

“local tradition” in the different populations of *R. auritus* as reported by Ellis, Wiens & Rodell (1976).

Acknowledgements: Authors wish to express their gratitude towards: Dr. Osvaldo A. Reig for suggestions and reading the manuscript, to Jorge Orbea, Andrea Clausen and Leopoldo Montes for their help in identification of plant specimens and to Silvia Cid for her help in the identification of epidermal plant fragments. Thanks are also due to Daniel Periz and the late Miguel Sánchez for his valuable help in the field work.

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Accepted, January 29, 1982.

Cranial and Dental Abnormalities in Sika Deer

ANOMALIE KOŚCI CZASZKI I ZĘBÓW U JELENIA SIKA

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Feldhamer G. A., 1982: Cranial and dental abnormalities in sika deer. *Acta theriol.*, 27, 24: 353—357 [With 1 Table & Plates VIII—IX]

Cranial and dental abnormalities are described from sika deer, *Cervus nippon* (Temminck, 1836). Congenital (intrinsic) abnormalities occurred in only 4 of 191 specimens (2.1%). Abnormalities that resulted from extrinsic factors included alveolar thinning, noted in 33 (18.3%) of the specimens, and periodontal disease, found in 2 (1.0%) specimens.

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1. INTRODUCTION

Abnormalities of the skull and dentition have been described for numerous mammalian species, including many species of cervids. Such anomalies as brachygnathism, agenesis and supernumeration have been noted for white-tailed deer, *Odocoileus virginianus* (Zimmermann, 1780) and mule deer, *O. hemionus* (Rafinesque, 1817) by several investigators (Robinette, 1958; Ryel, 1963; Short, 1964; and others). Similar anomalies have been described for other cervids, including red deer, *Cervus elaphus* (Linnaeus, 1758) (Mayer, 1977; 1978), fallow deer, *Cervus dama* (Linnaeus, 1758) (Chapman & Chapman, 1969), caribou, *Rangifer tarandus* (Linnaeus, 1758) (Miller & Tessier, 1971), and roe deer, *Capreolus capreolus* (Linnaeus, 1758) (Meyer, 1975). There is little, if any, published information, however, on cranial and dental abnormalities in sika deer, *Cervus nippon* (Temminck, 1836), despite the widespread distribution of this species by introductions throughout the last century. This paper deals with cranial and dental abnormalities found in an introduced population of sika deer from Dorchester County, Maryland, USA.

2. METHODS AND MATERIALS

The sample was comprised of 191 complete skulls collected at check-stations and hunting camps in Dorchester County, Maryland, during the deer hunting seasons in 1977–1979. All skulls were cleaned by boiling and examined for the following abnormalities: plagiocephaly — asymmetrical cranial growth caused by premature closure of one frontal-parietal suture; bregmatic bones — an extra bone derived from accessory ossification of any of the fontanelles; heterotopic bones — small, accessory bones; supernumeration — teeth in excess of the usual number; congenital agenesis — a reduced dental complement because teeth failed to develop; irregular placement — teeth in positions other than normal, and alveolar thinning — the exposure of the buccal tooth roots. Also, the lacrimal orifices of the skulls were examined for differences in size, shape or position among individuals. Finally, all skulls were examined for the loss of dental material because of periodontal disease. Age classes of deer were determined by the wear and eruption of dentition as described by Lowe (1967) for red deer and Duff (1969) for sika deer.

3. RESULTS AND DISCUSSION

The sex and age composition of deer in the sample is given in Table 1. Sika deer calves, which are dropped in the spring (May to June) were approximately six months of age when collections were made during the hunting season (late November to early December). Pedicles of male calves had not developed by this time, and the sex of calves could not be ascertained from skulls. Calves probably were collected in a 1:1 ratio, however. Significantly more adult females than males were represented in the sample ($\chi^2=32.9$, $P<0.001$), because hunters were reluctant to give up heads of males with well-developed antlers. Conversely, yearling bucks, which from only spike antlers, were represented signific-

antly more in the sample than were yearling females ($\chi^2=5.71$, $P<0.025$) These sampling biases had no affect on the observed results, however.

Cranial and dental abnormalities found in the sample are discussed according to whether they were believed to be intrinsic (systemic) or extrinsic (local) in origin.

Intrinsic Origin. In sika deer, as in other cervids, the normal position of the two lacrimal orifices is on the anterior rim of the eye orbit, one above the other, with the lower orifice slightly anterior. On the skulls examined, the position of the orifices was somewhat variable, and the lower orifice occasionally was narrowed in shape. However, on two

Table 1

The number of sika deer (*Cervus nippon*) skulls in each sex and age category from Dorchester County, Maryland, examined for cranial and dental anomalies.

Sex	Calves ^a (Age Class 0)	Yearlings (Age class 1)	Adults (Age Class 2+)
Male	—	45	15
Female	—	25	67
Unknown	39	0	0

^a The sex of calves could not be determined from skulls.

skulls (1⁰/₀ of the sample) the lower orifice on one side was slit-like and displaced about 8 mm anterior to the orbital rim (Fig. 1, Plate VIII). There was no evidence of previous injury. In both specimens, the orifices on the other side were normal. In their review of the lacrimal orifices in a variety of ruminants, Leinders & Heitz (1980) reported anomalies in only 5 of 172 skulls (2.9⁰/₀) of cervids examined. Their sample contained only two sika deer, both of which were normal.

Irregular placement involving maxillary premolars was apparent in two specimens (1.0⁰/₀). In a 2-year old female, the last premolar on the left side was rotated linguallly 90 degrees so that the cups were perpendicular to the tooth row. The other two premolars also were slightly rotated. On the right side, the second premolar was rotated and displaced posteriolingually; the third premolar was rotated and displaced anteriolabially (Fig. 2). In a 6-year old female, the second premolar on the right side was rotated linguallly about 20 degrees. In both specimens, there was no apparent traumatic injury, infection, impaction or loss of underlying bone. Colyer (1936) described position variations in eight other genera of deer that also occurred exclusively in the premolars. He felt this was because permanent premolars erupt after the molars, and the forward movement of the molars may leave reduced space for the premolars. Although exact sample sizes were not always given, Colyer (1936 : 373) found a "limited number" of positional variations in approximately 300 deer skulls.

No cases of plagiocephaly, heterotopic bones or bregmatic bones were found in the 191 sika deer skulls examined.

Likewise, no instances of supernumeration or agenesis were noted in the 152 adults and yearlings. These anomalies were not considered for

the molariform dentition of calves, however, as the second and third molars in each quadrant were not erupted. These anomalies were considered for yearlings, however, as the alveolus of M3, and often the unerupted tooth, were evident. In all samples, the alveoli of the maxillary canines were present. These teeth are loosely socketed, however, and were often lost in the process of cleaning the skulls.

Although supernumeration and agenesis have been described for many species of deer (see Miller & Tessier, 1971), these variations are rare when considered on a percentage basis. For example, maxillary canine teeth were reported in only 23 of 18,000 white-tailed deer (0.1%) in New York (Van Gelder & Hoffmeister, 1953). Supernumeration occurred in only 13 of 1,226 caribou (1.1%) (Miller & Tessier, 1971). Pekelharing (1968) found an additional molar in only 1 of 580 red deer (0.2%) and 1 of 130 wapiti (0.8%) in New Zealand. Similarly low percentages of occurrence have been reported for agenesis in large samples of white-tailed deer (Free *et al.*, 1972; Mech *et al.*, 1970).

Extrinsic Origin. Alveolar thinning in the sika deer skulls examined was associated only with the molariform teeth. It occurred in 33 skulls (18.3%); 2 calves, 19 yearlings and 12 adults. In almost all cases, alveolar thinning was slight. Smith *et al.* (1977) felt that alveolar thinning resulted from internal pressures during mastication, with no associated pathology. The preponderance of older-aged sika deer with alveolar thinning supports this view.

Periodontal disorders were found in 1% of the sample—a 9-year old female (Fig. 3A) and a 6-year old female (Fig. 3B). There is a direct correlation between periodontia and age in humans, and this condition also is generally found in older wild animals (Robinson, 1979). Both local and systemic causes of periodontal disease in humans have been summarized by Grainger (1968) and Orban (1967). Many of these causes are not applicable to species other than man. In wild animals, periodontal disease probably is caused by extrinsic factors such as food penetrating the soft tissues during mastication or by chemical products of impacted food that destroy the epithelial surface and lead to deeper infection (Colyer, 1936). Periodontal disorders are more common in captive than in wild cervids.

In the sika deer population in Maryland, the low incidence of abnormalities of an intrinsic origin may to a certain extent be associated with the very low degree of genetic heterozygosity in the herd. Feldhamer *et al.* (in press) found no polymorphism in 10 enzymes from liver and muscle tissue from this population. This was attributed to the small number of sika deer originally introduced in Maryland (Flyger, 1960) and a resultant "founder effect". This low incidence of abnormalities in the introduced sika deer population may be contrasted to the high incidence of congenital agenesis (16.7%) found in the molariform dentition of native white-tailed deer from Dorchester County (Feldhamer & Chapman, 1980).

Generally, the incidence of congenital skull anomalies is relatively low in cervids (Colyer, 1936; Pekelharing, 1968). The results of this study support this generalization. Congenital abnormalities that are seriously maladaptive probably predispose individuals to prenatal or

neonatal mortality. Thus, animals with such anomalies are rarely available for study. Conversely, sika deer with the cranial or dental abnormalities described here, and noted for other species of cervids, probably are adversely affected to only a minor degree, if at all.

Acknowledgements: W. Bruce Taliaferro and numerous students from the Appalachian Environmental Laboratory aided in the collection of skulls. Numerous hunting clubs from Dorchester County were most cooperative in this project, including the 10-4 Club and other organizations. This research was supported as part of a contract from the Maryland Wildlife Administration to the Appalachian Environmental Laboratory. This is Contribution No. 1311-AEL, Appalachian Environmental Laboratory, Center for Environmental and Estuarine Studies, University of Maryland and Federal Aid to Wildlife Restoration W-49-R to Maryland.

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Accepted, December 24, 1981.