

STUDIES ON THE EUROPEAN HARE. XXX.

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& Andrzej SZANIAWSKI**Relationship Between the Real Increase
and the Yield of Hares in Poland**

[With 1 Table & 3 Figs.]

Realised increase of hares was examined on the basis of age structure in four hunting seasons. Research was conducted on 25 hunting areas exploited with different intensity due to different methods of cropping. Age of shot animals was examined by the weight of eye lens. Realised increase oscillated in different years from 0.48 to 1.27 of young animals per one adult specimen. In the seasons with a big realised increase the highest percentage of young animals was observed in the most intensively exploited areas. In these years high positive correlation exists between the coefficient of realised increase and cropping level. Such correlation does not exist in the years of low natality. Increase in the hare bag, relatively to the preceding season, can be expected if the increase coefficient is higher than 0.8.

I. INTRODUCTION

Research on the hare is aimed at present in the direction of establishing the optimal yield *i.e.* the take of a number of specimens that would not threaten the existence of the population, and at the same time would not permit a part of the hares to be lost, as this often happens when the number of cropped animals is too low. At the same time methods are sought for forecasting the numbers of the population as an indispensable element for planning the size of the yield. The solution of these problems, so important for the hunting practice, is possible only after elucidating a number of elements of the population structure.

In our researches we have decided to investigate the relationship between the coefficient of the increase in population ($\Sigma\text{Young}/\Sigma\text{Adult}$) in the hunting season on the one hand, and the yield on the other. Andrzejewski & Jezierski (1966) pointed out the significance of this relationship. In Poland the take is limited in terms of land surface, not quantitatively (*i.e.* it is permitted to hunt on a certain percentage of the area once a year) that is why in our case we may treat the change in take as a function (the value of this function being not yet known) of the quantitative populational changes.

II. MATERIAL AND METHOD

The areas on which the investigations were made were 25 hunting areas with a total surface of 158,455 hectares. They are situated in five voivodships of Poland, five hunting areas in each. The following characteristics were considered while choosing the districts for investigation: differences in the density of hare population known from many years cropping; various types of land use, for example, majority of big, State owned farms (in Opole district) or small properties (in Warsaw district); different standard of wildlife management especially protection game animals'; type of soil; human agglomeration etc.

Such a differentiation of investigated areas was needed because the influence of different methods of hare exploitation had to be verified irrespectively of environment conditions.

The hare population was exploited by the following five methods:

I — hunting in drives in only one half of the area, with a switch over to the other half in the following year. This kind of hunting is obligatory in Poland.

II — hunting in circles in half of the area, the other half being not utilised (alternatively in successive years).

III — shooting in drives on one half of the area and catches on the other half (alternatively in successive years).

IV — on one half of the area shooting in circles and catches on the other (alternatively).

V — shooting in drives on the entire area (every year).

At the same time the authors used data on the number of hares taken in the provinces investigated; the data having been obtained by means of poll sent to hunters by the Institute of Ecology. This made it possible to evaluate the changeability of the take by two methods.

The age of the hares was assessed by means of the eye lens weight technique (Lord, 1969). Eye lenses were fixed in 10% formalin during minimum 2 weeks then prepared and dried for 72 hours in the temperature of 80°C. Each portion was verified while drying until its weight became constant. Dried lenses were weighed on the torsion balance accurate to 1 mg. The total number of lenses weighed amounted to 24,595. The weight of the lenses varied within the limits of 125 to 400 mg. By virtue of the frequency curves drawn (Fig. 1), one may reasonably conclude that current year's animals are all hares with a lens weight of up to 275 mg, and that all other ones are one-year-old and older ones, according to data by Caboń-Raczyńska & Raczyński (1972) or other authors.

III. RESULTS

The fluctuations in the increase during four hunting seasons were analysed on the basis of material from the period extending from November 1 to January 10 (Table 1).

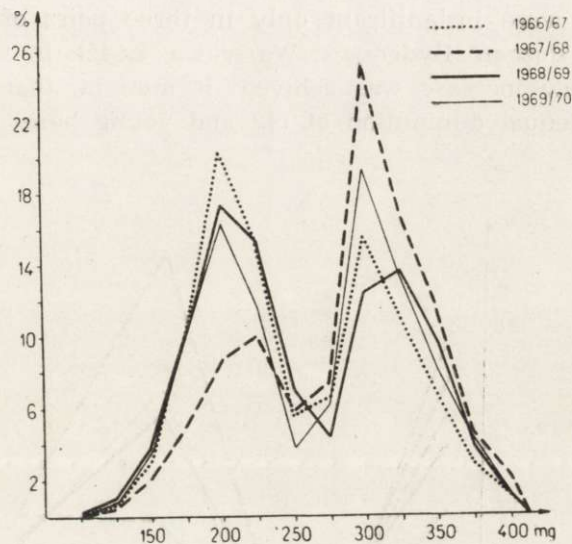


Fig. 1. Curves of the frequency of the weight of lenses in the seasons of 1966—1970.

Table 1

Numbers of young and old hares taken during four seasons in five provinces of Poland.

Province		1966/67		1967/68		1968/69		1969/70	
		jv	ad	jv	ad	jv	ad	jv	ad
Warszawa	n	627	446	350	499	762	507	408	508
	% jv	58.44		41.22		60.05		44.54	
Opole	n	242	158	151	466	475	365	455	448
	% jv	60.50		24.48		56.55		50.39	
Poznań	n	1282	1005	456	1141	1014	1058	831	975
	% jv	56.05		28.55		48.94		46.01	
Bydgoszcz	n	461	441	431	970	927	720	934	1037
	% jv	51.11		30.76		56.28		47.38	
Łódź	n	465	376	382	577	800	626	403	416
	% jv	55.30		39.84		56.10		49.20	
Total	n	3077	2426	1770	3653	3978	3276	3031	3384
	% jv	55.91		32.83		54.83		47.24	

The analysis of age structure showed that: the real increase in successive hunting seasons varied from 0.46 young animals per adult individual in the 1967/1968 season to 1.27 in 1966/1967.

Among provinces investigated, no constantly recurring (statistically significant) differences in the real increase of hares were found in successive seasons. The greatest differences appeared in the 1967/1968 season: they were insignificant only in three pairs of provinces (Poznań : Opole; Poznań : Bydgoszcz; Warszawa : Łódź). In that year in exceptionally low increase was achieved; it may be that high mortality caused an unequal diminution of old and young hares in various provinces.

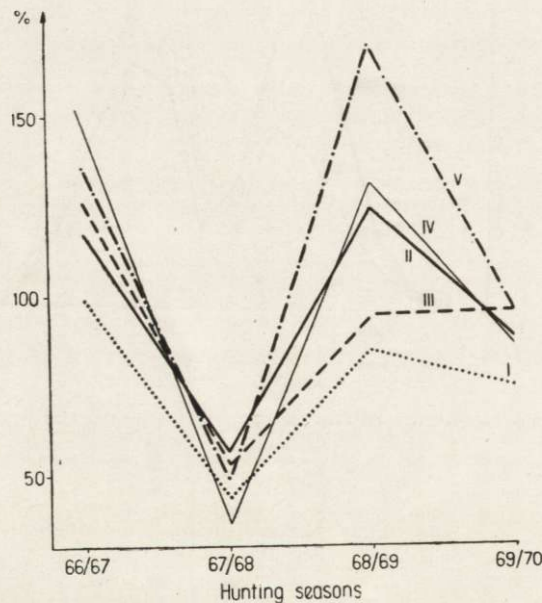


Fig. 2. Coefficients of the real increase according to live systems of hunting in the seasons 1966—1970. Detail explanations in the text.

In the 1968/1969 season the real increase in the Poznań province differed significantly from the provinces of Warsaw, Bydgoszcz and Opole. The real increase in that province was exceptionally low, below 1 young per 1 adult individual, while in the other provinces it exceeded considerably 1. Exceptionally disadvantageous local survival conditions for the young animals must have exerted an influence. In the 1969/1970 season non-significant differences between the provinces were found as far as the level of the real increase was concerned.

In the years of high increase the coefficient of the real increase differs

relatively to cropping method (Fig. 2). Significant differences were found in the 1968/1969 season between the results obtained in nearly all hunting systems. The greatest differences appeared between the system of drives on one half of the area (I) and drives with catches (III) where the smallest percentage of young animals was obtained and the system of drives on the entire area (V). The drives on one half (I) and the drives with catches (III) differ also from both variants of circles (II, IV). In the 1966 season, too, differences were found concerning the coefficient of the real increase between the hunting systems. In this case the results of drives on half the area (I) differ the most from these of hunting in circles with catches (IV), as well as from drives on the entire area (V).

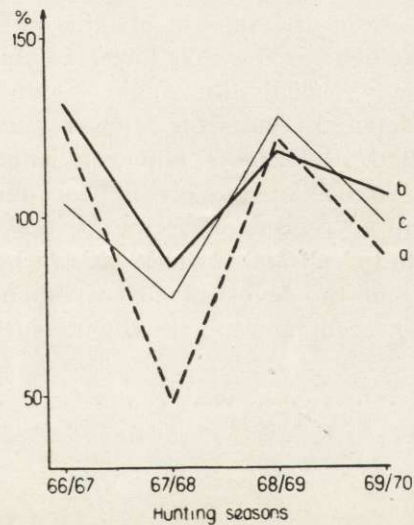


Fig. 3. Comparison of coefficients of the real increase (c) with: (a) poll data and (b) direct data about the takes. The changes in takes in consecutive years are expressed in terms of the ratio of hares taken in the given season to those taken in the preceding year.

Hunting in circles on half the area (II) significantly differs from the system of hunting in circles with catches. The other differences are statistically insignificant.

In both seasons with a low real increase no differences resulting from the system of hunting were found. It might be considered whether intensive takes in the year preceding an intensive reproduction did not additionally stimulate the natality of young animals yielding in effect a much more intensive real increase in highly exploited areas. The

mildest system of taken, *i.e.*, drives on half the area caused lower increases during the entire period of the investigations. Intensive methods, such as drives on the entire area and hunting in circles with catches in both years with a high real increase supplied material with the highest share of young hares.

The comparison of the real increase with cropping level examined by both methods, gave a very high interrelationship in all four seasons of investigations (Fig. 3). A proportionality between these figures was found by Jeziński (1965).

The correlation between the coefficient of the real increase and the take was analysed. A very high coefficient of correlation ($r=0.904$) was found between the real increase and the amount of take drawn from the poll data. The data on the amount of take obtained directly from the hunts in 25 areas yielded a somewhat lower correlation with the amount of the real increase ($r=0.695$); this might be due to the much greater scattering of more detailed results for a lower number of data as compared with the poll. Both coefficients, however, point to a close correlation between the real increase in the given year and the take. From the equation for the simple regression from the take according to the poll and the real increase ($y=48.725x+60.982$) it can be seen that the amount of the real increase at the level of 0.8 corresponds to a 100% take as compared with the preceding year; thus, with such an increase the take would be constant.

IV. CONCLUSIONS

1. The real increase is the main factor determining the amount of take.

2. The high correlation between the real increase and the amount of take enables to forecast the take when the amount of the real increase can be determined *i.e.* at the beginning of the hunting season. Quantitative planning, made without knowing the present increase, is highly dangerous. The amount of the take should be limited in terms of surface, as there is no danger then of excessive exploitation, because concomitantly with the drop in the number of animals — the take decreases too.

3. The age structure expresses more exactly the numbers of the population than the number of hares obtained in a small number of hunts; therefore the coefficient of the real increase of hares shot at the beginning of the hunting season should be used as a yard-stick for a possible forecast of the amount of take on large areas.

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ZALEŻNOŚĆ MIĘDZY ZREALIZOWANYM PRZYROSTEM
A POZYSKANIEM ZAJĘCY W POLSCE

Streszczenie

Na materiale obejmującym 24 595 sztuk zajęcy odstrzelonych w ciągu czterech kolejnych sezonów łowieckich (I.XI—10.I) zbadano przyrost zrealizowany na podstawie struktury wiekowej.

Zające pochodziły z łowisk eksploatowanych pięcioma różnymi metodami. Doświadczenie prowadzono w pięciu powtórzeniach na terenie różnych województw. Ilość obwodów łowieckich objętych doświadczeniem wynosiła 25, obejmujących powierzchnię 158 422 ha. Wiek odstrzelonych zajęcy określono metodą ciężaru soczewki ocznej.

Z uzyskanych danych wynika, że zrealizowany przyrost wahał się w poszczególnych latach od 0.48 do 1.27 młodych na jednego starego osobnika. W latach o dużym przyroście zrealizowanym najwyższy odstrzał młodych zajęcy obserwowano w łowiskach najintensywniej eksploatowanych. W takich latach istnieje ścisła korelacja między zrealizowanym przyrostem a wysokością pozyskania, nie stwierdzono jej natomiast w latach o niskim przyroście. Pozyskanie zajęcy byłoby stałe, gdyby wysokość zrealizowanego przyrostu utrzymywała się na poziomie 0.8.