

7. Summary

Characterisation of local European brown hare populations (*Lepus europaeus* PALLAS, 1778) in North Rhine-Westphalia using reproductive and habitat parameters

The applied methods in this long-term study provided reliable data on reproductive performance of Ebh. The aim of this study was to elucidate whether disrupted fertility was responsible for the decline of Ebh in different habitats in North Rhine-Westphalia. Infertility or subfertility were discussed as a potential cause for population decline.

A total number of 375 free-living Ebh, 178 females and 197 males, of 15 different habitats were caught and assessed under general anaesthesia. The applied methods included the evaluation of morphometrical, sonographical, spermatological and endocrinological parameters. The special catching technique in combination with inhalation anaesthesia and non-surgical examination provided, for the first time, the possibility to assess reproductive parameters in free-living hares during close season. In comparison with *post-mortem* studies, much more information was able without diminishing number of hares. The specific design of the examination protocol in this study allowed the acquisition of reproductive parameters for the detection of reduced fertility (BLOTTNER, 2001; modified and completed after MATTISON, 1989). The study periods included the main breeding season (February and April) and the period of reduced sexual activity (July). *Post-mortem* examinations *in situ* and *ex situ* provided the schematic illustration of the anatomy and topography of the entire urogenital tract. This information was not available until now and was essential for the interpretation of ultrasonographical findings.

Based on the results of the general examination, no reduced body condition was detected. The results suggested a seasonal influence, but there were no indications of any pathological changes of the gonads of female hares. A total amount of 83,15 % of the animals were reproductively active. The mean pregnancy rate of 67,98 % did not indicate an impairment of reproductive performance. Especially in July, a smaller portion of non-pregnant animals was elevated by a higher portion of lactating animals. In the group of non-pregnant and non-lactating animals, the ultrasonographical findings of the ovaries (including functional structures like follicles and corpora lutea) and the hormonal levels of P₄ (15,9 ± 4,7 ng / ml) and E₂ (0,07 ± 0,01 ng / ml) indicated physiological sexual activity in the main breeding season. Mean number of foetuses (1,9 ± 0,1) per pregnancy was smaller than in literature reported. This does not correlate necessarily with reproductive failure, because the ultrasonographical imaging of foetal integrity and vitality (prevalence

of embryonic or foetal death 8,26 %) did not result in any disturbance. In particular, the number of females with reproductive pathology (2,25 %) was very low.

The results showed a significant seasonal influence on testicular size and mean volume that was lower than in other studies, but ultrasonographical findings did not show any general or habitat-dependent disturbance of gonadal activity. Pathological alterations on testis found in one case were of traumatic origin.

Additionally, seasonal influence showed significant differences in sperm production. Mating activity in the field was not observed in this project. Time studies to determine the amount of time needed for sperm quantity and quality to return post mating should follow. The high percentages of motile and intact spermatozoa demonstrated an unimpaired reproductive performance. In some males with low ejaculate and/or sperm quantity, the analysis of testicular tissue (fine needle biopsy) did not show any disturbances of spermatogenesis. The variability of reproductive parameters between the individuals did not show any relationship to the different habitat types.

First, low testosterone concentrations (in April: $0,32 \pm 0,02$ ng / ml) suggested a disturbance of reproduction, but no relation between androgen production and habitats and high or low hare population density was detected.

The applied methods were suitable to detect reproductive failures and provided much more information than *post - mortem* studies. Until now no influence of habitat type could be found. Further examinations should occur on a larger number of animals. On the basis of these results, future studies could be performed on stability or changes of reproductive performance over an extended time period. In conclusion, the results suggested that the decline in Ebh populations is a result of a reduced survival rate rather than by a disturbed fertility.