

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 (knoblers) 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 ≥ 3.5 years, and 85 adult males (≥ 1.5 years). Animals were aged by eye-lens weight (MARINGGELE, 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