. 1963	187.3	< 281	374.6	< 415	561	> 427	+
The island 1964							
series 1	396.8	> 392	793.6	< 807	1190.4	> 1182	—
series 2	395.5	> 386	791.0	< 828	1186.5	> 1159	—
series 3	381.3	< 411	762.6	< 779	1144	> 1098	—
series 4	410.8	> 366	821.6	< 856	1232.4	< 1243	+
The island 1965							
series 1	352.8	> 311	708.6	< 781	1058.5	> 1025	+
series 2	159.1	> 151	318.2	< 349	477.3	> 455	—
series 3	193.6	> 160	387.2	< 432	580.8	> 570	—
series 4	52.5	> 51	105.0	< 117	157.5	> 145	—

captured rodents ought to be divided into ratio 1:2:3 between the points. This ratio of captures was accepted as teoretical, and real (empirical) number of captures were compared with it by means of the test chi-square (with the confidence limits = 0.05). Only in 4 cases for 13 series of captures, statistically significant difference from assumed distribution was obtained (Tables 2 and 3).

It seems that the number of captured rodents in a point of catch is proportional to the number of traps set in this point.

When analysing the obtained picture of deviations from the presupposed distribution in all series with traps set 1, 2 and 3 in a point, it

**Table 3.**

Comparison of teoretical and empirical number of captures in series I, III, IV 1959.

Series	Number of traps in a point:														Significance of difference between T and E	
	1		2		3		4		5		6		7			
	T	E	T	E	T	E	T	E	T	E	T	E	T	E		
I	39.3	>21	78.6	<97												+
III	18.6	<19	37.2	<46	55.8	<56	74.4	>65								-
IV	7.8	<10	15.6	<31	23.4	<27	31.2	<32	39.0	>33	46.8	>40	54.6	>47		-

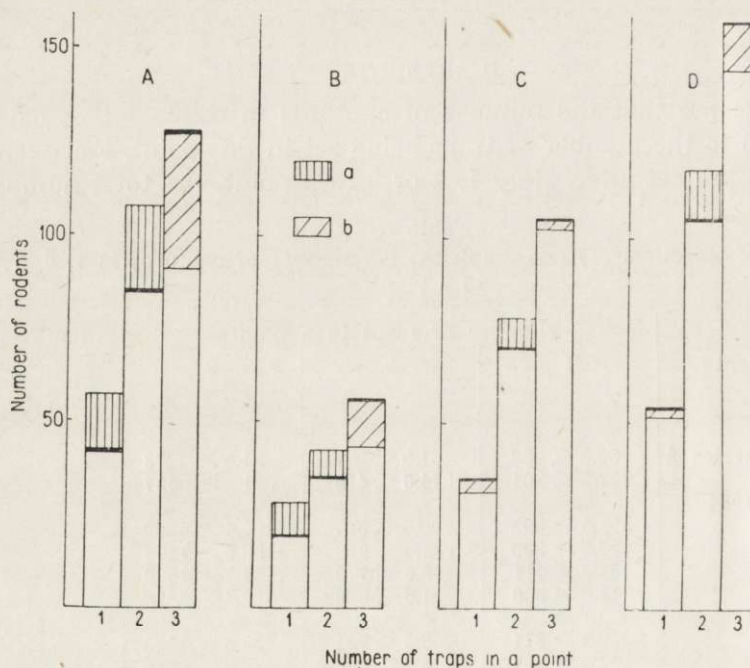


Fig. 1. Teoretical and empirical distribution of the number of captures in points with 1, 2, 3 traps.

A and B — Kampinos National Park, 1963; C and D — Island 1964 i 1965. A — *A. agrarius*, B and C — *C. glareolus*, D — *A. flavicollis*. a — predominance of empirical value, b — predominance of teoretical value.

can be noticed that in points with one trap the differences between the number of captured animals and the teoretical number are bigger or smaller than the presupposed ones. In points of with 3 traps, however, in 9 series for 10 slight deficit of the real number of captures in relation



to the theoretical value can be observed. On the contrary, in all series with 2 traps predominance of really captured rodents in relation to theoretical values can be observed. On the basis of this regularity it seems that a certain trend towards decrease of captures in 3-trap points and increase in 2-trap points in relation to exact proportionality between the number of captures can be expected, despite the only 3 tests showing statistically significant difference of distribution (Table 2, Fig. 1).

A similar tendency (although neither here the differences are statistically significant) can be proved by means of tests with higher number of traps in points of catch. In this case empirical distribution of the number of captured rodents in points of different number of traps crosses the theoretical distribution; the points of a larger number of traps displaying deficit in relation to theoretical number (Table 3, Fig. 2).

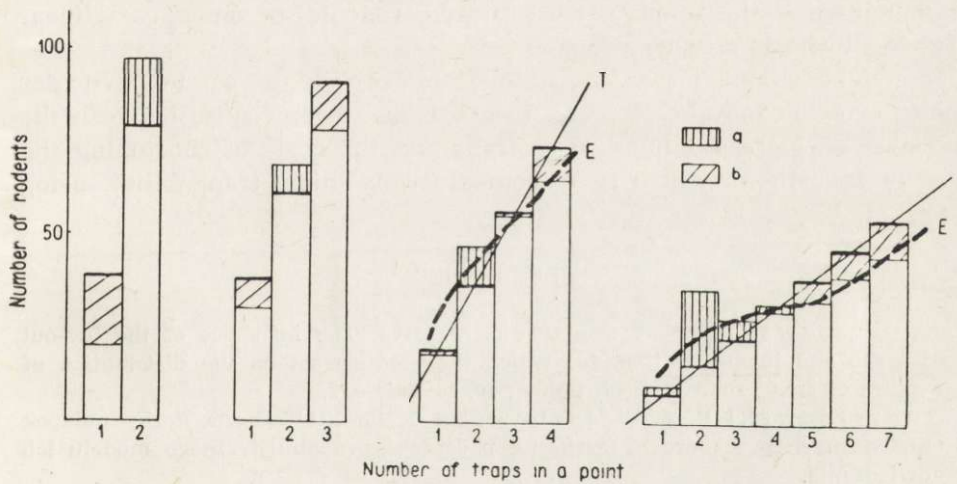


Fig. 2. Theoretical and empirical distribution of the number of capture in points with 2, 3, 4, 7 traps (Kampinos National Park, 1959).  
T — theoretical distribution, E — empirical distribution, Further explanation as in Fig. 1.

The most extreme deficit of captures (statistically significant) in points of 3 traps can be observed in the series of 1963 where another, different method of setting various number of traps in a point was used.

#### IV. DISCUSSION OF RESULTS

The simple proportion existing between the number of traps in a point of catch and the number of captures in the point, with the number of traps in points being 1, 3, 7, seems to prove that the increase of the

number of traps in points is a good methodical design to increase trappability of rodents on sampling areas.

Slight deficit of rodents in points with 3 traps and more suggest that probably this proportion is not linear.

It seems that the existing of such simple proportion, in case of a defined and not large number of rodents inhabiting sampling areas can be a result of numerous visits being paid by each animal in different points of catch in its home range; the succession of these visits being rather random (Andrzejewski & Wierzbowska, *in litt.*). What more, the number of visits resulting in capture is comparatively small. Consequently, a capture of an animal in a point is to a high degree random in relation to the intensity of visits in this point as well as to the fact that the traps in the point can be partly occupied by captured rodents.

It is possible that the linear proportion between the number of traps in a point and the number of captured rodents becomes curvilinear drawing towards an asymptote.

It can be assumed that the number of traps to be set in particular points of catch may be fixed on the basis of a compromise between the expenses of increased number of traps and the costs of shortening the time of investigation due to a comparatively high trappability being acquired.

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LICZBA PUŁAPEK W JEDNYM PUNKCIE POŁOWU A ŁOWNOŚĆ DROBNYCH  
GRYZONI

Streszczenie

W badaniach nad drobnymi gryzoniami w warunkach leśnych istotną rolę odgrywa uzyskanie wysokiej średniej łowności zwierząt zamieszkujących badany teren. Przez termin „łowność” rozumiemy zarówno procent złowionych zwierząt w jednym połowie w stosunku do wszystkich zwierząt zamieszkujących badaną powierzchnię jak też i częstość połowu tych samych osobników w serii nastawień pułapek.

W punktach połowu o różnej liczbie nastawionych pułapek (1—7), rozmieszczonych w odległościach  $15 \times 15$  m w postaci sieci na kilkuhektarowych powierzchniach badawczych poławiano gryzonia leśne. Stwierdzono prostą proporcję między liczbą złowionych w danym punkcie, a liczbą pułapek w nim nastawionych, z niedużą tendencją zmniejszania się łowności w punktach o dużej liczbie pułapek. Dyskutowuje się model odwiedzania punktów przez gryzonia dla powstania takiej proporcji.