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SPONTANEOUSLY ARISING DISEASE

Oral and Dental Examination Findings in Beech Martens (*Martes foina*)

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Summary

Detailed clinical and radiographical descriptions of oral/dental pathology in the beech marten (*Martes foina*) are lacking. In the present study, skulls of *M. foina* from a museum collection ($n = 109$) were examined macroscopically according to predefined criteria and full-mouth dental radiographs were obtained. Occlusion was diagnosed as 'scissor bite' in 22.5% of evaluated skulls, 77% of evaluated skulls showed 'level bite' of incisors and 9.2% of evaluated skulls had 'open bites'. In three skulls, class III malocclusion was diagnosed. Linguoversion of the mandibular second incisor teeth was noted in all skulls. Of the maximum possible number of teeth (i.e. full set of teeth in each skull), 90.4% were available for examination, 6.4% were missing artifactually, 2.0% were absent presumably congenitally and in 1.2 % the absence was presumably acquired. In three skulls supernumerary teeth were noted, all being incisor teeth. In four skulls, unerupted maxillary canine teeth were noted and in one skull odontodysplasia of the maxillary canine teeth was diagnosed. All other teeth were considered normal in morphology. The number of roots per tooth varied in the mandibular second premolar, maxillary first molar and mandibular second molar teeth. The most common dental pathology was attrition/abrasion with 72 skulls (66%) and 857 teeth (24.1% of evaluated teeth) affected, followed by periodontal disease affecting 52 (47.7%) of skulls and 773 teeth (18.9% of evaluated teeth). Dental fractures were present in 49 (45%) skulls and 148 teeth (3.8% of evaluated teeth). Radiographically evident periapical lesions were detected in 11 (10.1%) skulls and 18 teeth (0.5% of evaluated teeth). Other rare abnormal findings included tooth resorption, enamel hypoplasia/hypocalcification, fenestrations at palatal root of maxillary first molar tooth and different bony changes.

Keywords: beech martin; oral pathology; radiography; teeth

Introduction

Beech (stone) martens (*Martes foina*) are small carnivores that are widespread throughout Europe. The dominant component of the diet of *M. foina* in the summer–autumn period is plants, followed by birds, small mammals (e.g. voles, synanthropic house mice and brown rats) and domestic animals (e.g. poultry and eggs) (Lanszki *et al.*, 2009). The dental formula of adult *M. foina* is I 3/3 C 1/1 P 4/4 M 1/2 = 38 (Kryštufek and Polak, 1996).

Several studies have been performed on the teeth of the genus *Martes*, mostly focusing on the zoological aspects and evolutionary significance of specific dental conditions (Wolsan *et al.*, 1985; Wolsan, 1989), studying tooth morphotypes (Gimranov and Kosintsev, 2015) with craniometry and tooth measurement (López-Martín *et al.*, 2006) and cranial morphology of *M. foina* and *Martes martes* and the role of size and shape in sexual dimorphism and interspecific differentiation (Loy *et al.*, 2004). Skulls ($n = 106$) from *M. foina* from Slovenia were inspected macroscopically in a study by Kryštufek and Polak (1996), documenting that a missing first premolar

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tooth is of genetic origin, but oral/dental pathology was only described briefly. In a study of 220 pine marten skulls from Poland (Wolsan, 1985), dental pathology was observed in only eight skulls. Dierks (2001) mentioned dental caries and periodontitis in martens and badgers, but this was not evaluated systematically.

As reported previously (Wolsan, 1985; Kryštufek and Polak, 1996; Konjevič *et al.*, 2011), beech martens can have several oral/dental diseases, similar to other wild carnivores (Verstraete *et al.*, 1996), but none of the previous studies have focused on detailed clinical and radiographical description of oral/dental diseases in this species. Therefore, the aim of this study was to evaluate dental and orofacial pathology in *M. foina* by means of visual examination and intraoral radiography.

Materials and Methods

One hundred and nine beech marten skulls from a museum collection of the Slovenian Museum of Natural History, Ljubljana, Slovenia, were examined by means of visual inspection and dental radiography by two skilled examiners (KS and AN). Skulls were registered by collection number, sex and age of the animal (if known) and date and area of collection (if known).

Skulls with missing large parts or fragmented skulls were excluded from the study. Skulls with separated mandibles and those with artifactually missing teeth were included in the study.

Radiographical examination was performed using an intraoral dental unit and an indirect digital phosphor plate scanner system. The age of the animal was estimated based on the width of the pulp chamber and apical closure (Helldin, 1997; DuPont and DeBowes, 2008).

Visual findings were recorded on a dental chart developed for this study and a previously published scoring system (Winer *et al.*, 2013) was used. The presence of teeth was recorded and any abscence of teeth was verified by radiographical examination. The number of tooth roots was also determined from the radiographs.

Occlusion was evaluated based on the American Veterinary Dental College (AVDC) classification of malocclusions (AVDC Nomenclature Committee, 2012a). When evaluating fractures of teeth, the AVDC classification was applied (AVDC Nomenclature Committee, 2012b). Fractures that occurred presumably *ex vivo* were not included in the total count. As previously described (Winer *et al.*, 2013), periodontitis was scored from stages 2–4 only, as stage 1 (gingivitis only) could not be detected due to lack of soft tissues. For bony changes consistent with any stage of periodontitis, alveoli of teeth missing due to non-congenital reasons were also evaluated. Patients with periodontitis (stages 2–4) were divided into two groups depending on how many teeth were affected in a specific animal (≤25% teeth affected or >25% teeth affected) in order to differentiate not only the severity, but also the extent, of the disease in the population.

Any additional findings, such as enamel hypoplasia/hypocalcification, unerupted teeth, tooth resorption, bony changes or mandibular fractures were also recorded. Tooth resorption was classified according to Peralta *et al.* (2010).

All potential teeth were assumed when calculating the prevalence of supernumerary teeth and periapical lesions. All missing teeth were excluded when calculating the prevalence of abnormally formed teeth, attrition/abrasion, fractures and enamel hypoplasia/hypocalcification.

Results

Skulls

According to the label data, 26 (23.9%) of the skulls were from male animals, 20 (18.3%) from female animals and sex was unknown for the rest of the skulls. Most of the skulls were collected in Slovenia (83 [76.1%]), five were from Greece–Crete, Greece–Rhodes, Turkey, Serbia and Macedonia and the rest of the locations were unknown. The age of the animals was unknown for all of the skulls, but as estimated on dental radiographs, most of the skulls 72 (66.1%) were most likely from adults (with narrow pulp chambers), 36 (33%) of the skulls were most likely from young animals (with wide pulp chambers) and only one skull was from a juvenile animal (root apices of permanent teeth not closed).

Occlusion

Linguoversion of mandibular second incisor teeth was noted in all skulls. It was not possible to evaluate incisor occlusion in 33 (30.3%) of the skulls due to missing incisor teeth, open bite or artifactually separated mandibles. Level bite of incisor teeth was found in 59 (71%) and scissor bite in 17 (20.5%) of the skulls where evaluation of incisor occlusion was possible. One skull had a combination of a scissor bite on one side and a level bite on the contralateral side (MAL4/RC) and one showed malocclusion with the maxilla shorter on one side and longer on the other side compared with the mandible (MAL4/RC) (AVDC Nomenclature Committee, 2012a). Open bite (MAL4/DV) (AVDC Nomenclature