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Dental Loss, Disease or Abnormalities as a Mortality Factor in the Eurasian Badger

UBYTKI, CHOROBY I ANOMALIE ZĘBOWE JAKO CZYNNIK ŚMIERTELNOŚCI U BORSUKÓW

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Hancox M., 1988: Dental loss, disease or abnormalities as a mortality factor in the Eurasian Badger. Acta theriol., 33, 43: 575—579. [With 2 Tables]

Major abscesses in 1% out of 1050 badger *Meles meles* (Linnaeus, 1758), skulls were almost certainly responsible for premature death; but the minor abscesses in 6% of this material, the tooth loss with healed over alveoli, and the minor dental abnormalities encountered probably did not significantly impair foraging ability except under ecological conditions of severe food shortage.

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An age determination study of 1050 badger skulls in several European museums, also revealed a surprisingly high incidence of non-fatal tooth losses during life; although loss (or of teeth broken off at the root), with imperfect healing of the alveolus was often accompanied by subsequent osteomyelitis or parodontal disease, which in some cases led to abscesses and premature death.

The teeth most commonly lost are given in Table 1. The small, often well-spaced anterior premolars in eastern races were particularly prone to being broken off or lost, as are such teeth in the red fox, although the loss of even such important teeth as canines and molars in a minority of badgers hence did not necessarily result in death. The vestigial first premolars are geographically highly variable and useful taxonomically, and are discussed more fully elsewhere (Table 2, Hancox, in prep.; Russian races: Long & Killingley, 1983).

Rupture and bacterial infection of the periosteum with the development of the spongy bone characteristic of osteomyelitis can affect any bone, and was noted on one humerus, and in quite a number of cases on the cranial surface — including on a "remarkable" skull of *Meles* erroneously attributed to American Badger (*Taxidea*) shown in Shufeldt

(1922; identification confirmed by the Smithsonian Institution, Washington). Restricted spaces, such as those between the fourth premolars — molars and the mandibular first and second molars were especially prone to osteomyelitis. Alveolar infections in most cases probably resulted from, rather than caused, the tooth loss; although also arising externally or via the pulp cavity of chipped or worn teeth, which were not uncommon due to grit ingestion along with the major earthworm prey. In several 10—15 year old senile individuals the upper molar occlusal surface was worn through to the maxilla hence setting a limit to longevity.

Table 1

Teeth lost during life (%), N=349.

Lower third incisors	15	Lower canines	4
Lower first incisors	13	Lower third premolars	3
Lower second premolars	10	Upper canines	3
Lower second incisors	10	Upper fourth premolars	2
Upper first incisors	9	Lower fourth premolars	2
Upper second incisors	8	Upper molars	2
Upper third incisors	7	Upper third premolars	1
Upper second premolars	5	Lower first molars	1
Lower second molars	5		

Discrete caries are uncommon in *Meles* and carnivores generally, although most common in bears and sea otters. Caries are said to be more frequent in captivity, possibly owing either to a greater carbohydrate diet or inadequate natural tooth cleaning roughage; while the latter effect in restricted cheek teeth spaces my exacerbate plaque accumulation, increase the likelihood of parodontal infection, and impair foraging efficiency (Andrews & Murray, 1974; Gallagher & Nelson, 1979; Hall, 1940; Heran, 1971; Vitaz, 1986).

Dento-alveolar abscesses arising from small caries or chipped teeth occurred in 6% (N=63) of the total material and in order of frequency most commonly affected: — lower canines, carnassials, and fourth premolars; lower first and third incisors and second and third premolars; upper canines and first and third incisors; lower second incisors and molars; second to fourth upper premolars and lastly second upper incisors and upper molars. Swelling overlying the internal damage could be smooth, but often entailed superficial osteomyelitis, as also noted elsewhere (Vitaz, 1986). Major abscesses occurred in 1% (N=11) of the material and were linked with lower canines or larger cheek teeth or very occasionally with the upper canines or fourth premolars. Abscesses of single-rooted teeth often erupted through the jawbone to the exterior, one fourth premolar case imploded into the turbinal region, and in two cases the mandible was sufficiently eroded as to lead to its

fracture. Such abscesses have also been noted by Andrews & Murray (1974), G. Barker (pers. comm.); Batty & Cowlin (1969); Drabble (1969); Fullagar *et al.*, (1959); Hearn (1965); Neal (1986); Paget (1972); and Spittler & Jansen (1985); as well as in a hog badger (*Arctonyx*) mandible and in a skunk (*Mephitis*) (Hall, 1940). Severe abscesses were probably largely responsible for mortality in this minority of cases, but lesser dento-alveolar infections and lost teeth may lead to abnormal compensatory wear in other teeth, impaired foraging ability and a shortened life expectancy, particularly in mature individuals in the 5—15 year old category of either sex.

A number of young badgers in which abnormal development may similarly have partly contributed to premature death include one case of rickets, and single cases of malocclusion due to:

(1) Lag in tooth eruption: left maxilla lagged behind right set; incomplete eruption respectively of adult canines, lower right second incisor, second premolars;

(2) Asymmetry: arrested maxillary growth at 0.5 cm shorter than mandible (Vitaz, 1986, noted three cases amongst sixty-nine skulls of mandible protrusion; and the mandibular cheek teeth are generally less cramped than the maxillary row: see significantly higher incidence of lower first premolars in Table 2), also, one mandible twisted, one tooth row shorter than other side (Hearn, 1965);

(3) Tooth position or shape: upper canines recurved at different angles, or all canines directed forwards, incisors and anterior premolars cramped or misaligned not infrequently as is general in mustelids (Colver, 1936) and noted elsewhere in badgers (Vitaz, 1986), two cases of very thin canines, one upper molar perfect but very small;

(4) Supernumerary teeth: *eg.* two cases of presence of second upper molars in cubs, with lower two molars correspondingly more equal in size than normal (a third case in Fullagar *et al.*, 1959);

(5) Injury: non-healing of fracture of the fronto-parietal line of weakness present in fast growing cubs up until 5—6 months of age. The few adult cases of healed fractures included the zygoma, and minor foot bones not infrequently (D. Manuel pers. comm.); but major fractures sustained for example in road accidents are probably usually fatal (Gallagher & Nelson, 1979). A similar range of dental variation was noted in the American badger by Long & Long (1965).

Starvation due to inexpert foraging may be a significant mortality factor in cubs following the milk-permanent dentition transition and weaning, contributing to the mortality peak at 5—9 months of circa 20% (N=29) in the present material of known derivation (N=140). Dental abnormalities hence had only a minor effect on cub mortality but

Table 2

First premolar variation: + present, — absent, left — right/upper — lower, as %.

Variant	Berkshire	Hampshire	Devon+ Somerset	Somerset (Barker pers. com.,)	South England	Scotland	Scotland (Ratcliffe, (1970)	Great Britain Total	Denmark	Switzerland	Federal Republic of Germany (Spittler, 1985)	Czechoslovakia Herman (1971)
++ ++		13	26	12	20	37	43	16	38	48	31	37
−− −−	4	20	4	4	10	5	5	6	6			8
−− ++	75	46	57	68	44	21	16	57	29	13	28	21
−− +/−−/+	17	7			5			2	9	6	6	8
−/++/− ++		7	13	12	18	5	21	12	13	21	11	11
++ +/−−/+					3	5	10	2	2	6	11	9
++ −−				4				2	2		11	4
+−−++−−+ +−−+−++−	4	7			2			2	2			1
+−−+ −−−−							5	1	1		2	1
Number	23	15	23	25	107	19	19	212	219	32	36	79

during periods of food shortage, dental disease, tartar, loss or excessive wear may impair the foraging ability of older badgers and lead to premature death. Gallagher & Nelson (1979) attributed five cub and five adult out of seventy natural deaths to starvation, while newly weaned cubs may be particularly at risk in drought summers with poor earthworm availability such as 1955, 1975, 1976 and 1984 in Britain (Neal, 1986).

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