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Dental and Periodontal Health in Free-Ranging Swedish Brown Bears (*Ursus arctos*)

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Summary

Dental data from 22 Swedish brown bears (*Ursus arctos*) were collected during April and May 2008, during the annual capture of free-ranging brown bears in Dalarna County, Sweden by the Scandinavian Brown Bear Research Project. The bears were of different genders and ages. All animals were weighed and subjected to physical examination and all were found to be in good condition. The oral cavity was inspected and photographed and abnormalities were recorded on a dental chart. One bear had mild class II malocclusion. All yearlings had varying numbers of incompletely erupted permanent teeth. All adult bears were missing one or more premolars. Tooth wear increased with age; the most affected teeth were the incisors followed by the canines, premolars and molars. Complicated fractures most commonly affected the canines. Fifteen animals had gross evidence of enamel defects, but the aetiology of these was not determined. There was a low prevalence of calculus and periodontal disease and none of the bears had caries infections. The mean pH of saliva collected from these animals was 9.75. Further studies, based on a larger sample size followed over time, will be required in order to evaluate the progression of dental disease in brown bears.

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Introduction

Pathology of the oral cavity frequently occurs in domestic and wild animals (Hungerford *et al.*, 1999; Wenker *et al.*, 1999; Cuozzo and Sauter, 2006); however, there have been few studies of dental and periodontal disease in wild animal species (Robinson, 1979a, b; Hungerford *et al.*, 1999).

The normal dentition of bears (family Ursidae) includes incisor (I), canine (C), premolar (P) and molar (M) teeth and the dental formula of these animals is: $(2*(I3 \ C1 \ P4 \ M3))/(2*(I3 \ C1 \ P4 \ M2)) = 42$ (Wenker *et al.*, 1998). Previous studies of oral health in bears have reported that these animals may have missing premolars (Miles and Grigson, 1990), maloc-

clusion (Wenker *et al.*, 1999) and caries (Hall, 1940; Manville, 1992). These studies have generally been based on examination of skulls (Hall, 1940; Miles and Grigson, 1990; Wenker *et al.*, 1999; Sonne *et al.*, 2007) or the dentition of live captive bears (Wenker *et al.*, 1998). To our knowledge there has been no investigation of the oral health of free-ranging brown bears (*Ursus arctos*).

As part of the Scandinavian Brown Bear Research Project, free-ranging brown bears have been captured for study since 1984. During anaesthesia, the bears have been radio-marked and biological samples have been collected for demographic, genetic and ecological studies. During the captures, lesions of the teeth have been noted, but not investigated further. The aim of this study was to evaluate the dental and periodontal status of free-ranging brown bears in Sweden.

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Materials and Methods

During April and May 2008, dental data were collected from 22 brown bears during the annual capture of free-ranging bears by the Scandinavian Brown Bear Research Project. All captures took place in the county of Dalarna, Sweden. Approval was given by the Ethical Committee on Animal Experiments in Uppsala, Sweden.

The animals were immobilized from a helicopter using a remote drug delivery system (Dan-Inject®, Børkop, Denmark) involving the use of 1.5 ml darts with 1.5 × 25 mm barbed needles for yearlings and 3 ml darts with 2.0 × 40 mm barbed needles for adults. The bears were immobilized with tiletamine-zolazepam (Zoletil Forte Vet®, Virbac S.A., Cedex, France) in combination with medetomidine (Domitor® Vet, 1 mg/ml or Zalopine®, 10 mg/ml; Orion Pharma Animal Health, Espoo, Finland) according to body size (Fahlman, 2008). The total duration of anaesthesia was approximately 60 min. The time allowed for oral examination was limited to 15 min.

Seven of the bears were yearlings (one female and six males) and 15 were adults (10 females and five males). In three bears, age was estimated to be <10 years based on tooth wear. The ages of 12 adults were known due to earlier captures and ranged between 4 and 18 years. In two of these bears, age was known because they had been followed since they were yearlings. In the remaining 10 animals age had been determined based on cementum annuli in one premolar extracted during capture (Matson, 1981).

All animals were weighed and subjected to physical examination. Oral examination was performed independently by two persons after they had examined the first six bears together. The oral cavity was inspected and photographed and abnormalities were recorded on a dental chart modified for bears (Fig. 1). Teeth were counted and occlusion status was documented. In order to assess oral health, four indices were used: the calculus index (CI), gingival index (GI), periodontal index (PDI) (Kesel, 2000) and tooth

Nr of individual: _____	Name: _____	Place: _____	Date: _____
Sex: M _____ F _____	Age: _____	Weight (kg): _____	Photographed: _____
Occlusion: Normal: _____ Other: _____			

Supernumerary teeth: Yes _____ (is drawn) No _____	Absence of teeth: Yes _____ (Mark with a ring, R = persistent roots) No _____
Fractures: Yes _____ (mark with FC/FO, missing part are colored) No _____	Tooth wear: _____ Caries: Yes _____ No _____ (mark affected tooth with *)

pH saliva: _____	Gingival index GI: _____ (index for the whole mouth)	Periodontal index PDI: _____ (index for the whole mouth)
Calculi index CI: _____ (index for the whole mouth)		

Calculi Index CI

CI 0: No calculi present.

CI 1: Calculi cover less than 50 % of the tooth crowns.

CI 2: Calculi cover more than 50 % but less than 100 % of the tooth crowns.

CI 3: Whole tooth crowns are covered with calculi.

Gingival index (GI)

GI 0: Normal, no swelling.

GI 1: Less than 50 % of the gingiva has swollen, reddened or rounded margins.

GI 2: More than 50 % of the gingiva has swollen, reddened or rounded margins, and bleeds after passing a periodontal probe gently along the sulcus.

GI 3: GI 2, gingival hyperplasia, ulcer and/or bleeds spontaneously.

Periodontal index (PDI)

PDI 1: GI 1.

PDI 2: GI 1-2, minimal gingival recession, and/or pocket formation in <25 % of the teeth.

PDI 3: GI 1-3, hyperplasia or pus, gingival recession and pocket formation in >25 % of the teeth, loose teeth.

PDI 4: GI 2-3, ulcerations and pus, teeth so loose they might fall out.

Periodontal pocket depth

Any depth deeper than 4 mm should be noted at the correct location on the dental chart. The depth is noted as a number.

Gingival level

Are marked as a line on the dental chart.

Furcation

Actual tooth are marked with F1-F3.

F1: The alveolar bone has begun to be weakened.

F2: The alveolar bone is missing more than 50 % through the furcation.

F3: The alveolar bone is totally missing, it is a hole from side to side, this could be felt or seen.

Mobility

The mobility is noted on the dental chart if one or more teeth are mobile.

M1: Barely detectable movement.

M2: The tooth is moving, but stays in the alveolus.

M3: Very loose tooth that can fall out if touched.

Stomatitis and ulcers

Is drawn and described on the dental chart.

	Normal	Not normal	
1. Mucous membranes	<input type="checkbox"/>	<input type="checkbox"/>	_____
2. Palpable lymphnodes	<input type="checkbox"/>	<input type="checkbox"/>	_____
3. Heart auscultation	<input type="checkbox"/>	<input type="checkbox"/>	_____
4. Lung auscultation	<input type="checkbox"/>	<input type="checkbox"/>	_____
5. Hydration status	<input type="checkbox"/>	<input type="checkbox"/>	_____
6. Skin and fur	<input type="checkbox"/>	<input type="checkbox"/>	_____
7. Eyes	<input type="checkbox"/>	<input type="checkbox"/>	_____
8. Ears	<input type="checkbox"/>	<input type="checkbox"/>	_____

Fig. 1. Dental examination chart used in this study.

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