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# DESCRIPTIONS OF INCISORS OF KNOWN-AGE CAPE MOUNTAIN ZEBRAS, *EQUUS ZEBRA ZEBRA*, FROM THE MOUNTAIN ZEBRA NATIONAL PARK

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ABSTRACT

PENZHORN, B. L., 1987. Descriptions of incisors of known-age Cape mountain zebras, *Equus zebra zebra*, from the Mountain Zebra National Park. *Onderstepoort Journal of Veterinary Research*, 54, 135–141 (1987).

Twelve sets of incisors of Cape mountain zebras, 9 of which were from known-age individuals ranging in age from 11 months to 19 years, from the Mountain Zebra National Park, are described and depicted to illustrate not only the eruption and replacement sequence, but also the changes with increasing age in the configuration of the occlusal surfaces and of the infundibulum. Infundibula persist in maxillary incisors longer than in mandibular incisors. Shallow infundibula were still present in the maxillary incisors of a 19-year-old mare at least 4 years later than in plains zebras, *E. burchelli*, from the Kruger National Park. The physiological life span of Cape mountain zebras appears to be at least 26 years.

## INTRODUCTION

Criteria, based on tooth replacement and incisor wear, for age determination are in general use in domestic horses, *Equus caballus* (Anon., 1981; Wade, 1982). Similar criteria have been described for 2 plains zebra, *E. burchelli*, populations (Klingel & Klingel, 1966; Smuts, 1974; Spinage, 1972) and for Hartmann zebras, *E. zebra hartmannae* (Joubert, 1972). In Cape mountain zebras, *E. z. zebra*, from the Mountain Zebra National Park, (MZNP) (geographical coordinates: 32° 15′ S, 25° 41′ E), the tooth eruption and replacement sequence was found to resemble that of Hartmann and plains zebras, but infundibula persisted longer in the incisors of Cape mountain zebras (Penzhorn, 1982a). No age classes based on tooth wear could be defined for Cape mountain zebras, because of a paucity of available material (Penzhorn, 1982a). A further series of 12 Cape mountain zebra skulls, 9 from known-age individuals, from the same population as was reported on previously, subsequently became available for investigation. Only the incisors were retained, as the eruption and replacement pattern of premolars and molars resembles that of the other equids and age classes are usually based only on incisor wear.

All the sets of incisors examined are depicted and described here for comparative purposes. Although populations are increasing, Cape mountain zebras represent a rare taxon with only ca. 474 individuals in August 1985 (Smithers, 1986). Long series of skulls are not available and single specimens therefore assume greater scientific importance than in more numerous taxa.

Equid incisors are indented on the masticatory or occlusal surface (the "table") by a deep depression or infundibulum which is lined with enamel and contains cementum. Thus, as the tooth wears there is a central ring of enamel in addition to the peripheral enamel. The cavity, which becomes darkened by food deposits, is commonly called the "cup" or "mark" (St. Clair, 1975).

In horses, tooth wear patterns of maxillary and mandibular incisors differ, with infundibula remaining in the maxillary incisors long after they have disappeared from the madibular incisors (Anon., 1981). The same pattern was found in Cape mountain zebras (Penzhorn, 1982a); maxillary and mandibular incisors from each individual are shown here to illustrate the differences between them.

The Cape mountain zebra population of ca. 220 ranges freely in the 6 536 ha MZNP. The vegetation and habitat selection of the zebras in this park, both important factors when tooth wear rate is considered, have been described by Van der Walt (1980) and Penzhorn (1982b) respectively.

The dental formulae of all the recent Equidae are identical:

| | |
|---|---|
| Deciduous dentition: | Id3 Cd1 Pd4 |
| | Id3 Cd1 Pd4 |
| Permanent dentition: | I3 C1 P3 M3 |
| | I3 C1 P3 M3 |

(I=incisor, C=canine, P=premolar, M=molar, d=deciduous)

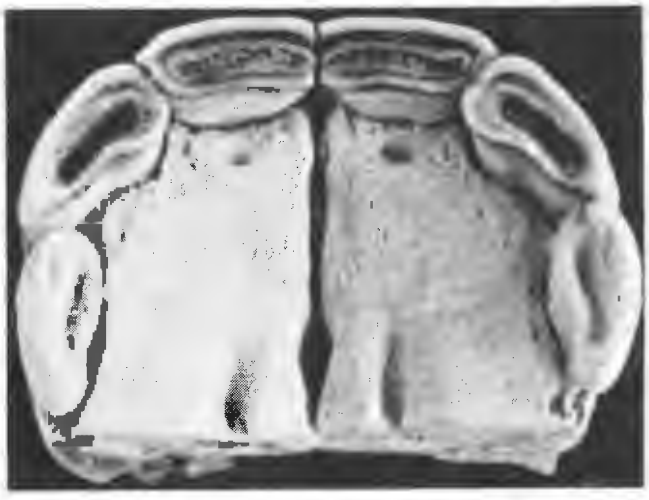

FIG. 1 Deciduous maxillary incisors of an 11-month-old Cape mountain zebra colt

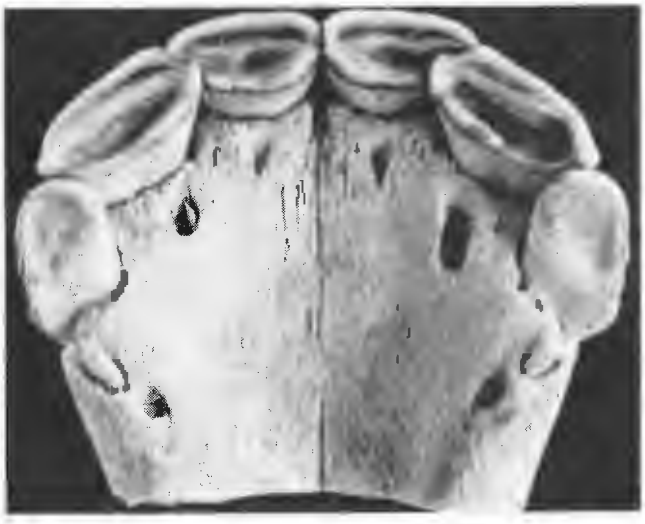

FIG. 2 Deciduous madibular incisors and canines of the same colt as shown in Fig. 1

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FIG. 3 Deciduous maxillary incisors of a 2-year-old Cape mountain zebra colt

FIG. 4 Deciduous mandibular incisors and canines of the same colt as shown in Fig. 3

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FIG. 5 Deciduous maxillary incisors of a 29-month-old Cape mountain zebra colt. Note the permanent first incisor visible in its bony alveolus (arrow)

FIG. 6 Deciduous mandibular incisors of the same colt as shown in Fig. 5

## MATERIALS AND METHODS

Twelve Cape mountain zebras (11 males; 1 female), ranging in age from 11 months to 19 years, were shot during a parasite survey. The characteristic stripe patterns of their haircoats allowed for individual recognition. The ages of 9 were known accurately, and those of the others to ±6 months. During autopsy the craniums were exposed by midline incision. The rostral portions of the skulls and mandibles, containing incisors and canines, were removed from most of the heads by sawing through the diastema before the skull was halved. Three skulls, however, had been sawn through before the rostral portions were removed. In 1 case the premaxilla had shattered.

The collected specimens[1] were cleaned and defatted and the occlusal surfaces of the incisors were photographed.

[1] These specimens have been accessioned in the archaeozoological collection of the Transvaal Museum, Pretoria, under the numbers AZ615–626.

## RESULTS

The maxillary and mandibular incisors of the 12 zebras are shown in Fig. 1–25 to demonstrate stages of incisor replacement and tooth wear at various ages and the lack of synchrony in the above criteria between maxillary and mandibular incisors of the same animal.

In an 11-month-old colt all deciduous incisors had erupted and were in wear. Deciduous canines were present in the mandible (Fig. 1 & 2). All deciduous incisors were still present in a 2-year-old colt, as well as deciduous canines in the mandible (Fig. 3 & 4). Erupting $I_1$ were visible in the bony alveoli of the maxilla of a 29-month-old colt (Fig. 5), but all deciduous incisors were still present. All deciduous incisors were still present in the mandible of the same colt (Fig. 6), but deciduous canines were lacking.

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FIG. 7 Maxillary incisors of a 3,8-year-old Cape mountain zebra stallion. Deciduous third incisors are still present

FIG. 8 Mandibular incisors of the same stallion as shown in Fig. 7. Deciduous third incisors are still present. Note the erupting permanent canines

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FIG. 9 Maxillary incisors of a 4,1-year-old Cape mountain zebra stallion. Deciduous third incisors are still present, but note the permanent third incisor visible in its bony alveolus (arrow). Note also the erupting permanent canines

FIG. 10 Mandibular incisors of the same stallion as shown in Fig. 9. Deciduous third incisors are still present. Note the erupting permanent canines

In a 3,8-year-old stallion $I_1$ and $I_2$ were in wear, while the permanent mandibular canines were erupting (Fig. 7 & 8). Erupting permanent canines were present in both maxilla and mandible of a 4,1-year-old stallion. $Id_3$ were still present, but $I_3$ were visible in their bony alveoli (Fig. 9 & 10). In a 4,5-year-old stallion, $I_3$ were erupting in both maxilla (Fig. 11) and mandible (Fig. 12). Both showed erupting permanent canines, which were not yet in wear.

The occlusal surfaces of the incisors of a ca. 6,5-year-old stallion were relatively broad. The infundibula of the maxillary incisors were elongated (Fig. 13). Infundibula of mandibular $I_1$ were oval, those of $I_2$ were elongated, while those of $I_3$ were lacking (Fig. 14). The canines were in wear.

The central incisors of a 14,5-year-old stallion were deeper and not as broad as those of the ca. 6,5-year-old stallion, while the infundibula were round (Fig. 15). Infundibula of $I_2$ and $I_3$ were more elongated. Round infundibula were present in mandibular $I_2$ only (Fig. 16). The canines showed heavy wear.

Maxillary infundibula of $I_1$ of a ca. 16-year-old stallion were round and smaller than those of the 14,5-year-old stallion (Fig. 17). The infundibula of $I_2$ were still oval, but tended to be more rounded. Round, shallow infundibula were present only in mandibular $I_2$ (left) and $I_3$ (right) (Fig. 18).

An 18-year-old stallion had lost the infundibulum in maxillary $I_3$ (right), but this was due to uneven wearing

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FIG. 11 Maxillary incisors of a 4,5-year-old Cape mountain zebra stallion. Deciduous third incisors are still present, but permanent third incisors are erupting (arrows). Permanent canines are erupting.

FIG. 12 Mandibular incisors of the same stallion as shown in Fig. 11. Permanent third incisors are replacing the deciduous ones. Permanent canines are erupting

FIG. 13 Maxillary incisors of a ca. 6,5-year-old Cape mountain zebra stallion. The canines are in wear

FIG. 14 Mandibular incisors of the same stallion as shown in Fig. 13. The canines are in wear

FIG. 15 Maxillary incisors and canines of a 14,5-year-old Cape mountain zebra stallion

FIG. 16 Mandibular incisors and canines of the same stallion as shown in Fig. 15

FIG. 17 Maxillary incisors and canines of a ca. 16-year-old Cape mountain zebra stallion

FIG. 18 Mandibular incisors and canines of the same stallion as shown in Fig. 17

FIG. 19 Maxillary incisors and canines of an 18-year-old Cape mountain zebra stallion

FIG. 20 Mandibular incisors and canines of the same stallion as shown in Fig. 19

of the teeth. All the other infundibula were still well-defined (Fig. 19). Infundibula had disappeared from all mandibular incisors, which had transversely compressed occlusal surfaces (Fig. 20).

Shallow infundibula were still visible in all maxillary incisors of a 19-year-old mare, bar $I_2$ (left) (Fig. 21). Infundibula had disappeared from the mandibular incisors (Fig. 22). A ca. 19-year-old stallion exhibited uneven wearing of the incisors (Fig. 23). This resulted in loss of infundibula from maxillary $I_2$ and $I_3$, while those of $I_1$ were still present (Fig. 24). Occlusal surfaces of mandibular $I_1$ and $I_2$ were strongly compressed laterally and infundibula were absent (Fig. 25).

## Discussion

The chronology of tooth eruption and replacement in Cape mountain zebras corresponds fairly closely with

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FIG. 21 Maxillary incisors of a 19-year-old Cape mountain zebra mare

FIG. 22 Mandibular incisors of the same mare as shown in Fig. 21. Note the presence of small canines

FIG. 23 Rostral view of the incisors of a ca. 19-year-old Cape mountain zebra stallion showing uneven wearing of the incisors

FIG. 24 Maxillary incisors and canines of the same stallion as shown in Fig. 23

FIG. 25 Mandibular incisors and canines of the same stallion as shown in Fig. 23

that described for Hartmann and plains zebras (Penzhorn, 1982a). $I_1$, $I_2$ and $I_3$ were usually in wear by 2,5, 3,5 and 4,5 years respectively. The statement that the full complement of permanent teeth of Cape mountain zebra had erupted by age 4 years (Penzhorn, 1982a) should be modified accordingly. In 4,1- and 4,5-year-old stallions maxillary $I_3$ was visible in its bony alveolus, but had not yet replaced $Id_3$ (Fig. 10–12).

If the material discussed here is compared with that of Hartmann zebras (Joubert, 1972) and plains zebras (Klingel & Klingel, 1966; Smuts, 1974), it appears that infundibula persist in the maxillary incisors of Cape mountain zebras to a greater age than in the other 2 taxa. This agrees with earlier findings (Penzhorn, 1982a), where infundibula were still present in $I_1$ of 6 Cape mountain zebras known to be >15 years old when they died. The maximum longevity of Cape mountain zebras in the MZNP apparently also exceeds that of plains zebras in the Kruger National Park (KNP) by a few years. Three MZNP mares were known to have lived to >26 years, >24 years and 23,5 years respectively.

Smuts (1974) postulated a maximum ecological longevity of 22 years for plains zebras in the KNP. At that age incisors were worn down to stumps which were frequently level with the gum. Old, debilitated zebras are more vulnerable to predation. The absence of large carnivores in the MZNP implies that Cape mountain zebras could reach their full physiological life span, which would appear to be at least 26 years.

Joubert (1972) stated that infundibula of $I_1$ in Hartmann zebras had disappeared by age 11–12 years, those of $I_2$ by age 13–14 years and those of $I_3$ by age 15 years. The ages of the animals in this study, however, were only estimations based on criteria for domestic horses and East African plains zebras. The cementum annulation method of age determination of plains zebras in the KNP and Cape mountain zebras is relatively accurate (Smuts, 1974; Penzhorn, 1982a). It would be interesting to determine whether age classes proposed by Joubert for Hartmann zebras would correspond to ages estimated by means of this method.

Virtually all MZNP zebras are individually known and, in most cases, their birth dates are known fairly accurately (at least to within a few months). With a little effort, skulls of known-age animals dying from natural causes could be collected and relevant data (i.e. identification number, approximate date of death) recorded. In this way the meagre data base could be expanded significantly.

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