Original Article

Urial (Mammalia, Bovidae, Caprini) from the Kala Chitta Range of Northern Pakistan

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Abstract
Punjab Urial (*Ovis vignei punjabiensis*) was studied in fifteen sectors of Kala Chitta range, Attock district in northern Pakistan namely Sojhanda, Ganda kus, Kali Dilli, Dhok Mori, Nara, Sagri, Muriala, Lalu Bangla, Bagh e Neelaab, Surg, Choi, Mongiwali, Thatta, Jhalar and Bhatiot. The vegetation was analyzed from the studied areas and almost 20 plant species were found: 8 tree species, 5 shrub species and 7 grass species. The focus of the article is to explain the ecology, population and distribution of the Punjab Urial.
Key words: Artiodactyla, *Ovis*, Urial, Ecology, Population.

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INTRODUCTION

Punjab Urial (*Ovis vignei punjabiensis*), a wild sheep endemic to the northern Punjab, Pakistan, is classified as endangered species (IUCN, 2007). Punjab Urial is mostly present in Salt range and Kala Chitta range up to 1500 m elevation including Attock, Jhelum, Chakwal, Khushab and Mianwali districts particularly in Kala Bagh Sanctuary of Jabbah Valley (Valdez, 2008). Urial resides in hilly landscape and rocky canyons in low elevation, open areas that are often close to human settlements and thus greatly used by livestock, and nearby to hunters.

The species live in environment that is classified as "rangeland". Generally their habitat is barren and of low primary productivity, so Urial population is obviously small (<1/km^2). Areas, previously considered of less agricultural value, are now being converted to the areas of food production due to increase in human population. Grazing pressure is continuously increasing from domestic livestock. The mountain habitats, to which the Urial are adapted, are reducing due to habitat destruction. Again the main cause is directly related to increasing human figures, in this case their rising energy demands for fossil fuels, hydroelectric power, and fuel wood. The range of Kala Chitta consists of dry sub-tropical, semi evergreen forest. The most important grasses are *Cynodon dactylon, Cymbopogon jawarancusa* and *Crogrostis cynoneroides* and the important plant species are *Acacia modesta, Olea cuspidata*, *Zizyphus jujuba* and *Dodonaea viscose*. Among plants, *Acacia modesta* is the favourite browse. Sometimes, Punjab Urial feed on the mucilaginous fruits. The feeding activity is restricted to early morning and evening in summer season and the animal take some rest during day time under a bush or in nearby rock. Urial is wary and has well developed sense of hearing, smell and vision (Roberts, 1997).

All species increase browsing in winter season. In spring and summer season, browsing is <20%. Diet of Punjab Urial and domestic sheep is similar, therefore both compete each other. Major forage is dominant graminoid. For domestic sheep and Urial, the diet overlap index is ≥0.80 for one species browse, two forbs and three graminoids. Conservation of Urial may reduce the number of livestock like in the area of Kalabagh Game Reserve, livestock grazing is prohibited strictly in 20 km^2 areas where Urial density is more and few cattle and sheep are allowed in low density area (Awan, 2006). Punjab Urial is endemic to the Salt and Kala

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Chitta range in Punjab Province (Aleem, 1977; Mirza, 1980; Chaudhry, 1991). According to Schaller and Mirza (1974), Punjab Urial is distributed in between Indus and Jhelum River with elevation up to 1500 m. Roberts (1997) reported the distribution of Urial in southern KPK province in low rounded stony hills along with the vegetations.

MATERIAL AND METHODS

Study area. Kala Chitta (Lat. 33° 30 N; Long. 72° 45 E), the main narrow mountainous belt in the Attock district. Kala Chitta range is a northern part of Potwar basin.

Table I: The vegetation in the Attock district (Punjab) Pakistan.

Local name	Species
Kikar	*Acacia nilotica*
Karir	*Capparis deciduas*
Kaoah	*Flacourtia ramontchi*
Frash	*Tamarix articulate*
Simal	*Salmalia malabarica*
Dhaman	*Grewia oppositifolia*
Ber	*Zizyphus mauritiana*
Mallah	*Zizyphus nummularia*
Koher	*Sageretia theezans*
Sanatha	*Dodonaea viscose*
Kangar	*Pistacia integerrima*
Shisham	*Dalbergia sisso*
Siris	*Albizzia lebbek*
Phulai	*Acacia modesta*
Khair	*Acacia catechu*
Gurgura	*Monotheca buxifolia*
Kau	*Olea cuspidate*
Pilo	*Salvadora oleoides*
Granda	*Carissa spinarum*
Kaner	*Nerium odorum*
Bata	*Periploca aphylla*
Lahura	*Tecome undulate*
Shamshad	*Buxus papillosa*
Toot	*Morus alba*
Pipal	*Ficus religiosa*
Baid	*Salix tetrosperma*
Chittar thor	*Opuntia dillenii*
Danda thor	*Euphorbia royleana*
Kakri	*Rhododendron arborium*

The Islamabad-Peshawar highway is located on the east of Kala Chitta range while the Indus river flows on the west of the Kala Chitta range. Kala Chitta range is submerged in Hazara Mountains and Margala hills in east and Samana range in west, while Attock-Cherat range is located towards its north. The Punjab Urial is one of the main species of the Kala Chitta range. Fifteen spots were selected for the survey of Urial population in the Kala Chitta range. The areas selected for survey of Urial abundance are Sojhanda, Ganda kus, Kali Dilli, Dhok Mori, Nara, Sagri, Muriala, Lalu Bangla, Bagh e Neelaab, Surg, Choi, Mongiwali, Thatta, Jhalar and Bhatiot.

Apparatus: Nikon cool pix 880 digital camera, hand bag, Jeep, Quadrangle (5m2), Binocular, white papers with a pencil, map, measuring tape of 100 feet, field book and compass analysis of the vegetation and survey of the Kala Chitta vegetation were determined by using 25 quadrates of 5×5 m. The vegetation of Kala Chitta range, on the basis of Urial food, is divided into grasses, shrubs and trees (Table 1). For the recorded %age frequency of diffent vegetations, their category can be visualized from table II after locating a particular %age range.

Population assessment.

There were two types of observations made to study Punjab Urial:

Direct observations.

Time was an important factor responsible for making direct observations of Urial populations. Punjab Urial can be seen in morning and evening only because animals come out from dense vegetation. It was difficult to count the animals without search lights.

Table II: The category of percentage frequency and abundance.

Percentage	Category
0-20 %	Rare
21-40%	Occasional
41-60%	Common
61-80%	Abundant
81-100%	Very Abundant

Indirect observations.

Indirect observations were made by viewing footprints and fecal pellets. In different areas of the range, particularly near grazing

area and drinking water area, footprints and fecal pellets were abundant. These were indication of their presence. Indirect observations were made to estimate the population of Urial. The vegetation was observed carefully with different aspects to compare their density, frequency, relative density and relative frequency:

$$\text{Density} = \frac{\text{Total number of organisms in all sampling units}}{\text{Total number of sampling units}}$$

$$\text{Relative density} = \frac{\text{Number of individuals of species in all sampling units}}{\text{Total number of individuals in all sampling units}} \times 100$$

$$\text{Frequency} = \frac{\text{Number of sampling units in which species occur}}{\text{Total number of sampling units}}$$

$$\text{Cover} = \frac{\text{Area covered by species}}{\text{Total area of the sampling unit}} \times 100$$

$$\text{Relative cover} = \frac{\text{Cover of the species}}{\text{Total cover of all species}} \times 100$$

$$\text{Percentage frequency} = \frac{\text{Number of sampling units in which species occur}}{\text{Total number of sampling units}} \times 100$$

$$\text{Relative frequency} = \frac{\text{Frequency value of a species}}{\text{Total value of all species}} \times 100$$

$$\text{Est. Population} = \frac{\sum \text{Expected min. population} + \sum \text{Expected max. population}}{2} \times 100$$

Correlation coefficient was used for comparing observed population and estimated population.

$$\text{Correlation Coefficient (r)} = \frac{\sum XY - (\sum X) . (\sum Y)/n}{\sqrt{\Sigma X2 - (\Sigma X)^2/n} \cdot \sqrt{\Sigma X2 - (\Sigma Y)^2/n}}$$

RESULTS

Punjab Urial habitat in Kala Chitta hills was divided into fifteen sectors for the purpose of survey of their feed and population (Table 3, 4). Each sector was efficiently covered by vegetation. The result of direct observation (Table V and Fig. 1).

Indirect Observations.

Some indirect observations were made through screening of two important indications like footprints, and fecal pellets. For the most times, hooves signs were observed near the bank of river Indus and in the area with abundant food source (Table VI and Fig. 2).

Minimum estimated population of Punjab Urial was 27 and maximum estimated population was 60 with the average of 43.5. On the basis of indirect observations, density/km²

was determined and in total area of 85 km²; 98 Urial individuals were estimated indirectly in Kala Chitta range, Punjab, Pakistan. Observed population and estimated population were compared by using correlation coefficient represented by r. The value of r was 0.78.

Table III: Study sectors of the Kala Chitta range.

Sector	Area	Locality
Sector 1	5 km²	Sojhanda
Sector 2	12 km²	Ganda kus
Sector 3	7km²	Kali Dilli
Sector 4	4km²	Dhok Mori
Sector 5	8km ²	Nara
Sector 6	11km²	Sagri
Sector 7	4km²	Muriala
Sector 8	4km²	Lalu Bangla
Sector 9	3km²	Bagh e Neelaab
Sector 10	2km²	Surg
Sector 11	4km²	Choi
Sector 12	3km²	Mongiwali
Sector 13	7km²	Thatta
Sector 14	5km²	Jhalar
Sector 15	6km²	Bhatiot

Table IV: Mammalian fauna of in the study area.

Sr. No.	Common Name	Scientific Name
1	Chinkara	*Gazella bennettii*
2	Fox	*Vulpes vulpes*
3	Jackal	*Canis aureus*
4	Mouse	*Mus booduga*
5	Porcupine	*Hystrix indica*
6	Squirrel Palm	*Funambulus pennantii*
7	Wolf	*Canis lupus*
8	Pangolin	*Manis crassicaudata*
9	Mongoose	*Herpestes javanicus*
10	Hyena	*Hyena hyena*
11	Hedgehog	*Hemiechinus collaris*
12	Hare	*Lepus nigricolis*

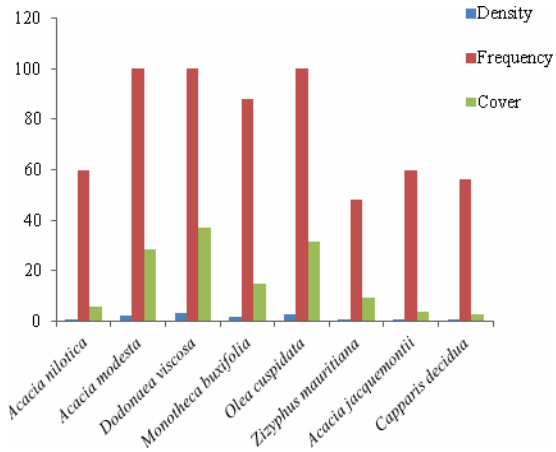

Figure 1 Density, frequency and cover of trees in Kala Chitta range.

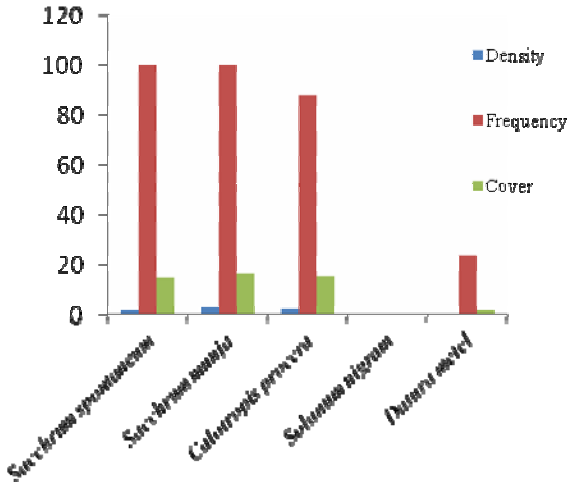

Figure 2 Density, frequency and cover of shrubs in Kala Chitta range.

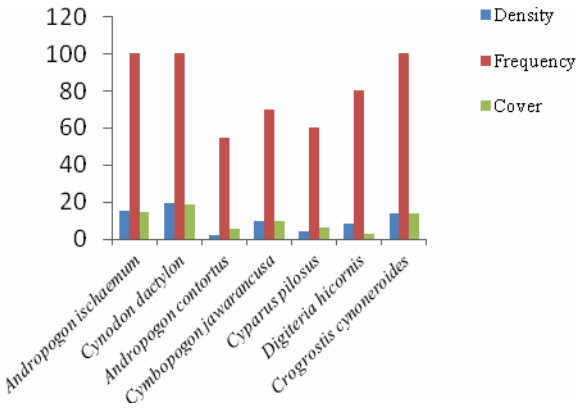

Figure 3 **Density, frequency and cover of grasses in Kala Chitta range.**

Table V: The vegetation analysis of Kala Chitta hills.

Species	Density	R. Density	%age Frequency	R. Frequency	Cover	R. Cover	Importance Value
Trees							
Acacia nilotica	0.60	0.64	60	4.02	5.60	2.22	6.88
Acacia modesta	2.24	2.40	100	6.71	28.50	11.30	20.41
Dodonaea viscose	3.24	3.47	100	6.71	36.95	14.65	24.83
Monotheca buxifolia	1.68	1.80	88	5.91	14.80	5.87	13.58
Olea cuspidate	2.68	2.87	100	6.71	31.60	12.53	22.11
Zizyphus mauritiana	0.60	0.64	48	3.22	9.48	3.76	7.62
Acacia jacquemontii	0.68	0.72	60	4.02	3.73	1.47	6.21
Capparis deciduas	0.56	0.60	56	3.76	2.55	1.01	5.37
Shrubs							
Sacchrum spontaneum	2.28	2.44	100	6.71	14.85	5.89	15.04
Sacchrum munja	2.80	3.00	100	6.71	16.23	6.43	16.14
Calotropis procera	2.56	2.74	88	5.91	15.10	5.98	14.63
Solanum nigram	0	0	0	0	0	0	0
Datura metel	0.32	0.34	24	1.61	1.85	0.73	2.68
Grasses							
Andropogon ischaemum	15.20	16.29	100	6.71	14.27	5.66	28.66

Cynodon dactylon	19.20	20.58	100	6.71	18.60	7.37	34.66
Andropogon contortus	2.44	2.61	55	3.69	5.38	2.13	8.43
Cymbopogon jawarancusa	9.48	10.16	70	4.70	9.79	3.88	18.74
Cyparus pilosus	4.32	4.63	60	4.02	6.40	2.53	11.18
Digiteria hicornis	8.20	8.79	80	5.37	2.62	1.03	15.19
Crogrostis cynoneroides	14.20	15.22	100	6.71	13.80	5.47	27.40

Table VI: Punjab Urial population observed in Kala Chitta range in December, 2011.

Sr. No.	Locality	Observed Population			Total Population
		Male	Female	Lamb	
1	Sojhanda	4	3	0	7
2	Ganda kus	2	1	2	4
3	Kali Dilli	2	3	2	7
4	Dhok Mori	1	1	0	1
5	Nara	2	0	0	1
6	Sagri	1	1	0	2
7	Muriala	2	1	0	1
8	Lalu Bangla	0	2	1	4
9	Bagh e Neelaab	1	2	1	3
10	Surg	1	0	0	2
11	Choi	0	1	0	0
12	Mongiwali	0	0	1	2
13	Thatta	1	1	1	4
14	Jhalar	0	1	1	2
15	Bhatiot	0	0	0	0

Table VII: Punjab Urial population observed in Kala Chitta range in January, 2012.

Sr. No.	Locality	Observed Population			Total Population
		Male	Female	Lamb	
1	Sojhanda	4	3	0	7
2	Ganda kus	1	1	2	4
3	Kali Dilli	2	3	2	7
4	Dhok Mori	0	1	0	1
5	Nara	1	0	0	1

6	Sagri	1	1	0	2
7	Muriala	1	0	0	1
8	Lalu Bangla	1	2	1	4
9	Bagh e Neelaab	0	2	1	3
10	Surg	1	1	0	2
11	Choi	0	0	0	0
12	Mongiwali	0	1	1	2
13	Thatta	2	1	1	4
14	Jhalar	0	1	1	2
15	Bhatiot	0	0	0	0

Table VIII: Punjab Urial population observed in Kala Chitta range in February, 2012.

Sr. No.	Locality	Observed Population			Total Population
		Male	Female	Lamb	
1	Sojhanda	4	2	0	6
2	Ganda kus	2	1	1	4
3	Kali Dilli	2	3	1	6
4	Dhok Mori	0	0	0	0
5	Nara	1	1	0	2
6	Sagri	2	1	0	3
7	Muriala	1	1	0	2
8	Lalu Bangla	1	2	1	4
9	Bagh e Neelaab	0	2	0	2
10	Surg	1	1	0	2
11	Choi	0	1	2	3
12	Mongiwali	0	0	0	0
13	Thatta	2	1	1	4
14	Jhalar	1	1	0	2
15	Bhatiot	0	2	2	4

Table IX: Punjab Urial population observed in Kala Chitta range in March, 2012.

Sr. No.	Locality	Observed Population			Total Population
		Male	Female	Lamb	
1	Sojhanda	3	2	2	7
2	Ganda kus	1	1	2	4
3	Kali Dilli	2	3	0	5
4	Dhok Mori	1	1	2	4
5	Nara	0	0	0	0

6	Sagri	1	1	0	2
7	Muriala	1	1	1	3
8	Lalu Bangla	1	2	3	6
9	Bagh e Neelaab	0	1	0	1
10	Surg	1	0	0	1
11	Choi	1	3	2	6
12	Mongiwali	0	0	0	0
13	Thatta	2	1	3	6
14	Jhalar	1	1	0	2
15	Bhatiot	0	0	0	0

Table X: Punjab Urial population observed in Kala Chitta range in April, 2012.

Sr. No.	Locality	Observed Population			Total Population
		Male	Female	Lamb	
1	Sojhanda	3	2	1	6
2	Ganda kus	1	1	2	4
3	Kali Dilli	2	3	2	7
4	Dhok Mori	1	1	1	3
5	Nara	0	0	0	0
6	Sagri	1	1	1	3
7	Muriala	1	1	0	2
8	Lalu Bangla	1	2	2	5
9	Bagh e Neelaab	2	3	4	9
10	Surg	0	0	0	0
11	Choi	1	3	2	6
12	Mongiwali	0	0	0	0
13	Thatta	2	1	3	6
14	Jhalar	1	1	1	3
15	Bhatiot	2	0	0	2

Table XI: Summary of Punjab Urial population observed in Kala Chitta range.

Sr. No.	Locality	Observed Population		Average Population
		Minimum	Maximum	
1	Sojhanda	6	9	7.5
2	Ganda kus	4	5	4.5
3	Kali Dilli	5	7	6
4	Dhok Mori	0	4	2
5	Nara	0	2	1
6	Sagri	2	3	2.5
7	Muriala	1	4	2.5
8	Lalu Bangla	4	6	5
9	Bagh e Neelaab	1	9	5
10	Surg	0	2	1
11	Choi	0	6	3
12	Mongiwali	0	2	1
13	Thatta	4	6	5
14	Jhalar	2	3	2.5
15	Bhatiot	0	4	2

Table XII: Estimation of Punjab Urial in Kala Chitta range in December, 2011.

Sr. No.	Locality	Number	Remarks
1	Sojhanda	5	Four adults with a lamb
2	Ganda kus	3	Two adults with a lamb
3	Kali Dilli	4	Four adults
4	Dhok Mori	2	Two adults
5	Nara	3	Two adults with a lamb
6	Sagri	2	Two adults
7	Muriala	4	Two adults with two lambs
8	Lalu Bangla	3	Two adults and a lamb
9	Bagh e Neelaab	4	Four Adults
10	Surg	2	Two adults
11	Choi	4	Four adults
12	Mongiwali	4	Four adults
13	Thatta	3	Two adults with a lamb
14	Jhalar	2	Two adults
15	Bhatiot	0	--

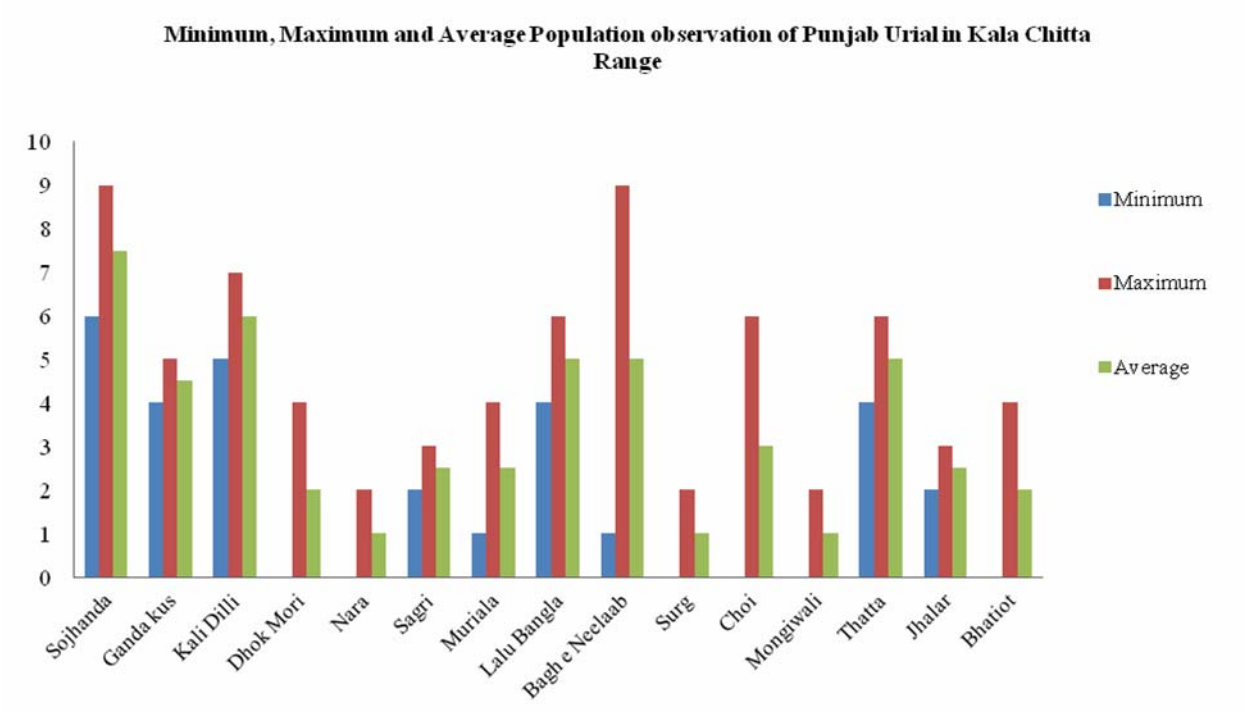

Figure 4 Estimation of Punjab Urial Population from direct observations in fifteen localities of Kala Chitta.

Table XIII: Estimation of Punjab Urial in Kala Chitta range in January, 2012.

Sr. No.	Locality	Number	Remarks
1	Sojhanda	6	Six adults
2	Ganda kus	4	Four adults
3	Kali Dilli	2	Two adults
4	Dhok Mori	2	Two adults
5	Nara	4	Two adults with two lambs
6	Sagri	3	Two adults with a lamb
7	Muriala	2	Two adults
8	Lalu Bangla	3	Two adults with a lamb
9	Bagh e Neelaab	3	Two adults with a lamb
10	Surg	2	Two adults
11	Choi	4	Two adults with two lambs
12	Mongiwali	3	Two adults with a lamb
13	Thatta	2	Two adults
14	Jhalar	2	Two adults
15	Bhatiot	0	--

Table XIV: Estimation of Punjab Urial in Kala Chitta range in February, 2012.

Sr. No.	Locality	Number	Remarks
1	Sojhanda	4	Four adults
2	Ganda kus	2	Two adults
3	Kali Dilli	3	Three adults
4	Dhok Mori	5	Three adults with two lambs
5	Nara	2	Two adults
6	Sagri	4	Two adults with two lambs
7	Muriala	3	Three adults
8	Lalu Bangla	2	Two adults
9	Bagh e Neelaab	4	Four adults
10	Surg	2	Two adults
11	Choi	3	Two adults with a lamb
12	Mongiwali	3	Two adults with a lamb
13	Thatta	3	Three adults
14	Jhalar	2	Two adults
15	Bhatiot	2	Two adults

Table XV: Estimation of Punjab Urial in Kala Chitta range in March, 2012.

Sr. No.	Locality	Number	Remarks
1	Sojhanda	6	Four adults with two lambs
2	Ganda kus	3	Three adults
3	Kali Dilli	4	Three adults with a lamb
4	Dhok Mori	4	Three adults with a lamb
5	Nara	0	--
6	Sagri	2	Two adults
7	Muriala	3	Two adults with a lamb
8	Lalu Bangla	5	Three adults with a lamb
9	Bagh e Neelaab	2	Two adults
10	Surg	2	Two adults
11	Choi	4	Two adults with a lamb
12	Mongiwali	0	--
13	Thatta	3	Three adults
14	Jhalar	2	Two adults
15	Bhatiot	0	--

Table XVI: Estimation of Punjab Urial in Kala Chitta range in April, 2012.

Sr. No.	Locality	Number	Remarks
1	Sojhanda	5	Four adults with a lamb
2	Ganda kus	4	Two adults with two lambs
3	Kali Dilli	2	Two adults
4	Dhok Mori	5	Three adults with two lambs
5	Nara	2	Two adults
6	Sagri	3	Two adults with a lamb
7	Muriala	4	Two adults with two lambs
8	Lalu Bangla	2	Two adults
9	Bagh e Neelaab	4	Four adults
10	Surg	3	Two adults with a lamb
11	Choi	4	Two adults with two lambs
12	Mongiwali	3	Three adults
13	Thatta	4	Four adults
14	Jhalar	3	Two adults with a lamb
15	Bhatiot	0	--

Table XVII: Summary of Punjab Urial population estimated in Kala Chitta range.

Sr. No.	Locality	Total Population of Punjab Urial Estimated		Average Population Estimation
		Minimum	Maximum	
1	Sojhanda	4	6	5
2	Ganda kus	2	4	3
3	Kali Dilli	2	4	3
4	Dhok Mori	2	5	3
5	Nara	0	4	2
6	Sagri	2	4	3
7	Muriala	2	4	3
8	Lalu Bangla	2	5	3.5
9	Bagh e Neelaab	2	4	3
10	Surg	2	3	2.5
11	Choi	3	4	3.5
12	Mongiwali	0	4	2
13	Thatta	2	4	3
14	Jhalar	2	3	2.5
15	Bhatiot	0	2	1

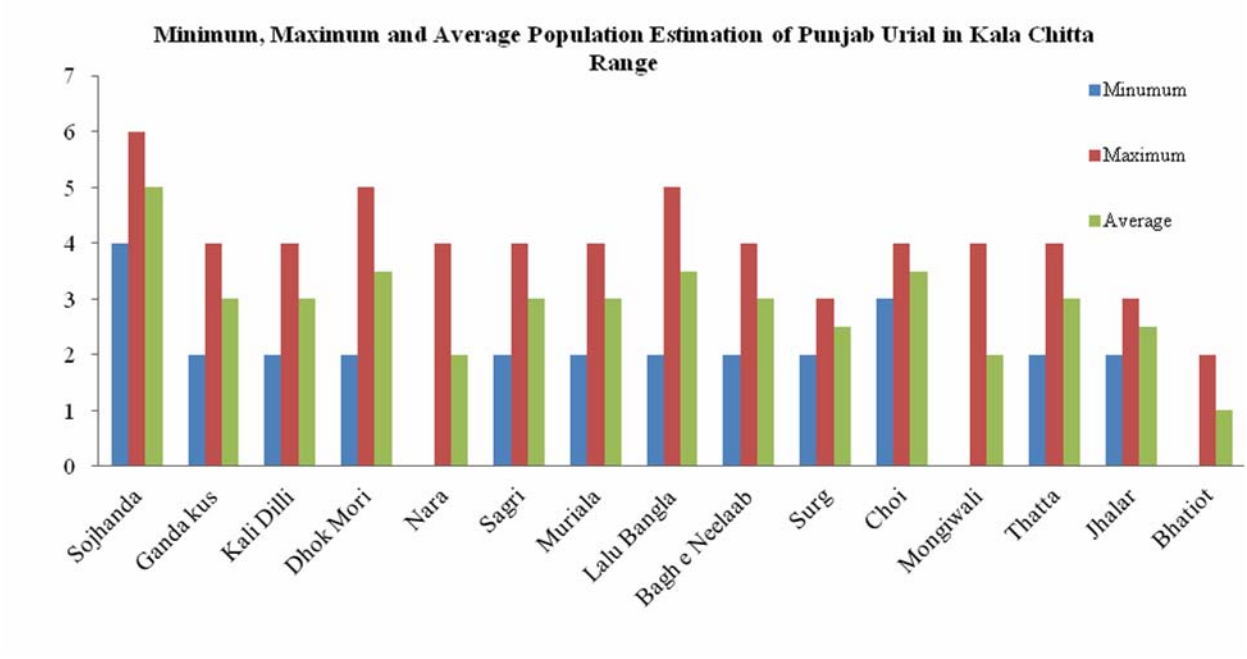

Figure 5 Estimation of Punjab Urial population from indirect observations in fifteen localities of Kala Chitta range.

DISCUSSION

The plants were represented by 20 species in the sectors including 8 trees species, 5 shrubs species as well as 7 grass species. By analyzing vegetation of Kala Chitta range on the basis of density, frequency and cover, it was concluded that *Dodonaea viscosa* was thedominant species in Kala Chitta range. Second and third dominant species were *Olea cuspidata* and *Acacia modesta,* respectively. Trees were dominant over shrubs and grasses. Population of Punjab Urial in Kala Chitta range was conducted from December, 2011 to April, 2012. No Urial population was seen at night, so some ideas were taken from local people. Mostly Punjab Urial was seen early in the morning and evening in the area near to Indus River. Some population was using water for drinking purpose from small dotted ponds scattered in the range. During direct observations, maximum population was seen in Sojhanda because of suitable habitat. Surg was the area with low population because of army, poachers and predators. In the time period of five months, minimum average population was 29 and maximum population of Urial was 72 while average population was 50.5. During indirect observation, the maximum individuals were estimated in Sojhanda because footprints and fecal pellets were obvious in the riverine area. Minimum population was estimated in the Bhatiot because of harsh vegetation and rigid soil. Minimum estimated average population was 27 and maximum was 60 with average population of 43.5. Threats for Urial population are mostly because of increasing human population along with decrease in food, shelter and other sources. The following threats are observed for Urial population in the Kala Chitta range: habitat destruction, poaching, land erosion, livestock competition and hunting.

Conclusion

Total survey area was 85 km² in which 101 Urial individuals were observed. By indirect observations, density/km² was determined and in the area of 85 km², total 98 Urial individuals were estimated in Kala Chitta range, Attock district, Punjab, Pakistan. During direct observations, maximum population was seen in Sojhanda while Surg was the area with low population. Minimum average population was 29 and maximum population of Urial was 72 while average population was 50.5 in Kala Chitta range. During indirect observations, maximum individuals were estimated in Sojhanda and minimum population was estimated in the Bhatiot. Minimum estimated average population was 27 and maximum was 60 with average population of 43.5. In the area of 85 km², total 98 Urial individuals were estimated in Kala Chitta range, northern Pakistan.

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