

Morphological and trophic distinction in the dentitions of two early alcelaphine bovids from Langebaanweg (genus *Damalacra*)

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The early Pliocene fossil bovids from Langebaanweg are of interest, as they represent among the earliest well-defined members of modern tribes, such as Reduncini, Bovini and Alcelaphini (Gentry 1980; Vrba 1997). In these fossils typical tribal morphology appears to be in an early stage of evolution, which on the one hand hinders diagnosis, but on the other hand offers a unique opportunity to investigate ancestral morphological states and adaptations. In this study, we focussed on the two alcelaphine species from Langebaanweg, *Damalacra neanica* and *D. acalla*. They were of the size of the blesbok, *Damaliscus pygargus*, but their skulls and dental morphologies are underived representing an early stage in the appearance of distinctive alcelaphine characteristics (Gentry 1980). The dentitions of the two species are very similar and difficult to distinguish, especially when dealing with individual teeth (Gentry 1980). The aim of this study was to define the morphological characters that differentiate the dentitions of the two species and to use this distinction as the basis for assessing their trophic niches.

The Alcelaphini and Caprini are thought to have evolved from an antilopine ancestry in the later Miocene (Gentry 2000). Pleistocene and modern alcelaphine species can be broadly classified into two morphological groupings; those with antilopine body proportions, such as hartebeest, blesbok and tsessebe (genera *Alcelaphus* and *Damaliscus*) and those with more advanced caprine-like body proportions, such as wildebeest (genera *Connochaetes* and *Megalotragus*), reflecting the common ancestry of the Caprini and the Alcelaphini. This two-fold division is also evident in the dentitions of extant and Pleistocene Alcelaphini, where the genera *Damaliscus* and *Alcelaphus* tend to have less hypsodont tooth crowns, longer premolar rows and more complicated enamel folds in the molars. In spite of the underived nature of the alcelaphine dentitions from Langebaanweg, it was possible to classify the dentitions into two morphological groups. *D. neanica* has more derived and caprine-like dentitions, while the dentitions of *D. acalla* are more generalised, typical of what one might expect of an early alcelaphine. This is in accordance with Gentry's observation that the skulls of *D. acalla* are less derived than those of *D. neanica*. The dental characters distinguishing the two species of *Damalacra* can be summarised as follows:

- The dentitions of *D. neanica* are generally slightly larger than those of *D. acalla* (Figs. 1 & 2).
- The premolar rows of *D. neanica* are shortened, the P₂ is absent and in the P₄ the tooth as a whole is distally shortened, giving it a very caprine-like appearance (Fig. 2). In *D. acalla* the premolar row is longer, the P₂ is present and the P₄ is less squared off distally, more like in extant *Damaliscus* or *Alcelaphus*.
- The lower jaws of *D. neanica* are deeper than in *D. acalla* (Fig. 1), suggesting greater hypsodonty. In both species there is a tendency for the metaconid-paraconid fusion to be incomplete, which is an underived character..
- In comparison with *D. acalla*, the upper molars of *D. neanica* tend to have a more squared, blocky outline in occlusal view, they tend to expand more bucco-lingually towards the base of the crown, they have larger infundibulae, the styles are robust, ribs tend to be less well developed and basally on the M³ the metastyle tends to flare distally. The general impression of the upper molars of *D. neanica*, but in particular the last two

characters mentioned, is caprine-like, whereas *D. acalla* has a less derived and more generalised alcelaphine appearance.

The dental characteristics of the two species of *Damalacra* agree broadly with Gentry's assessment of the skull morphologies. It appears that *D. neanica* was more derived and caprine-like in its morphology than *D. acalla*. If mandibular depth may be taken as a proxy for hypsodonty, then it appears that *D. acalla* (37.9mm - 44.5mm) is only marginal less hypsodont than *D. neanica* (40.0mm - 47.4mm) (Fig. 1), while both are very similar to the extant blesbok, *D. pygargus* (38.9 - 43.9). This is somewhat unexpected, given the partly fused state of the metaconid and paraconid of the P₄, and suggests the need to test hypsodonty further by means of direct measurements on unworn M₃'s.

If the mandibular depth data reflect hypsodonty then one would expect the trophic niches of both species of *Damalacra* to have tended towards grazing, as in the case of the blesbok. However, a mesowear analysis of the upper molars of *Damalacra* spp. suggests that this was not the case (Fig. 3). *D. acalla* clusters with the sample of known mixed feeders and is closest to the bushbuck (*T. scriptus*) in mesowear pattern. *D. neanica*, on the other hand, clusters with the sample of known browsers and is closest to the mule deer (*O. hemionus*) in mesowear pattern. Unlike modern alcelaphines then, grass appears to have been a less important component in the diets of these two early alcelaphine species. The mesowear results are in good agreement with a microwear study of an undifferentiated sample of *Damalacra* teeth (Ungar *et al.* 2007), which suggested feeding niches ranging from browsers to mixed feeders. The apparent lack of agreement between the morphological analysis and the mesowear and microwear results is of interest and will be the focus of further research.

Figures

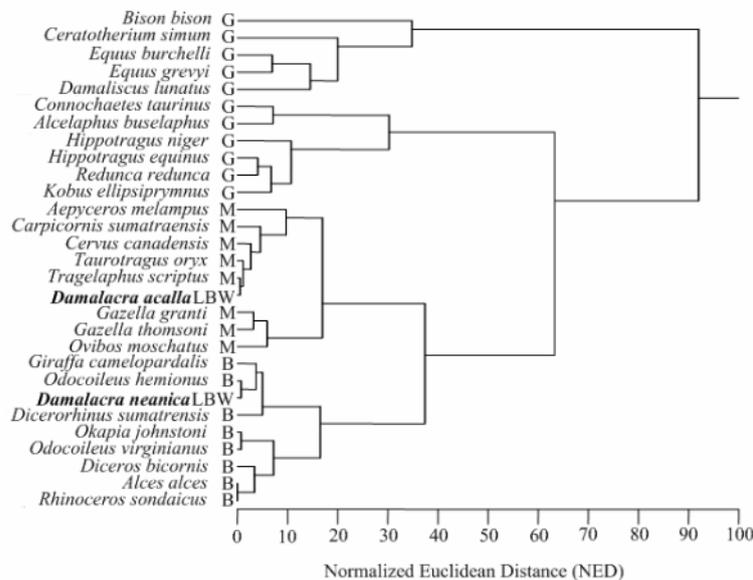


Figure 1: A plot of tooththrow/premolar ratios against the depth of the lower jaw at the M₂-M₃ junction of *Damalacra neanica* and *D. acalla*.

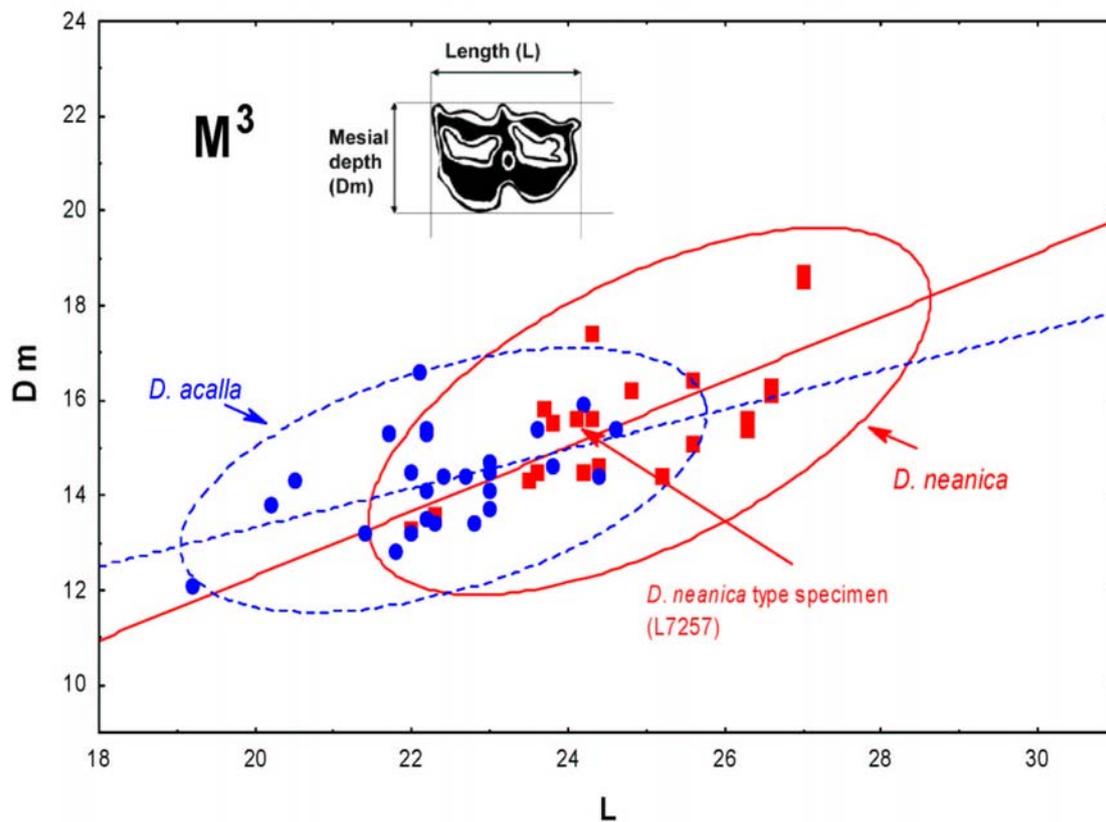


Figure 2. A plot of the occlusal length of the M3 against its bucco-lingual (mesial) depth of *Damalcula neanica* and *D. acalla*.

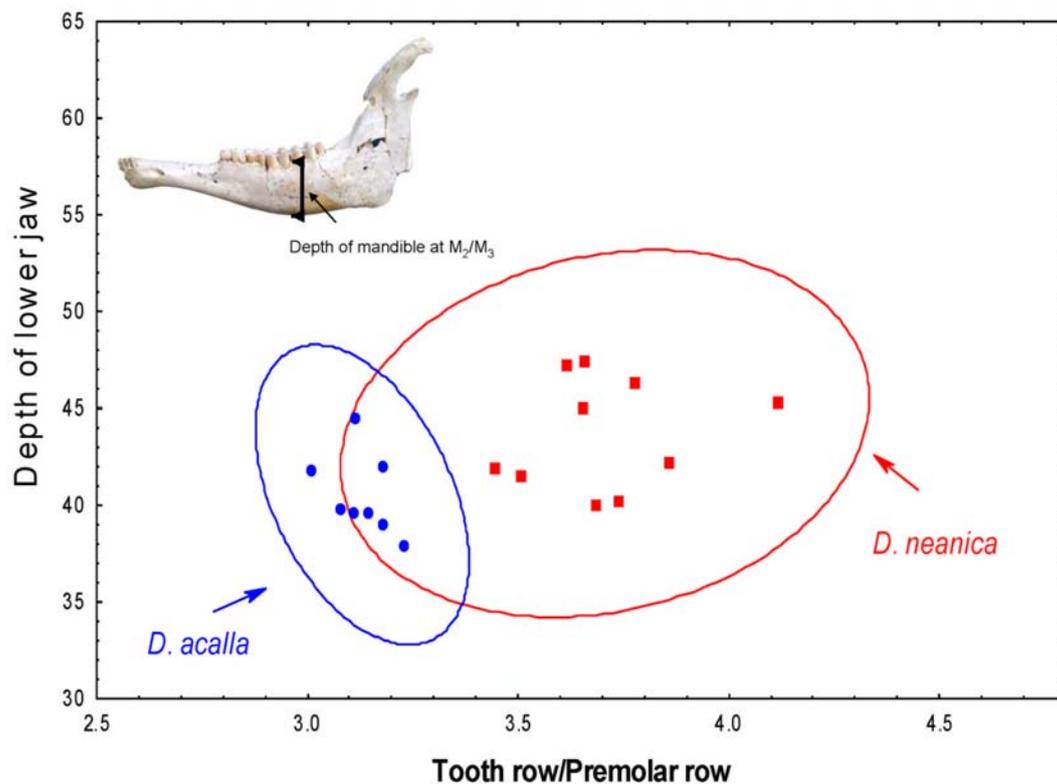


Figure 3: Hierarchical cluster diagram of the two *Damalacra* species compared to a set of 27 “typical” extant species from Fortelius and Solounias (2000). Mesowear variables

Figures after J.S. Brink & D.D. Stynder. In press. Morphological and trophic distinction in the dentitions of two early alcelaphine bovids from Langebaanweg (genus Damalacra). Palaeontologia Africana.

References

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