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Use of dung piles by neighbouring vicuñas

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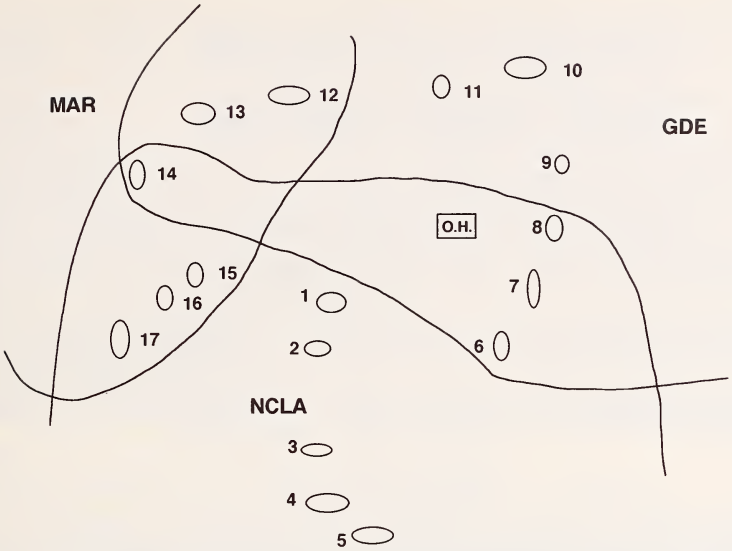
Dung-piling behaviour is typical among the South American camelids, and is notable in the wild vicuña (*Vicugna vicugna*) where both males and females, adults and young urinate and defecate in dung piles. Vicuña social organization is based upon stable family groups that live in an area defended year round, and bachelor groups which are more variable in composition and location. Bachelors and "passing vicuñas" usually use dung piles in family territories if the family is absent (drinking water or walking) (Koford 1957; Franklin 1974, 1980, 1983; Bosch 1984) suggesting that the marks "keep insiders in" instead of "keeping outsiders out". The aim of this study is to analyse the use of dung piles between adjacent families.

This study was conducted at the Abrapampa Experimental Station of the National Institute of Agricultural Tecnology (INTA). The station is located in dry grassland 3475 m above sea level in the Puna region of Jujuy Province, NW Argentina. For details of the study area see Vilá (1992). The vicuña stock of the station consisted of 600 animals living in a 400 ha area limited by sheep fence, containing natural pasture with a narrow river flowing through the area. No management techniques were used on these animals. The field work was carried out during March 1989. Observations were made from an observatory hut (6.5 m high) with binoculars.

The 16 dung piles that were located close to the observation hut were numbered. They were under view simultaneously (Fig.). The vicuñas belonging to the three families that use this area intensively were recognized individually. These families were: "NCla" with composition 1:3:1 (male:female:offspring), "Gde" 1:7:5 and "Mar" 1:4:2. When an animal (member of these families, member of a bachelor group, or solo) used a dung pile, a record was made of his/her identity and the individual number of the pile used. "Use" was considered when the animal defecated and/or urinated in the pile and not when they only smelled the pile.

In this study, vicuñas' behaviour in relation to the dung pile prior to elimination (smelling, kneading, turning and positioning) was the same as that described for the species in Perú (Koford 1957; Franklin 1980).

Use of dung piles: 140 defecation-urination events were observed. For each dung pile, the percentage of use by animals belonging to each family or no family groups and/or solo animals was calculated (Table). As is clear from the table, some dung piles were used exclusively by some families, while others were shared between families. The Figure shows the distribution of the dung piles and the location of families which used them. In almost all cases animals not belonging to these families made use of the piles. Among members of the family groups, males used the dung piles more than three times as often as females (t test 3.16 $p < 0.05$).



Distribution of the dung piles under observation and the families which shared them. The observation hut is marked as O. H.

Vicuñas territorial behaviour has been described as having very rigid boundaries, and the mating system has been described as "resource defence polygyny". (Franklin 1974, 1983). Some evidence of males defending females and retaining them in their territories has been found (Bosch 1984; Bosch and Svendsen 1987; Vilá 1990) (suggesting in Abrapampa a mixed mating pattern of territory and females defence, Vilá 1992) and also social organization has been found to differ according to wet/dry conditions, pasture and season (Menard 1982; Franklin 1983; Vilá and Roig 1992).

This study showed that although families used an area almost exclusively there was some tolerance between neighbours, and adjacent families used border areas at different

Percentage use of dung piles by animals belonging to different families and non-familiar ones

Dung pile	Families NCLA	GDE	MAR	No-families
1	100 %			
2	87.5 %			12.5 %
3	75 %			25 %
4	75 %			25 %
6	40 %	40 %		20 %
7	66.6 %	16.6 %		16.6 %
8	11.1 %	77.8 %		11.1 %
9		71.4 %		28.6 %
10		64.3 %		35.7 %
11		100 %		
12		43.7 %	50 %	6.3 %
13				100 %
14	33.3 %	33.3 %		33.3 %
15	75 %			25 %
16	33.3 %		33.3 %	33.3 %
17	44.4 %		33.3 %	22.2 %
18	23 %		46.3 %	30.7 %

times. This territory overlap allowed one family to use the dung piles of another family. Koford (1957) showed that vicuñas used the nearest dung pile to defecate, and this might explain the pattern found here. In a study which analysed the relationship between scent marking and resource holding of some antelopes, Gosling (1990) discussed the possible function of scent-marking as status advertisement, reducing the cost of agonistic encounters. This hypothesis requires that males have to be "sufficientely sedentary" (Gosling 1990), which is the case in the vicuñas year-round defended areas. The scentmark as part of a compound (dung pile-male) causes bachelors to move out of the zone. The frequent use of the piles on the boundaries may mark the "possibilities" of expanding the territory (Gosling 1987), that is the tolerance male vicuñas have with their neighbours. This hypothesis can also explain why in the absence of the territorial male and the family, other animals use the piles; again the scentmark and the scent-marker form a compound and without both components the message is not the same. Thus, the data presented here are consistent with both "using the nearest" and "compound dung-pile/male" explanations.

Although preliminary, this work shows how a knowledge of the individual animals can help to discover differences in relation to previous information.

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