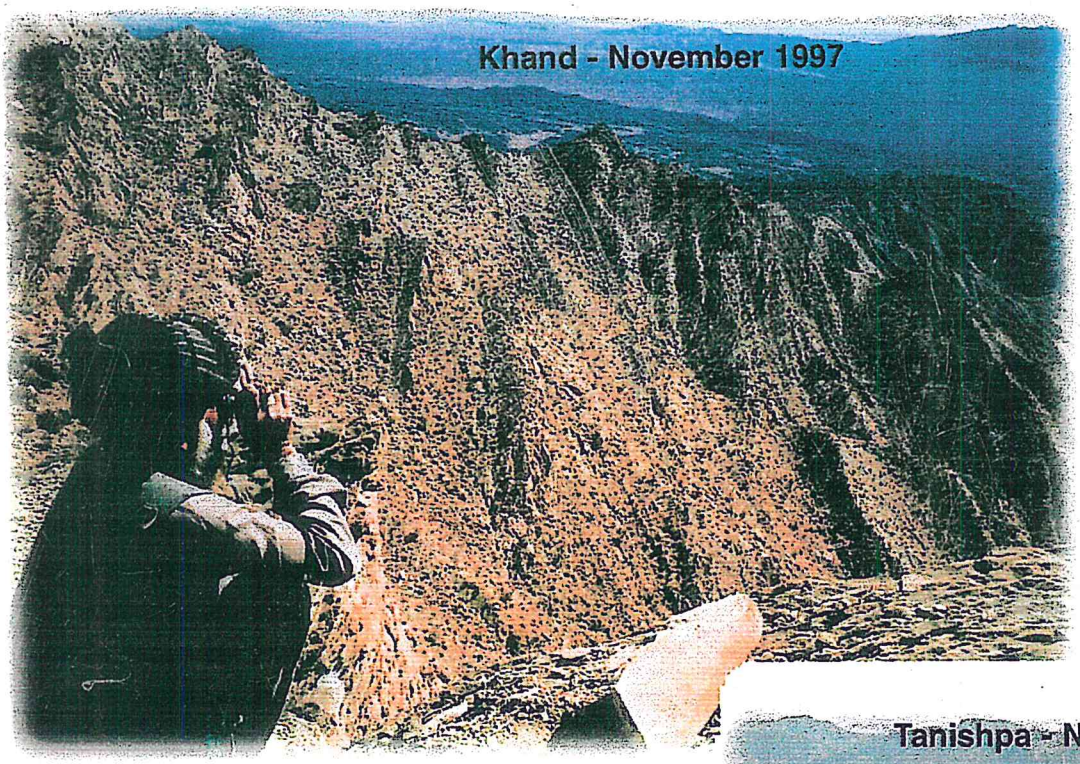
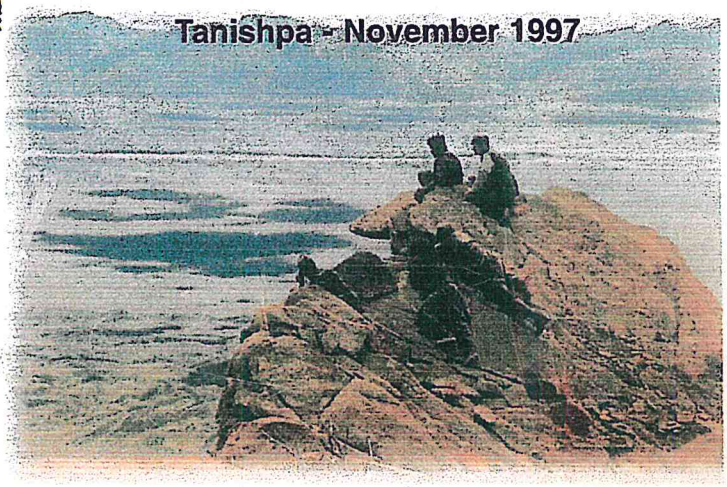
Population Trend Of Suleiman Markhor *(Capra falconeri jerdoni)* And Afghan Urial *(Ovis orientalis cycloceros)* With Reference To Habitat Conditions Torghar Hills, Baluchistan Province Pakistan

A Report To The United States Fish and Wildlife Service
Office of International Affairs And
Society for Torghar Environmental Protection (STEP)


Khand - November 1997


Tanishpa - November 1997

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INTRODUCTION

In 1984, tribal leaders concerned with the decline of Suleiman markhor (*Capra falconeri jerdoni*) and Afghan urial (*Ovis orientalis cycloceros*) in the Torghar Hills of Baluchistan Province, Pakistan, sought assistance from wildlife biologists in the USA. From this association the Torghar Conservation Project (TCP) developed (Johnson 1998). The TCP was maintained informally until 1994, when an officially registered non-governmental organization, the Society for Torghar Environmental Protection (STEP), was established to administer the TCP. The TCP's primary goal is the conservation of markhor and urial. The TCP employs local tribesmen, who refrain from hunting in exchange for employment as game guards charged with prevention of poaching in the Torghar Hills. The project has effectively eliminated poaching, especially within the "core protected area" (Johnson 1998).

To monitor effectiveness of the project, STEP, conducted a systematic survey of markhor and urial populations in the Torghar area during November 1994. Professional biologist Kurt Johnson assisted STEP, through the U.S. Fish and Wildlife Service Special Foreign Currency Program in Pakistan. Johnson (1998) estimated populations of 695 Sulaiman markhor and 1,173 Afghan urial in the TCP area. As a follow up to the 1994 surveys and to establish markhor and urial population trend, a field survey was carried out with STEP in November 1997. This paper presents the results of the 1997 surveys, compares the 1997 data with that reported for 1994, and generally describes habitat conditions for markhor and urial in the TCP area.

STUDY AREA

The TCP lies within the Torghar Hills, Toba Kakar Range, of Baluchistan Province, in west central Pakistan near the southwest border with Afghanistan (Figure 1).

Physical Features

The Torghar Hills are a series of very rugged upturned ridges composed of sedimentary

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APPENDIX A. Figure 2, Page 7 of Johnson (no date)

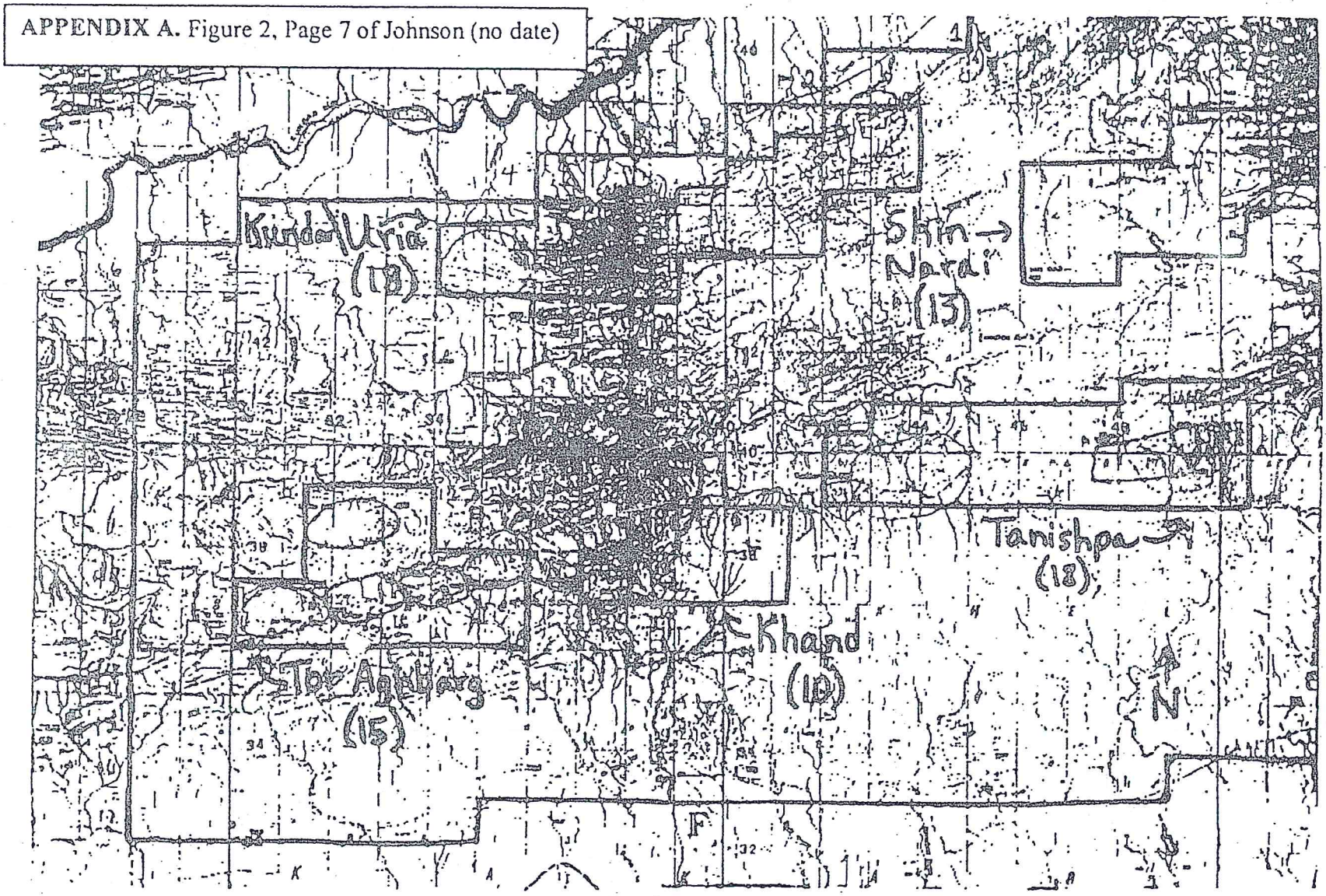

Figure 2. Major survey areas within the core protected area of the Torghar Conservation Project. Numbers in parentheses represent the number of 1,000-yard x 1,000-yard blocks contained within each major survey area.

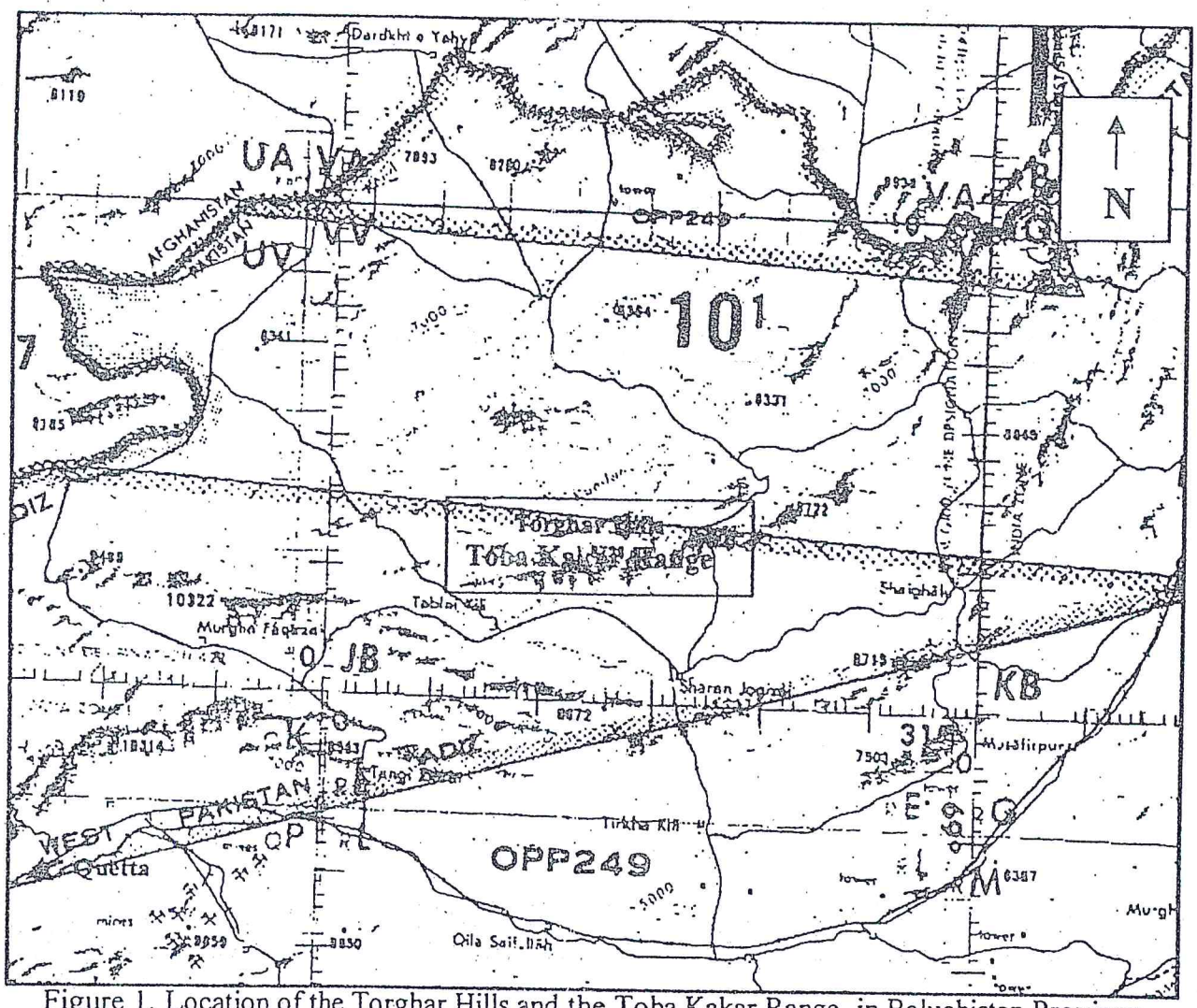

Figure 1. Location of the Torghar Hills and the Toba Kakar Range in Baluchistan Province Pakistan. From Defense Mapping Agency Aerospace Center, Map ONC, H-8, 8. Scale 1:1,000,000

materials. The ridges are approximately 90 km long and vary from about 15 to 30 km in width. Johnson (1998) described the TCP as a 300 km-area consisting of three parallel ridges separated by two NE-running stream drainages. The southernmost ridge has a north-facing slope that gradually rises to an elevation of 2,800 meters, and is dissected by a several deeply incised drainages. The southfacing slopes drop precipitously from the ridge forming a series of step-like cliffs to the Khaisore Valley. The northern ridges consist of steeply upturned rock layers resembling a series of parallel, jagged-toothed combs.

Climate

The climate is dry, with cold winters and warm summers. Violent dust and thunderstorms occur during summer months (Superintendent of Government Printing, Calcutta 1991). During

July and August, the mean temperature is about 26° C. During winter, the temperature averages about 4° C. Strong winds are common. Total annual precipitation within the region varies from 18 to 27 centimeters. Most precipitation occurs between December and March.

Vegetation

Shrub-steppe plant communities dominate the semi-desert landscape of the Torghar Hills. Bunchgrasses, forbes, almond bushes (*Prunus dulcis*), *Ephedra*, *Artemesia*, and other shrubs occur along upland slopes with *Cargana* and *Tamarix* common in low lying areas and drainage ways where water is available. Wild rhubarb (*Rheum sp.)* is common in the highlands during years of good rainfall. Trees are not common, but juniper (*Juniperus macropoda*) and wild pistachio trees (*Pistacia macropoda*) are scattered across the landscape. The Baluchistan Gazetteer (Superintendent of Government Printing, Calcutta 1991) provides a general description of the flora within Baluchistan Province.

Agriculture

The predominant human land use is livestock herding with cultivated orchards of fruit and nut trees common in valley bottoms near human settlements. Herds of domestic goats, sheep, and camels are common. Cattle, donkeys, and horses also occur in limited numbers.

CONSERVATION STATUS

According to Roberts (1997) Suleiman markhor occur in low numbers and have a limited distribution in Pakistan, including the rugged mountains of western Pakistan. Afghan Urial are more widespread and common than Suleiman markhor, but are not abundant (Roberts 1997).

Suleiman markhor and Afghan Urial are protected from poaching within the TCP by STEP. Both species are also listed in the Third Schedule of The Baluchistan Wildlife Protection Act of 1974 as animals which can only be hunted under specific circumstances (Johnson 1998). Suleiman markhor are listed as "Endangered" under the U.S. Endangered Species Act (ESA) (Fish and Wildlife Service 1997) and are listed in Appendix 1 of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (Fish and Wildlife Service 1996). The Afghan urial is not listed on either ESA or CITES. All markhor are listed as "endangered" in the IUCN Red Data Book (IUCN 1996).

METHODS

Markhor and urial survey areas (Table 1), survey methods, and population estimate calculations closely follow those described by Johnson (1998). A seven-day survey was conducted from November 3 to November 9, 1997. November is the rutting season for Suleiman markhor and Afghan urial. This time period is similar to that used in 1994 (Johnson 1998). The same five major survey areas described by Johnson (1998) were used in this survey (Table 1, APPENDIX A). These spatially separated areas were selected to minimize the possibility of double counting.

Table 1. Size of survey areas and habitat quality reference within the Torghar Core Protected Area (Johnson 1998).

Survey Location	Area (sq. km.)*	Markhor	Urial
Tanishpa	15.0504	High Quality Habitat	High Quality Habitat
Shin Narai	10.8693	Low Quality Habitat	High Quality Habitat
Khand	8.361	High Quality Habitat	Low Quality Habitat
Tor Aghbarg	12.5415	Low Quality Habitat	High Quality Habitat
Kundar/Uria	15.0504	High Quality Habitat	Low Quality Habitat

*Converted to metric units using data in APPENDIX A (Johnson no date).

Each day during the survey, one or two survey teams of two to five people went into the field shortly after sunrise and selected a point from which to conduct the days survey. The same survey points selected by Johnson (1998) were used in this survey. Morning and afternoon hours were spent continuously surveying the area through binoculars and spotting scopes.

Data were recorded for the total number in each group and number in each sex or age category: lambs (.5 years old), adult females (1.5 years or older), adult males I (2.5 to 5.5 years of age), and adult males II (trophy animals of 6.5 years or more). It was not always possible to accurately classify animals observed at a distance, and some yearling males of both species may have been incorrectly classified as adult females. We were not able to consistently classify yearling females from adult females. The tribesmen were very good at classifying adult males at a distance.

Following Johnson (1998) population estimates for markhor and urial in the core protected area and entire TCP were calculated using the following formula:

HQD X 300 sq. km. X %HGH

+

HLD X 300 sq. km. X %LQH

=

Estimated Population Size in Core Protected Area

HQD = Pop. density for High Quality Habitat
300 sq. km. = size remainder of core protected area
%HGH = % of area High Quality Habitat

HLD = Pop. density for Low Quality Habitat.
%LQH = % of area Low Quality Habitat

Johnson (1998) determined that 30 and 70 percent of the core protected area were high and low quality habitat for markhor, respectively. Urial habitat within the core protected area was similarly determined to be 40 and 60 percent high and low quality habitat respectively. The remainder of the TCP. in addition to the core protected area, was determined to be 650 sq. km. in size and all low quality markhor and urial habitat. The low quality habitat density figures for markhor and urial were applied to the remainder of the TCP then added to the estimates for the core protected area to arrive at TCP population estimates.

RESULTS AND DISCUSSION

Markhor

Four of the five locations surveyed in 1994 were re-surveyed in 1997 (Table 2, APPENDIX A). The Tor Aghbarg area was only partially surveyed during 1997. Since more markhor were observed in the portion of the area surveyed during 1997 than the entire survey area in 1994 (Table 2), the data were included. Therefore, numbers of markhor reported for Tor Aghbarg in 1997 should be considered conservative.

Population Trend

During 1997, 201 markhor were observed in the same areas in which 92 markhor were observed in 1994 (Table 1). In 1994, 135 markhor were observed during a survey of all five observation areas (Johnson, 1998). In 1997, three of the five areas were surveyed intensively and a fourth partially; 201 markhor were observed. Population trend is definitely upwards. The data indicate a +118 percent change between 1994 and 1997.

Population Density

Methods and habitat classifications provided by Johnson (1998) were used to calculate a November 1997 population density of .68 and 7.90 markhor per sq. km. for low and high quality habitats, respectively. Johnson (1998) reported markhor densities of .47 and 3.22 per sq. km. for low and high quality habitats in the TCP area in 1994.

Population Estimates

Johnson (1998) reported a conservative population estimate of 389 markhor for the core protected area in 1994. Using the same method of calculation, a conservative estimate of 854 markhor was calculated for 1997.

In 1994, Johnson (1998) reported a conservative population estimate of 695 markhor for the entire TCP Using the same method of calculation, a conservative estimate of 1,296 markhor was calculated for 1997.

Markhor are obviously responding well to management and protection by the TCP. We agree with Johnson's (1998) conclusion that, when observational bias related to terrain and visual distance during ground surveys are considered, any errors in the estimates are on the conservative side. Johnson's calculation method also yields a conservative estimate.

Table 2. Numbers of Suleiman markhor counted in survey areas in the Torghar Hills, Baluchistan Province, Pakistan during 1994 and 1997.

Location	November 1994*	November 1997
Tanishpa	60**	177
Shin Narai	0	0
Khand	21	8
Tor Aghbarg	11	16***
TOTALS	92	201

*All 1994 data from Johnson (1998).
** Number of markhor observed.
*** This survey area was only partially surveyed in 1997.

Urial

Two of the five survey locations described by Johnson (1998), Tanishpa and Khand, were surveyed in a comparative manner during November 1997 (Table 3, APPENDIX A). We attempted to survey Shin Narai, but were unsuccessful due to recent human activity. Herders had recently moved into the area and, due to the open nature of the country, had obviously biased our results. Only one urial was observed; however, recent tracks left by urials along two mountain divides indicates more urial had recently been using the area. Several days of strong winds and one day of heavy rain biased the survey data in the Tor Aghbarg unit. Fresh urial tracks were observed along several mountain ridges on which no urial were observed. Obviously the wind and rain hampered observability of wild sheep. Wind and rain has a more dramatic effect on observability of urial than markhor. Markhor generally confine their activities to cliffs and precipitous slopes, while urial tend to feed and travel along open wind-swept ridges. For these reasons, data from Tor Aghbarg were not included in the population trend, density, or size estimates. Since the Shin Narai unit is located near Tanishpa the data was included, even though probably biased on the conservative side.

Population Trend

During 1997, 47 urial were observed in the same area in which 67 urial were observed in 1994 (Table 2). Considering the survey method reported by Johnson (1998) this magnitude of difference is likely well within the range of inherent accuracy limitations of the field survey method. The data indicate population trend is stable. However, adequate survey of only two of five areas, and not including a survey of the Tor Aghbarg unit, biases the information. During the 1994 survey, 118 of 189 urial were observed in Tor Aghbarg. *Population trend conclusions in this report should be considered tentative. A complete urial survey of all five units under suitable weather conditions to establish population trend should be a priority.*

Population Density

Methods and habitat classifications provided by Johnson (1998) were used to calculate a November 1997 population density of 1.55 and 2.20 urial per sq. km. for low and high quality habitats, respectively. Johnson (1998) reported urial densities of .77 and 4.45 per sq. km. for low and high quality habitats in the TCP area in 1994.

When compared with the 1994 estimate, the 1997 estimated population density of 1.55 urial per sq. km. may be biased on the high side. In 1994, the Kundar/Uria low quality habitat area was included in the survey and a density of .26 urial per sq. km. was observed. The reason for the higher observed density for low quality habitats may result from not including Kundar/Uria in the 1997 survey.

When compared with the 1994 estimate, the 1997 estimated population density of 2.20 urial per sq. km. may be biased on the low side. In 1994, 118 of 189 urial were observed in Tor Aghbarg high quality habitat area (Johnson 1998). The 1994 observed population density for Tor Aghbarg was 9.4 urial per sq. km. The lack of survey data for Tor Aghbarg, and a biased survey for Shin Narai in 1997, may explain the lower observed population density for urial in high quality habitat.

Population Estimates

Johnson (1998) reported a population estimate of 672 urial for the core protected area in 1994. Using the same method, an estimate of 543 urial was calculated for 1997.

In 1994, Johnson (1998) reported a population estimate of 1,173 urial for the entire TCP Using the same method of calculation, an estimate of 1,543 urial was calculated for 1997.

These population estimates may be biased for the same the reasons described in the Population Density section. The 1997 TCP estimate is higher than 1994 because most of the area was classified by Johnson (1998) as low quality habitat, and the 1997 density estimate for low quality habitat was about twice that of the 1994 estimate.

Table 3. Number of Afghan urial counted in survey areas in the the Torghar Hills, Baluchistan Province, Pakistan during 1994 and 1997.

Location	November 1994*	November 1997
Tanishpa	28**	33
Shin Narai	25	1***
Khand	14	13
TOTALS	67	47

*All 1994 data from Johnson (1998).
** Number of urial observed.
*** This survey was biased due to human disturbance.

Population Viability for Sustainable Harvesting

Data from this survey supports Johnson's (1998) conclusion that the Suleiman markhor and Afghan urial populations of Torghar are viable for both population and genetic processes. Since 1994, the markhor population has about doubled in size and the urial population has, at least, remained stable.

Trophy hunting has not impacted the ability of markhor and urial populations to increase the male population segment. In 1997, 25 percent of the markhor observed were males older than yearlings. The comparative figure from the 1994 data is 13 percent. In 1997, 14 percent of the markhor observed were males older than six years of age (trophy class). The comparative figure from the 1994 data is 10 percent. In 1997, 49 percent of the urial observed were males older than yearlings. The comparative figure from the 1994 data is 22 percent. In 1997, 25 percent of the urial observed were males older than six years of age (trophy class). The comparable figure from the 1994 data is 10 percent.

For similar species and populations, Harris (1993) concluded that annual harvests of trophy males in numbers equivalent to one or two percent of the total population size can be maintained without negative consequences. Assuming a total markhor population of 854 for the core protected area, a sustainable annual trophy harvest in the core protected area should be 8 to 17 markhor. Assuming a total urial population of 543 for the core protected area, a sustainable annual harvest in the core protected area should be 5 to 11. Harvest levels at Torghar have not been more than 3 markhor and 4 urial in any given year (Johnson 1998). Harvesting of males within a limit of 10 to 20 percent of the replacement of the trophy-sized segment is considered by Wegge (1997) to be a safe and conservative harvest level for stable or increasing wild sheep and goat populations. Harvest levels at Torghar have been conservative.

HABITAT CONDITIONS

While conducting surveys at the core protected area's observation sites, habitat condition and the influence of human land use was noted. This section summarizes those observations.

The dominant land use is livestock grazing and it's influence is most noticeable within valley corridors, plains, and in or near riparian corridors. Within these areas, livestock use has

strongly influenced plant species composition, soil stability, and the ability of the land to produce vegetation. Within the core protected area, the influence of livestock grazing becomes much less evident on steeper upland slopes and generally throughout the higher elevation areas. The transition is especially noticeable about midway between the valley bottom and mountainous upland areas. In relation to livestock grazing, the integrity of markhor and urial habitat is protected over large areas due to steep topography and long distances between water sources. Generally speaking, habitat conditions steadily improve as one climbs the mountains and due to the vastness of the landscape there is abundant good quality habitat for markhor and urial.

Since markhor concentrate their habitat use in the steeper cliff-like areas, human land use has much less influence on the habitat base than with urial. Most of the "key" areas for markhor are so steep and rocky that very little, if any, livestock grazing or human occupation occurs. Completing a survey and inventory of markhor habitats within the core protected area and TCP is necessary to determine potential carrying capacity of markhor habitat and to monitor maintenance of the habitat base over time. Because poaching has been effectively controlled within the TCP since 1984, maintenance of habitat quality and quantity will ultimately determine markhor population numbers.

Urial and markhor habitat use does overlap somewhat, but urial primarily utilize the broad open ridges and slopes and are much more mobile than markhor. Urial tend to travel throughout the TCP, with individuals using a much broader land base than the markhor. The vast landscape of the Torghar area with abundant open space makes for excellent urial habitat, but creates a greater potential for human land use to impact urial habitat use than with markhor. This can be most noticeable if, when weather conditions are severe during winter months, urial move to lower elevation sites where livestock grazing is intensive. Forage competition may result in such situations. When urial and livestock are forced into close proximity, the potential for disease transmission between domestic and wild animals is increased. *Conducting a survey and inventory of urial habitats within the core protected area and TCP is necessary to determine habitat carrying capacity, and monitor maintenance of habitat quantity and quality.*

CONCLUSIONS AND RECOMMENDATIONS

1. The markhor population is increasing both in the core protected area and the TCP. The 1997 estimated markhor population in the TCP was 1,296 markhor.
2. The urial population is stable within the core protected area, and stable or increasing within the TCP. For reasons discussed, this conclusion is tentative, pending results from the next survey. The 1997 estimated urial population in the TCP was 1,543 urial.
3. Trophy hunting has not impacted the ability of markhor and urial populations to increase the male population segment. A sustainable annual trophy harvest for markhor should be 8 to 17. A sustainable trophy harvest for urial should be 5 to 11.
4. During November 1999, conduct a survey for markhor and urial in all five observation areas described by Johnson (1998). Plan an extra few days in the field for bad weather and other problems so that all five areas can be properly surveyed.
5. Complete a survey and inventory of markhor and urial habitats within the core protected area and TCP. A habitat survey is necessary to determine potential markhor and urial habitat carrying capacity, monitor maintenance of the habitat base, and predict future limiting factors to markhor and urial populations.
6. If funding became available and permission obtained an aerial survey combined with infra-red photography may provide an accurate census of both species.

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All Photographs Taken During November 1997.

Shin Narai - Looking easterly toward Afghanistan