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Age Determination in the Red Deer (Cervus elaphus)

OCENA WIEKU JELENIA EUROPEJSKIEGO (*CERVUS ELAPHUS*)

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Establishing of a proper method enabling fast and precise age de-
termination is of great importance for analysis of aging phenomena
in animal populations. The Mitchell's technique is especially useful
in studies on cervids. It is suggested to introduce the Mitchell's techni-
que instead of the method currently used by Polish Hunting Councils.

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The estimation of tooth wear pattern belongs to the commonest
metod employed for the age determinatgion on the red-deer *Cervus
elaphus*). This technique is based on the fact that the teeth of juvenile
specimens are provided with deep crests the depth of which decreases
in course of time. The method is commonly used by hunters in order
to determine the age of shot males of the roe deer, red deer, and moose.
In the 1960s, a number of scholars began to estimate the age of cervids,
considering the amount of layers in the dentine of in cement; of them,
Mitchell (1963) determined the age of *Cervus elaphus,* while Klevezal
and Kleinenberg (1967) did it for *Capreolus capreolus.*

In the present study, 107 mandibles of red-deer males coming from the forest
inspectorate of Komańcza were examined. The age of the red-deer was previously
determined by game managers of the inspectorate according to the tooth wear
pattern. The age of the mandibles was then estimated in the laboratory on the
basis of the annual growth of cement. The incisors were first examined, with
the employment of histological techniques. The teeth were decalcified in 3.7%
hydrochloric acid during 24 hours (Zekor, 1984), and after the decalcification, the
incisors were cut along the axis of roots into sections of 16 micrometers thick
with use of the freezing microtome. After staining by Giemsa the preparations

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were washed with distilled water and then dried. The layers of the annual growth can be observed in magnification ×10 under the optic microscope. This method enables determinations of the age with an utmost accuracy but it requires laboratory equipments. Because of this reason a part of the mandibles was additionally examined with use of the less time-consuming method of Mitchell (cf. Ohtaishi & Hachiya 1985). This method is also based on the analysis of the annual growth of cement but it does not require complex laboratory procedures.

On this account, the first molar was extracted so that the root remained not damaged. It was then cut in half along the root by saw and polished with whetstone. In result, layers of the annual growth become visible between the roots. In order to receive a better display of these structures, the tooth was sunk in the pure alcohol for about five minutes. Afterwards, the layers of the annual growth were observed under a binocular microscope. In the red-deer, the complete permanent dentition appears in the age of about 30 months. Considering that the first incisor (I1) appears in the age of 16 months and the first molar (M1) after 12 months, it was necessary to add a year to each age estimate (Bobek et al. 1984). The above two methods were used for the examination of 40 mandibles. After ascertainment of uniformity of the results, the remaining mandibles were estimated with the employment of the latter technique.

Comparison of the results based on the tooth wear pattern with those received in the present work reveals that the former age estimates, provided by hunters, were correct in 22% only; the age was underestimated in 12% and overestimated in 65%. The most significant errors occurred in reference to the male red deer of age 7—8 years. Erroneous age estimates based on the tooth wear pattern result from a peculiar system of shots obligatory in Poland. Shots of male red deer up to the age of 10 years are regulated by the selection criteria (i.e. that only specimens with untypical antlers are killed), while these regulations do not concern older animals. According to the rules in force, the person responsible for age estimates is not a hunter but a quide and the latter is awarded for every proper shot. These factors involve a tendency to overestimate the age of the killed red deer so that the animals represented an older age group. A similar situation occurs in the case of roe deer. According to Szabik (1973), only 26% of age estimates were carrect, while 64% of them were overstated and 10% understated. In order to eliminate erroneous age determination, one should estimate age of animals from different environments and then make a list of patterns of a series of mandibles with designated absolute ages. Having had the patterns, Polish Hunting Councils would not overstate age so often.

In the Carpathians, the maximum weight of antlers is received by males of age 13 years (Bobek & Kosobudzka, unpubl.). A transfer of the age limit of animals submitted to the selection shots from 10 to 12 years would improve the population structure of these animals. The criteria

employed up to now are appropriate for lowland animals that maturate earlier.

Introducing a method that enables fast and correct age estimations is very important for analysis of the age structure of populations. Although the previously used methods are very accurate, they are highly labour--consuming. An employment of the histological techniques (*i.e.* staining by Giemsa and haematoxylin) require use of many reagents. Moreover, these methods need laboratory equipment (*e.g.* freezing microtome), inaccessible for general public. In its accuracy, the method of Mitchell is not inferior to the other techniques, whereas it is much easier to use. The employment of this technique for the age determination in red deer would eliminate erroneous estimates made by both the Commission of Hunting Trophies and hunters themselves. Nevertheless, the method of Mitchell cannot be used in reference to all game animals. The satisfactory results can be received exclusively for larger species of deer as well as for those animals in which the thickness of layers of the annual growth exceeds the value of 50 micrometres (Ohtaishi & Hachiya, 1985). In such cases the colouration is not necessary because the layers of the annual growth are well visible under a binocular microscope. Regarding other animals characterized by narrower layers, the histological techniques are necessary. It should be stressed that the histological method employed in the present work, despite some difficulties, is simpler than other histological techniques, *i.e.* colouration by haematoxylin, used up to now for the age determination. Its fault is Giemsa's decolourization that makes it impossible to store preparations for a longer time.
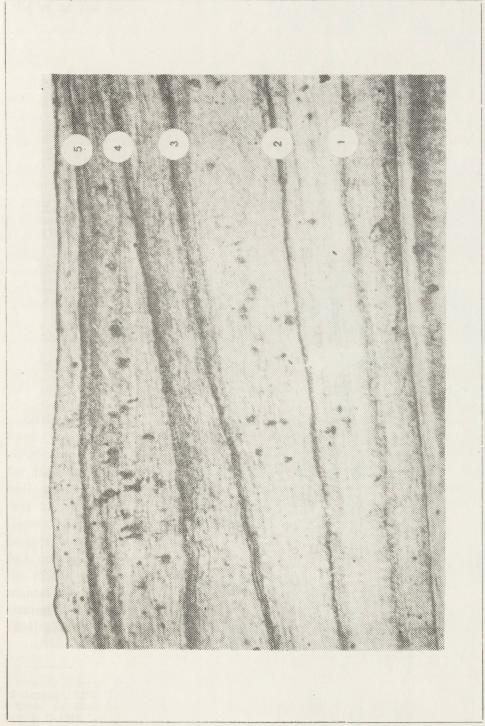
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EXPLANATION OF PLATE VI

Fig. 1. Cross-section of the incisor of the six years old male. 1, 2, 3, 4, 5 —
annual growth layers. ×450.