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Estación Experimental de Zonas Aridas, Almería

An Analysis of Vigilance in the Spanish Ibex (*Capra pyrenaica*)

By Concepcion L. Alados

With 3 figures

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Abstract and Summary

Observation of ibex (*Capra pyrenaica*) in Cazorla and Segura (South-eastern Spain) revealed a negative relationship when group size was plotted against individual time dedicated to vigilance and a positive one when plotted against time used for feeding. Generally, adults of both sexes were more vigilant than juveniles and more vigilance occurred in the morning than in the afternoon and evening combined. Peripheral animals were more vigilant than central ones.

The relationship between group size and vigilance rate shows that when mixed groups become large, and correspondingly when the level of interactions is frequent, the negative relationship observed between small group size and rate of vigilance is broken. This occurs during the rut, when the importance of the animals as look-out also decreases if they are located at the periphery of the group, due to an increase in the interest in activities related to reproduction.

Introduction

The relationship between individual vigilance and group size has been demonstrated for several animal species (Siegfried and Underhill 1975; Bertram 1980; Treherne and Foster 1980, 1982), both parameters being inversely related. There is some evidence, however, that very large groups may become less effective at detecting predators, perhaps through communication disadjustments, as suggested by Jarman (1974) and Lazarus (1979).

The most common interpretation of distribution of vigilance periods amongst members of a social group is that when the vigilance requirements are met for the whole group, each member may use the extra time for feeding and other important activities (Powell 1974; Caraco 1979; Caraco et al. 1980; Jennings and Evans 1980; Lipetz and Bekoff 1982; Underwood 1982).

On the other hand, a relationship between vigilance and group geography has been detected, the most peripheral individuals acting more frequently as look-out (Jennings and Evans 1980; Lipetz and Bekoff 1982).

Concerning vigilance in the Spanish ibex, I shall try to answer the following questions.

1. Does group size affect vigilance?
2. Does vigilance vary with rutting?
3. Does group geography affect vigilance?

Methods

The animals were observed in the wild, in the Cazorla and Segura mountains (South-eastern Spain) from February 1982 to June 1983.

The samples were collected when most members of a contacted group of ibex were visible and at least half of them were feeding and/or watching. Each sample consisted of the date, time of day, habitat, age and sex classes of group members, the group geography and the type of activity of each individual.

Two types of groups were considered: mixed groups (made up of males and females of different ages) and female-fawn groups (adult females plus young).

A total of 225 samples was obtained during the rutting season and 283 samples at other times.

An individual was considered to belong to a certain group if its nearest neighbour was less than 50 m away in closed habitats (when bushes impeded sight), or less than 100 m away in open habitats.

The criteria of vigilance used were:

a) *Watching.* Two levels were considered.

Active watching: The animal stands on four legs, keeping its head raised and looking attentively at its surroundings, while pushing its ears forward. It may also turn its head a little in different directions.

Watching (weak): The animal lies down or walks, keeping its head raised.

b) *Head lifting.* The animal interrupts its feeding to lift its head for just a moment.

The recordings of head lifting were obtained from female-fawn groups during the spring of 1983 by the focal animal technique, counting the frequency of the activity during 5-min periods. The sampling method was used for the remaining parameters. Vigilance rate refers to the proportion of group members involved in each parameter.

"Social interaction" was the term given to any social activity obviously directed at another group member by any subject during a sampling period.

Group members were called "central" if surrounded by other members, otherwise they were "peripheral".

Other aspects of the social behaviour of the Spanish ibex are dealt with by Alados (in press).

Results

Non-rut Period

Analysis of the *active watching* rate and group size produced a statistically significant negative correlation ($r_s = -0.90$, $df = 6$, $p < .01$), matching a parabolic curve ($y = 28.68 - 4.35\,x + 0.19\,x^2$, $r = 0.93$, $p < .01$) (Fig. 1, above).

Comparison of the data obtained in the morning (a.m.) with that of the afternoon and evening (p.m.), showed that the *active watching*-group size correlation remained statistically significant in both cases, although it was slightly stronger in the morning (a.m.: $r_s = -0.93$, $df = 5$, $p < .01$; p.m.: $r_s = -0.82$, $df = 5$, $p < .05$).

The correlation between *active watching* rate and group size from mixed groups and from female-fawn groups were also both negative and statistically significant (mixed groups: $r_s = -0.86$, $df = 5$, $p < .05$; female-fawn groups: $r_s = -0.93$, $df = 5$, $p < .01$).

When *head lifting* was tested against group size, the significance level was maintained ($r_s = -0.97$, $df = 7$, $p < .01$) and the curve found was hyperbolic ($y = -2.70 + 5.25/x$, $r = 0.98$, $p < .01$) (Fig. 1, below). However the results were far from significant for the *watching* (*weak*) criterion ($r_s = -0.38$, $df = 6$, N.S.).

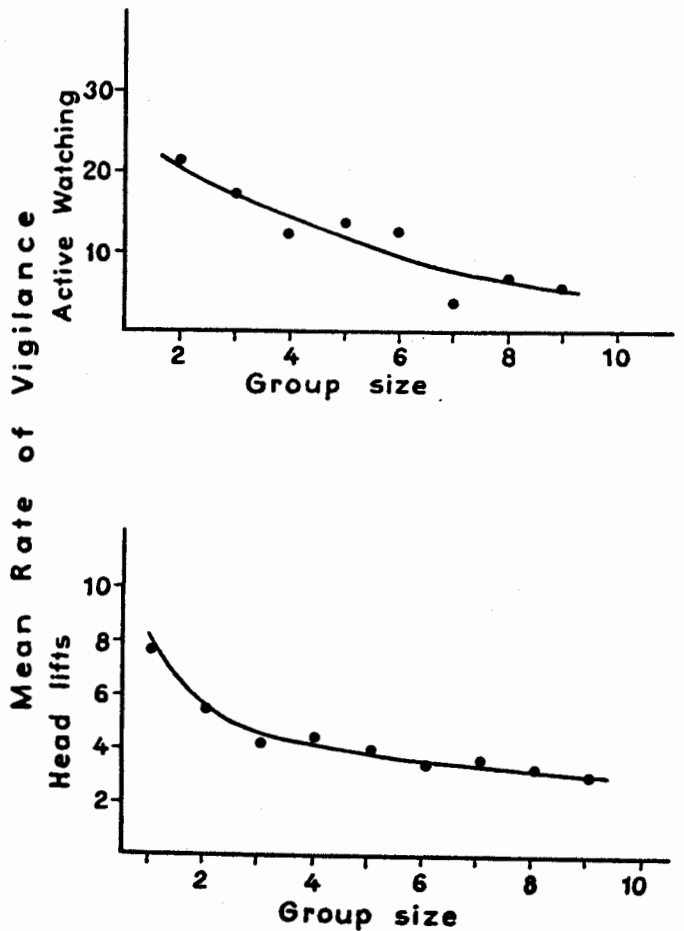

Fig. 1: Relationship between group size and mean active watching rate (above) and mean head lift rate (below)

A positive, but non-significant, correlation was found between group size and time spent feeding per individual ($r_s = 0.53$, $df = 6$, N.S.).

Rutting Period

The dramatic changes in quality and amount of interactions during the rut (from about the second week of November to the third week of December) suggested a separate analysis of vigilance for this period was appropriate.

The results of testing *active watching* rates against group size for mixed groups during the rut are suggestive, for while the data as a whole did not show any important trend ($r_s = -0.07$, $df = 16$, N.S.), that for groups of 9 or less showed a significant negative correlation ($r_s = -0.96$, $df = 5$, $p < .01$). This was not the case for groups of 10 or more ($r_s = -0.18$, $df = 9$, N.S.), the former matching a hyperbolic curve ($y = -1.48 + 98.55/x$, $r = 0.96$, $p < .01$).

Moreover, the rate of vigilance during the rutting period was larger than in the non-rutting period when data from groups of equal size were compared ($t = 3.9$, $\alpha = .01$).

Analyses of correlation between the mean rate of time spent in social interactions and the size of mixed groups during the rut, showed a statistically significant positive relationship ($r_s = 0.48$, $df = 16$, $p < .05$, see Fig. 2).

Vigilance and Group Geography

When the intensity of *active watching* was analysed for central and peripheral animals, the latter were observed to be more vigilant. Although this trend was maintained throughout the year, it showed some relaxation during the rut, due to a decrease in the *active watching* rate of peripheral animals (rut-non-rut comparison: $T = 3$, $N = 8$, $p < .05$, Wilcoxon test).

It is interesting to note that vigilance is mainly an adult activity, and is a little more pronounced in males. Fig. 3 shows that although peripheral individuals are more watchful than central ones in all three classes, this tendency is much more marked in the case of adult females and young ($\chi^2 = 21.54$, $df = 2$, $p < .001$).

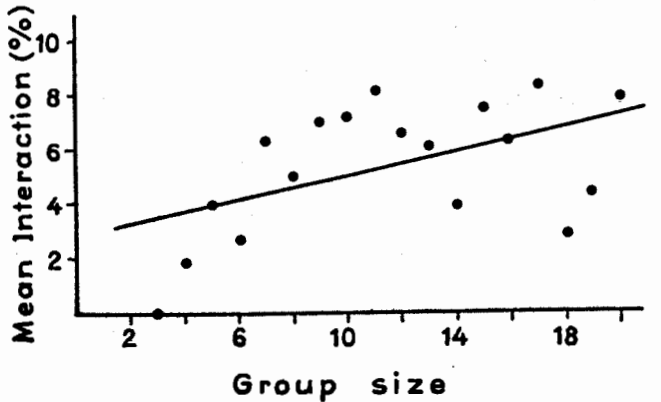

Fig. 2: Mean interaction rate as a function of group size during the rutting period

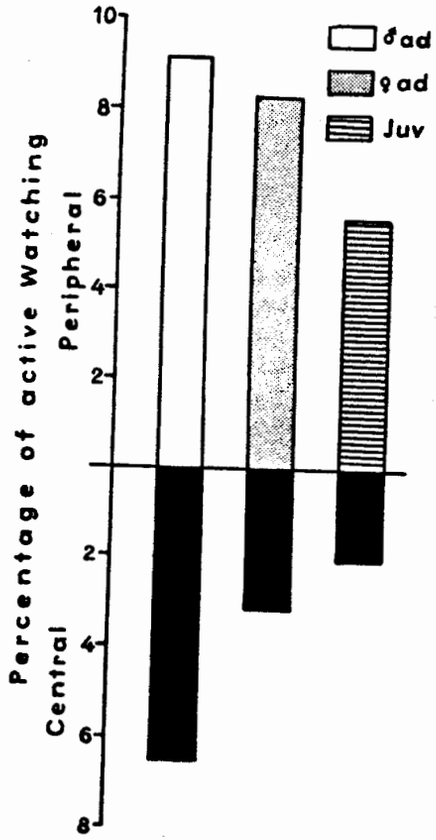

Fig. 3: Percentage of active watching by animals in peripheral and central positions during the non-rut period

Discussion

The negative correlation found between group size and time dedicated to vigilance per individual is in accordance with information obtained for other ungulate species (BERGER 1978; LIPETZ and BEKOFF 1982; UNDERWOOD 1982).

Without being conclusive, the trend shown by the Spanish ibex, of spending more time feeding as group size increases, would help explain the strategy implied by the distribution of vigilance amongst group members, for the resulting extra time would allow more feeding for each individual.

The lowering in the vigilance-group-size relationship observed in mixed groups compared to female-fawn groups is better understood if we examine the data obtained on the predominantly mixed groups during the rut, when the rate of vigilance is greater and the level of interaction increases at the same rate as group size. Thus it appears that the rising level of interactions disturbs co-operative vigilance during the rut, as the animals probably dedicate most of their watching to activities related to reproduction.

The lowering of interest towards predators at this time is apparently also shown in the shorter flight distance which I was able to observe (although

actual data were not collected) for our ibex in Cazorla and Segura, as well as for other ungulates (ALTMANN 1958; ROWE-ROWE 1974).

The different levels of vigilance shown by animals from the centre and the periphery of the group, which also occur in pronghorns (LIPETZ and BEKOFF 1982) and starlings (JENNINGS and EVANS 1980), are probably due to a process of individual selection whereby the most peripheral animals, being those most frequently taken by predators, have become more watchful. Again such centre-periphery differences are diminished during the rut.

The hyperbolic and parabolic curves followed by the watching data show that the larger the group size, the smaller the correlation between group size and vigilance.

Finally, the different results obtained from the ibex for the various criteria of vigilance appear to indicate that just keeping the head up while resting or walking is not sufficient for predator detection, and therefore special movements and postures (*active watching, head lifting*) have been selected for. In fact the occurrence of specialized vigilance patterns appears widespread in prey animal species.

Zusammenfassung

Beim Iberiensteinbock in Südostspanien nimmt mit der Truppgröße die Wachsamkeit der Individuen ab, ihre Freßdauer zu. Erwachsene beiderlei Geschlechts sind wachsamer als Junge, und alle sind morgens länger wachsam als nachmittags und abends. Individuen am Gruppenrand sind wachsamer als die im Gruppenzentrum.

In ganz großen gemischten Gruppen während der Paarungszeit folgt die Wachsamkeit diesen Regeln nicht. Dann ist die Aufmerksamkeit mehr auf die vielen Interaktionen in der Gruppe gerichtet.

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Author's address: Dr. C. L. ALADOS, Estación Experimental de Zonas Aridas, C/General Segura 1, Almería (Spain).

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