Foraging behaviour and dietary adaptation of the Arabian Sand Gazelle

Ellen Schulz, *Sven Fraas, Thomas M. Kaiser, Peter L. Cunningham, Khairi Ismail, Torsten Wronski*

Biocentre Grindel and Zoological Museum - University of Hamburg, Martin-Luther-King-Platz 3, 20146 Hamburg, Germany
email: ellen.schulz@uni-hamburg.de

Research Unit 771, German Research Foundation

1. Introduction

Figure 1 (A) Male Sand Gazelle in the protected area of Mahazat as-Sayd (Saudi Arabia).

Figure 1 (B) The distribution (grey area) of the Sand Gazelle in the Middle East.

The dietary adaptation of the extant *Sand Gazelle Gazella marica* THOMAS, 1897 from the Mahazat as-Sayd Protected Area (Saudi Arabia) (Figs. 1A, B) is evaluated using a behavioral method to determine food preferences (Fig. 2) in conjunction with an eco-morphological method examining the tooth wear.

2. Foraging Behaviour

During drought the gazelles spent significantly more time browsing (51.0%) but less time grazing (49.0%, Figs. 3A, B) than under non-drought conditions (browsing: 17.6%; grazing: 82.4%, MWR-test, $p<0.001$).

Regardless season or sex, Sand Gazelles consumed significantly more grass (58.4%) than browse (41.6%, P-*t*-test, $p<0.001$). Moving is a measure of search activity, which increases if food availability is low.

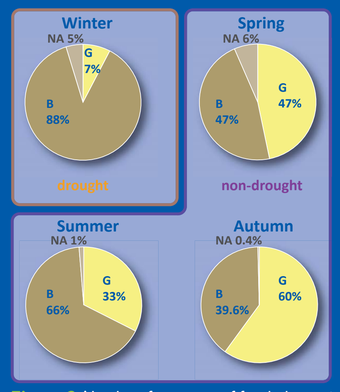

Figure 2 Absolute frequency of food plants given as percentage in relation to the total amount of that specific plant. %G = grasses, and B = forbs/trees/shrubs in the diet of two *Gazella marica* given per season and drought/non-drought according Cunningham (2009).

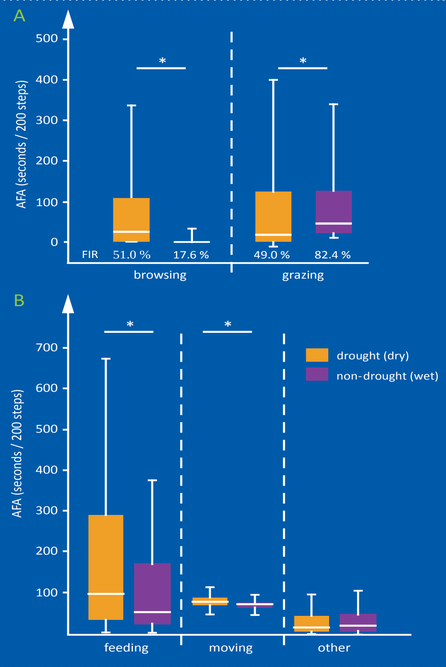

Figure 3. **(A)** The time spent grazing/browsing whilst taking 200 steps (Acceptable Food Abundance, AFA) during drought and non-drought. (**B**) AFA and other activities: Box plots: median (middle line), the interquartile range (box) and the 5th and 95th percentile values (whiskers). Food Ingestion Rate (FIR) as a proportion of total feeding time (* indicates $p < 0.05$).

3. Tooth wear

Comparison of the tooth wear with other ruminants reveals that mesowear signature represents the "grazing" spectrum with a tendency towards mixed feeding. This is not congruent with the graze and browse components in its diet. Surprisingly the browsing components of the diet are less reflected in the mesowear signature (Fig. 4).

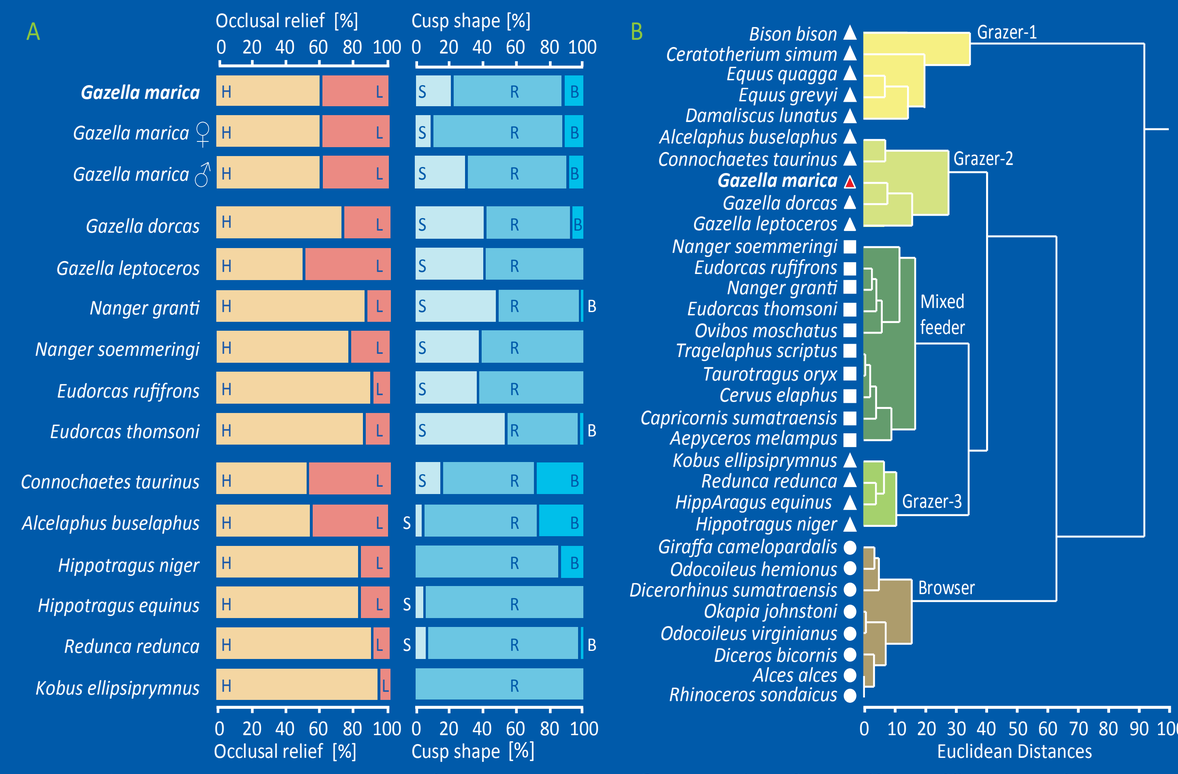

Figure 4 (A) Bar charts showing the mesowear signatures of the second upper molars in *Gazella marica* ($n_{all} = 53$, $n_{females} = 23$, $n_{males} = 30$); occlusal relief given as H = high or L =low, and cusp shape given as S = sharp, R = round or B = blunt. (B) Cluster analysis using 27 reference species according the consensus category by Fortelius & Solounias (2000). Antilopinae obtained from Louys et al. (2011).

4. Conclusion

Behaviour: Sand Gazelles are considered mixed feeders (Fig. 3A and B), switching to more grass in their diet during periods of higher productivity. **Tooth wear**: the **m**esowear signature (Figs. 4A, B) is not congruent with the mixed feeding style (behaviour). Since dicotyledonous browse plants rarely bear silica phytoliths (Piperno 2006, Piperno et al. 2002) grit or dust has to be the abrasive agent.

5. Methods

Foraging observations were conducted over a period of one year from April 2008 to March 2009. AFA modified according Owen-Smith (1979) and Dunham (1982). A total of 192 males and 188 females were sampled. Direct observations were made from a vehicle at distances ranging from 50 to 200m. **Mesowear analysis** using skull and skull fragments of 53 individuals collected from mummified carcasses (01-2006 to 03-2008), mesowear analysis according to Fortelius & Solounias (2000). **Hierarchical cluster analysis** (complete linkage/furthest neighbours) as well as Mann-Whitney Rank Sum tests (MWR) and Paired *t*-tests (P) calculated using SYSTAT 11.0 (SYSTAT Software Inc., Richmond, CA).

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7. References

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