

Livestock selective behaviour in natural grasslands challenges the concept of plant preference in the elaboration of a successful diet

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Introduction

Conciliating livestock production and conservation of grassland biodiversity is now an imperative. We propose that a way to reach that goal is to take advantage of the natural tendency of herbivores to exploit environmental heterogeneity. However, it would go against the well-rooted concept that mammalian herbivores have invariable preference for some plants. Preference was defined as being “what the animal selects when given the minimum of physical constraints” (Parsons *et al.* 1994). But after decades of studies, the concept of preference remains particularly inefficient in predicting observed patterns of selection by herbivores (*e.g.* Newman *et al.* 1992; Parsons *et al.* 1994; Provenza 2006). We performed detailed descriptions of cattle diet composition and foraging strategy in highly diversified natural pasture of South Brazil. We present here preliminary results that seriously question the concept of plant preference.

Methods

We used a 25 year old experiment conducted on 40 ha of unmodified natural pampas, South Brazil (lat 30°05'S, long 51°40'W), made up of more than 250 plant species. The experiment consists in 5 levels of forage allowance grazed by heifers between 2 and 3 years old. Details on the experiment can be found in Da Trindade *et al.* (2012). During the 4 seasons of 2012, 4 trained observers repeatedly monitored the foraging behaviour of 30 heifers, totalling 120 animal grazing days of observation. Monitoring consisted recording, bite number, the plant species and plant parts consumed by the animal during the total duration of the morning and afternoon grazing periods. We present here results for one individual grazing in a treatment with intermediate forage allowance (12 kg DM for 100 kg LWT) during fall (April 2012). Observed bites were classified into 5 categories: 1- bites took from the short lawn grass community, 2- bites of *Luziola peruviana*, a highly palatable species encountered in flooded areas, 3- bites took on small (< 25 cm) tussocks, 4- bites more than 20 cm deep took on tall, fibrous tussock grasses and 5- bites of forbs.

Results

Figure 1 presents evolution of the plant species composition of the diet of the heifer over the morning and the afternoon grazing periods. We can see clear modification in the pattern of short-term selection. The short lawn grass community dominated the first part of the morning diet but strongly decreased by the end of the grazing time, when large bites from tall fibrous tussock grasses became dominant. Forbs were only consumed during the first 30 min of the grazing time. *Luziola peruviana*, was virtually absent from the morning diet, dominated first part of the afternoon diet but disappeared in late afternoon. The proportion of both lawn grasses and tussocks regularly increased along the afternoon grazing time. The pattern of diet selection by the heifer did not only change with time along the day, but also between days, as illustrated by the evolution of the daily plant species composition of the diet of the animal over 3 consecutive days (Fig. 2).

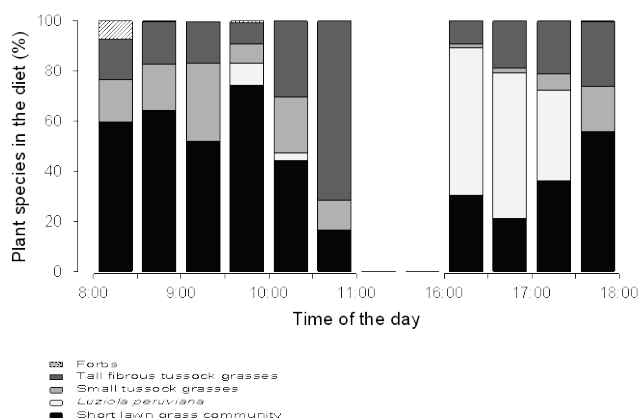


Figure 1. Evolution of plant species composition of the diet of a 2 years old heifer grazing unmodified natural pampa, south Brazil, on the 12/04/2012. Diet composition, presented for the morning and afternoon meals, was grouped by periods of 30 min. Forage allowance was 12 kg DM for 100 kg LW

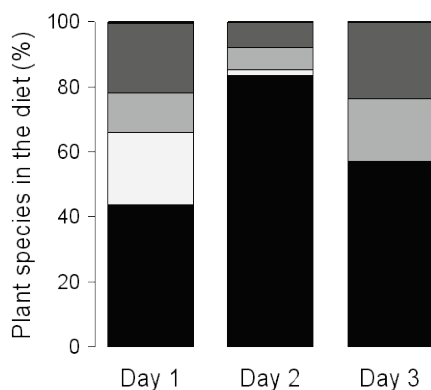


Figure 2. Evolution of the daily plant species composition of the diet of a 2 years old heifer grazing unmodified natural pampa, south Brazil, over 3 consecutive days (12-14 of March 2012). Forage allowance was 12 kg DM for 100 kg LW. See legend in Figure 1.

Discussion

It is a classical argument that the difference between observed plant species selection and supposed plant preference is due to the presence of physical constraints (e.g. Penning *et al.* 1997; Rutter 2006). A classically mentioned constraint offered is composition of the plant species community, which would not allow the animal to meet its daily needs with a pattern of selection reflecting its preference. This argument is not valid in the detailed case we present here. Indeed, feed on offer in a 4 ha paddock with a stocking density of 1 animal per ha did not change in the time lapse of one morning, or even of 3 days. Considering that feed on offer, or other external physical constraints did not change over a single grazing time, evolution in the plant selection pattern reflected modification in the short-term preference. Physiological feedbacks, the need for balancing intake or synergetic interaction between the forage items can explain these modifications of short-term preference. One can argue that preference is only relevant at the scale of the day. But we showed that the pattern of selection equally

evolved from one day to the other, without significant modification of the feed on offer.

Conclusion

In complex grassland, trying to explain herbivores foraging behaviour based on a concept (preference) is only relevant in the theoretical case of the absence of constraints to access forage looks particularly useless. Consenting that preference is not fixed but more likely depends on the particular context the animal is facing, will be of great help to understand mammalian herbivores foraging strategies.

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