

## II. MITTEILUNGEN

# The frequency of antlered female and antlerless male roe deer (*Capreolus capreolus*) in a population in south-east Norway

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### 1 Introduction

Antlers of Cervidae are spectacular features of male morphology, and have probably evolved as a result of intense inter-male competition for mates (CLUTTON-BROCK, ALBON, and HARVEY, 1980), and function probably both as a signal and a weapon (GOSS, 1983). Only in genus *Rangifer* do females possess antlers (GOSS, 1983), possibly as an adaptation to intrasexual competition for resources (ROBERTS, 1996). The development of antlers is regulated mainly by sexual hormones, and disturbance of the hormonal balance may affect the growth of antlers (BUBENIK, 1990). Thus, in cervid species where females normally do not develop antlers, they grow some occasionally (review in GOSS, 1983). Similarly, males may not grow antlers due to malfunction of the control mechanisms regulating an antler-growth (GOSS, 1983).

It has been reported that antlered female roe deer (*Capreolus capreolus*) are not as rare as assumed (CEDERLUND and LIBERG, 1995; STUBBE, 1997). Antlers in female roe deer are usually small but often develop several irregular ends, and are more common among older individuals (CEDERLUND and LIBERG, 1995; STUBBE, 1997). A doe with 15 cm long antlers has been reported (GOSS, 1983). However, the actual frequency of antlered female roe deer has never been reported. Here we report the frequency of cranial outgrowths (antlers and pedicles) in females and antlerless male roe deer (knobblers) as determined in a population of south-east Norway. In addition, we tested whether frequency and length of cranial outgrowths developed was age-dependent.

### 2 Material and methods

The study area is located in the Lier valley in south-east Norway (between 59°45'–60°00'N and 10°05'–10°20'E) (see MYSTERUD and ØSTBYE, 1995; MYSTERUD, 1999 for a further description of the study area). From 1985 to 1998, skulls of roe deer hunted in the study area were collected. The culling took place between September 25 and December 23 of each year. The material consisted of skulls of 50 female fawns, 49 females between 1.5 and 2.5 years, 27 females  $\geq 3.5$  years, and 85 adult males ( $\geq 1.5$  years). Animals were aged by eye-lens weight (MARINGELE, 1979; STUBBE, LOCKOW, and ZÖRNER, 1987; ANGIBAULT, BIDEAU, VINCENT, QUÉRÉ, and KHAZRAIE, 1993) calibrated for this study area (E. ØSTBYE, unpubl. data). Ages of female and male deer varied from 1.5 to 6.5 and 7.5 years, respectively.

By cranial outgrowths, we refer to any type of elevation (knob) observed in the occipital portion of the external crests of the frontal bones of the skull which was beyond the "normal" shape (Fig. 1). In fawns, we define as normal when no elevation of the skull surface was detected, whereas a bony tissue 2–3 mm wide and 3–6 mm high was considered normal in adults (STUBBE, 1997; Fig. 1A). We use the same nomenclature that are used for the male antler counterparts (sensu BUBENIK, 1990). (1) We called it a pedicle if the elevation of this bone-structure was a knob-like enlargement (Fig. 1B and C). (2) We called it a "true antler" if there was a bony extension above the pedicle (Fig. 1D), which was often accompanied by a

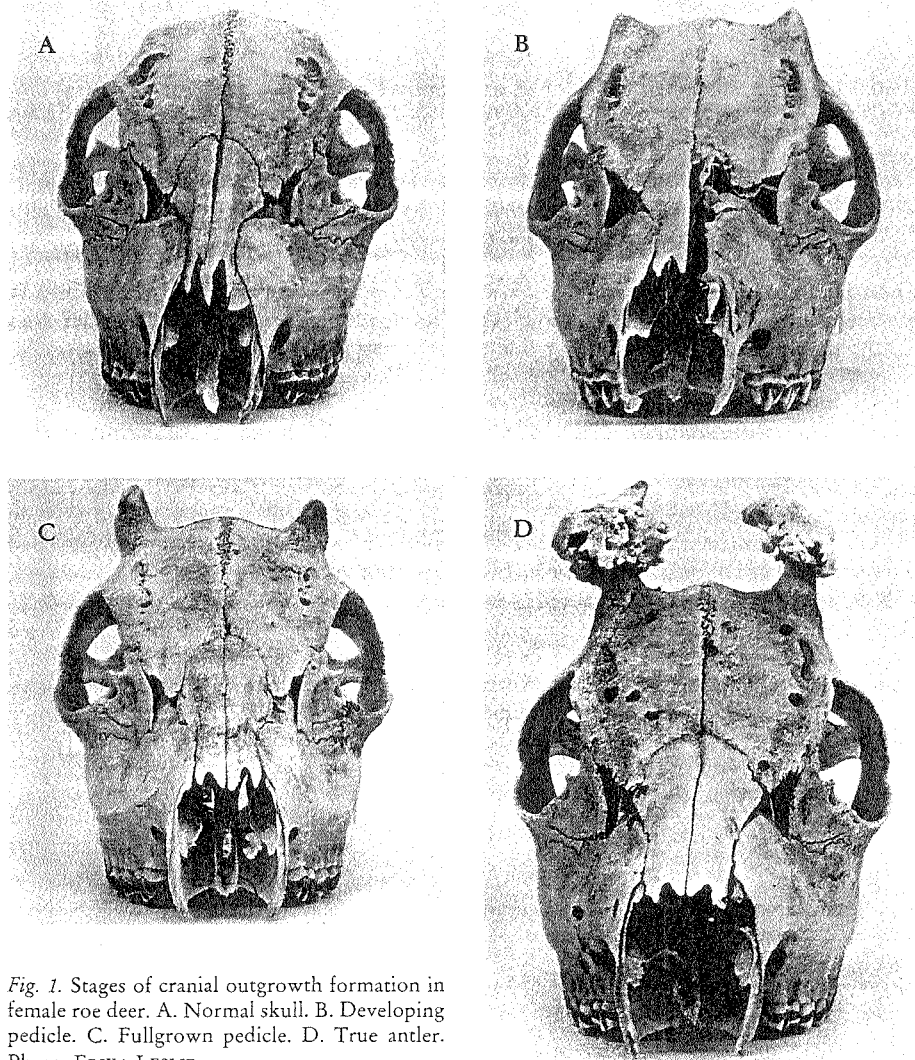


Fig. 1. Stages of cranial outgrowth formation in female roe deer. A. Normal skull. B. Developing pedicle. C. Fullgrown pedicle. D. True antler. Photo: ERIKA LESLIE.

coronet (burr). The pedicles were always covered with a normal skin and true antlers with velvet. All measurements were done to the nearest mm, and the means of both sides were used.

We tested whether the frequency (chi-square test) and length (t-test) of antler-development differed among young (< 3.5 years) and old females.

### 3 Results

The frequency of cranial outgrowths was 6.0 % (n = 50) among female fawns, 6.9 % among 1.5 year olds (n = 29), 0 % among 2.5 year olds (n = 20), and 14.8 % among older females ( $\geq 3.5$  years) (n = 27). However, the difference in cranial outgrowths frequency among age-groups was not statistically significant ( $\chi^2 = 3.455$ , df = 3, p = 0.327). Similarly, when

comparing the frequency of pedicles among young (5.1 %; < 3.5 year) and old females (14.8 %) ( $\chi^2 = 2.515$ ,  $df = 1$ ,  $p = 0.113$ ), no significant difference was found. However, cranial outgrowths of younger individuals tended to be shorter than the older ones ( $n = 9$ ,  $T = 4.900$ ,  $p = 0.064$ ). Only one female (1.3 %) had true antlers (Fig. 1D).

Among the 85 male roe deer shot in the same period, only one 2.5 year old buck (1.1 %) possessed pedicles only, but no antlers.

#### 4 Discussion

Cranial outgrowths in female roe deer was rather a common occurrence in our study area. It has been suggested that this is due to elevated levels of male sex hormones in older does (CEDERLUND and LIBERG, 1995) or due to tumours (DOUTT and DONALDSON, 1959). However, 6 % of female fawns had pedicles up to 12 mm in length, and although the frequency was somewhat higher among older females, this difference was not statistically significant. Thus, there seems to be relatively little variation in frequency of cranial outgrowths among young and old does, but the length of the pedicles tended to be longer in older deer. It has been reported that the frequency of antlerless female reindeer (*Rangifer tarandus*) varies between populations (JACOBSEN, COLMAN, and REIMERS, 1998). It remains to be seen whether this is also the case for the cranial outgrowths in female roe deer, but we assume that the average length of pedicles will probably vary with their age.

Among the 85 male roe deer shot in the same period, only one individual possessed pedicles only (1.1 %). Absence of antlers in males is probably mal-adaptive, and probably caused by hormonal disturbances possibly in relation to physiological pathologies (LINCOLN, 1984; BUBENIK, 1990; STUBBE, 1997). Antlerless male cervids are usually completely fertile (GOSS, 1983). The male was part of a telemetry-project (MYSTERUD, 1999), and was known to defend a territory the summer prior to being shot. It thus seemed to have a normal breeding cycle, and the reason for the lack of antler development remains unknown.

#### Summary

Female roe deer with antlers and male roe deer without antlers have earlier been mentioned in the literature, but the frequency of these phenomena has never been reported. We found that the frequency of pedicles was 6.0 % among 50 female fawns, 6.9 % among 29 females 1.5 year old, 0 % among 20 females 2.5 years old, and 14.8 % among 27 females 3.5 years or older in a Norwegian roe deer population; only one female (1.3 %) grew true antlers. However, the differences in the frequencies of pedicles among does of various ages was not statistically significant, but the length of the cranial outgrowth in younger individuals tended to be shorter than that of older ones. Among the 85 male roe deer shot in the same period, only one 2.5 year old buck (1.1 %) possessed pedicles, but no antlers.

#### Zusammenfassung

##### *Über die Häufigkeit des Auftretens gehörter Ricken und gehörmloser Rehböcke (Capreolus capreolus) in einer Population im Südosten Norwegens*

Gehörnte Ricken und Rehböcke ohne Gehörn fanden schon früher in der Literatur Erwähnung, jedoch wurde über die Häufigkeit des Auftretens dieser Phänomene nicht berichtet. Die Häufigkeit der Rosenstöcke betrug in einer norwegischen Rehpopulation bei 50 Rickenkitzen 6 %, bei 29 Schmalrehen (1,5 Jahre alt) 6,9 %, bei 20 Ricken im Alter von 3,5 Jahren und älter 14,8 %. Nur eine Ricke (1,3 %) trug ein echtes Gehörn. Obgleich die Unterschiede in der Häufigkeit des Auftretens von Rosenstöcken unter den Ricken verschiedenen Alters nicht signifikant sind, tendiert die Länge der Stirnanswüchse dazu, bei jüngeren Individuen kürzer zu sein als bei älteren. Unter 85 Rehböcken, die in der gleichen Periode erlegt wurden, besaß nur ein 2,5 Jahre alter Bock Rosenstöcke, aber kein Gehörn.

##### *La fréquence de che*

Le cas de chevrettes dans la littérature m trouvé, dans une pop faons femelles, de 6, 14,8 % parmi 27 fem les différences dans l ment significatives, l que chez les sujets pl 2,5 ans (1,1 %) possé

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*Anschrift des Autor*

## Résumé

### *La fréquence de chevrettes portant des bois et de brocards sans bois dans une population de chevreuils (Capreolus capreolus) du Sud-Est de la Norvège*

Le cas de chevrettes portant des bois et de brocards dépourvus de bois a d'ores et déjà été mentionné dans la littérature mais il n'a jamais été rendu compte de la fréquence de ce phénomène. Nous avons trouvé, dans une population norvégienne de chevreuils, que l'occurrence de pivots était de 6 % parmi 50 faons femelles, de 6,9 % parmi 29 femelles âgées de 18 mois, de 0 % parmi 20 femelles de 30 mois et de 14,8 % parmi 27 femelles de 3 ans et plus; une seule chevrette (1,3 %) portait de vrais bois. Cependant, si les différences dans les fréquences de pivots parmi les chevrettes de différents âges n'était pas statistiquement significatives, la longueur de ces apophyses crâniennes tendait à être moindre chez les jeunes sujets que chez les sujets plus âgés. Parmi les 85 brocards tirés au cours de la même période, seul un brocard de 2,5 ans (1,1 %) possédait des pivots mais non des bois.

Trad.: S. A. DE CROMBRUGGHE

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Rehböcke  
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Erwähnung, jedoch  
Läufigkeit der Rosen-  
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Ricke (1,3 %) trug ein  
Rosenstöcken unter  
auswüchse dazu, bei  
gleichen Periode er-