Chapter - VI

SOCIAL ORGANIZATION

INTRODUCTION

The patterns of spacing and mating that result from interactions both between and among the sexes are generally referred to as a species' social organization (Eisenberg 1966, 1981). Jarman (1982) re-affirmed earlier views that social systems are merely descriptions of how individuals are organized in space and time, ostensibly responding to a set of conditions. Descriptions of social systems have incorporated: patterns of intraspecific spacing, resource distribution, intraspecific interactions (Eisenberg 1981; van Schaik and von Hoff 1983; Bekoff and Wells 1986; Berger 1988). Body size and diet specialization are still viewed as primary influences affecting species social organization (Eisenberg 1966, 1981; Western 1979). The social system of any species is shaped by the environment. As the environmental forces change, group sizes, spatial dispersion and mating systems also change (Rubenstein 1986).

Few analyses of ungulate social organization have considered how and where the family Equidae fits into the ungulate scheme (Berger 1988). Equids are interesting anomalies to the group. Unlike bovids, cervids, giraffids and antilocaprids, equids and other groups (camel, pigs, tapirs) are not true ruminants (Langer 1973). In addition to being caecal digesters (Janis 1976) all equids are monomorphic in body size and lack conspicuous secondary characteristics and some groups live in year-round harems (Berger 1986). This has led to the equid omission from the contemporary analysis of ungulate social organization.

Among equids, there are six native and two feral species showing a remarkable diversity of social systems. Horses (*Equus przewalskii and E caballus*), plains zebra (*E*

burchelli) and mountain zebra (*E. zebra*) typically live in closed membership harem groups consisting of adult females, a single adult male and their young (Klingel 1974). In contrast, Grevy's zebra (*E. grevyi*) and the asses (*E. africanus* and *E. hemionus*) typically exhibit social systems in which female bonds are more ephemeral. Most stallions live alone in territories (Klingel 1974).

Lack of adequate data on equids may have prevented their inclusion in existing theory, but there are also phytogenetic variables and evolutionary factors that may have rendered such groups as inappropriate choices for testing predictions.

Very little information is available on the Indian wild ass social organization, most of which is based on inferences. The Asiatic wild ass live in unstable groups of varied composition with open membership and poor bonds. Stallions are territorial (Klingel 1977). Solomatin (1964, 1973 in Klingel 1977) describes sociological features of kulan (*E. h. kulan*) such as unstable groups and the existence of male, female and mixed groups.

Some common and important terms used in this chapter are defined here to precisely indicate what they mean.

Resources: Many factors including food, water and mates constitute resources (Weins 1984). My working definition includes food, water and refuge (mating and foaling ground).

Territory: The simple definition of Burt (1943) is followed. "Territory is an exclusive area which is defended."

Harem: A group of females (with/without young) associated simultaneously for extended time periods which are defended by their consort male(s) from interactions with other males (Berger 1988).

METHODS

Observations were made with the aid of binoculars, spotting scope and photography. Data were also collected on the two radio collared mares and few individuals identified on the basis of natural markings and wounds/scars.

Extensive study was done on few groups from 1989 to 1991. The study on two radio collared mares YC and BC was conducted from 1990 to 1992. Information on group size and structure was collected on the basis of monthly surveys of the southern fringe and bimonthly surveys of the eastern and northern fringes and the Bets. The animals were approached on camel back. During the dry season, vehicle was used to traverse the areas (see methods of chapters III and V).

Apart from the above mentioned methods, whenever the herds in the intensive study area were sighted, the animals were sexed and counted. The habitat in which they were sighted was also noted. The various family bands were pooled to calculate the seasonal variation in group sizes. The intensive study area had five territorial males one family band (in narali) and an all-male herd (in Jesra)

Z-statistics (Zar 1984) was mainly used to compare the proportions of association of a stallion with a family band and without a family band between the breeding and non-breeding periods. K-W ANOVA (Siegel 1956) was used for the seasonal comparison of family groups and all male group sizes. Group size was analyzed using the arithmetic mean as well as the typical group size (TGS) (Jarman 1974). TGS was defined as TGS= n^2/N, where n= group size and N= total # of animals in all groups.

Mean group size was included to facilitate comparison to other studies, while typical group size best represents the social environment experienced by an animal in the population (Jarman 1974).

RESULTS

Group Composition

Group size in the wild ass was variable. There were two primary social units, family/breeding band and all-male group.

a) Family band: All age classes of females, foals, yearlings and few (occasional) sub adult males and dominant stallion were found. This type of composition was observed along the fringes, Wasraj and Nanda Bets almost all the year round with the presence or absence of a dominant stallion.

- Family band consisting of more than two dominant stallions, large number of mares, yearlings, foals and subadult males and females, was observed on Pung Bet only during the breeding season (n=2).

b) All-male group: This group constituted males from yearling stage, males evicted from female herds by territorial stallions, before the males attain reproductive maturity. Males ostracized from the family herds also formed part of this group.

The group members had weak bonds except that of female-foal bond. Group fusion in family groups was observed during monsoon when good quality food was abundant in the form of fresh grass flush.

Group Size and Structure

There were a total of 19 family groups occupying the southern fringe, northern fringe and the Bets (Figure III.3). Seven localities had meagre sightings which have not been considered for analysis. The mean group size varied from 4.6 to 28.67 in 1990 in southern fringe (Table VI.1). In 1991, in Little Rann it was 4.29 to 49.16 (Table

VI.2). The mean, median and typical group size obtained, showed that the wild ass lived in large groups (Tables VI.1, VI.2).

The frequency of observation of solitary animals were low, 3.57% in 1990 and 8.163% in 1991. In the intensively studied herd, frequency of solitary animals was 6.9% to 11.24% during the summer.

On the Bets, Pung and Dhut the family group and all- male group congregated to form one unit during the monsoon (Range= 125-175).

Family Group size: The surveyed group sizes showed no variation in all the three seasons (K-W ANOVA $_{1990}$ = 3.897, P>0.05, n=56 , K-W ANOVA $_{1991}$ = 4.84, P>0.05, n=98). On the contrary, the Narali herd (intensively studied) showed a significant variation in group size in all the three seasons (K-W ANOVA $_{1990\text{-}91}$ = 136.78, P<0.001, n= 507). Large group sizes were observed during the monsoon as the wild ass congregated for mating and foaling (Median= 17, range= 1 to 55, Mean=17.86). The winter and summer group sizes were comparatively smaller ($Median_{winter}$ = 8, Range= 1 to 34, Mean=9.20, $Median_{summer}$ = 5, Range= 11 to 37, Mean=6.61) (Figure VI.1).

Group size varied in the southern fringe as some were large and others were very small. Seasonal variation in group size could not be detected adequately because of the fluid nature of the groups with continuous group fission and fusion (Table VI.3).

All-Male Group: In the whole of LRK, five all-male groups were observed, three in the southern fringe and one each on the bets and eastern fringe (Figure III.3). The all-male groups formed larger groups the mean ranged between 6.5 to 33.57 (Tables VI.1 and VI.2). The typical group size estimated, showed larger groups than that of the arithmetic mean i.e. 9.62 to 32.66.

No variation was observed in all the three seasons for the all-male group (K-W ANOVA = 1.89, P>0.05, n= 63). Group sizes were inconsistent and fission-fusion occurred throughout the year. All-male group were comparatively smaller during the breeding season ($Median_{1990}$ =13, $Mean_{1990}$ =15.31 and $Median_{1991}$ =20, $Mean_{1991}$ =22.24) (Figure VI.2).

Sightings of solitary males from the all-male group was 1.59% indicating that males tend to live among the groups. This result was based on the survey information, though solitary sightings were encountered often within the intensively studied area, Narali. The dominant stallions within the study area, were without the harem, once the breeding period was over. In the non-breeding period (January - June), the stallions maintained their territories.

Typical Group Size: The typical family group size varied between 9.7 and 39.15. In the all-male group the typical group size was 6.36 to 50.7. The year round group sizes observed were higher than that reported for the other Asiatic wild ass, feral horse, burros and feral ponies.

The largest groups were observed in monsoon and winter, the median being 24 in 1991 and 21 in 1992. It was at this time that food resources were available in plenty. Towards the end of winter and in summer, the resources got depleted.

Harem

The wild ass were observed to form two kinds of harem; all year round harem and seasonal harems. The family groups congregated along the Rann fringe, it was with these groups that the territorial stallions formed seasonal/all year round harems.

In the intensively studied herd (in Narali), the family group was maintained by JJ till November 1989. JJ was displaced by KM in November 1989 in a severe territorial fight. Since then on, KM maintained the family group. Of the five males JJ, CT and *Bhagdhod* maintained marginal seasonal territories, and *Bandio* and KM maintained year round territory.

The association of territory holders with the family band was compared in breeding and in non-breeding period. All five territorial males of the intensively studied area in 1990 and 1991 showed significant variation (Z_{1990} =5.25, P<0.001, Z_{1991} =4.26, P<0.001).

The study of eight family bands along the southern fringe indicated that in year 1990 all the 8 dominant stallions having prime territories showed significant difference (Z=5.26, P<0.001) during both the periods. In the year 1991, no difference was observed in the association of males with family band (Z=1.91, P>0.05).

The year 1990 was a good rainfall year, while 1991 was a drought year. Therefore maintaining family groups in the non-breeding period (especially in the drought years) would prove to be too expensive for the stallions.

The dominant stallion KM of the intensively studied herd showed a significant difference in association with family bands in the breeding and non-breeding seasons in 1990 (Z_{1990} =2.35, P<0.01).

Exceptional Case in Pung Bet: During the monsoon (1990 and 1991) a different organization was observed on the Pung Bet than that on the other two fringes, Nanda Bet and Wasraj Bet. With the onset of monsoon, a large congregation of multi-male (> four dominant stallions) family group was observed on the Pung Bet.

Apart from these there were a number of males from the adjoining all-male herd (Dhut Bet) in the congregation. Such a situation was not observed in the other parts of the Little Rann. Towards the end of the monsoon/early winter, resources got depleted on the Bets, the family band moved to the fringes (northern/eastern). One to two males remained on the island during the summer and winter.

Spatial Relationship and Territoriality

The mares had an overlapping home range with that of males. The intensively studied family groups in Narali herd (MH) had overlapping ranges with KM and the other males JJ, *Bandio*, *Bhagdod* and CT throughout the year.

The territories of these males were within 0.5-1.0 kms range of the other males and were exclusive during the breeding period, though during the non- breeding season the males were allowed to enter the respective territories. Between all these territories, there was a free zone where interactions were non-aggressive and free movement was observed.

JJ was ostracized from the herd after a territorial fight, and thereafter he occupied the free zone maintaining a marginal territory in it, only during the breeding period.

The ranges of *Bandio* and CT males overlapped with that of the all-male group (BH) (Jesra).

Territoriality

The dominant stallions in the Rann of Kutch defended territories throughout the year. This attracted all the mares for a limited duration during the mating season, and

territory-holders alone contributed to breeding. It was observed that the marginal territories were held by young or old, rather than the prime males (stallions).

A territorial stallion excluded all other territorial stallions, and tried to herd all the mares which entered his territory, within which he had exclusive mating rights. Members of the all-male group were permitted to enter the stallion's territory, but when mares were present, the territory-holder would usually drive them away.

Territoriality was well documented while doing the study on the intensively observed herd (MH) in Narali. It was observed that the dominant stallion KM maintained more or less the same home range throughout the year. He herded the mares into his territory only during the breeding season.

Apart from KM, *Bandio* maintained a seasonal territory at the other end of the study area. Two marginal territories were maintained by an old ostracized male JJ and a young stallion *Bhagdod.*

Group size increased significantly during the breeding season as the wild ass herds congregated along the fringe during the monsoon. The herd would split into smaller groups, whose membership was open and the mares would keep moving between KM and *Bandio* territories and were also herded by the marginal territory holders for a few hours/few days. The marginal territorial areas could be traversed by all the stallions and members of all-male herd (BH).

In the non-breeding season, the group size was much smaller than that observed during the breeding period (Range 6-11). Usually the mares shifted into to the marginal territory areas and once in a while were herded by *Bandio*/ JJ /an all-male member. KM maintained his harem only during the breeding period. In non-breeding period, KM had no harem in his territory. In peak summer, a few gravid mares were observed in his territory, only for a few days.

Territorial stallions soiled themselves with mud/slush during the breeding period, this could be a visual display. The stallion (territorial and bachelors) urinate-defecate on the edge of their territories, which is probably an olfactory signal associated with territorial patrolling and marking by males.

Territorial Fights

The fate of stallions which lose territory and become floaters is yet to be understood in the Indian Wild ass. JJ on being defeated and ostracized from his territory by KM, did make an immediate attempt to regain the same territory later, but was unsuccessful. JJ maintained a seasonal marginal territory (only during breeding period). During summer and winter, sighting frequency of JJ was low.

INTERACTIONS

Social Roles

Dominant Stallion: A harem stallion often herds his band together upon the approach of another male. In all, 44 instances of herding of mares by stallions,were recorded, and in all cases the stallions had vocalized. This was mainly to herd the group away from other stallion, or to direct their movement, or an attempt to copulate with a mare, or to move non-members into the group. There were seven occasions when a vocalizing stallion entered the herd causing the band to split.

The stallion was observed to either lead the band (n=6) or follow at the rear end (n=6). Mares were observed to lead the band especially during the breeding period (n=9).

Foal-Mare Interaction: A day old foal had poor co-ordination and the mare and her foal were not observed with the herd. On the second day the mare and foal were seen to join the herd, but their movement was limited. The mare and the foal avoided the stallion.

Allogrooming was observed between the mare and foal. The mare micturate over the foal's urine. The other members of the herd were prevented from coming close to the foal. Mare and foal were observed to make soft contact calls to each other. The interspatial distance between the two was 1 to 1.5 metres. All the foals and their mares remained together and maintained some distance from the rest of the band.

DISCUSSION

The family group size and the all-male group size seemed to be influenced by resource availability and distribution. The Rann fringe has good quality forage during the monsoon. The congregation on the Pung Bet with multi-male and a large number of mares could be mainly due to resource availability.

The prime or marginal territory holders showed difference in association with family bands. During breeding season most of these males showed high association with family bands. The prime territory holders during non-breeding season defend the territory more than that of family bands. The quality of the territory seems to be prime determinant of dominance. The prime territory holders have an access to water resources and food. Ginsberg (1988) reported that males with territories having access to safe and maximum vegetation biomass attract post partum cycling females. In the year 1991, prime territory holders showed no difference in association with females. It may be due to resource availability, mainly water as the year 1991 was a drought year.

As per Leuthold's (1977) classification of territories, the wild ass fall in the "Normal" Mating Territory. There are three kinds of social units: 1) single adult males on territories, 2) groups of females and young of variable size and composition, 3) groups of males, including some adult ones that are - temporarily at least - not territorial (all-male groups). Except for more or less temporary associations between either territorial males or bachelor herds and female groups, the sexes are largely segregated. Home ranges of units 2 and 3 usually overlap and extend over several territories of 1; they may also include areas not occupied by territorial males (Leuthold 1977).

A male's territorial activities were usually restricted to part of his home range only; secondly, a variable but often substantial proportion of adult males, at any one time, were not territorial but, together with subadult males, formed bachelor herds; thirdly, female groups were larger and generally more fluid in composition. They are basically free to move between different territories, although the territorial males make efforts to keep females within their boundaries ("herding"). No case is reliably reported of a permanent association between an adult male and a given female group (the so-called "harem" system) being the norm.

Territoriality seems to provide some adaptive advantage for maintenance activities and for reproduction (Waring 1983). The males occupying the marginal territories tend to form seasonal harem during the monsoon. The good quality food meets their energy demand for maintaining the territory and harem. The harems are not guarded during the summer/late winter as zealously as during the monsoon (breeding period) by the stallions.

The wild ass forms both year round and seasonal harems. The equids like feral and Prezwalski's horses, mountain and common zebra live in year round harems

(Klingel 1972; Berger 1986; Rubenstein 1986). The feral asses in subtropical Ossabau Island possess the resiliency between year round harem and other less permanent types of social groupings, when ecological conditions vary (McCort 1980). Simple explanations have failed to explain year round harems, most arguments favouring a multitude of factors are post hoc and not amenable to experimental verification.

Phylogeny and to some extent ecological factors can account for year round harem living (Berger1986). Since all the non-haremic living equids are asinus derivatives and the harem-dwellers are all caballine derivatives (Groves 1974), it has been speculated that the differential social systems could have arisen simply as a product of phylogenic inertia (Berger 1986). But according to Berger (1986), the problem in implicating phylogeny is that ecological factors also correlate well, since the harem-dwellers all live in relatively mesic areas whereas the non-harem dwellers are from xeric environment. My results from the intensively studied herd and surveys indicate that both year round and seasonal harems are found. The wild ass is a xeric dweller and maintain harem. The seasonal harems were formed by most of the dominant males during monsoon when resources were in plenty. The observations indicate that year round harems were maintained by mostly prime territory holders.

Table VI.1: Wild Ass Group sizes in Southern Fringe (LRK) (1990).

Location of Herds	N	X	SD	Range	g	Median
Family Band						
Kiddi	7	26.14	19.92	8-61	39.15	18
Malaniyad	5	4.6	5.14	1-14	9.70	3.5
Enjar	8	26.25	6.48	20-36	27.65	23.5
Koparni	9	28.67	10.84	16-40	32.31	30
Kuda	10	13.60	14.39	2-52	27.29	11
Narali	12	24.08	10.62	9-47	28.38	21
Krishnanagadh	8	25.63	17.66	2-55	36.27	24
Sultanpur	7	15.86	9.74	3-33	20.98	15
Degam	7	23.71	5.28	15-29	24.72	23.5
All-Male Group						
Jogadh	9	18.44	13.47	6-40	28.28	14
Jesra	12	14.75	9.97	7-35	20.92	13.5
Bajana	7	33.57	25.90	7-80	50.70	33

N = # of sightings; X = Mean; g = Realized or typical group size (Jarman 1974)
SD = Standard Deviation

Table VI.2 : Wild Ass Group sizes in Little Rann of Kutch (1991).

Location of Herds	N	X	SD	Range	g	Median
Southern Fringe: Family Band						
Kiddi	10	24.8	9.48	9-40	28.06	25
Malaniyad	7	4.29	4.07	1-11	7.6	6
Enjar	10	19.70	11.60	1-49	25.85	20.5
Koparni	12	31.67	12.24	13-45	35.32	33
Kuda	14	12.93	12.88	1-46	24.86	11.5
Narali	10	24.1	20.00	7-55	39.05	23
All-Male Group						
Jogadh	11	23.72	15.26	3-37	32.66	12.50
Jesra	14	13.14	9.31	2-29	19.27	13.5
Bajana	11	23.73	15.27	5-59	32.66	24
Eastern Fringe & Bets: Family Band						
Kharaghoda	5	22.4	12.66	9-34	28.125	20
Odu/Chikasar	4	16	11.23	1-29	21.90	22
Fatehpur	3	15.33	11.06	2-14	20.65	5
Visnagar	5	20.2	13.046	6-38	26.94	16
Wasraj Bet	7	23.42	14.40	2-39	31.02	25
Pung Bet	6	49.166	62.44	3-129	115.25	15
Taranagar	3	4.33	3.05	1-7	5.76	5
Kordha	3	9	7	1-14	12.629	12
Amrapar	4	7.25	9.46	1-21	16.51	6
Pati	2	13.5	0.707		13.518	
Wadesar	1	10			10	
Antarnes	1	1			1	
Dongi Bet	1	5			5	
Mardak Bet	3	2.66	2.081		3.75	
Nanda Bet	3	15.66	12.58	4-29	22.40	14
Shedwa Bet	3	3.66	3.055	1-7	5.363	3
Piprara	1	4			4	
All-Male Group						
Jhinjhuwada	2	6.5	6.36		9.61	
Dhut Bet	5	17.2	7.56	11-49	19.86	19.5

N = # of sightings; X = Mean; g = Realized or typical group size (Jarman 1974)
SD = Standard Deviation

Table VI.3: Seasonal Group Sizes of Family Bands in Little Rann of Kutch.

Season	N	X	SD	Range	g	Median
Southern Fringe						
Winter 1989-90	13	26.54	12.73	6-61	32.17	24
Summer 1990	29	19.04	12.25	1-46	26.64	17.5
Monsoon 1990	17	23.47	13.11	4-52	30.37	21
Winter 1990-91	33	21.00	15.47	1-55	32.11	21
Summer 1991	32	15.81	11.56	1-44	24.01	15.5
Monsoon 1991	33	26.15	37.63	1-70	17.60	24.0
Winter 1991-92	15	29.53	20.26	1-66	42.51	30.00
Eastern Fringe						
Winter 1990-91	14	27.86	31.11	2-129	60.01	21
Summer 1991	25	10.60	10.79	1-39	21.12	12
Monsoon 1991	17	22.12	31.22	1-129	63.59	12

N = # of sightings; X = Mean; g = Realized or typical group size (Jarman 1974)
SD = Standard Deviation

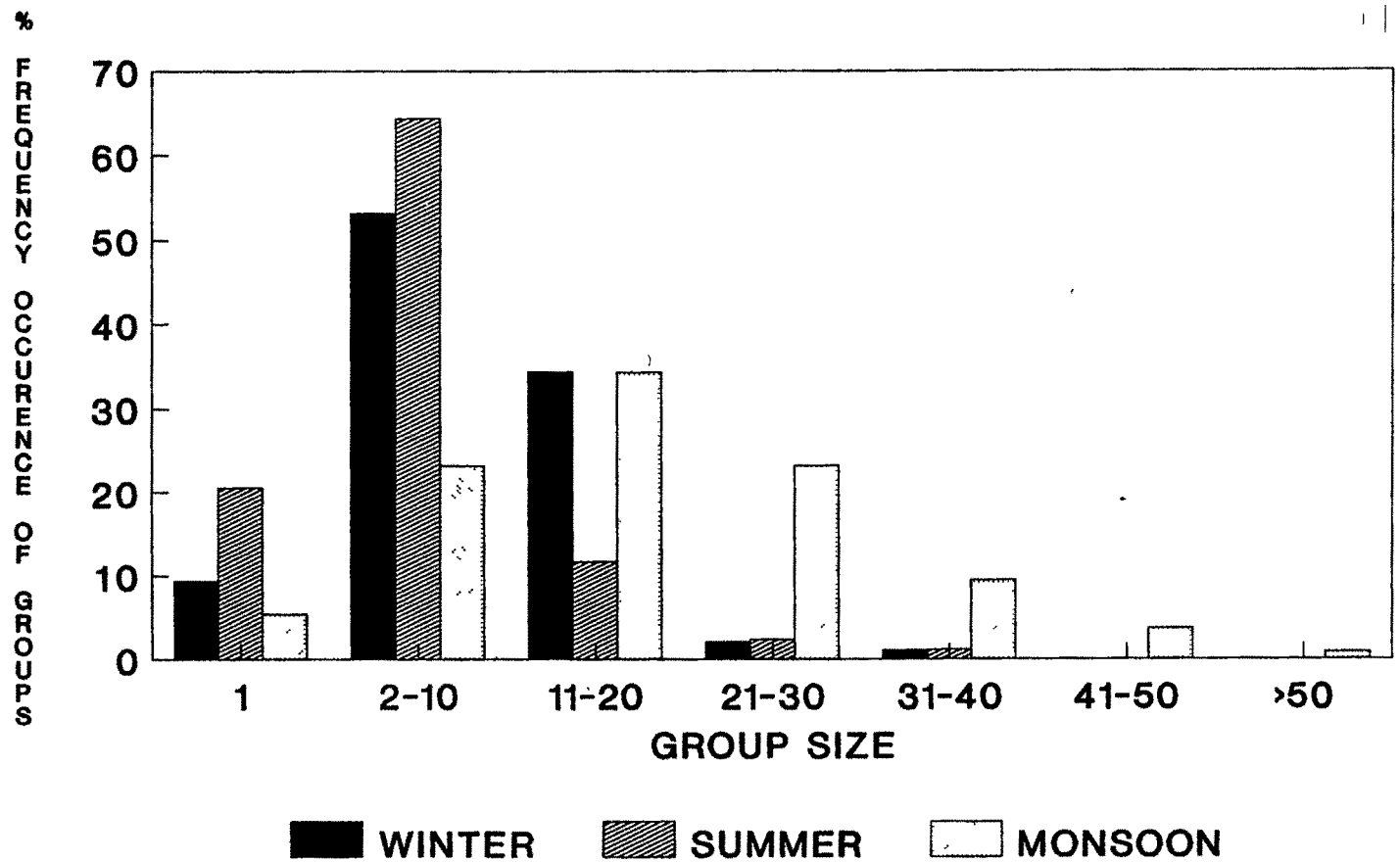

Figure IV.1 Group size variation in the family band in different seasons.

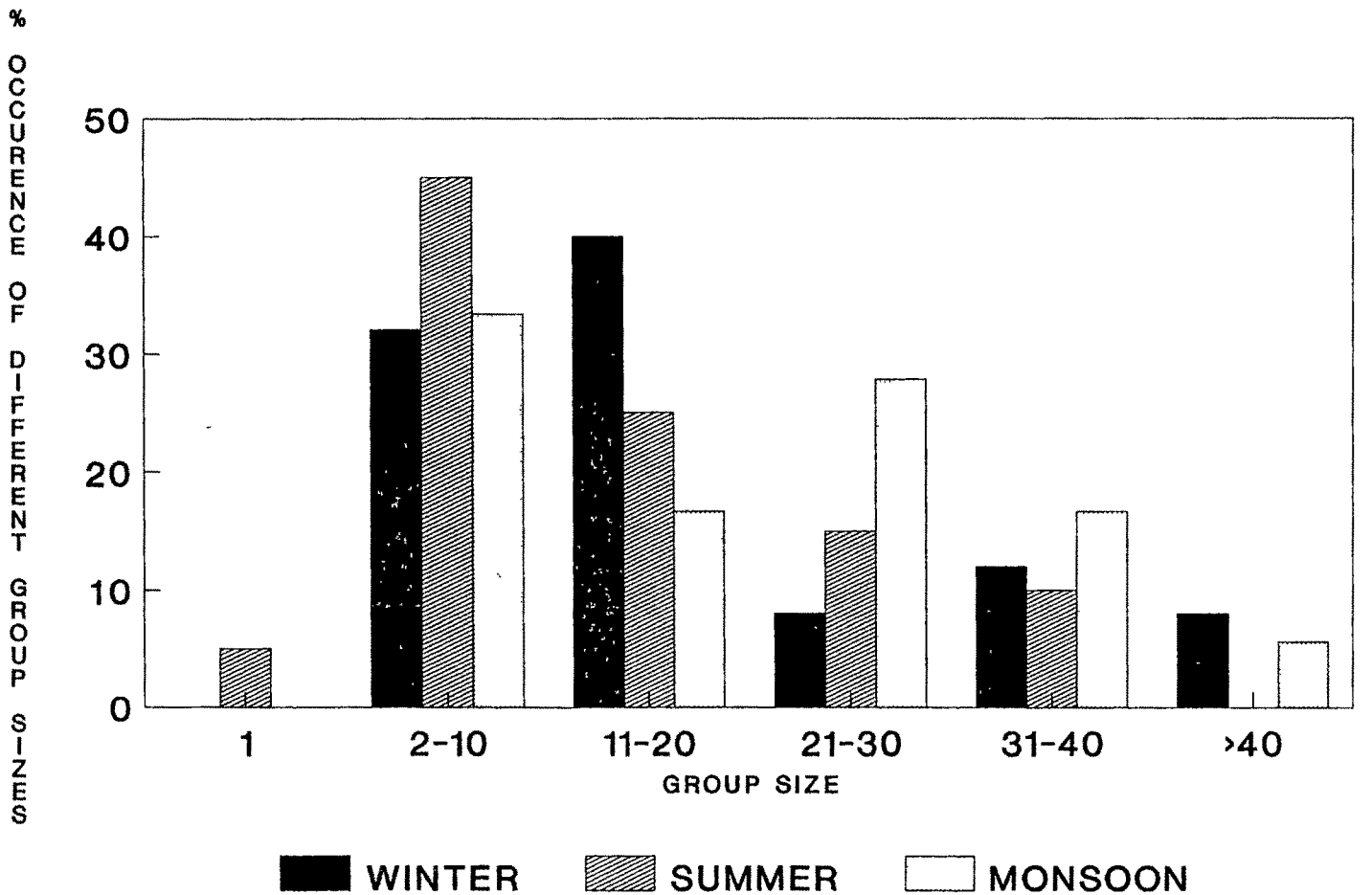

Figure VI.2: Group size variation in all-male herd in different seasons.