MARKHOR, POPULATION DYNAMICS AND FOOD AVAILABILITY IN CHITRAL GOL GAME SANCTUARY

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Summary. *Periodic surveys made to assess the changes occurring in markhor population in Chitral gol Game Sanctuary revealed an increase of* 137 *animals* (397 *as against* 240) *during a period of* 3 *years. The male/female ratio registered a decrease whereas the young/female ratio increased from* 0.56 *in February-March* 1975 *to* 0.79 *in December* 1977. *Herd size also considerably increased. Footprints of snow leopard were again seen in the area. Food production was determined in the winter habitat of markhor and it was inferred that the feed is not scarce for the wild animal.*

Introduction. From December 12 to December 22, 1977 markhor (*Capra falconeri falconeri*) in Chitral gol game sanctuary (declared in 1971) were counted to compare the population and its structure with that recorded in February-March 1975 and January 1977.

The rut was at its prime by this time and the herds were being shuffled and reshuffled. The fact posed a difficulty in the identification of the herds but by careful selection of the site for observations and the identification of the animals, the survey was attempted using binocular (7 × 50). The weather during the study period remained clear most of the time and spotting was possible only in the mornings and evenings from 7.00 a.m. to 10.00 a.m. and from 3.00 p.m. to 5.30 p.m.

Population. Though a total of 452 animals were flushed and categorised, the poulation was estimated to be 397 after discounting possible double counts. They were categorised as follows:

Category	Number	Percentage in population	Number per female
Male	118	29.5	
Female	139	35.1	
Yearling	31	7.9	0.22
Young	109	27.5	0.79

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The estimate is compared below with the estimates of January 1977 and February-March 1975 (Aleem 1977, 1976).

Category	Feb/March 1975	January 1977	December 1977
Males	61	107	118
Females	94	124	139
Yearling	32	37	31
Young	53	31	109
Yearling per female	0.33	0.30	0.22
Young per female	0.56	0.25	0.79

While comparing January 1977 and December 1977 populations, an increase of 11 males and 15 males was observed out of 37 yearlings, thus about 70% have grown into adults whereas the rest i.e., 30% seem to have been lost to the population. In January 1977—about 90% young and yearling of 1975 had grown into adults.

Analysis of population. Male/Female ratio: The population was categorised according to mature sexes as follows:

Locality	Number in the locality	Male	Females	Male/Female ratio
Shah Dehar	5	1	2	1 : 2
Ishper jue	7	1	2	1 : 2
Meran	6	1	3	1 : 3
Chutak	22	6	7	1 : 1
Shosh Mologh	21	5	10	1 : 2
Khush Bakht	17	5	7	1 : 1
Daleem Dehar	67	20	20	1 : 1
Marden Gol	45	11	16	1 : 2
Tongogh	64	19	22	1 : 1
Sardawais gol	15	3	6	1 : 2
Banju Nakh	4	1	1	1 : 1
Tajammal Nakh	67	29	24	1 : 1
Kasaver Lasht	16	6	6	1 : 1
Ishpe Dher	15	5	4	1 : 1
Krui Dheri	26	5	9	1 : 2
	397	118	139	

The male/female ratio (118/139) remained almost the same as in January 1977 count (107/124) whereas there was a distinct increase in the number of males as compared to 1975 estimation (61/94). The male/female ratio was lower in localities where small number of animals were present as compared to the localities with higher concentration of animals where the ratio tended to be almost one.

Male categorisation: The males were categorised into 2 types: males with a greater horn spread i.e., A—more than 7½ years old, and B—the younger or less than 7½ years of age. Following categorical distribution was observed:

Location	No. of males	Males category A	Males category B
Shah Dehar	1	—	1
Ishper jue	1	—	1
Meran	1	1	—
Chutak	6	1	5
Shosh Mologh	5	1	4
Khush Bakht	5	1	4
Daleem Dehar	20	2	18
Mardeen Gol	11	3	8
Tongogh	19	7	12
Sardawai gol	3	1	2
Banju Nakh	1	—	1
Tajammal Nakh	29	10	19
Kasaver Lasht	6	2	4
Ishpo Dher	5	1	4
Krui Dheri	5	2	3
	118	32	86

Thus the number of younger males was almost threefold as compared to the males of more than 7½ years. Compared with the previous year's account the increase of 10 males was in category A i.e., from 22 to 32, whereas the number of category B males remained almost the same.

Females in relation to yearlings and the young: The number of yearlings and the young in the population was as follows:

Locality	Females	Yearling	Yearling/ female ratio	Young	Young/ female ratio
Shah Dehar	2	—	—	2	1.00
Ishper jue	2	2	1.0	2	1.00
Meran	3	—	—	2	0.66
Chutak	7	2	0.30	7	1.00
Shosh Mologh	10	—	—	6	0.60
Khush Bakht	7	—	—	5	0.71
Daleem Dehar	20	5	0.25	22	1.1
Mardeen Gol	16	4	0.25	14	0.88
Tongogh	22	10	0.45	13	0.59
Sardawai gol	6	1	0.17	5	0.86
Banju Nakh	1	1	1.0	1	1.00
Tajammal Nakh	24	3	0.13	11	0.46
Kasaver Lasht	6	—	—	4	0.65
Ishpe Dher	4	2	0.50	4	1.00
Krui Dheri	9	1	0.11	11	1.00
	139	31	0.22	109	0.79

Herd composition. Because of the rut, the markhor did not exhibit a stable herding behaviour. 22 herds were observed with more than 6 members in each. Following is a list of herds of more than 10.

Herd No	Total animals	Males	Females	Yearling	Young
1	14	4	3	1	6
2	26	6	9	2	9
3	10	—	6	2	2
4	15	5	4	2	4
5	11	4	4	—	3
6	23	5	8	—	10
7	27	6	9	3	9
8	12	4	3	1	4
9	16	4	6	2	4
10	25	16	9	—	—
11	10	4	4	—	2
12	15	3	6	1	5
13	14	4	6	—	4

Herd number 10 had 19 males who were contesting for 9 females. 7 of the males were over 7½ years of age. Various patterns of agonistic behaviour were shown for a period of 35 minutes from 5.20 p.m. to 5.55 p.m., the time they were observed. The behaviour patterns included: Displays such as involving spreading odour, emphasising physical attributes, to test the estrous state of the female and active courting.

Snow leopard. The tracks of snow leopard (*Panthera uncia*) were again seen in the area.

The habitat. The vegetation of the area has already been described by Beg (1974) and Aleem (1976). To study the habitat characteristics, the area was surveyed in December 1977. Cover conditions, and forage production were determined. Eighteen, 30 m long transects were laid out in the winter habitat of markhor covering all the vegetation types. Equidistant quadrats of one m^2 each (spaced at 1.5 m) were read along the transect lines to determine cover percent (foliage as well as base cover), litter, rock pavement and bare soil; results:

	Cooler aspects	*Warmer aspects*
	Percent cover	
Quercus ilex	31.8	1.6
Pistacia spp.	1.5	1.1
Prunus amygdalis	0	9.6
Sophora mollis	3.2	0
Artemisia fragrans	2.3	11.9
Rumex hastatus	4.5	0
Vicia spp.	1.8	0
Elionurus hirsutus	2.5	0.9
Saccharum sp.	0.8	0
Bromus sp.	0.6	0
	Percent occurrence	
Plant base	3.8	6.7
Litter	30.8	10.3
Rock pavement	54.3	66.5
Bare soil	11.9	16.5

The data above indicate that the foliage cover percent on cooler aspects is almost double the cover on warmer aspects. Tree cover is also more on the cooler aspects whereas rock pavement and the bare soil surface are predominant on warmer aspects. Litter percent is also more on cooler aspects.

Food availability: Forage production was determined by clipping the vegetation by one m^2 equidistant quadrats (spaced at 3 m) on the 18 transect lines. Vegetation was weighed green and after air drying. Air dried weight in grams was multiplied by 10 to determine forage production in kg/hectare (Hussain, 1968). Yield was determined separately for grasses and forbs, shrubs, and trees as 160, 77 and 790 kg/hectare respectively (total 1035 kg/ha).

About 17 km^2 area can be delineated as the winter habitat of markhor, out of which 5 km^2 area is exclusively enjoyed by the livestock in the lower reaches. An over-lapping of both the habitats is also commonly observed. The vegetation types surveyed however, cover about 8 km^2 (800 hectares), leaving pure conifer vegetation not eaten by markhor, the forage production is: 800 × 1035 = 828,000 kg. As the maximum forage is produced in the form of tree vegetation, use factor should be more than 0.5 (after Khan, 1971) considering the markhor habit of browsing oak vegetation by climbing even up to a height of 8 metres. For the purpose of this study, it is considered to be 0.6. The utilizable forage thus would be: 828,000 × 0.6 = 496,800 kg.

Based on the weight reported by Prater (1973) and Roberts (1977), (for the male markhor) the categories of population were transformed into animal units as follows:

Category	Number in population	Animal units equivalent	Animal units
Male category I	32	0.4	13
Male category II	86	0.3	26
Female	139	0.25	35
Yearling and young	140	0.15	21
	397	Total:	95

The forage requirement for one animal unit is 10 kg (Khan, 1973), thus for six months —the winter season, 10 × 30 × 6 = 1800 kg forage would be needed. The winter forage requirement for the population can thus be worked out as: 1800 × 95 = 171,000 kg. During summer all the males and about half of the rest of population migrate to high hills. 30 animal units thus consume forage for another six months (54,000 kg) thus raising the total requirement to 225,000 kg. It would thus appear that food is adequate for the markhor in the habitat of Chitral gol Game Sanctuary.

Animal nutrition: The following food plant species collected in July and December 1977 from Chitral gol were analysed for nutrition contents by the Chemistry Branch of

Pakistan Forest Institute, Peshawar using Official Methods of the Association of Agricultural Chemists of U.S.A. (Horwitz, et al 1960) The results:

Species	Moisture %	Total ash %	Fats %	Fibres %	Proteins %	Carbo hydrates %
Collected in July, 1977						
Acer sp	11.2	6.7	5.5	21.1		
Betula utilis	12.2	5.9	6.9	15.1		
Ferula narthax	9.6	10.9	2.6	21.2	12.34	34.5
Minvertia sp	9.6	10.9	2.6	27.0	5.5	40.4
Astragalus sp	9.5	6.6	1.9	45.3	5.1	31.6
Vicia sp	11.3	8.2	3.9	25.9		
Agropyron sp	9.1	13.9	4.2	38.9		
Collected in December 1977						
Pistacia sp. (twigs)	9.6	8.3	2.9	3.1	6.2	69.9
Prunus amygdalis (twigs)	10.2	4.8	3.3	32.8	5.5	43.4
Quercus ilex (leaves)	10.0	1.9	6.0	22.8	6.2	53.1
Sophora mollis (twigs)	11.0	5.5	2.8	22.9	7.4	50.4
Vicia sp. (leaf stalks)	10.0	4.9	3.2	55.9	4.1	21.9
Eleusine flagellifera (shoots)	9.8	7.3	2.9	40.0	2.7	37.3
Artemisia fragrans	9.4	6.7	10.5	20.4	4.7	48.3
Artemisia scoparia	11.8	6.9	3.5	40.9	2.5	34.4

References

ALEEM, ABDUL. 1976. Markhor in Chitral gol. *Pakistan J. For.* 26(2): 117-128.

ALEEM, ABDUL. 1977. Population dynamics of markhor in Chitral gol. *Pakistan J. For.* 27(2): 86-92.

BEG, A.R. 1974. Vegetation on the scree slopes of Chitral gol. *Pakistan J. For.* 24(2): 393—402.

HUSSAIN, IJAZ. 1968. Determination of forage production. Pakistan Forest Institute, Peshawar: 10 pp.

HORWITZ, WILLIAM, A. H. ROBRTSON, H. J. FISHER, E. A. EPPS, Jr., F.W. QUACKEN BUSH and HELEN REYNELDS. 1960. Official Methods of Analysis of the Association of Official Agricultural Chemists, Association of OAC Washingtor 4-DC. U.S.A.

KHAN, CH. M. ANWAR. 1971. Range Management in Hazara District. Board of Economic Enquiry. N.W.F.P. University of Peshawar. Publication 64.

KHAN, CH. M. ANWAR. 1973. Rangelands of Pakistan—A study. National Range Management Committee, Pakistan, Islamabad.

PRATER, M.J. 1973. A book of Indian Animals. Bomb. Nat. Hist. Soc. India.

ROBERTS, T.J. 1977. The Mammals of Pakistan. Ernest Been Ltd. London.