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Niche overlap and resource partitioning between rare topi antelope (*Damaliscus korrigum*) and other sympatric bulk grazers in Pendjari Biosphere Reserve (Northern Benin): Implication for topi conservation

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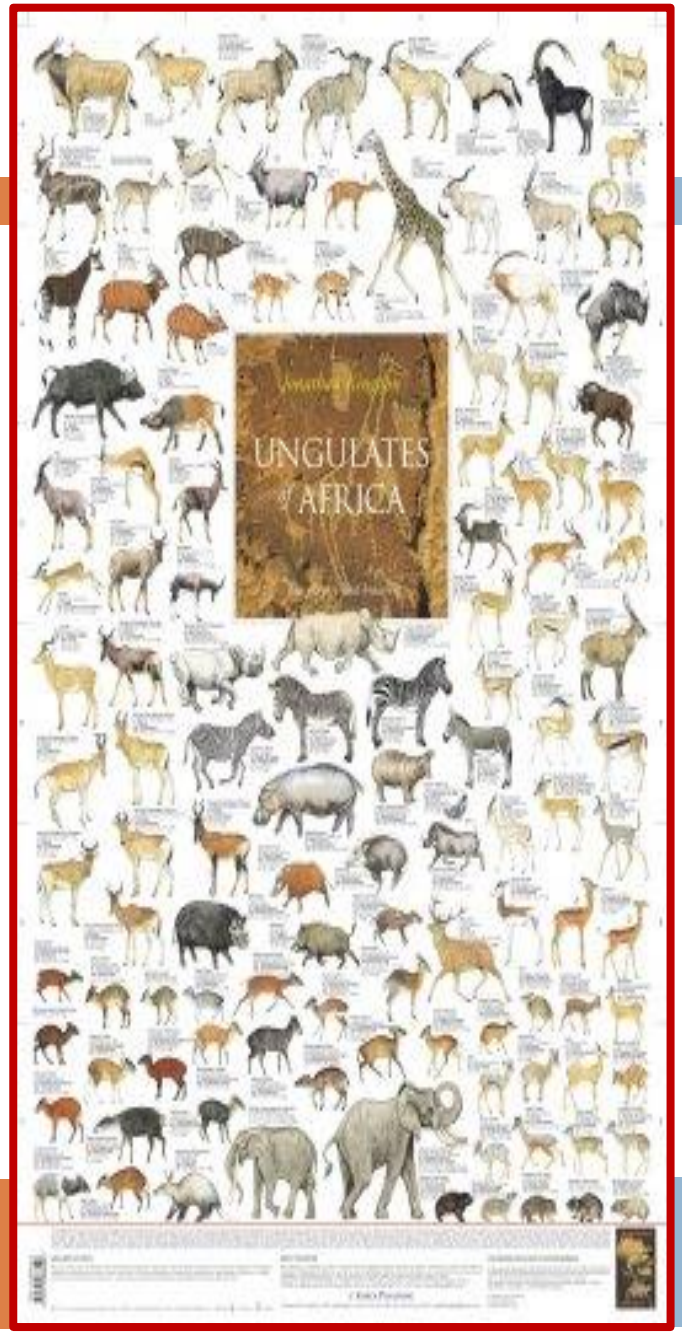
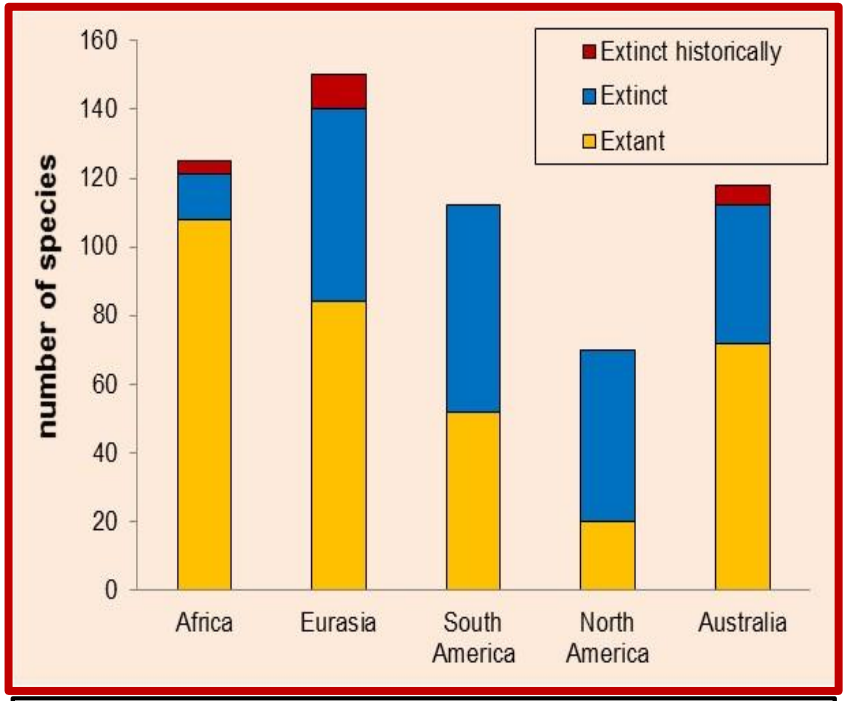
Mammalian herbivores – Diversity and global distribution



	Orders	Families	Genera	Species
Africa	4	9	45	107
Eurasia	3	10	38	84
Americas	2	6	20	35

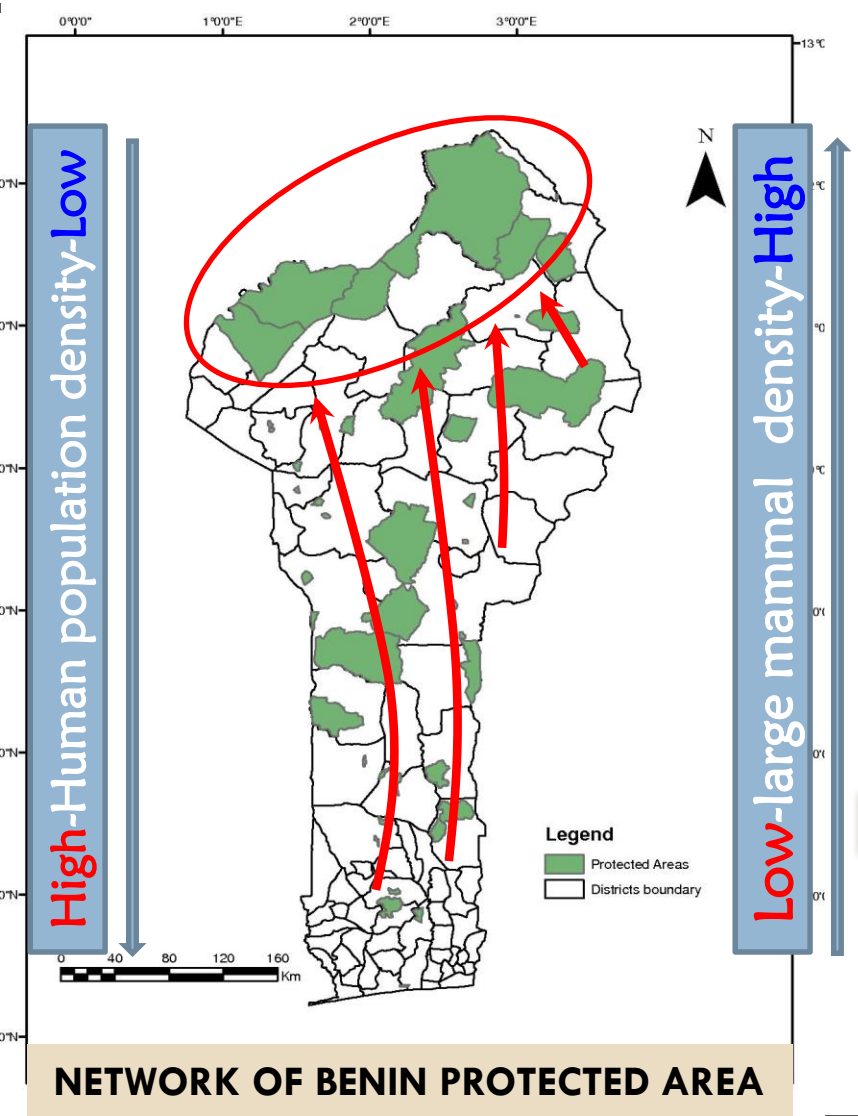
African refuge?



Codron D (2013) In: Grzimek B, MacLeod N, Archibald JD, Levin PS, Blanchfield DS (eds) Grzimek's animal life encyclopedia: Extinction. Gale/Cengage Learning, Detroit, pp 385-395

To prevent from biodiversity extinction PA have been created worldwide including Africa

RESEARCH BACKGROUND



NETWORK OF BENIN PROTECTED AREA

Worldwide: large mammal populations are restricted to protected areas of minimal human disturbance

Cause: Human population growth and land transformations also negatively influence ungulate population dynamics through the degradation and destruction of animal natural habitats with high exploitation (Ogutu *et al.*, 2009)

GRAZER herbivores diversity – Population Density in Pendjari Biosphere Reserve

Reduncinae

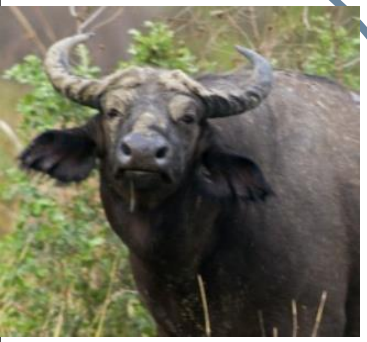


- *Redunca redunca*
  Population: 957 **Diet:** Gr
- *Kobus defassa*
  Population: 1235 ind **Diet:** MF
- *Kobus kob*
  Population: 12513 ind **Diet:** Gr

Alcelaphinae

- *Damaliscus lunatus*
  Population: 209 ind **Diet:** Gr
- *Alcelaphus buselaphus*
  Population: 1117 ind **Diet:** Gr


Bovinae



- *Syncerus cafer*
  Population: 14450 ind **Diet:** Gr
- *Tragelaphus scriptus*
  Population: 42Kg **Diet:** Br

Hippotraginae

- *Hippotragus equinus*
  Population: 2975 ind **Diet:** Gr

One of the major problems associated with management of animal community confined in protected area is the accommodation of the number of different species in equilibrium with one another and their natural environment.

- **Topi population has registered persistent declines (Kidjo et al. 1991, RBP, 2012, Bouché et al. 2015)**

1991: 2240 individuals

2011: 650 individuals

2015: 209 individuals

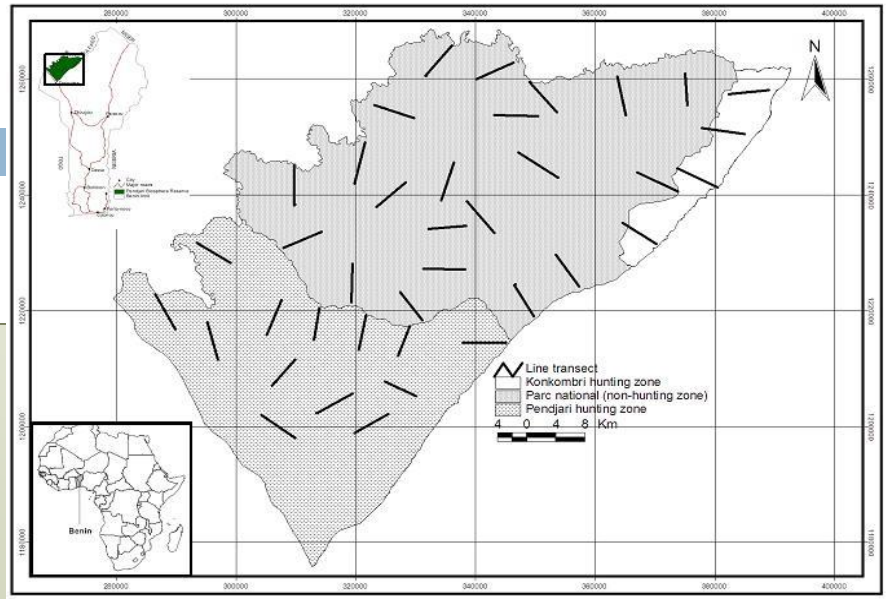
Predictions

Competition for available habitat and natural resources, such as water and food, could lead to gradual decline of less dominant species (Macandza 2009).

Accordingly, low density species should avoid sharing space with trophically similar much more abundant and competitively superior species, particularly during seasons of limited food availability

As selective grazers and in very low density in PBR, topi antelope is predicted to be sensitive to habitat change and competition from sympatric grazers, and are susceptible to nutritional deficiencies (Codron et al. 2009).

METHODS



Data collection:

- **Dependent variable:**

Number of individual per species along 38 transects of 7 km each.

- **Independent variables:**

"habitat types", "wood density", "fire", "grass" and "canopy cover", the nearest "distance to roads", "distance to the closest river", "distance to the closest pond" and "tree density".

Collagen samples from herbivore tooth were analyzed for 13C/12C and 15N/14N ratios by stable light isotope ratio mass spectrometry (Codron et al., 2007).

METHODS

Data analysis

Poisson regression: Crucial variables in habitat selection.

Discriminant Function Analysis (DFA): to determine whether the areas used by western kob, waterbuck and the unused but available discriminated on the basis of the most crucial variables identified.

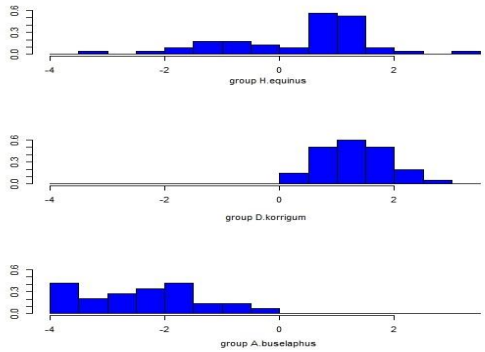
The extent of diet separation along the C and/or N isotope niche axis: SIBER (Stable Isotope Baesyian Ecology in R) and nicheROVER (Niche Region and Niche Overlap Metrics for Multidimensional Ecological Niches)

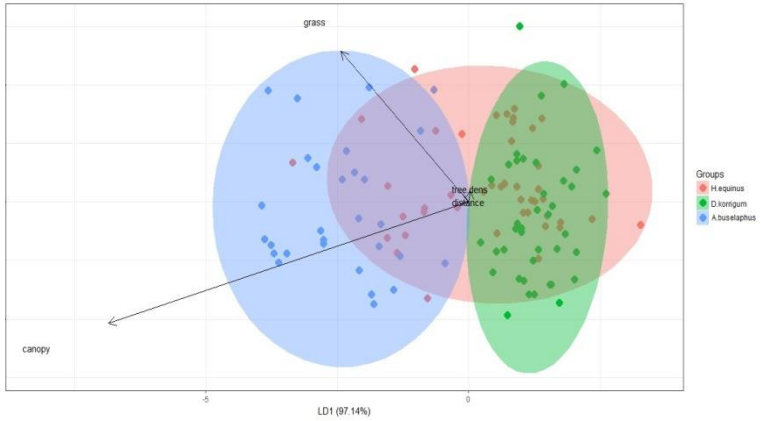
R Core Team, 2013

RESULTS

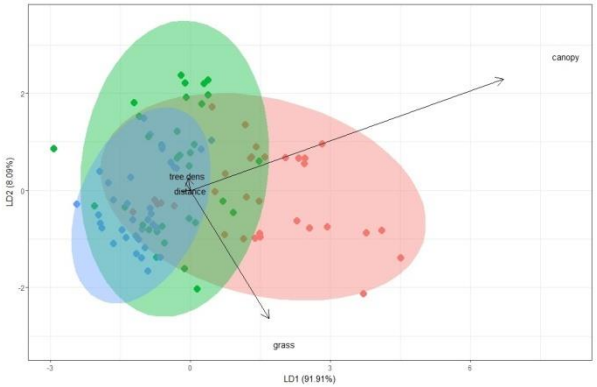
Output of linear discriminant function analysis to examine whether the areas used by Topi, Hartebeest and Roan at seasonality scale could be discriminated on the basis of habitat features in the areas.

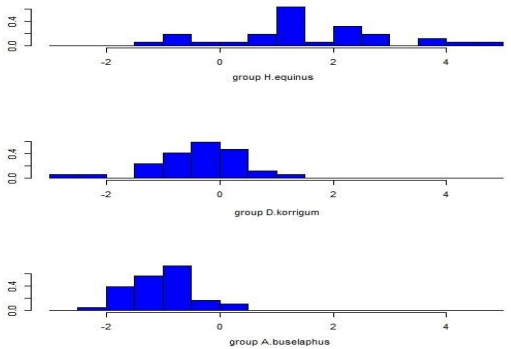
Dry Season





Wet Season



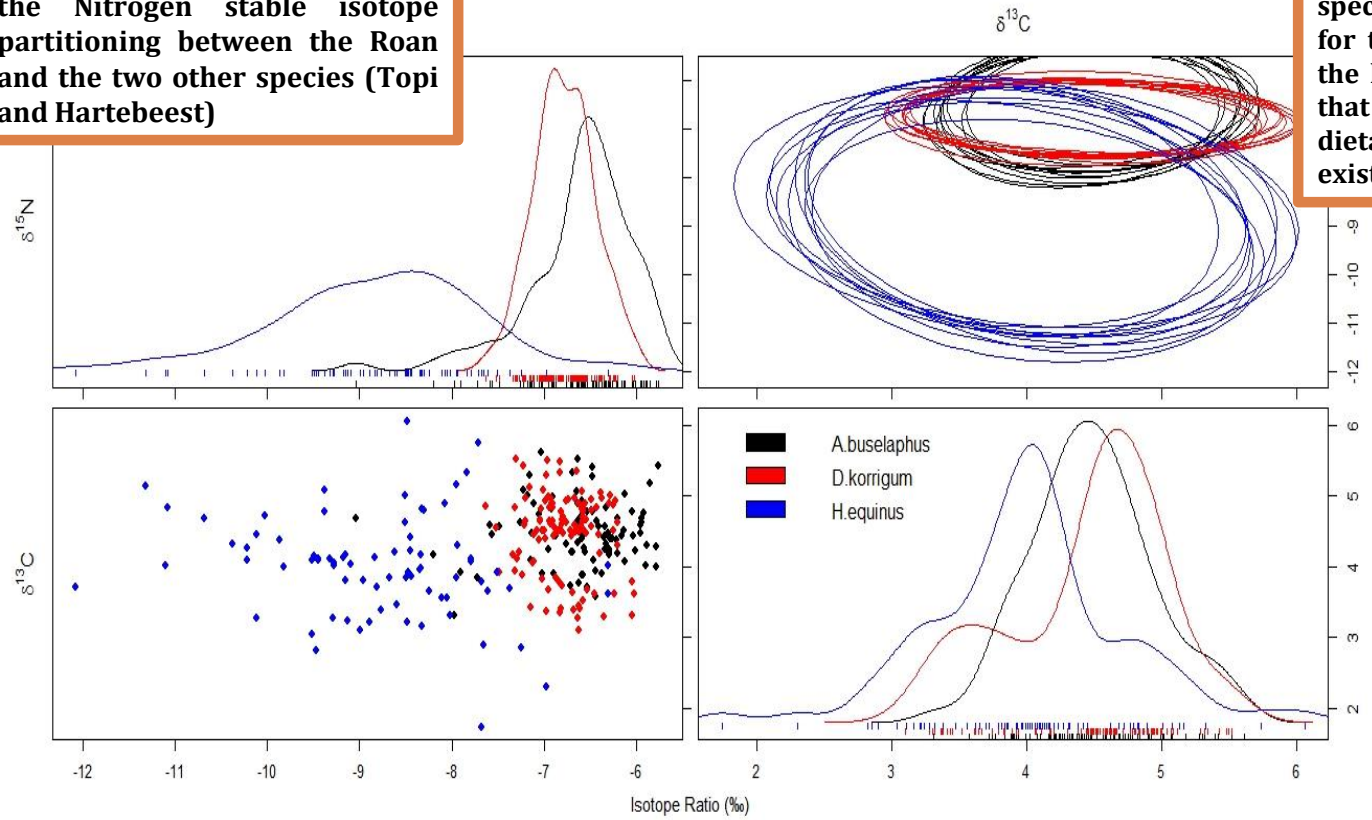


Locations used by the Hartebeest differ from those used by Topi in Dry season could be well discriminated by canopy and grass cover. In wet season Distance watering point and tree density could explain that discrimination but with no clear parttern

RESULTS

Ten random elliptical projections of trophic niche region (NR) for each species and pair of isotopes (elliptical plots)

Higher segregation is noticed on the Nitrogen stable isotope partitioning between the Roan and the two other species (Topi and Hartebeest)



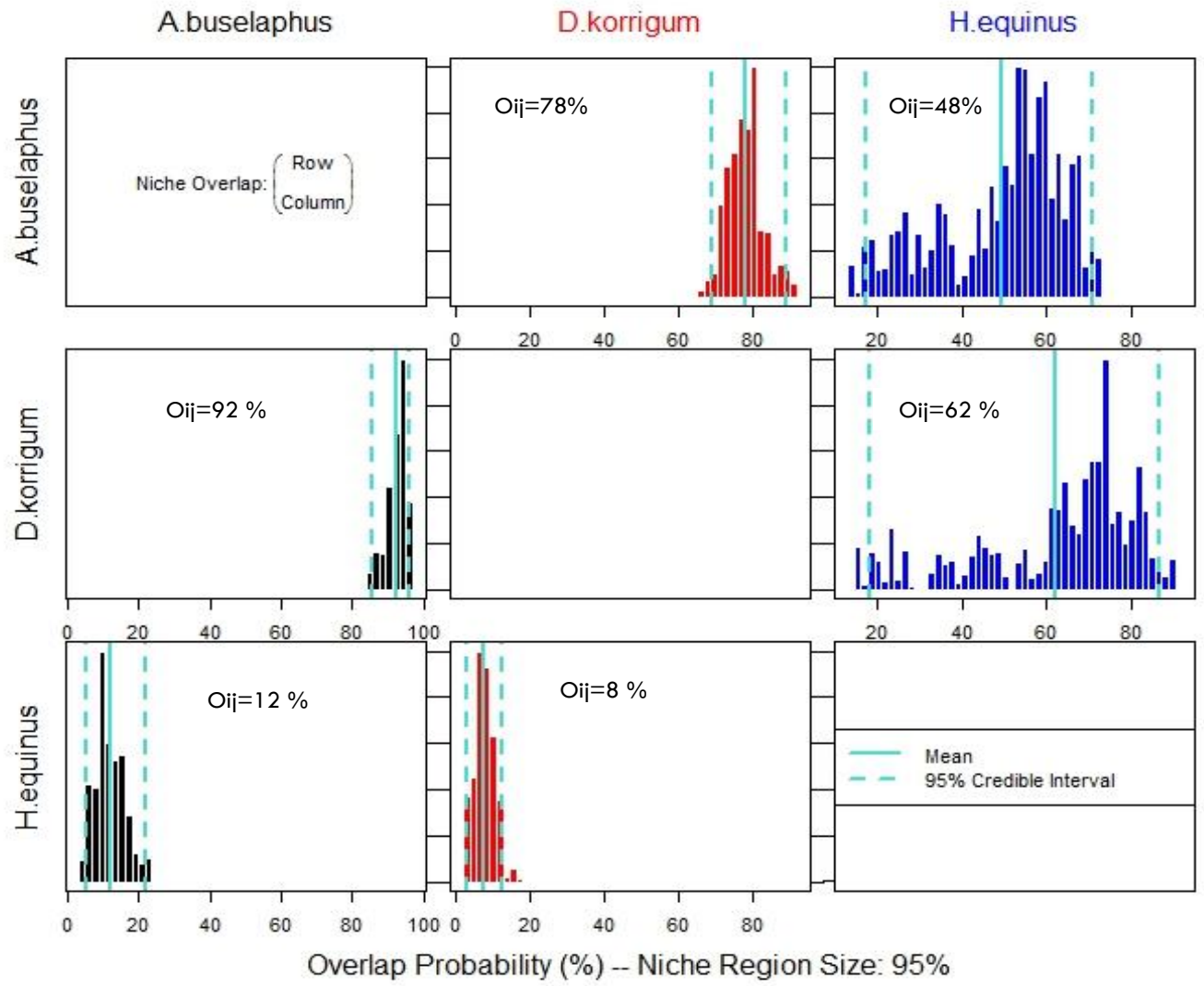
The isotopic niche area of high density species such as Roan is higher than the one for the hartebeest and the Topi which has the lowest population density. This suggest that rare antelope could narrow their dietary niche to limit competition in the co-existing system

Partial segregation could be noticed on the Carbone stable isotope axis for the three species

Higher niche overlap occurs between tree species on the Carbone stable isotope axis, but on the Nitrogen stable isotope axis only topi and hartebeest show the same pattern.

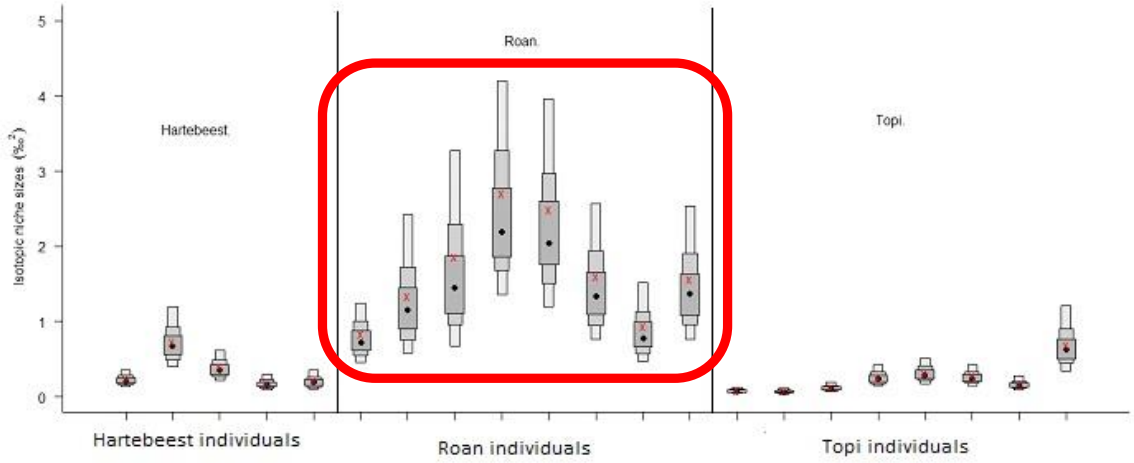
RESULTS

Posterior distribution of the probabilistic niche overlap (Oij) metric (%) for a specified Niche Region of 95% for topi, hartebeest and Roan

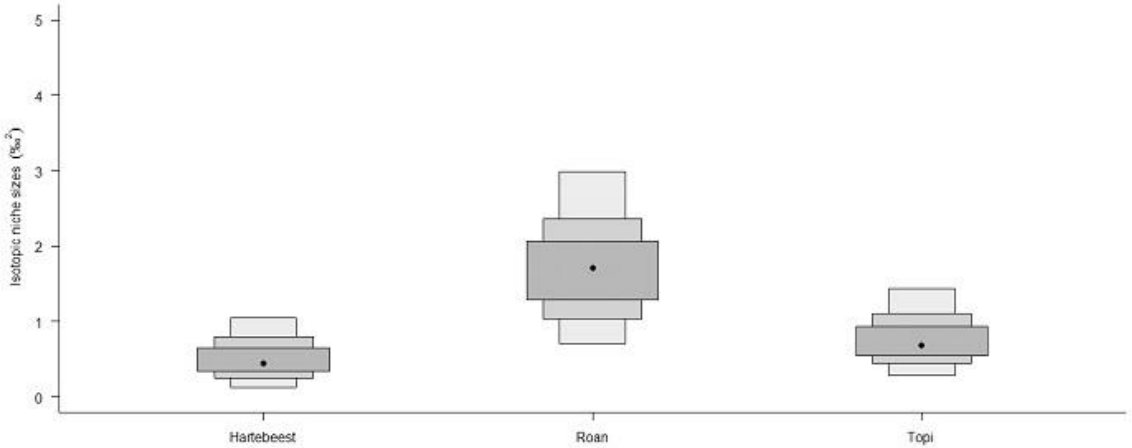


RESULTS

Isotopic niche sizes of Hartebeest, Roan and Topi



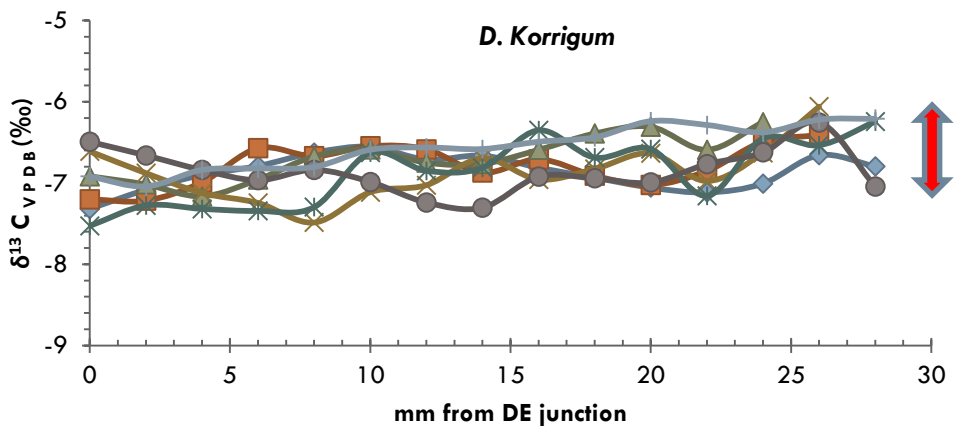
Large isotopic niche breath at individual level in Roan antelope.

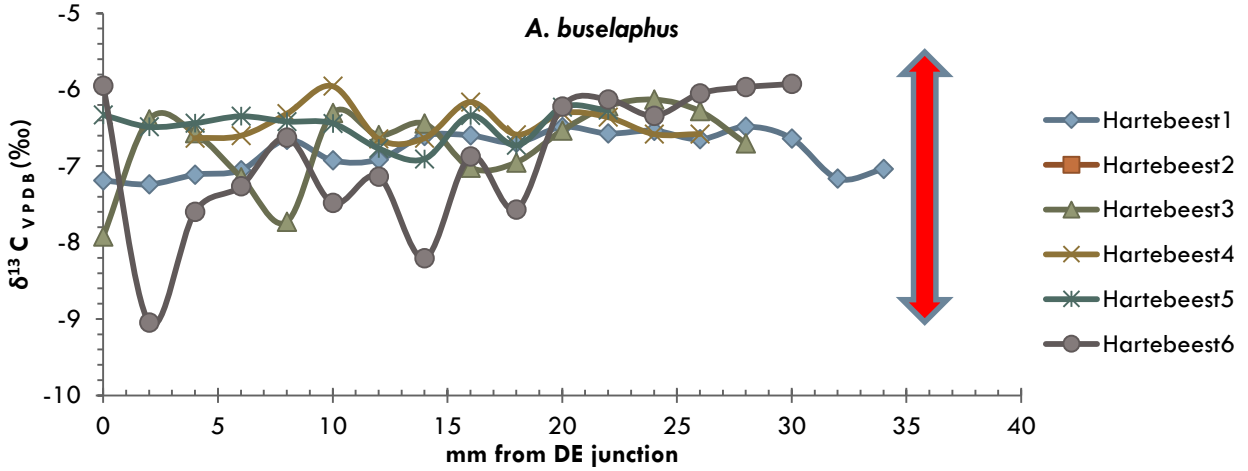


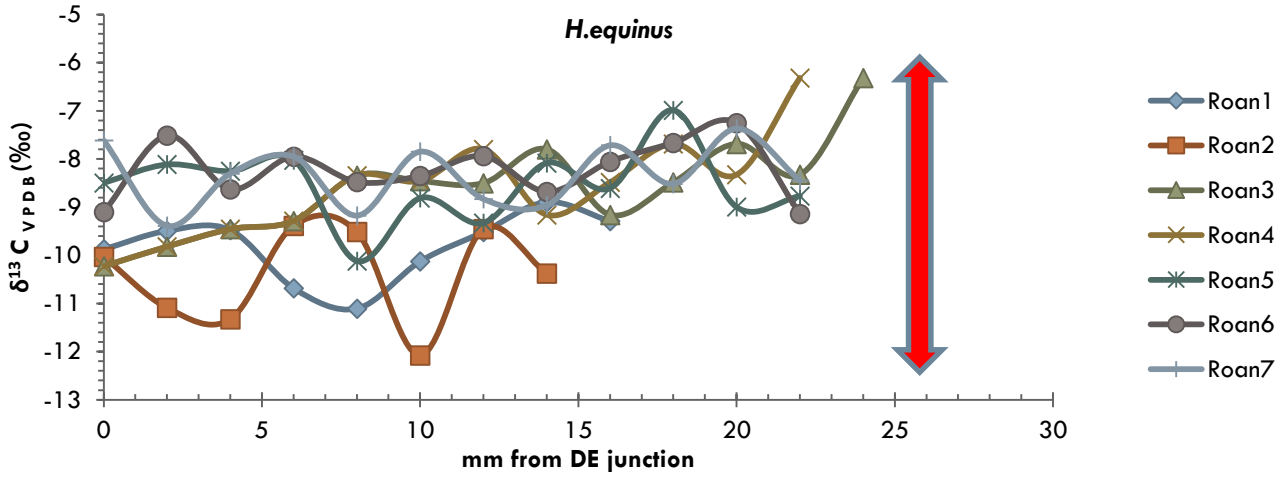
Large isotopic niche breath at individual level in Roan antelope.

This result revealed that within species variation of stable isotope ratios explained the isotopic niche breadth of the study species better than between-species variation.

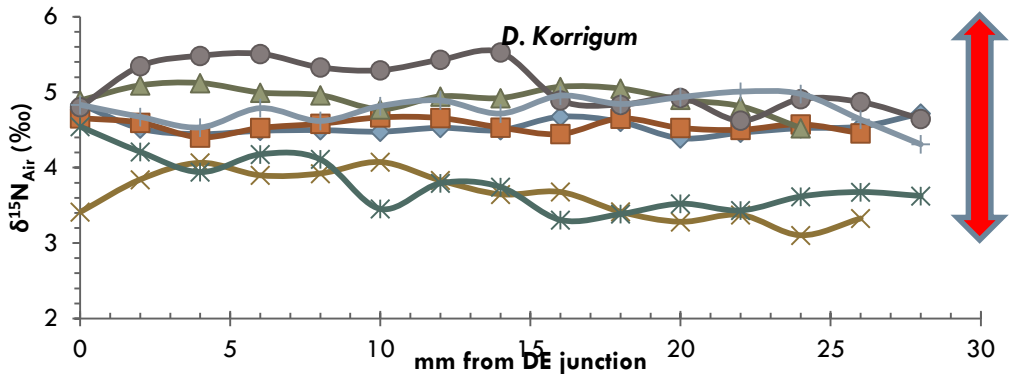

CM
DEAN-FIBREGLASS
MADE IN ENG

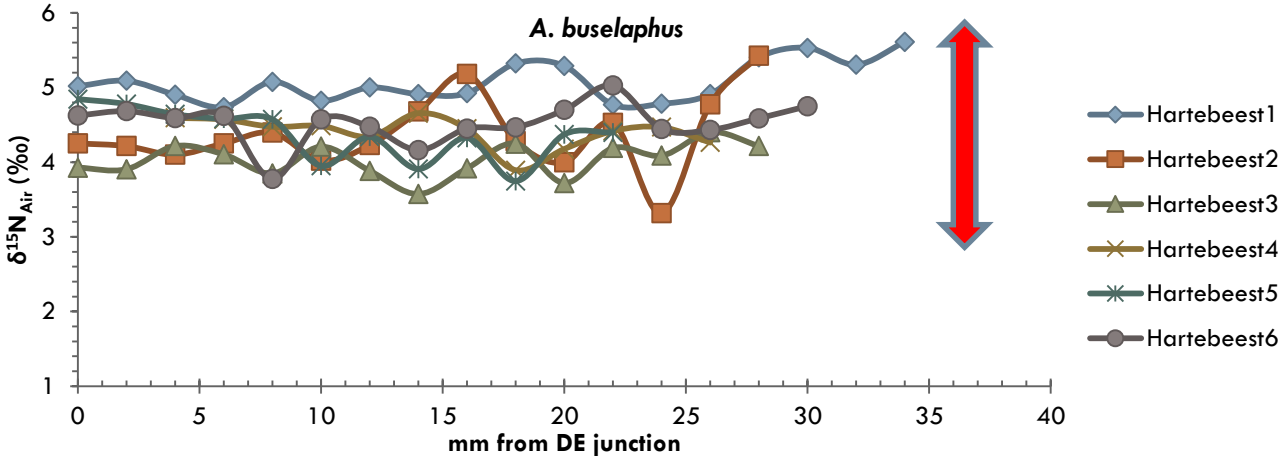

D. Korrigum
δ13 C VPDB (‰)
-5
-6
-7
-8
-9
0
5
10
15
20
25
30
mm from DE junction
Topi1
Topi2
Topi3
Topi4
Topi5
Topi6
Topi7

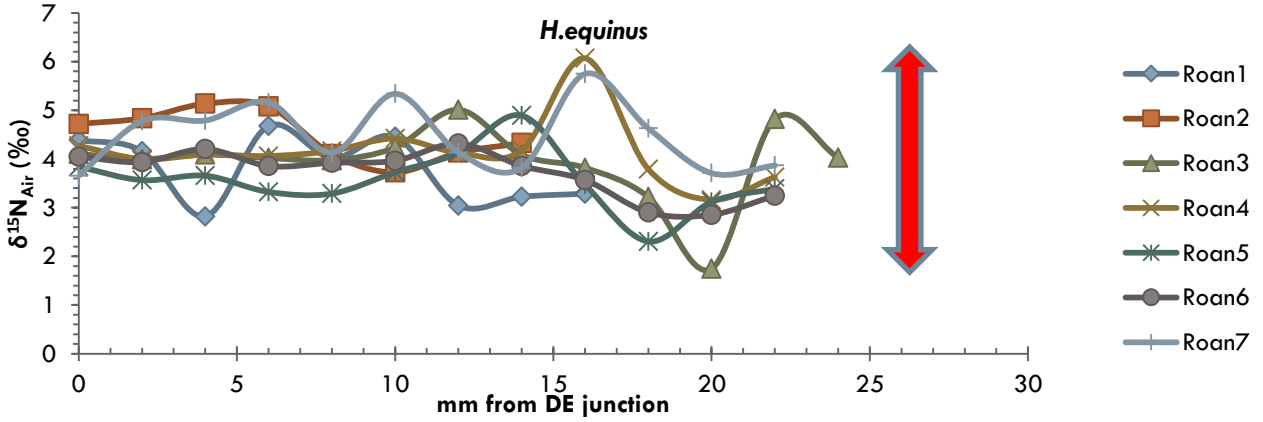

A. buselaphus
δ13 C VPDB (‰)
-5
-6
-7
-8
-9
-10
0
5
10
15
20
25
30
35
40
mm from DE junction
Hartebeest1
Hartebeest2
Hartebeest3
Hartebeest4
Hartebeest5
Hartebeest6


H.equinus
δ13 C VPDB (‰)
-5
-6
-7
-8
-9
-10
-11
-12
-13
0
5
10
15
20
25
30
mm from DE junction
Roan1
Roan2
Roan3
Roan4
Roan5
Roan6
Roan7


CM
DEAN-FIBREGLASS
MADE IN ENG


D. Korrigum
δ15NAir (‰)
mm from DE junction
Topi1
Topi2
Topi3
Topi4
Topi5
Topi6
Topi7


A. buselaphus
δ15NAir (‰)
mm from DE junction
Hartebeest1
Hartebeest2
Hartebeest3
Hartebeest4
Hartebeest5
Hartebeest6


H.equinus
δ15NAir (‰)
mm from DE junction
Roan1
Roan2
Roan3
Roan4
Roan5
Roan6
Roan7

CONCLUSION

- The sections of the landscape supporting the low density topi were distinct from areas frequently used by high density grazers (Roan and Hartebeest) in dry season.

- stable isotope ratios of teeth increments indicated that isotopic dietary niches were distinct and, overall, separated from each other in individuals of Roan (the high density species), Hartebeest and Topi co-existing in Pendjari.

- This could contribute to explaining why topi occur in low density as well as the decline and the lack of recovery by the population.


THANKS FOR
YOUR ATTENTION