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A Review on Markhor (Capra falconeri falconeri Wagner 1839) population trends (2016-2019) and community-based conservation in Toshi Shasha, Gehrait Goleen, Kaigah Kohistan Conservancies and Chitral Gol National Park, Khyber Pakhtunkhwa, Pakistan

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A Review on Markhor (*Capra falconeri falconeri* Wagner 1839) population trends (2016-2019) and community-based conservation in Toshi Shasha, Gehrait Goleen, Kaigah Kohistan Conservancies and Chitral Gol National Park, Khyber Pakhtunkhwa, Pakistan

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ABSTRACT

Purpose: Recognizing the dynamics of ungulate populations is vital because of their economic and ecological significance. The dry temperate ecosystem of Hindu Kush is one of the most remarkable and significant mountain ranges, which supports near threatened markhor population in districts Chitral and Kohistan of Pakistan. However, the current population trends and community-based management of markhor are data lacking or unrevealed, requiring a crucial need for research to examine. The central goal of this study is to review population trends (2016-2019) of markhor and community-based conservation in Toshi Shasha, Gehrait Goleen conservancies, Chitral Gol National Park in district Chitral and Kaigah conservancy in district Kohistan using well developed questionnaire.

Methodology: Review of existing record of Khyber Pakhtunkhwa Wildlife Department Pakistan through a well-developed questionnaire

Findings: The finding revealed that over a period of four years population of markhor enlarged to 5658 individuals, fawn population to 2185, female population to 1589, young population to 1491 and the trophy size male increased to 850. Community based conservation resulted 15 markhor trophy hunts in Toshi Shasha, Gehrait Goleen and Kaigah conservancies with gross income of USD 5770400 except Chitral Gol National Park where trophy hunting is not allowed under Khyber Pakhtunkhwa Wildlife and Biodiversity Act 2015.

Unique contribution to the theory, practice and policy: The author recommended that, As the government has fixed Markhor trophy hunting quota of hunting four animals per year in Khyber Pakhtunkhwa province of Pakistan. This quota of Markhor trophy hunting should not be fixed but should be based on population of Markhor with reference to trophy size male. The present quota of four Markhor trophy hunt need to be increase from 4 animals per year to 1% leading to 2% of the population of markhor. As the population of Markhor in Chitral Gol National Park Khyber Pakhtunkhwa Pakistan has been increased to 2926 individuals and have enlarged to buffer zone of the National Park. At least 1% of Markhor trophy hunts in buffer zone is recommended to support local community for their livelihood improvement and encouragement of the conservation. The community organizations should be strengthened in terms of establishing their offices, field equipment and mobility beside protection.

Key words: *Review, Markhor, population, community-based conservation*

1. INTRODUCTION

Pakistan is a significant country for diversity of wild caprine. The caprine species found in Pakistan, are divided in to 7 species with further sub division of 12 sub species **(**Hesse et al., 1977; Roberts, 1997). Grubb, (2005) reported that three subspecies of Markhor include *Capra falconeri falconeri*, Wagner 1839, *Capra falconeri megaceros*, Hutton 1842 and *Capra falconeri heptneri*, Zalkin 1945, while two other sub species of markhor include *Capra falconeri cashmiriensis*, Lydekker 1898 and *Capra falconeri jerdoni*, Hume 1875 have recognized by other sources. Shaller and Khan, (1975) reported two subspecies of markhor which are recognized as flared horned markhor (*Capra falconeri falconeri*) and straight horned markhor (*Capra falconeri magacerus*). Robert, (1977); Shaller and Khan, (1975) described that former Astor markhor (*Capra falconeri falconeri)* and Kashmir markhor (Capra *falconeri cashmiriensis)* are one species while straight horned markhor (*Capra falconeri magacerus*) include Kabal markhor (*Capra falconeri megaceros)* and Suleiman (*Capra falconeri jerdoni*).

However, markhor has been classified as near threatened by International Union for Conservation of Nature (2015) on Convention on International Trade in Endangered Species (CITES) Appendix-1, trade of markhor and its products are prohibited (Convention on International Trade in Endangered Species, 2015). In Pakistan, markhor is offered for trophy hunt (Shackleton, 2001; Schaller & Khan, 1975).

Schaller & Khan, (1975) reported occurrence of Kashmir markhor or flare-horned markhor in Swat, Chitral, Dir and straight-horned markhor to the south of Khyber Pass while Bhatnagar, (2009). Wildlife population surveys and applicable population dimensions are the two factors that effects population sustainability, wildlife conservation and management planning (Luikart et al., 2010). Increases in the number of time-series long enough to provide an adequate description of population fluctuations clearly show that population fluctuations vary widely among animals with similar longevities and rates of reproduction (Caughley & Krebs 1983; Gaillard et al., 2000). Population of wild goats is variable in period of cycles (Boyd et al, 1981). Population of ungulates decline due to the land changes and other human influence appeared to be fundamental cause (Ogutu et al., (2011). Many populations of large mammals are stable from year to year due to overcoming factors affecting population (Clutton-Brock et al., 1997).

Methodologies advances are needed to improve methods for estimating population trends (Buckland et al, 2000). Maintenance of sustainable wildlife populations is one of the primary purposes of wildlife management. Thus, it is important to monitor and manage population trend over time (Koons & James, 2006). Trophy hunting is one of the programs which supports conservation of endangered species and also initiate economic incentives without comprising on the growth of wildlife (Bond et al. 2004). Trophy hunting also plays its role in encouraging local community in income generation and reduction in poaching (Ali et al. 2015; Weinberg et al.1997). Trophy hunting is a source of income generation from various state and communal lands (Baldus & Cauldwell, 2004; Lindsey et al. 2006) while community-based management is one of the conservation measures (Hammer et al. 2008).

There may be a few studies conducted on review of population trends of markhor and community-based conservation (2016-2019) in Toshi Shasha, Gehrait Goleen conservancies

and Chitral Gol National park in district Chitral and Kaigah Kohistan in district Kohistan, Khyber Pakhtunkhwa, Pakistan

2. MATERIAL AND METHODS

2.1. Study area

The study area comprisedof Toshi Shasha, Gehrait Goleen conservancies and Chitral Gol National Park in district Chitral and Kaigah conservancy in district Kohistan.

2.1.1. Toshi Shasha conservancy

Toshi Shasha is located in district Chitral (Fig-1). The Toshi Shasha conservancy lies in between 35˚ 57′ 13″ N and 31˚ 48′ 51.70″ E with an area of 20000 hectares and is located to the northern east of Chitral town in the foot hills of Hindukush Mountains. This conservancy has boundaries in the with ridge between Shoghor, in the west with boundaries of Chitral Gol National Park, in the east with watershed line between Lotkoh River and Mastuj River and towards south is tehsil boundary between Lotkoh and Chitral. The distance from the main town Chitral to Toshi is 16 km. In 1979 the area was declared as a game reserve with an area of 1045 hectares but in December 16, 1998, it was re-notified as a community game reserve with a revised area of 20,000 hectares by adding additional areas (Ali et al., 2015)

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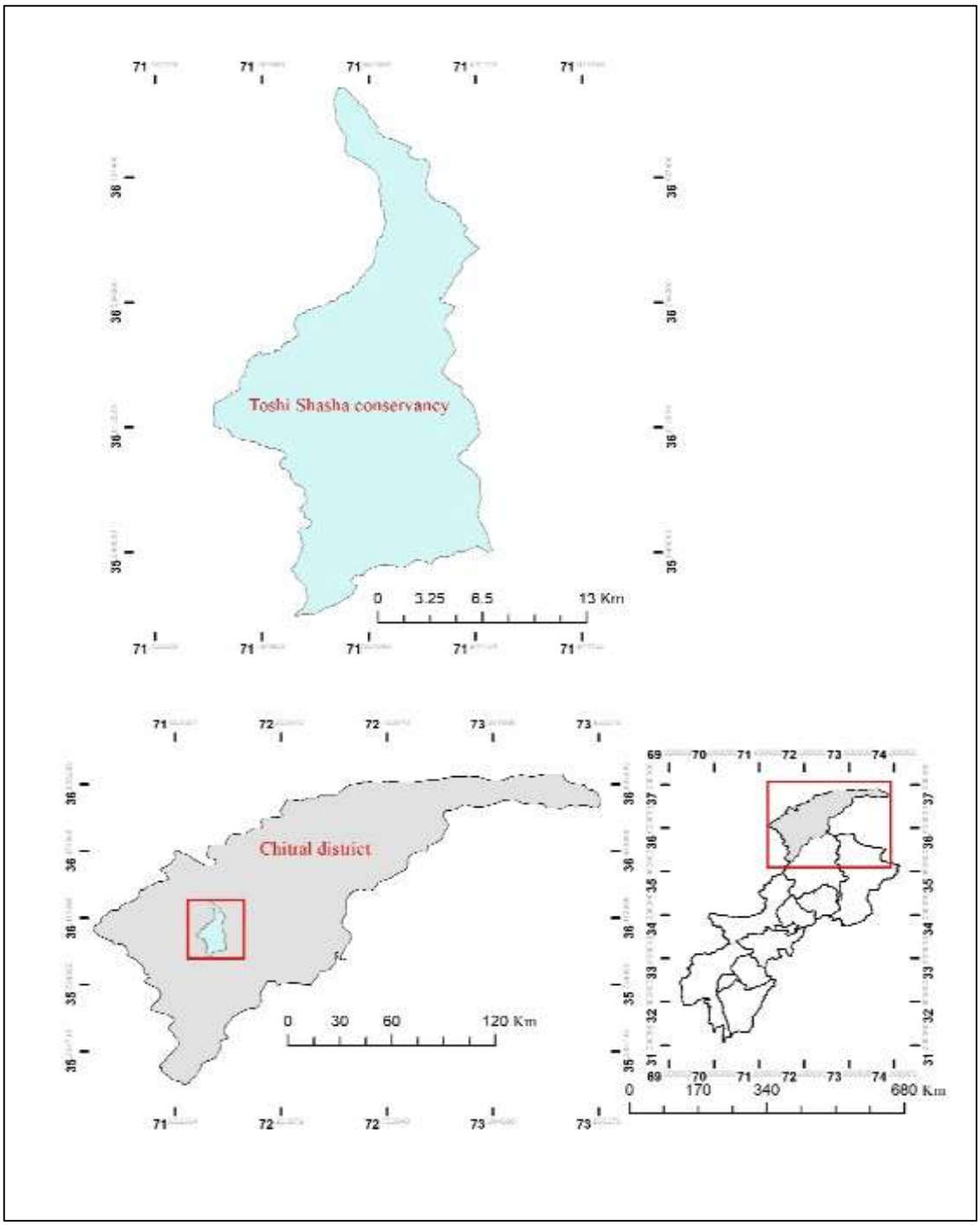

Fig-1: Location of Toshi Shasha Conservancy Chitral

2.1.2 Gehrait Goleen conservancy

Gehrait Goleen conservancy lies in between 35 ˚ 40 ′ 9.22 ″ N and 71 ˚ 45 ′ 59.07 ″ E with an area of 95000 hectares. (fig-2) In December 16, 1998 the area was declared as community game reserve. The area has boundaries in the north with River Chitral, ridge between Basqargol in the east, ridge between Shishikoh valley in the south and again River Chitral in the west. The area is rocky in terrain and supports flora of dry temperate zone with main

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species including *Quercus ilex, Cedrus deodara, pinus gerardiana* and other associated species. However, the dominant vegetation is oak.

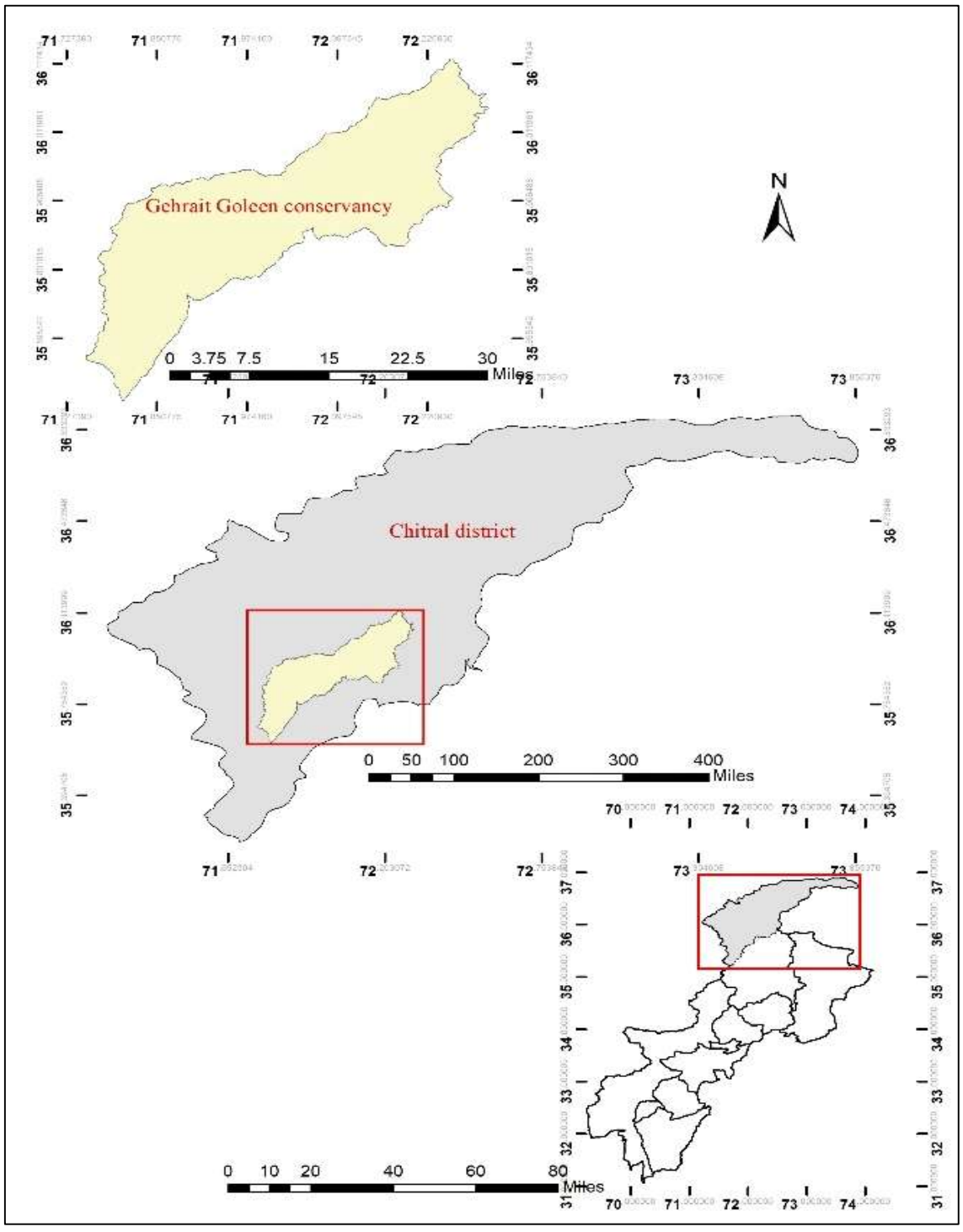

Fig-2: Location of Gehrait Goleen Conservancy Chitral

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2.1.3 Chitral Gol National Park

Chitral Gol National Park is situated at a distance of 3 km towards west of Chitral town and geographically located at 35º 51/ 0″ and 35º 57/ 0″ N Latitude and 71º 37/ 30 ″ and 71º 48/ 0″ E Longitude (fig-3) with elevation of 1553 meter to 4875 meters. Formerly, Chitral Gol was notified as wildlife sanctuary by Commissioner Malakand Division on 23 December 1971. Later on, in 1984 it was re-designated as National Park with boundaries towards north is ridge separating Lutkoh Tehsil and part of Singoor Gol, on the west is Lutkoh Tehsil and part of Chimersan Gol, in the south is Moleen Gol and Chimersan Gol and towards east is Singoor and Chitral River. The area of the core zone is 7750 hectares and buffer zone 34599 hectares. Chitral Gol National park supports diverse topography, fauna and flora. The park is unique due to occurrence of national flower (Jasmine), bird (Chukar), animal (Markhor) tree (Deodar). However, the dominant forest types are baloot (Quercus baloot) forest, deodar (Cedrus deodara) forest, chilghoza (*Pinus gerardiana*) forest, dry zone Juniper (*Juniperus excelsa*) forest, blue Pine (*Pinus wallichiana*) Forest, Salix (*Salix spp.)* Forest, Pastures, Valleys and Riparian Zone. The park supports more than 125 species of birds, 42 species of mammals, 8 species of reptiles and 13 species of amphibians. The topography of the park is highly rugged with steep slopes. The elevation varies between 1500 meters at Hyran kot and 4,950 meters at Dhuni Gol.

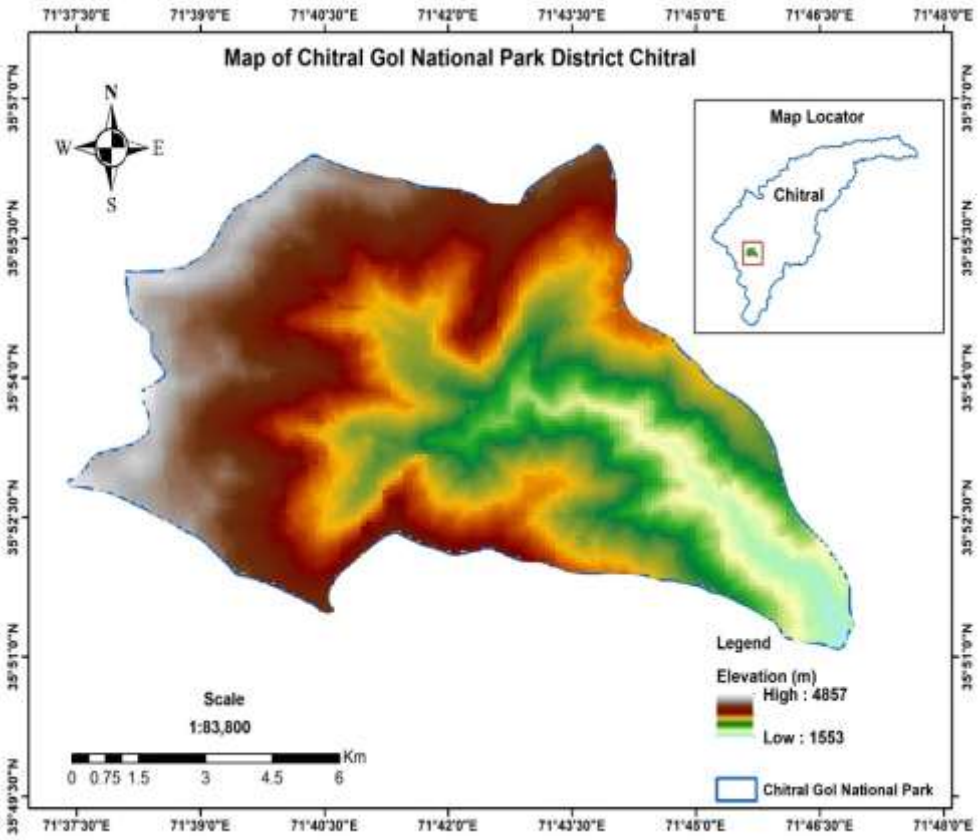

Fig-3: Location of Chitral Gol National Park district Chitral

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2.1.4 Kaigah conservancy

Kaigah conservancy has an area of 5000 hectares and positioned at a distance of about 20 kilometers from Kohistan upper district headquarter Dassu and located at 35º 25/ 30″ to 35º 22/ 30″ N Latitude and 73º 12/ 0 ″ to 73º 19/ 30″ E (fig-4). Kaigah valley was declared as a private game reserve on July 15, 2000. The reserve has boundaries in the north with ridge separating Shoori and Lotar sub-streams catchment, in the south with the ridge separating the watershed line of Chhar Gah, Barsin Gah and Kaigah sub-stream, in the east is the ridge separating the watershed line of Churi and MS Gah and in the west is Karakorum High Way (KKH). The lowest elevation in the valley is 1000 meters and the highest is 4500 meters. The conservancy represents temperate forests with transition zone of moist and dry temperate having rich biodiversity of temperate and alpine regions. The key plant species of the conservancy are *Cedrus deodara, Abies pindrow, Quercus ilex, Pinus gerardiana and Betula utilis.*

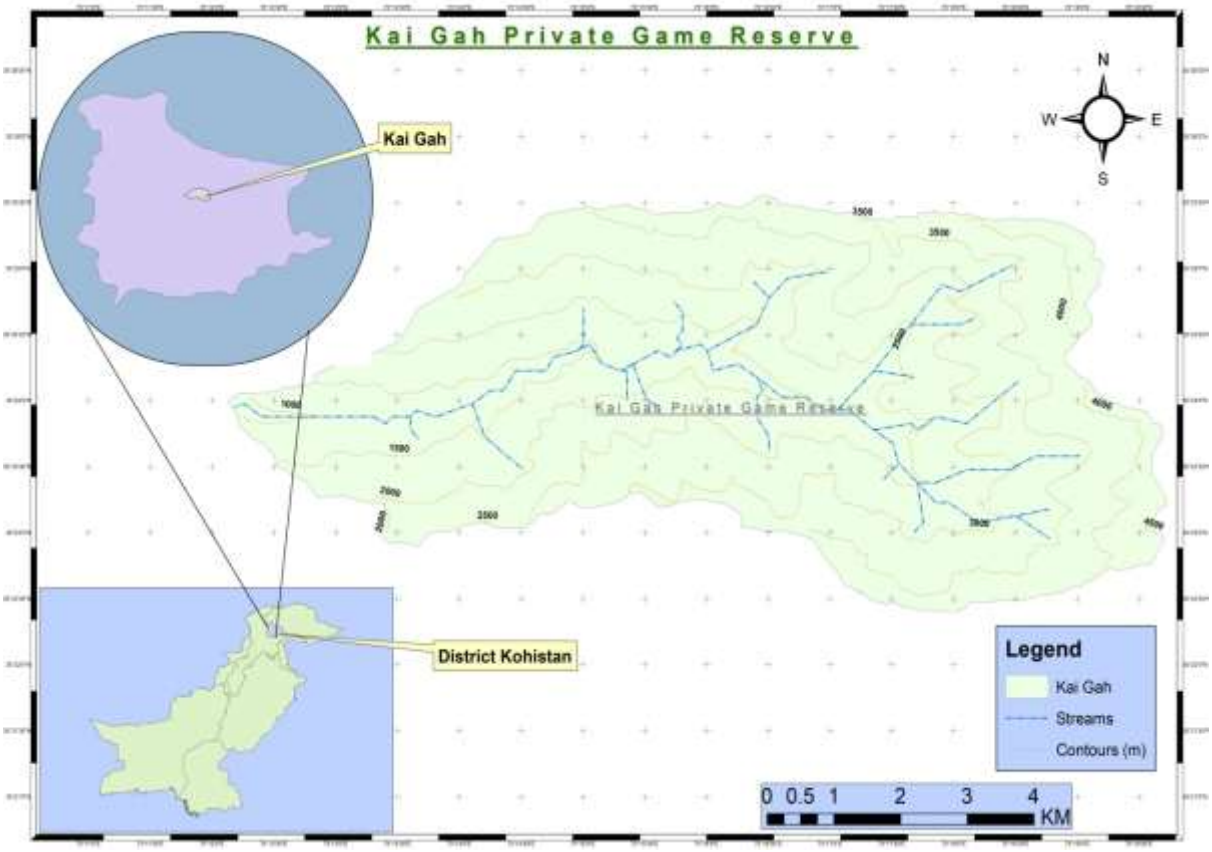

Fig-4: Location map of Kai Gah conservancy District Kohistan

3. METHODS

The researcher reviewed record on markhor population and community-based conservation in Toshi Shasha, Gehrait Goleen conservancies and Chitral Gol National Park and Kaigah conservancy from Khyber Pakhtunkhwa Wildlife Department through a well-developed questionnaire (Moser & Kalton, 1971; Shackleton, 2001) during June to August 2020. The Wildlife staff (10) in Khyber Pakhtunkhwa province of Pakistan include office Chief Conservator Wildlife Khyber Pakhtunkhwa (2), Conservator Wildlife Northern Circle Swat (2), Divisional Forest Officer Wildlife Chitral (2), Divisional Forest Officer Wildlife Kohistan (2) and Divisional Forest Wildlife Chitral Gol National Park (2) responded to the questionnaire (Annexture-1)

4. RESULTS

4.1 Markhor population trend

4.1.1 Population

The researcher recorded population trend of markhor (*Capra falconeri* Wagner*)* in Toshi Shasha, Gehrait Goleen conservancies, Chitral Gol National Park and Kaigah conservancy during the years 2016 to 2019 (table-1). Over four years, the population showed an up-ward trend in Toshi Shasha, Gehrait Goleen conservancies and Chitral Gol national Park. The population growth was 250 individuals in Toshi Shasha and 152 individuals in Gehrait Goleen and 552 in Chitral Gol National Park. The population remained fluctuated and a down ward trend by 58 individuals was found in Kaigah conservancy.

4.1.2 Fawn

The fawn populations showed a downward trend in Toshi Shasha conservancy and reduced with 126 individuals. In Gehrait Goleen Conservancy and Chitral Gol National Park the population of fawn showed an upward trend. The fawn population increased with 47 individuals in Gehrait Goleen and 318 individuals in Chitral Gol National Park. However, in Kaigah conservancy fluctuation was recorded in fawn population and the fawn population reduced by 30 individuals.

4.1.3 Female

The female population showed an up-trend in Toshi Shasha, Gehrait Goleen conservancies and Chitral Gol National Park. The female population increased with 47 individuals in Toshi Shasha, 21 individuals in Gehrait Goleen and 510 individuals in Chitral Gol National Park. In Kaigah conservancy the female population fluctuated and reduced by three (3) individuals.

4.1.4 Young male

The population of young males increased in Toshi Shasha and Gehrait Goleen conservancies while reduced in Chitral Gol National Park and Kaigah conservancy. The young male population increased by 332 individuals in Toshi Shasha and by 50 individuals in Gehrait Goleen conservancies. The population of young males shrunk by 330 individuals in Chitral Gol National Park. The population of young male remained fluctuated and a down ward trend by three (3) individuals was recorded in Kaigah conservancy.

4.1.5 Trophy size male

Trophy size males showed an up-ward trend in Toshi Shasha, Gehrait Goleen conservancies and Chitral Gol National Park. They increased by 72 individuals in Toshi Shasha, by 34 individuals in Gehrait Goleen and by 454 individuals in Chitral Gol National Park. In Kaigah Conservancy a down trend by 25 individuals was recorded.

Table-1: Markhor population in Toshi Shasha, Gehrait Goleen conservancies and Chitral Gol National Park Chitral during 2016 to 2019

Toshi Shasha conservancy					
Year	**Fawn**	**Female**	**Male**		**Total**
			Young	**Trophy size**	
2016	622	530	260	43	1455
2017	554	460	509	35	1558
2018	467	568	577	93	1705
2019	496	579	592	115	1782
Gehrait Goleen conservancy					
2016	181	163	121	17	482
2017	171	178	136	18	503
2018	193	207	188	45	633
2019	228	184	171	51	634
Chitral Gol National Park					
2016	954	233	973	214	2374
2017	649	649	605	291	2521
2018	1057	706	650	284	2692
2019	1272	743	643	668	2926
Kaigah Kohistan conservancy					
2016	159	86	88	41	374
2017	131	138	68	23	360
2018	104	95	59	25	283
2019	129	83	85	16	316

4.2 Community based conservation

4.2.1 Village Conservation Committees in Toshi Shasha conservancy

Conservation of Markhor is carried out through involvement of local community by establishing Village Conservation Committees (VCC) in Toshi Shasha conservancy. The existing total village conservation committees are 12 (table-2). Each committee has its executive body with members. Members are selected on the basis of one member per house hold. The members then elect their executive body normally comprises of 12 members with, a president/chairman, vice president/vice chairman, general secretary, finance secretary. The Village Conservation Committees in Toshi Shasha are 12 include VCC Pursan, VCC Bukthuli, VCC Oghder, VCC Kasat, VCC Bulyogh, VCC Kohra Lust Shali, VCC Seen, VCC Alburhan, VCC Kuju Payeen, VCC Shoghur, VCC Siwakth, VCC Madashil Karim Abad.

4.2.2 Village Conservation Committees Gehrait Goleen Conservancy

The Village Conservation Committees (VCC) in Gehrait Goleen conservancy are 13 (table-2) include VCC Keso Geldeh, VCC Kessu VCC Metrarjaowan, VCC Gehrai No.1, VCC Gehrait No. 2, VCC Gang Gehrait, VCC Syed Abad, VCC Broze, VCC Nerdet Danin, VCC Kaari, VCC Koghuzi, VCC Goleen, VCC Jughor.

4.2.3 Kaigah Valley Conservation Committee

Kaigah valley conservation committee was organized during May 2000. Markhor Trophy hunting initiated during 2005 with the concept of community-based management. The committee comprises of a President, General Secretary, Finance secretary and 10 members (table-2).

4.2.4 Chitral Gol Community Development and Conservation Association (CGCDCA)

Chitral Gol Community Development and Conservation Association is the existing umbrella organization resulted from the existing twelve (12) Village Conservation Committees (VCC) and eleven (11) women village conservation committee (WVCC) in 2005 (table-2). This organization is jointly working with Khyber Pakhtunkhwa Wildlife Department for conservation and preservation of natural fauna and flora of Chitral Gol National Park. The organization is registered under companies Act 1984 and Khyber Pakhtunkhwa Social Welfare Department Chitral bearing registration No.758 in November 2009. The board of directors govern the CGCDCA. The directors of the board appoint the chairman of the board with 14 members (directors)

Table-2: Community involvement in conservation

Conservancy/National Park	No. of VCC	No. of Women VCCs	Executive body members per VCC
Toshi Shasha conservancy	12	-	12
Gehrait Goleen conservancy	13	-	12
Kaigah conservancy	01	-	13
Chitral Gol National Park	12	11	12

4.3 Income generation

A total of 15 markhor trophy hunts were successfully carried out in three conservancies include Toshi Shasha, Gehrait Goleen and Kaigah in Khyber Pakhtunkhwa province of Pakistan during 2016-17 to 2019-20 (table-3). Highest Markhor trophy hunts remained four (4) during the years 2017-18 to 2019-2020 while three (3) hunts were carried during 2016-17. Consequently, a total of USD 5770400 revenue was earned by the Khyber Pakhtunkhwa Wildlife Department Pakistan during 2016-17 to 2019-20, out of which 80% (USD 4616320) was paid to the local community as their due share and the remaining 20 % (USD 1154080) was kept by the government. The highest revenue was earned during the year 2019-20 with USD 4873600.

Table-3: Revenue generated from markhor trophy hunt during 2016-2019 in Toshi Shasha, Gehrait Goleen Chitral and Kaigah Kohistan conservancies Khyber Pakhtunkhwa Pakistan

Year	Markhor trophy hunts	Community share 80% (USD) of the total revenue	Govt: share 20% (USD) of the total revenue	Total revenue (USD)
2016-17	3	186800	46700	233500
2017-18	4	257040	64260	321300
2018-19	4	273600	68400	342000
2019-20	4	3898880	974720	4873600
Total	15	4616320	1154080	5770400

5. DISCUSSION

Worldwide adult markhor population was assessed to be less than 2500 individuals (Valdez, 2008) while Weinberg et al., (1997) reported less than 100 individuals and their occurrence in highly fragmented populations. Bhatnagar, 2009 reported occurrence of the flare horned Markhor *Capra falconeri* in Northern Pakistan. Robert, (1977) reported markhor occurrence, habitat selection, distribution, range, habitat types in Pakistan. Ali, (2008) reported an upward trend in population of markhor in the northern parts of the Khyber Pakhtunkhwa. Numerous researchers conducted studies on wildlife population trend include; Smallwood and Fitzhugh 1995; George, et al., 2004, Sauer, J. R et al., 1994: Steinmetz, R et al., 2010; Danilkin, A. A. 2020; Kamgaing et al., 2019; Millsap, B. A. et al., 2013; Lopez, R. R. et al., 2004.

The markhor populations are threatened with habitat loss (IUCN, 2000), positive trend in human population (Shackleton, 2001; Burrard, 1925; Stockley, 1936); poaching and competition with livestock population (Johnson, 1998; Woodford et al. 2004; IUCN, 2000; GoNWFP and IUCN, 2004). Arshad et al., (2012a); Schaller and Khan, (1975) reported competition with livestock, predation by carnivores, loss of habitat, natural calamities as main threats to markhor population. Schaller, (1976) reported that Kashmir markhor is threatened. Weinberg et al., (1997) studied that various factors responsible for increase in population of markhor are improved conditions of range and control overgrazing of livestock.

Schaller and Khan (1975) and Roberts (1977) explained occurrence, habitat selection of flared horned markhor and straight-horned markhor in Pakistan. Robert (1997) reported habitat types, distribution, range, occurrence of markhor. Schaller (1976) reported Kashmir markhor as threatened species. Weinberg et al. (1997) reported conservation status of Heptner's Markhor (*Capra falconeri heptneri*) in the Kugitang Nature Reserve, eastern Turkmenistan. Ali**, (**2008) carried out studies on markhor (*Capra falconeri*) in the northern parts of North West Frontier Province, Pakistan. Bhatnagar et al., (2009) studied occurrence of flare-horned markhor *(Capra falconeri falconeri)* in, Northern Pakistan, Afghanistan, Uzbekistan and India. Castello, (2016) also reported occurrence of Bukhara, Tadjik or Russian markhor (*Capra falconeri haptneri)* in Uzbekistan.

The results of the present study reveal that over four years from 2016 to 2019 population of markhor expanded to 5658 including 1782 in Toshi Shasha conservancy, 634 in Gehrait Goleen conservancy, 2926 in Chitral Gol Nation Park and reduced to 316 in Kaigah

conservancy. The fawn population enlarged to 2185 which remained fluctuated in Toshi Shasha conservancy with 496, increased to 228 in Gehrait Goleen conservancy and also expanded with 1278 in Chitral Gol National Park and reduced to 129 in Kaigah conservancy. The female population extended to 1589 with 579 in Toshi Shasha, 184 in Gehrait Goleen, 743 in Chitral Gol National Park and 83 in Kaigah conservancy. The young population widened to 1491 include increase to 592 in Toshi Shasha conservancy, 171 in Gehrait Goleen conservancy, reduction 643 in Chitral National Park and 85 in Kaigah conservancy. The trophy size markhor increase to 850, out of which 115 increase occurred in Toshi Shasha conservancy, 51 in Gehrait Goleen conservancy, 668 in Chitral National Park and reduction to 16 Kaigah conservancy.

This present study is in conformity with the studies carried out by IUCN and MACP (Arshad et al., 2012a). Khan, et al. (2018) described 162 flare horned markhor explaining composition of female, male, adults and kids in Jutial conservancy district Gilgit in Gilgit Baltistan. Frisina et al (2000) assessed 1,684 Suleiman markhor in Torghar project area. Weinberg et al. (1997) documented 227 Heptneri markhor in Kugitang Nature Reserve of Eastern Turkmenistan. Kakakhel, SFB et al (2017) reported 84 markhor in Kalam valley and 52 in Mankial valley with population structure of male, female, adults, young and yearlings. Kakakhel, SFB (2020) reported 1878 markhor in Toshi Shasha and Gehrait Goleen conservancies include 1423 in Toshi Shasha conservancy and 455 in Gehrait Goleen conservancy with population structure include male, female, adults and fawns in different age classes.

Markhor conservation is practiced through community participation in the form of Village/Valley Conservation Committees (VCCs) in Toshi Shasha with twelve (12) VCCs, Gehrait Goleen (13), Kaigah Conservancies one (1) and Chitral Gol National Park twelve (12) Men VCCs and eleven (11) Women VCCs under the umbrella of a cluster organization the Chitral Gol Community Development and Conservation Association. A total of 15 markhor trophy hunt were carried out during the years 2016-17 to 2019-20 in Toshi Shasha, Gehrait Goleen, Kaigah conservancies with gross income of USD 5770400. Out of the total revenue generated 80% (USD 4616320) was paid to the community as their due share and the remaining 20 % (1154080) was kept by the government as token money.

While trophy hunting is not allowed in Chitral Gol National Park under Khyber Pakhtunkhwa Wildlife and Biodiversity Act 2015. Kakakhel, SFB (2020) studied that a total of 39 trophy hunt of markhor was carried over 18 years in Toshi Shasha conservancy Chitral and on average US$ 123255 annual income was made, out of which 80 % as a due share of the community was paid and was financed in community livelihood 50 projects and an amount of Rs.61.385 Million (US$ 385463) was also saved in community bank accounts. Out of the gross income the remaining 20 % was kept by the government as token money. Many researchers carried out alike studies on trophy hunting. Trophy hunting is conducted in Africa with participation from 23 countries (Lindsey et al. 2007). South Africa earn US $ 100 million income from trophy hunting each year, Namibia generate US $ 28.5 million per year (PHASA, 2006), Zimbabwe (US $ 16 million) and Botswana (US $ 20 million) per year (Chardonnet, 2002). Trophy hunting plays a key role in wildlife conservation and development of rural communities (Muposhi et al., 2016). The trophy hunting programs in Pakistan aims to defend large mammals and their habitats including caprine along with

delivering viable benefits to the community for their involvement in conservation efforts, the program is evolving and fruitful but require backing for supportable conservation (Shackleton, 2001).

6. CONCLUSION

The results of the present study reveal over four years from 2016 to 2019 population of markhor enlarged in Toshi Shasha, Gehrait Goleen conservancies, Chitral Gol Nation Park and decrease in Kaigah Kohistan Conservancy. The fawn population enlarged in Toshi Shasha conservancy, Gehrait Goleen conservancy, Chitral Gol National Park and reduced in Kaigah Kohistan conservancy. The female population extended in Toshi Shasha, Gehrait Goleen, Chitral Gol National Park and Kaigah conservancy. The young population widened in Toshi Shasha conservancy, Gehrait Goleen conservancy, reduced in Chitral National Park and Kaigah conservancy. The trophy size male markhor increased in Toshi Shasha conservancy, Gehrait Goleen conservancy, Chitral National Park and reduced in Kaigah conservancy. The findings also show that fluctuation occurred in population structure of markhor. The males in the study area are rich enough to inseminate females. The rise and fall in the population structure may be due to the anthropogenic and natural factors, association concerning sex ratio, parental lifecycle, relationships and characteristics, competition for resource, late calving which may result in high-level wintertime mortality.

Markhor conservation is practiced through community participation in the form of Village/Valley conservation committees (VCCs) in Toshi Shasha, Gehrait Goleen, Kaigah Kohistan Conservancies and Chitral Gol National Park. A total of 15 markhor trophy hunt were carried out during the years 2016-17 to 2019-20 in Toshi Shasha, Gehrait Goleen, Kaigah conservancies and significant gross income of USD 5770400 was made. While trophy hunting is not allowed in Chitral Gol National Park under Khyber Pakhtunkhwa Wildlife and Biodiversity Act 2015. Keeping in view the total population of markhor with reference to trophy size males necessitate enhancing markhor trophy hunting quota from four (4) every year in Khyber Pakhtunkhwa to 1 %- 2%. Over the time because of climate change and related disaster, the habitats are degrading and natural springs are also shrinking. Specific measures like bioengineering structures and check dams essential to be deliberated and applied so as to recover the habitat and springs. The results of this study may enable conservation organization in managing this species and its habitat.

7. RECOMMENDATIONS

i. As the government has fixed Markhor trophy hunting quota of hunting four animals per year include two animals for Toshi Shasha conservancy district Chitral, one for Gehrait Goleen conservancy district Chitral and one for Kaigah conservancy district Kohistan in Khyber Pakhtunkhwa province of Pakistan. This quota of Markhor trophy hunting should not be fixed but should be based on population of Markhor with reference to trophy size male. The present quota of four Markhor trophy hunt need to be increase from 4 animals per year to 1% leading to 2% of the population of markhor.
ii. As the population of Markhor in Chitral Gol National Park Khyber Pakhtunkhwa Pakistan has been increased due to the efforts of Khyber Pakhtunkhwa Wildlife

Department Pakistan and community based conservation to 2926 number of markhor and have enlarged to buffer zone of the National Park. At least 1% of Markhor trophy hunting in buffer zone is recommended to support local community for their livelihood improvement and further encouragement of the community-based conservation.

iii. The community organizations should be strengthened in terms of establishing their offices, field equipment and mobility beside protection.

Annexture-1: Questionnaire

S.N	Questions
I.	**Markhor population**
a.	Year wise population of Markhor 2016-2019?
b.	Year wise fawn population 2016-2019?
c.	Year wise female population 2016-2019?
d.	Year wise young population 2016-2019?
e.	Year wise trophy size male population 2016-2019?
II.	**Community based conservation**
a.	Process of community organization?
b.	No. of Village Community Organizations (VCCs)?
c.	No. of Women Village Community Organization (WVCCs)?
d.	No. of Executive members per VCC?
e.	No. of cluster organization if any?
III.	**Income generation**
a.	No. of Markhor trophy hunt per year for 2016-17 to 2019-20?
b.	Income generated in USD per year for 2016-17 to 2019-20?
c.	Percent community share per year in USD 2016-17 to 2019-20?
d.	Percent Govt: share in USD per year for 2016-17 to 2019-20?

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