

**On the behaviour of male Sardinian mouflons  
(*Ovis orientalis musimon*)  
during the pre-rut**

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**Summary.** — Mouflon rams (*Ovis orientalis musimon*) were observed during the pre-rut (4th of Sept.-8th of Oct.).

19 different behaviour patterns were quantitatively recorded.

12 of these (i.e. Block, Butt, Clash, Huddle, Kick, Lipcurl, Low-Stretch, Neck-Fight, Present, Rubbing, Shoulder-Push, Twist) had not been reported, or were described in partly different forms, by previous authors. Different population features may have determined such discrepancies.

The Low-Stretch and the Lipcurl were the commonest behaviour patterns performed to females (27.9 % and 21.6 %, respectively), while the Kick (9.9 %) was the most frequent interaction among males.

**Résumé.** — Des mouflons (*Ovis orientalis musimon*) mâles ont été observés pendant le pré-rut (du 4 sept. jusqu'au 8 oct.).

Dix-neuf comportements différents ont été enregistrés quantitativement. De ces comportements, 12 (Block, Butt, Clash, Huddle, Kick, Lipcurl, Low-Stretch, Neck-Fight, Present, Rubbing, Shoulder-push, Twist) n'ont pas été décrits par d'autres auteurs, ou bien ont été décrits d'une façon partiellement différente. Ces discordances sont peut-être déterminées par les caractéristiques différentes des populations étudiées.

Le Low-Stretch et le Lipcurl ont été les comportements les plus fréquents parmi ceux adressés aux femelles (27,9 % et 21,6 % respectivement) ; le Kick (9,9 %) a été l'interaction la plus fréquente entre les mâles.

## INTRODUCTION

While there is a wealth of information on the behavioural repertoires of *Ovis canadensis* and *O. dalli* (Geist 1971), *O. orientalis punjabensis* (Schaller and Mirza 1974 ; Schaller 1977) and *O. aries* (e.g., Banks 1964, Grubb 1974), almost nothing has been published on the behaviour patterns of Sardinian mouflons (*Ovis orientalis musimon*).

Pfeffer (1967) provided some qualitative information on the social behaviour of a small population of mouflons from Corsica, while Schaller and Mirza (1974) and Schaller (1977) reported on several zoo observations. The aim of this paper is to provide a qualitative and quantitative outline of the pre-rut behaviour of adult male Sardinian mouflons.

## MATERIAL AND METHODS

The observations were carried out from the 4th of September to the 8th of October 1985, at intervals, for a total of 14 days (67 hours of observation ; more than 110 animal hours) during the pre-rut (i.e. the period extending from the onset of sexual behaviour to actual mating-related activities). A 12 × 50 field glass was used for watching, at a distance of 200-600 m. Data were recorded by means of manual notes. Coat and/or horn features characterized at least 12 different males of classes III and IV (cf. Geist 1971 : 54). Data on the two classes of rams have been pooled, as, in fact, often the distance prevented the observer from a definite age assessment of the males under watching. For each pattern it is reported (1) the percentage of occurrences on the total number of interactions (marked in parentheses at end of the description of each behaviour pattern, see « Results ») and (2) (Fig. 1) the relative frequency of occurrences.

## STUDY AREA

The study area lay in the Orecchiella Nature Reserve, which extends (3280 ha) in the central Apennines, Italy, at an altitude ranging from 1000 m to 2054 m a.s.l. About 250 mouflons, introduced 20 years ago from Sardinia with a founding group of 20-30 individuals, live in the reserve. Some red, roe, fallow deer and wild boars also occur in the area. Potential predators include several golden eagles, free-ranging dogs and erratic, rare wolves. From May to October some sheep-grazing occurs in the mouflon area.

## RESULTS

281 behavioural interactions were recorded, belonging to the following categories :

- **BLOCK (Bl)** : a ram moves on in front of another male and stands broadside to prevent the latter from reaching e.g. a female (cf. Schaller 1977). (1,4 %).
- **BUTT (Bu)** : two rams, one in front of the other, lower their heads rapidly so that their horns knock together. Contrary to the behaviour of mountain sheep (Geist 1971), the rams do not push forward their heads upon contact. (5 %).
- **CHASE (Ch)** : a ram chases another up to several hundred metres till the latter moves away on its own. Only then the former returns to his herd of ewes. (2,1 %).

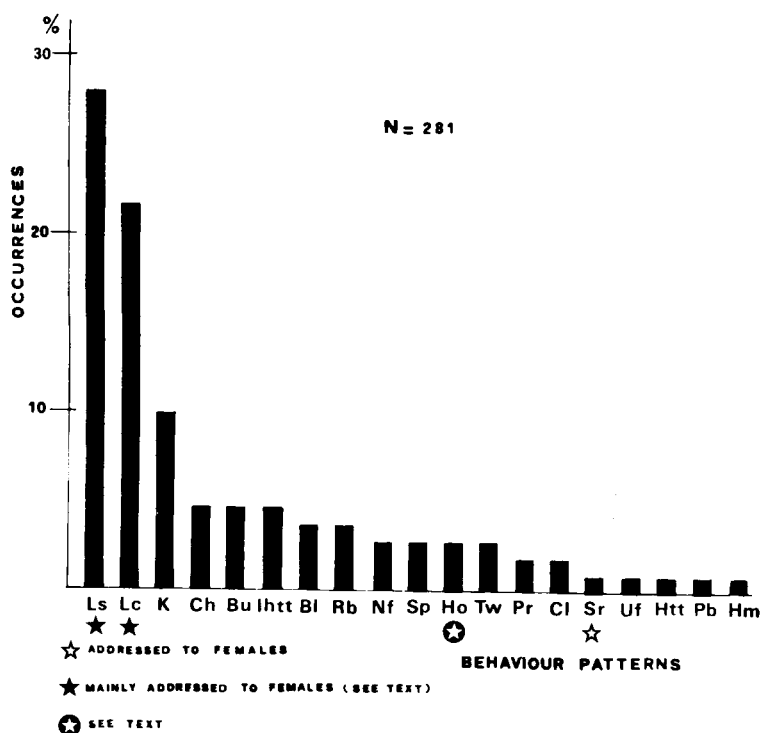


Fig. 1. — Relative frequency of occurrences of the behaviour patterns recorded. For abbreviations, see text (*Erratum* : Hm, read Hu).

- CLASH (Cl) : two males, one in front of the other, walk backwards, their legs slightly bent. Then they rush at each other, their heads down, till their horns clashes. Sometimes the flank may be hit, too. The clash is preceded by several kicks and followed by a chase. (8,5 %).
- HEAD TO TAIL (Htt) : two rams approach one another, each moving his head in the direction of the rump-patch of the other while performing a number of low-stretches and twists of various intensity. The animals do not push each other as urials do (Schaller 1977). (0,3 %).
- HORNING (Ho) : rubbing of the muzzle and of the horns against ferns or, in one case, against rocks (a noise could be heard in the distance, then). Horning has always occurred in presence of mixed flocks, so that the target-animal(s) was (were) difficult to assess. (1,4 %).
- HUDDLE (Hu) : rapid exchange of aggressive actions (mainly present, clash and kick) between several rams in group (cf. Schaller 1977). (0,3 %).
- INTENTIONAL HEAD TO TAIL (lhtt) : one male approaches another, his head down in the direction of the rump-patch of the other. If the latter keeps still, a series of kicks may follow. (2,1 %).
- LIPCURL (Lc) : a ram, after approaching in low-stretch a ewe, which urinates, lowers its head where the ewe urinated and raises it again curling the upper lip (cf. Geist 1971). This movement can be repeated 1-2 times again.

- In one case, in an aggressive interaction with other males, a ram raised its head lipcurling, without any female having urinated. (16,7 %).
- KICK (K) : a blow striken with a stretched foreleg, often between the hind legs of the target animal, sometimes hitting his testicles. In this case the kick turns out to be painful (the recipient moves away with a jump). Whenever I could verify it, the bigger ram kicked the smaller (N = 9), or there was an exchange of kicks between rams of similar body and horn size (N = 10). 2-4 series of 3-5 kicks were usually performed in each bout. Only the number of bouts have been used for quantitative evaluation. (10,3 %).
  - LOW STRETCH (Ls) : a male approaches a female, keeping his neck and head stretched forward, parallel to the ground, sometimes even with his muzzle slightly upwards. A ram performed it in front of another in two aggressive contests. (42,7 %).
  - NECK FIGHT (Nf) : a male places his neck on the withers of another male, in a trasversal position ; then he thrusts forward with his chest. The latter may sway. (1,1 %).
  - PRESENT (Pr) : a ram approaches another, his head up and his neck slightly turned sidewise, but not so stiff as in the posture described by Geist (1971). (0,7 %).
  - RUBBING (Rb) : a male rubs his muzzle to the muzzle and the lower part of the horns of a bigger male, which stands still with his head up. Always (N = 7), the latter starts kicking the former. (2,5 %).
  - SHOULDER PUSH (Sp) : different from the static behaviour pattern described by Pfeffer (1967). The two rams run side by side, very near one another ; the preceding ram pushes the other sidwards, cutting across his way as if to block him. (1,1 %).
  - SNIFFING OF REAR (Sr) : only in one case observed in the same way as described by Geist (1971), but usually performed in a confused way difficult to quantify. (0,3 %).
  - TWIST (Tw) : rotation (max. : 60°) of the head around the axis of the body, the neck being stretched forward as in low-stretch. (1,8 %).
  - UNRITUALIZED FIGHT (Uf) : with an upwards movement a ram butts with his horns against the abdomen of another. (0,3 %).

TABLE 1. — A comparison of behavioural differences between patterns observed by Pfeffer (1967) and those recorded in the course of this study.

	Pfeffer (1967)	This study
BLOCK	not described	see text
BUTT	« joute frontale », pushing of horns without knock	butt with the horns that can be heard in the distance, though not violent
CLASH	the rams look carefully at each other for a long time after having departed and before setting off for the clash	the rams set off immediately after departing
HUDDLE	not described	see text
KICK	« coup de patte en marchant » dealt on the external side of the leg, in close connection with the sexual behaviour (either hetero- or homo-sexual)	blows striken from a still position, between the front or hind legs or on the abdomen, without any connection with homo-sexual behaviour

LIPCURL	occurs when a ram sniffs a ewe in heat or in the same time when the ewe is urinating	is preceded by the sniffing of the ewe's urine or occurs in an agonistic context
LOW STRETCH	apparently not mentioned, but « le mâle porte la tête basse » during courtship	is the most frequent behaviour pattern
NECK FIGHT	chest thrusts (described for the territorial males) and « cérémonial d'allégeance » (p. 163)	very different, in relation to orientation of the rams and to the neck position (see text)
PRESENT	not described	see text
RUBBING	reported as part of the « cérémonial de reconnaissance » followed by a reciprocal neck-licking	always (N = 7) followed by kicks of the other male which never returns the rubbing
SHOULDER-PUSH	from a still position or in very slow motion, with a strong pushing of the shoulders	in rapid motion, with a light pushing of the shoulders and with endeavour of block
TWIST	not described	see text

## DISCUSSION

The results of my observations in some respects seem to be different from what reported in Pfeffer (1967). I found on the contrary a wider accordance with the descriptions provided by Geist (1971) and Schaller (1977) (even though concerning different species and subspecies), as well as with the mouflon zoo observations carried out by Schaller and Mirza (1974) and by Schaller (1977).

The behavioural repertoire of a species is partly genetically encoded and partly flexible, thus adapting to same extent to different environmental conditions, e.g. food quality and dispersion. Thus, populations of the same species can differ in the utilization of specific behavioural repertoires (e.g. Berger 1979 *a, b*) or also in the behavioural repertoire itself (Shackleton 1973).

Also, the genetic structure can affect the performance of behaviour patterns (e.g. Alcock 1984). In the case of the mouflon, genetic differences, also morphologically evident (e.g. often Corsican ewes bear horns, whereas the Sardinian ones very seldom have), might be of importance. The environmental differences seem to be more relevant, especially in terms of population structure: the mouflons of the Orecchiella Nature Reserve, in fact, are more numerous than at Bavella (about 250 in the former population and 34-50 in the latter) and also herd size is usually greater in the former (Cavallini, unpublished data). This can elicit a major behavioural complexity, providing richer social experiences (cf. Berger 1979 *a*).

Moreover, it could be expected that, in a smaller population, the familiarity between individuals could reduce the number and the intensity of aggressive interactions. Finally, the age structures in these two populations may have been different, since at Bavella the presence of many poachers could have lowered the mean age of the rams (as suggested by their shorter horns, see below).

Some Orecchiella rams had horns bigger than « full curls », which was not observed in the Bavella population (Pfeffer 1967, tab. 9, page 107). The Orecchiella mouflons, in fact, keep spreading towards contiguous areas, which would classify that population as a « colonizing » one (cf. Geist 1971, 1978), whereas the mouflons at Bavella belonged to an already stable population (see Pfeffer 1967).

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