A C T A T H E R I O L O G I C A

VOL. XVII, 8: 87—92. BIAŁOWIEŻA May, 1972

STUDIES ON THE EUROPEAN HARE. XXVIII.

Johs. ANDERSEN & Birger JENSEN

The Weight of the Eye Lens in the European Hares of Known Age

[With 1 Table & 2 Figs]

The eye lenses were collected from 90 hares of known age. Those which were preserved 4 days after an animal's death showed signs of incipient decay, especially in deterioration of the internal capsule. However, the associated weight loss of the lenses was only a few percent compared with freshly preserved lenses. Although lens weight increases with age, it is only possible to separate hares of the most recent generation from others on the basis of lens weight differences.

I. INTRODUCTION

Following a paper by Lord (1959) on the weight of the eye lens in *Sylvilagus floridanus*, this character has been used for age-grouping of animals in several species of mammals (Friend, 1967, 1968), including the hare *Lepus europaeus* (Rieck, 1962, 1967; Bujalska *et al.*, 1965; Walhovd, 1966; Hell, 1967; Möller, 1968; Wandeler & Huber, 1969). In larger species of mammals, it has generally been possible to differentiate between animals of over and under 1-year old on the basis of the weight of the eye lens. Whether it is also possible to carry out age classification of the animals which are more than 1-year old on the same basis is another question. In such cases, material from animals of known age, and especially from animals of known age in the wild state, has been lacking.

At the conclusion of a study on hare population dynamics carried out by one of the authors (J. A.), it was possible to obtain eye lenses from hares of known ages of up to 5 years old. This opportunity has been taken, partly to determine the weight of the lens in relation to the age

of the animal, and partly to investigate the keeping properties of the lens before preservation.

II. THE MATERIAL

From 1957—1970, the hare population of the Danish island of Illumö was investigated by the capture-recapture method (Abildgaard *et al.*, in press). The island is about 100 ha in area, 3.5 km long, and a few hundred meters broad. It lies in Helnaes bay, off the south-west coast of the island of Funen. Half of the island is cultivated land and the rest is composed of salt meadow.

From October to March in each year, almost 100% of the total population of between 100 and 300 adult hares were captured and marked with both ear tags and an ear tattoo. The annual captures were so intensive that in practice all unmarked hares the following year could be considered as having been born that year. 98% of the unmarked hares taken in captures close on October 1st had an epiphysial knob, a sign of their having been born in the preceding summer or spring. Thus on collection of the material described here, the year of birth of almost every individual was known.

In November 1970 the population dynamics investigation was concluded, and 90 hares of known age were collected, partly by net capture and partly by shooting, to examine them for age criteria. However only the eye lens weight is treated hare.

III. METHODS

Less than 4 hours after the hares were killed of on November 19th 1970, the left eye lens was removed and preserved in approximately 5 cc of 10% formalin. The hares were then taken to the Game Biology Station, where they were hung in the open air (average temperature, 6°C), and 4 days after death the right eye lens was removed and preserved. After 5 months preservation the remains of the vitreous body and the ciliary body were removed from the lens, which was then dried in an oven for 4 days at 90°C. Immediately after cooling the lens was weighed to the nearest mg on an analytical balance.

Some eye lenses were excluded from the investigation because of damage, either while the hare was alive or during capture, or during removal of the lens. In general there was no difficulty in distinguishing damaged lenses from undamaged ones. Together with undamaged lenses are included some lenses, where some small parts of the internal capsule were lost on cleaning after preservation. The weight of such lenses may thus be up to some few percent lower than that of intact lenses (see below).

IV. RESULTS

It was already clear on cleaning of the preserved lenses that the internal capsule glazed more readily in those lenses which were first preserved 4 days after the hares' death than in those which were preserved immediatly. After drying, the eye lenses were divided into 3 groups; intact lenses, those which had lost small sections of the internal capsule, and those which were severely damaged. The last group was

not included in further calculations or figures in this paper. In addition to these are causes in which the eye lens was excluded beforehand, *e.g.* because shot had passed through them. The distribution of lenses in the 4 groups is shown in Table 1.

Table 1

Distribution of the eye lenses of 90 hares according to their condition.

	Intact	Slightly damaged	Severely damaged	Not included	Total
Preserved immediately	50	25	6	9	90
Preserved 4 days after death	10	67	2	11	90

It is quite clear from the results in Table 1 that lenses which are first preserved 4 days after the death of the hare are more often slightly damaged, but only a very few are severely damaged. All severe damage must be ascribed to accidents on removal of the lens, while minor damage almost always consists of glazing or desquamation of parts of the internal capsule after preservation.

It was possible to compare directly the weight of the right and left eye lens of the same animal in 65 cases. In 51 cases the freshly preserved eye lens was up to 19 mg heavier than the one which was preserved 4 days after the animal's death, the average difference being 5.8 mg (1—2%). In one case the weight was the same, and in 13 cases the lens preserved later was up to 8 mg heavier than the freshly preserved one, the average difference being 4.2 mg.

In Fig. 1, the weight of the eye lens is shown in relation to the year of birth for 86 hares which were killed off on Nvoember 19th 1970. In the figure, the heaviest eye lens weight for each individual has been used. The eye lens weight of animals born in 1970, that is those less than 1-year old, is quite clearly less than of animals older than one year. In the animals born during 1966—1969, that is those of from 1½ to 4½ years old, there is an obvious increase in eye lens weight with increasing age, but there is a considerable amount of overlapping of the results in the different age groups.

The absolute eye lens weight was used for Fig. 1. To determine to what degree a more definite relationship between eye lens weight and age could be discovered, the eye lens weight was expressed as a percentage of each animal's total weight and plotted against the year of birth (Fig. 2). Figures 1 and 2 illustrate that the weight of the eye lens

increases both relatively and absolutely with increasing age. However, the differences between age groups are greatly diminished when the relative eye lens weight is considered. Amongst other things, this is due to the hares' total weight increasing gradually with increasing age. In

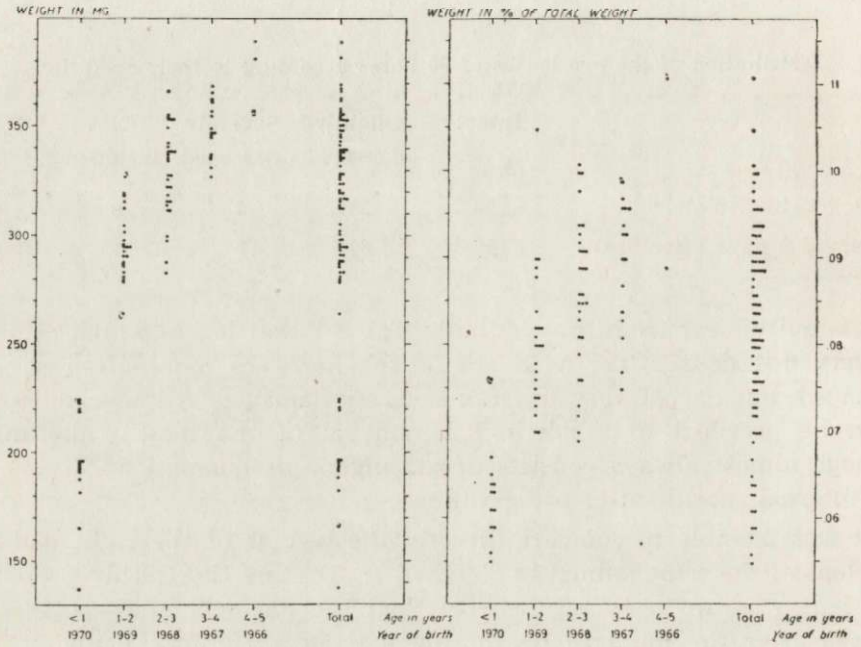

Fig. 1.

Fig. 2.

Fig. 1. The eye lens weight in mg of 86 hares of known age.

Fig. 2. The eye lens weight as a percentage of total body weight of 86 hares of known age.

addition, female hares weight a little more on average than male hares of the same age, but a sexual difference in the absolute lens weight is less marked.

V. DISCUSSION

Several authors have considered different treatments of removal and preservation of lenses (F r i e n d, 1967a), and their effect on eye lens weight. It is generally accepted that eye lenses should be preserved as fresh as possible or should be quickly frozen down (F r i e n d, 1970). The present study has shown that lenses which are first removed and

preserved 4 days after a hare's death in general weigh less than freshly preserved ones. However, the difference in weight does not generally exceed more than a few per cent. Thus the possibility of simultaneously removing the lenses from the results of several days shooting is not excluded, and the eye lens weights can then be used for age classification. This has practical interest in cases where it is possible to investigate the shooting yield from different districts, sent to businesses which deal in game.

At the farthest right of Fig. 1, the weight distribution of eye lenses of all hares of known age collected on 19th November is shown. This distribution is comparable to one which would be obtained from the classification of material of unknown age. Young animals, presumably born between April and September, are clearly delineated from those of over 1 year of age by their lower eye lens weight (<230 mg). The distribution of the eye lens weights in hares of more than 1 year allows no further classification of the material into age groups, in the present study. The same appears to be true for the material described by Bujalska *et al.* (1965), Walhovd (1966), Hell (1967), Rieck (1967), Möller (1968) and Wandeler & Huber (1969).

It is certain that one must be altogether strongly critical of the possibility of basing a detailed age distribution in older animals of a population on the eye lens weight.

REFERENCES

1. Abildgaard F., Andersen J. & Nielsen O. B., 1971: The hare population of Illumö Island, Denmark. Dan. Rev. Game Biol., *6*, 5:
2. Bujalska G., Caboń-Raczyńska K. & Raczyński J., 1965: Studies on the European hare. VI. Comparison of different criteria of age. Acta theriol., *10*, 1: 1—10.
3. Friend M., 1967a: Some observations regarding eye-lens weight as a criterion of age in animals. N. Y. Fish Game J., *14*, 2: 91—121.
4. Friend M., 1967b: A review of research concerning eye-lens weight as a criterion of age in animals. N. Y. Fish Game J., *14*, 2: 152—165.
5. Friend M., 1968: The lens technique. Trans. 33. North Am. Wildl. and Nat. Resources Conf.: 279—298.
6. Friend M., 1970: Quick freezing as a standard method for eye lens collection. N. Y. Fish Game J., *17*, 2: 124—125.
7. Hell P., 1967: Variabilita váhy očných šošoviek vzhl'adom na určovanie věku zajacov. Lynx, *8:* 3—6.
8. Lord R. D., 1959: The lens as an indicator of age in cottontail rabbits. J. Mamm., *40*, 1: 63—81.
9. Möller D., 1968: Probleme der Hasenbewirtschaftung in der Deutschen Demokratischen Republik. Beitr. Jagd- und Wildforsch., *6:* 139—145.

10. Rieck W., 1962: Analysis on Feldhasenstrecken nach dem Gewicht der Augenlinse. Supp. Ricerche di Zool. Appl. alla Caccia, *4*, 1: 21—29.
11. Rieck W., 1967: Ergebnisse der Untersuchung von Feldhasenstrecken. VII'e Congres der Biologistes du Gibier. Beograd-Lujbljana, septembre 1965: 383—388.
12. Walhovd H., 1966: Reliability of age criteria for Danish hares (*Lepus europaeus* Pallas). Dan. Rev. Game Biol., *4*, 3: 106—128.
13. Wandeler I. & Huber W., 1969: Zum Altersaufbau der bernischen Feldhasenbestande im Jahre 1967. Rev. Suisse Zool., *76*, 3: 680—686.

Accepted, August 15, 1971

Game Biology Station,
Kalö, Rönde, Denmark.

Johs ANDERSEN i Birger JENSEN

CIĘŻAR SOCZEWKI U ZAJĘCY O ZNANYM WIEKU

Streszczenie

Zebrano 90 soczewek ocznych zajęcy (*Lepus europaeus* Pallas, 1778) o znanym wieku. Te soczewki, które były utrwalane w 4 dni po śmierci zwierzęcia wykazywały pewne oznaki rozkładu. Jednakże strata ciężaru wynosiła zaledwie kilka procent w porównaniu do soczewek pobieranych w kilka godzin po śmierci osobnika. Chociaż ciężar soczewki wzrasta z wiekiem to na podstawie tej cechy możliwe jest tylko odróżnienie zajęcy z najpóźniejszej generacji od pozostałych.