

Sex-related differences of morphological and densitometric properties of mandible in Silver foxes (*Vulpes vulpes*)

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Introduction

Extremely limited information are available on morphometric and densitometric properties of skeletal system in foxes. Considering that silver foxes (*Vulpes vulpes*) belong to the Order Carnivora and Family Canidae, this species may be used as an alternative experimental model for dogs and other monogastric animals for investigations on metabolic factors influencing bone tissue properties and skeletal homeostasis. Thus, the aim of this study was to determine morphological and densitometric properties of mandible obtained from male and female silver foxes.

Materials and methods

The study was performed on 1-year old male (n = 7) and female (n = 8) silver foxes. Mandible was isolated and its weight and length were determined. Bone mineral density (BMD) and bone mineral content (BMC) for whole mandible, mandibular body and mandibular ramus were determined using dual-energy X-ray absorptiometry (DEXA) method and Norland XR-46 Densitometer (Fort Atkinson, WI, USA) equipped with Research Scan software (Figure 2). Statistical comparison of the investigated parameters of mandible between males and females was performed with a use of non-paired Student t-test and $P < 0.05$ was considered as statistically significant.

Results

Final body weight was significantly higher by 20% in males than in females ($P = 0.004$; Figure 3). Mandible length and weight were significantly higher in males by 7% and 22%, when compared to the group of females, respectively ($P < 0.001$; Figures 4 and 5). BMC measured for whole mandible and for its ramus reached significantly higher values in males by 10.5% and 18.3% when compared to the females ($P < 0.01$; Figures 7 and 11). BMC of mandibular body and BMD measured for whole mandible and its several parts were not significantly different between females and males ($P > 0.05$; Figures 6, 8, 9 and 10).

Conclusions

In conclusion, this study has shown sex-related differences of body weight as well as length, weight and BMC values of mandible in silver foxes. This study provided data on basic anatomical and densitometric properties of mandible in male and female silver foxes. The obtained results indicate that silver fox may serve as an attractive experimental model for further studies on bone metabolism regulation in mammals in response to physiological, environmental, pharmacological, nutritional and toxicological factors, being an alternative model for other monogastric animal species such as dogs.

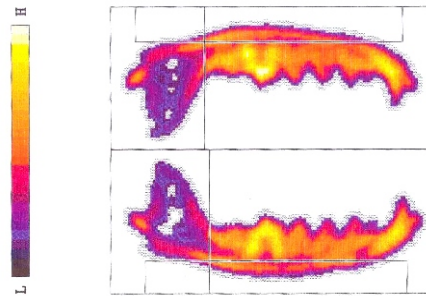


Fig. 2. Bone mineral density and bone mineral content measurements in whole mandible, mandibular body and mandibular ramus from one-year-old silver fox.

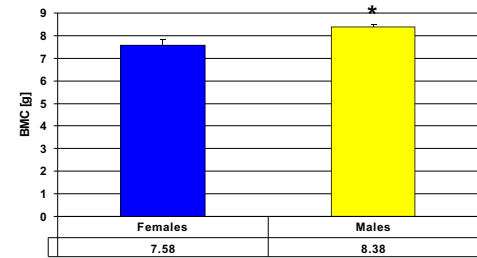


Fig. 7. Bone mineral content (BMC) of mandible in one-year-old female and male silver foxes. * $P < 0.05$.

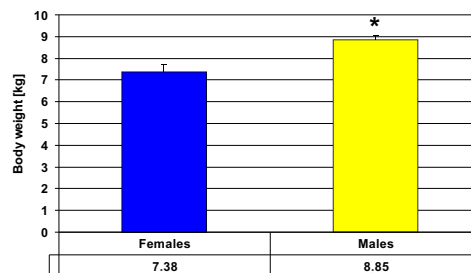


Fig. 3. Body weight in one-year-old female and male silver foxes. * $P < 0.05$.

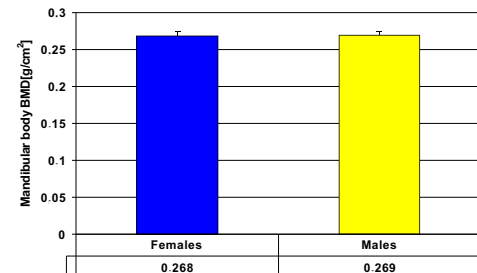


Fig. 8. Bone mineral density (BMD) of mandibular body in one-year-old female and male silver foxes.

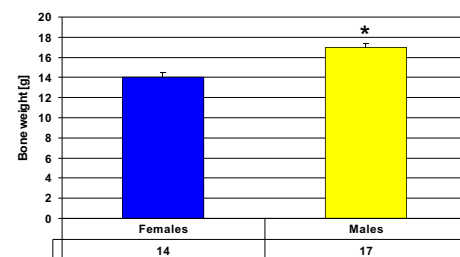


Fig. 4. Weight of mandible in one-year-old female and male silver foxes. * $P < 0.05$.

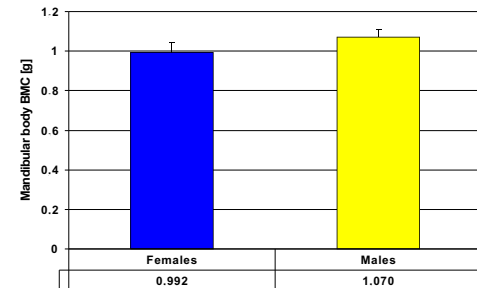


Fig. 9. Bone mineral content (BMC) of mandibular body in one-year-old female and male silver foxes.

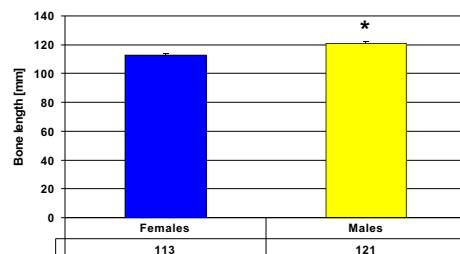


Fig. 5. Length of mandible in one-year-old female and male silver foxes. * $P < 0.05$.

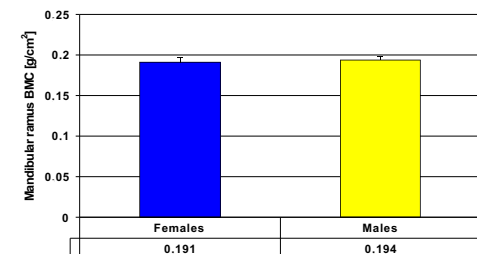


Fig. 10. Bone mineral density (BMD) of mandibular ramus in one-year-old female and male silver foxes.

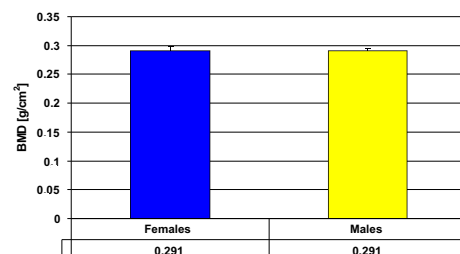


Fig. 6. Bone mineral density (BMD) of mandible in one-year-old female and male silver foxes.

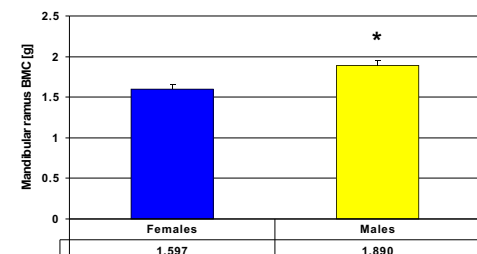


Fig. 11. Bone mineral content (BMC) of mandibular ramus in one-year-old female and male silver foxes. * $P < 0.05$.



Fig. 1. One-year-old Silver fox (*Vulpes vulpes*) kept in standard breeding conditions.