Habitat and Disease Issues of Concern to Management of Straight-Horned Markhor and Afghan Urial in the Torghar Hills Balochistan, Pakistan

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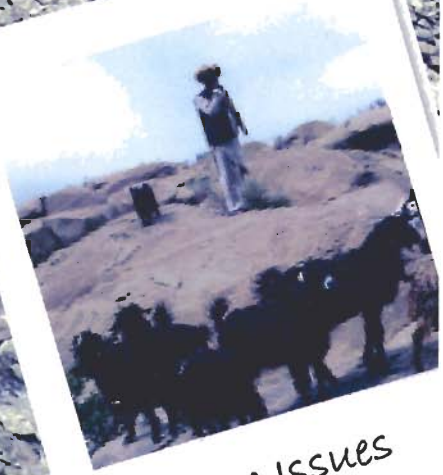
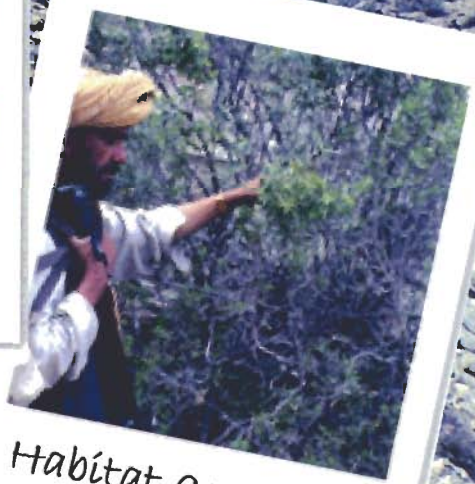
2002

Markhor Management



Disease Issues



Habitat Concerns

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INTRODUCTION

The Society for Torghar Environmental Protection (STEP) a community-based non-governmental organization established in 1994 in Balochistan, Pakistan has successfully brought straight-horned markhor (*Capra falconeri jerdoni*) and Afghan urial (*Ovis orientalis cycloceros*) populations in the Torghar Hills from the brink of extinction to currently thriving populations. A number of technical reports and publications (Johnson 1997a, Johnson 1997b, Frisina et al. 1998, and Frisina 2000) document this well. The Torghar Hills are located in west central Pakistan within Balochistan Province (Figure 1). STEP funds the Torghar Conservation Project (TCP) using monies derived from limited sport hunting.

The most recent surveys conducted during November 1999 estimated the markhor population at 1,684 and the urial population at 1,742 (Frisina 2000).

Straight-horned markhor are currently listed as Endangered by the United States Fish and Wildlife Service (USFWS) under the Endangered Species Act. Due to the success of their conservation program, in 2000 STEP petitioned the USFWS to downlist the straight-horned markhor from Endangered to Threatened. If granted, this request could provide additional funding from hunting that STEP could use to further conservation goals for the area. The USFWS has not yet issued a finding on the STEP petition, but in March 2001 responded with a number of issues requiring further explanation (USFWS 2001).

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Figure 1. The Torghar Conservation Project is located in west central Pakistan.

In April 2001 a team consisting of Michael R. Frisina, Wildlife Biologist and Range Coordinator for Montana Fish, Wildlife & Parks; Dr. Michael H. Woodford, Wildlife Veterinarian and chair of the OIE Working Group on Wildlife Diseases; and Ghulam Ali Awan, Conservation Biologist WWF-Pakistan, were invited by STEP and the USFWS Division of International Conservation to visit the Torghar Hills. The purpose of the visit was to assist STEP officials and local tribesmen develop a management plan that would expand the project from wildlife protection into a new phase of improved habitat management.

The Torghar area is part of a much larger unit that is subject to periodic droughts. The current 4-years of continuous and severe drought[2] has apparently brought local tribesmen to the conclusion that the path to a more secure future lies with a greater emphasis on wildlife conservation, even if that means a reduced emphasis on the more traditional livestock production. While answering the request from STEP, the team also sought answers and clarification to some of the issues raised by USFWS (2001) regarding the management of straight-horned markhor. This report summarizes accomplishments to date including development of a management plan for the TCP.

BOUNDARY OF THE TORGHAR CONSERVATION PROJECT

The TCP is in the Torghar Hills and has been described in a number of reports and publications, but its boundaries, although well established by STEP, have not been clearly described using a legal or “meets-and-bounds” description. This has caused some confusion as the geographically recognized area known as the Torghar Hills is a larger area than the TCP. The boundaries of the TCP consist of a number of interconnecting roads or jeep trails many of which follow natural land forms such as stream valleys or hill-plain interfaces. On April 18, 2001 we traveled this interconnecting road system with members of STEP and developed

[2] Normally the area receives an annual precipitation of about 250 mm, mostly in the form of snow during the winter months. Since 1996 snowfalls have been very sparse and rainfall extremely limited (Naseer Tareen, personal communication, 2001).

a legal description for the TCP. Legal description details are graphically illustrated in Figure 2, Figure 3, and described in detail in Appendix A.

TORGHAR HILLS MARKHOR AND URIAL HABITAT AREA SIZE

The availability of good topographical maps at the 1:25,000 to 1:50,000 scale has been a constant problem confronting the development of accurate surveys, estimating areas, and conducting land use planning in the TCP.

Using 1:50,000 scale maps borrowed from the Balochistan Forest Department Johnson (1997a) estimated the TCP to be about 1,000 km^2. Since 1:50,000 scale maps for the entire Torghar Hills markhor habitat area (portion protected by STEP and unprotected area), were not available to the 2001 survey team, we calculated areas using a dot counter and 1:250,000 scale map (Figure 3). The TCP was estimated at 642 km^2 and the area of markhor habitat currently unprotected at 207 km^2. Although different from the earlier estimate by Johnson (1997a), the current estimate is suitable for determining the relative proportion of protected versus unprotected area. Using the aforementioned figures, 76 percent of the Torghar Hills habitat is protected by STEP. This leaves about 24 percent currently not protected by STEP. STEP is in the process of negotiating with local tribal peoples to annex the unprotected area into the protected area (Naseer Tareen, personal communication 2001)[3]. As for the actual area size of the TCP, the estimate by Johnson (1997a) is likely to be the more accurate since 1:50,000 scale maps were used for the calculations. It is suggested that Johnson (1997a) figures be used with animal population data for calculating densities, etc.

[3] Following our April 2001 visit, STEP officials successfully negotiated an expansion of the TCP (Naseer Tareen personal communication 2002, Appendix B). This expansion includes a portion of the 24% described as unprotected in this report. Since we did not visit the new addition to the TCP, it is not described here and should be explained in greater detail in future reports.

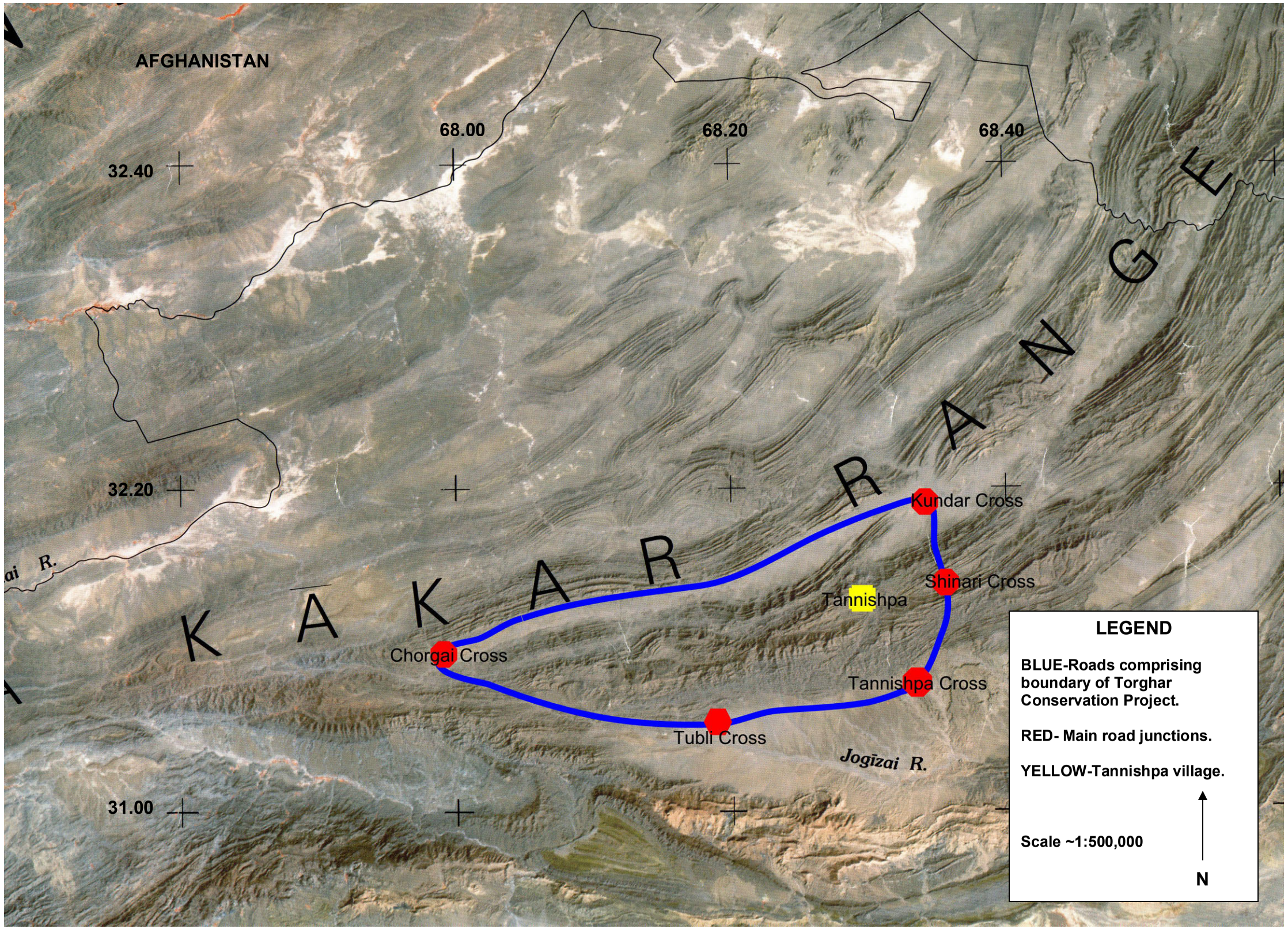

Figure 2. Location of the Torghar Conservation Project within the Toba Kakar Range, Balochistan Province, Pakistan.

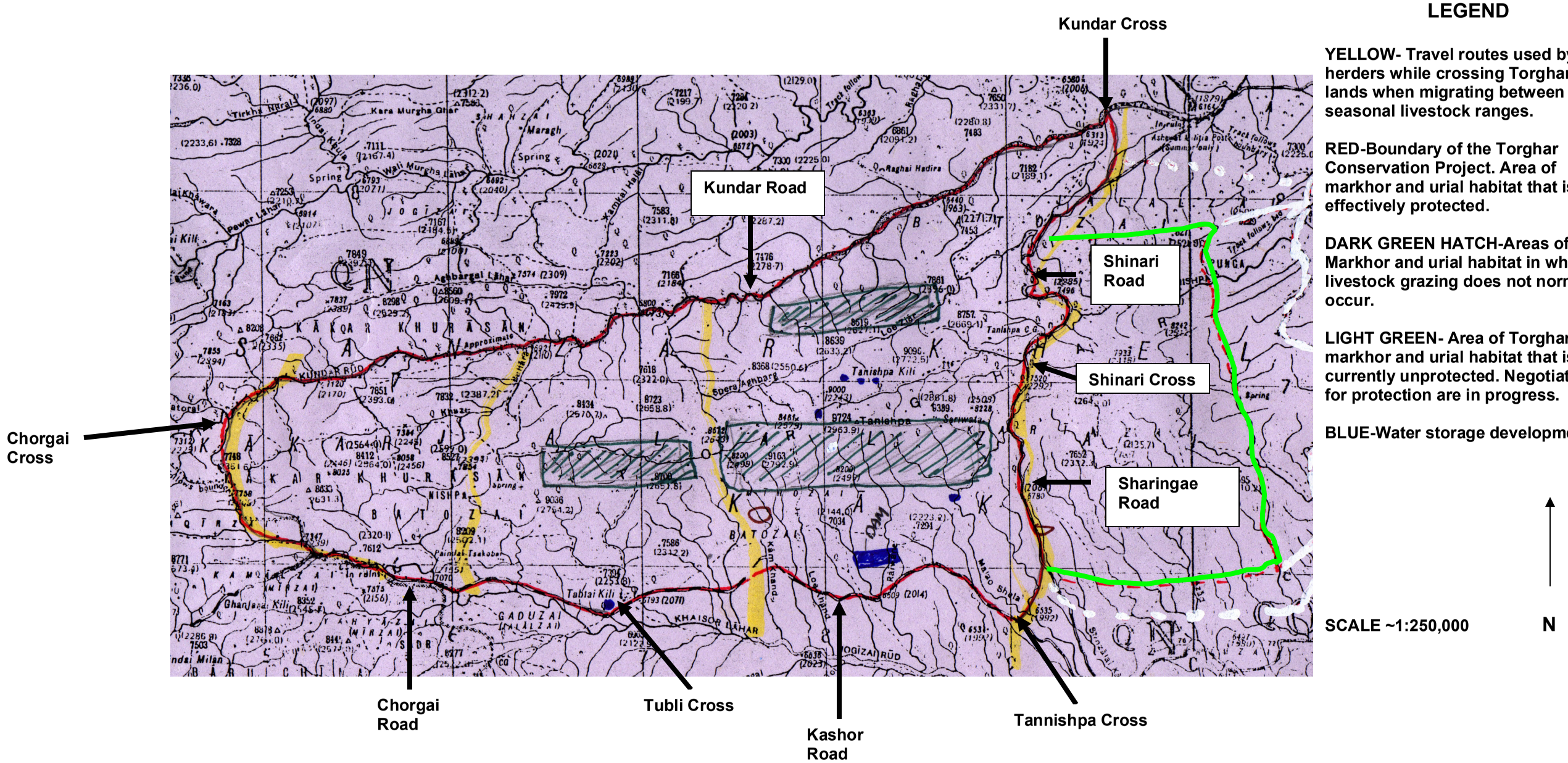

Figure 3. Map showing the boundaries of the Torghar Conservation Project, migration routes used by nomadic livestock herders, water developments, areas excluded from livestock grazing, and area under consideration for future annexing.

DISCRETENESS OF THE TORGHAR CONSERVATION PROJECT AREA

The description in Appendix A for the TCP provides boundaries that are clearly defined and geographically discrete or clearly identifiable as roads or jeep trails. The TCP lies within the Torghar Hills which are geographically isolated by broad valleys through which the Kundar, Chorgai, and Kashor Roads pass. The eastern portion of the area is bounded by the Kashor and Shinari Roads which are well defined and pass through valleys and mountain passes that readily separate that portion of the Torghar Hills protected by STEP from the relatively small (24%) eastern portion that is currently not protected (Figure 3).

The area lying north of the Kundar Road (TCP north boundary), near the Afghanistan border, is likely more suitable habitat for urial than markhor; the topography being less severe than that preferred by markhor. The area lying south of Tubli Cross (TCP south boundary) is not suitable markhor habitat as the area near the Jogezai River is a broad, relatively level valley and the overall area is inhabited by humans. A highway, the major trade route to Quilla Saifullah and the Jogezai Village, also passes through the area. Some of these variations in topography can be observed on the aerial photograph in Figure 2.

As a result of the aforementioned, the described TCP within the Torghar Hills is for the most part a self-contained discrete habitat unit for markhor and urial. It is reported that a few markhor and urial periodically move in and out of the TCP to utilize the eastern portion of the Torghar Hills (24%) that is currently unprotected. STEP is in the process of negotiating for the addition of this area into the TCP. Once accomplished, a completely discrete and protected habitat unit will be in place. Although in theory markhor and urial are free to move in and out of the north and south TCP boundaries, in reality such movements rarely occur, due to the lack of suitable habitat as described above.

HABITAT AND DISEASE ISSUES

Development of a habitat management plan for both wildlife and domestic livestock that integrates disease issues for Torghar is a high priority (Naseer Tareen, personal communication 2001). April 16 – 21,2001 were spent in the field and office to begin developing the framework for such a plan (Appendix C).

Habitat

Two land use types were identified within the TCP: 1. Land reserved for wildlife, and 2. Land managed for sustainable use by both wildlife and domestic livestock. In Figure 3, the Type 1 lands are marked in green crosshatch and are about 91 km^2 in total area (calculated using a dot counter and 1:250,000 topographic map; subsequent calculations should emphasize better scaled maps such as 1:25,000 or 1:50,000). These lands provide year-round habitat for both markhor and urial, but are particularly important for markhor. The local people at Torghar have agreed to work towards exclusion of livestock grazing on these lands and have, except for a few instances during the current drought, avoided grazing these areas for several years. The Type 2 lands comprise the remaining or unshaded area in Figure 3. Type 2 lands are important to both the local human population and wildlife. It is essential that a more refined management plan be developed over time that, while being made primarily for local human populations, also integrates the needs of wildlife. This is especially important for urial, as they tend to move to lower elevations during severe winter conditions. Overlapping range use by markhor and domestic livestock is apparently minimal (Frisina 1998).

A series of meetings with local herders must be continued to be held to reach agreement on a broad grazing strategy for Type 2 lands from which a detailed rotational grazing plan can be developed. A main issue of importance is development of a grazing strategy that allows for periodic use and rest from livestock grazing of portions of the landscape in a planned approach. For rangelands at Torghar to be maintained and improved in productivity, it is

essential the plant communities be allowed periodic rest from livestock grazing during the growing season, so that plants can perform their essential biological processes. These essential processes include photosynthesis, food storage in roots, production of seed, and the establishment of new plants (Hormay 1970, Frisina 1989, Frisina 1991, Egan 2000).

Through an enlightened approach of scheduled grazing and rest, plants can maintain their biological processes. The pastures scheduled for rest from grazing can serve as improved wildlife habitat as they will be free of livestock and the vegetation produced on them is available as food and cover for wildlife (Anderson and Scherzinger 1975, Frisina 1991, Frisina and Morin 1991, Frisina 1992, Frisina and Peterson 1992, Peterson and Frisina 1993, Douglass and Frisina 1993. This can be especially important on wildlife winter range sites where there is a high potential for forage and habitat competition between livestock and wildlife. If in the rotational grazing use of the landscape, areas important to wildlife are available each year, and free of livestock, the potential for contact between domestic and wild animals can be significantly reduced.

For success, it is essential that such an approach be developed cooperatively with the herders so that the needs of their livestock are met in the grazing system design. Specific portions of the landscape should be identified and divided into distinct grazing units. A multi-year grazing rotation strategy can be developed for each grazing unit. The herders would know years ahead of time when various grazing units are available for grazing and also when they are scheduled for rest. At Torghar, due to existing animal husbandry techniques, grazing units could be established without fences. Herders are always in close proximity to their livestock and carefully control their distribution. Grazing units could be drawn on management plan topographic maps for administrative reference and demarcated on the ground with paint, stone piles or some other means as a visual markhor for the herders.

Due to the arid conditions and types of plant communities present at Torghar, the recommended grazing rotation is as follows. Once a “grazing unit” is grazed during the active plant growing season, the next year that same grazing unit should be protected from grazing until the end of the growing season when the above-ground portions of plants have matured and become dormant. Dormancy coincides with seed maturation in most of the plant species. During the third year, this same grazing unit should be rested from livestock grazing for the entire year. This recommended approach allows each grazing unit to be utilized by livestock two out of every three years, but only one out of every three growing seasons. To develop a specific approach, important plant phenologic events (recurrent natural phenomena such as blossoming, and their relation to climate and changes in season) must be determined by field surveys. These phenologic events include date of initiation of rapid plant growth at the beginning of the growing season and date of maturation for the slowest maturing plants of importance within the TCP. The growing season rest periods are designed to allow plants to accomplish critical biological processes and thus maintain their health and vigor.

Table 1. Location of rangeland inventory sites visited during April 2001.

NUMBER	GENERAL AREA	COORDINATES	GPS NUMBER	ELEVATION (meters)	COMMENTS
1	Tannishpa	N31 11.293 E068 25.779	053	2,382	urial winter range, livestock summer range
2	Tannishpa	N31 10.608 E068 25.738	054	--	urial winter range, livestock summer range
3	Tannishpa	N31 11.818 E068 28.776	055	2,368	urial winter range, livestock summer range
4	Kundar	N31 10.541 E068 10.271	059	1,947	Urial/markhor winter range, livestock summer range

As an initial step to develop a grazing strategy, a rangeland inventory was initiated by visiting 4-sites within the TCP (Table 1). Since it was not possible to arrange for botanical assistance in the field, anecdotal information was collected with the aid of game guards. The Torghar game guards spend most of their time

either in close observation of markhor and urial or of their domestic livestock. They have a good working knowledge of the various plants eaten by both wild and domestic species. At the four sites, a variety of plants reported to be eaten by domestic and wild ungulates were listed (Table 1). We documented the plants photographically and referenced them using the local Pashtu names. In all about 28 different plants were noted. Dr. Rasool Bakhsh Tareen, Associate Professor, Botany Department, University of Balochistan, was consulted in Quetta. Dr. Tareen has agreed to identify the plants scientifically from the photographs and field notes. As of the writing of this report, the analysis has not yet been completed. Once this report is finished, M. Frisina will provide Dr. Tareen with field notes and photographs of individual plants in need of identification. Dr. Tareen also agreed to work with STEP in developing the habitat management plan and will be available in the future to provide field assistance and accomplish botanical collections at Torghar. Botanical investigations at Torghar are essential for an effective management plan and will probably be a slow and tedious process requiring much cooperative effort.

Although the aforementioned efforts were very limited in scope, it is obvious that most of the dominant palatable plants at Torghar provide forage for both domestic and wild animals, thus the potential for competition is high.

People living in the TCP have endured the past four years of continuous and severe drought. The pre-drought domestic animal population of 40,000 has declined to about 24,000. The local people intend to maintain livestock numbers near the current reduced level (25,000 maximum) to allow for flexibility in expanding emphasis on increased markhor and urial populations.

Disease

As a result of the drought, domestic livestock, predominately sheep and goats, upon which the semi-nomadic pastoralists depend, have suffered severely from starvation, disease and reduced fertility.

In the year 1999 to 2000, surveys indicated that the domestic sheep and goat population at Torghar had declined as a result of the drought, from 34,624 head to 24,298. These animals support about 250 households (approximately 10 people per household) and the total loss due to livestock mortality in Torghar up to May 2000 has been estimated at Pakistani rupees 15,699,000 (US $ 302,485) or US $ 1,210 per household, a substantial amount of loss in a country who's average wage earner's estimated annual income is about US $ 250.

At the time of our visit to Torghar in mid-April 2001, the sheep and goat flocks of the local people had suffered further marked losses and although accurate numbers were not available, it was estimated that only about half of the original 34,624 animals now survived. This implies that the number of small stock upon which each household depends, has been reduced over four years from 138 to 69.

In April 2001 the surviving flocks were found to be in poor condition and the lambing (and kidding) rate was reported to be very low. Lamb and kid survival, normally high, has been significantly reduced as a result of the debility of the female sheep and goats and the lack of fresh grazing when the young were born.

Overall, the goats had survived the drought better than the sheep.

Apart from malnutrition, no overt infectious disease was seen at Tannishpa in April 2001. It was, however, reported that during the four years of drought the flocks had suffered severe mortality following outbreaks of foot and mouth disease, lungworm, liver fluke infestation and sarcoptic mange.

Although there have been no reports yet of disease transmission from the drought-stricken domestic livestock to the very valuable sympatric wild Caprinae (Afghan urial and straight-horned markhor) at Torghar, the risk that this will occur has been greatly increased by the imminent invasion of the higher altitude grazing areas (normally considered out of reach of the domestic livestock), by starving and diseased flocks of sheep and goats.

The drying up of natural water points by the drought has also resulted in closer contact between the domestic and wild Caprinae that are now forced to share dwindling water supplies with potentially infectious livestock.

The biannual passage of Afghan nomadic herdsmen, their families and flocks, southwards in October and November and northwards in March and April, and comprising an estimated 200,000 people accompanied by as many as 2,000,000 head of domestic livestock, is considered to present a very serious risk of the introduction of infectious diseases to the semi-resident Torghar flocks. The migration routes are long established and reflect ancient agreements. Some trade is undertaken between the nomads and the semi-resident Torghar herdsmen during this transhumance and the opportunity for livestock disease exchange must be considered to be high.

The domestic sheep and goats of Afghanistan are known to be very widely infected with Peste des petits ruminants (PPR), a highly infectious and fatal viral disease that often closely resembles Rinderpest (RP) both in its clinical signs and devastating consequences.

At present PPR does not appear to occur in the Torghar area (or indeed to have been reported in Balochistan), but it is known to be spreading rapidly throughout

Pakistan and to be causing heavy mortality in sheep and goats (particularly goats).

It is not yet known if the wild Caprinae, urial, markhor and ibex (*Capra ibex*), are susceptible to PPR but they probably are, and if infected by contiguous domestic livestock would probably die in large numbers.

Other debilitating diseases, perhaps of less consequence to the wild Caprinae, that might be carried into the Torghar area by the transhumants are foot and mouth disease, sheep and goat pox, contagious ecthyma, contagious caprine pleuropneumonia (CCPP), anthrax, pasteurellosis, sarcoptic mange, lungworms, intestinal worms and liver flukes.

For a full account of the infectious diseases of sheep and goats in Balochistan that present a threat to the wild Caprinae in the Torghar Mountain Range, Zhob District, Baluchistan refer to Woodford (1997).

Appendix D describes the clinical signs of the common diseases of domestic sheep and goats, some of which may infect the wild urial, ibex and markhor.

CONCLUSIONS AND RECOMMENDATIONS

In order for the most efficient and effective use of the TCP and adjacent Torghar Hills, the high priority by STEP should be to develop a Management Plan following the framework described in Appendix C. The following conclusions and recommendations should be incorporated into such a Management Plan. A concerted effort should be made to obtain current 1:25,000 or 1:50,000 topographic maps of the Torghar area to be used for planning and management purposes.

A. Habitat

1. Completion of an ecological inventory of plant communities at Torghar is essential for development of a suitable rotational grazing strategy designed to protect the soils and vegetation within the TCP.

2. Carrying capacity of the range at varying times of the year, breed selection, crop production for fattening livestock, marketing of fatstock before the winter etc. should be the subject of early support studies at Torghar.

3. ***Implementation of a carefully designed grazing strategy that meets the habitat requirements of wildlife, the needs of livestock, and emphasizes minimum contact between domestic and wild ungulates should be accomplished as soon as practical.***

4. A permanent livestock reduction to 25,000 sheep and goats would greatly reduce the grazing pressure on the range and in combination with a carefully planned rotational grazing system would allow the vegetation to recover. This livestock density was considered to be within the notional carrying capacity of the available grazing resources and took into account the sympatric presence of increasing numbers of Afghan urial and straight-horned markhor. The problems associated with drought are best dealt with by grazing system design. Drought in the Torghar Hills is more the norm than the exception.

B. Disease

Long discussions were held with the Torghar tribal leaders and herdsmen on the subjects of flock composition, breed improvement, optimal flock sizes, range management, disease prevention and control, and the urgent need for the provision of veterinary services throughout the Torghar Mountain area (Appendix E).

1. ***It was generally agreed that the provision of a mobile veterinary service is a very high priority since if such a service could be made available, losses from diseases would be substantially reduced, the productivity of the flocks would be increased, and the number of sheep and goats required to support each of the approximately 250 households could be held at 100 head per household i.e. a total of about 25,000 for the Torghar Mountain area.***

Most important of all is to limit, or better still, to eliminate, all direct and indirect contact between the potentially infectious and domestic livestock and wild Caprinae.

Since it is not at present possible to vaccinate widely dispersed wild ungulates in mountainous terrain, the best and only way to protect them from the diseases transmissible by domestic livestock is to ensure that the domestic animals are regularly vaccinated against the important diseases described here. They should also be strategically treated for external and internal parasites.

By "strategic treatment" is meant the application of multivalent anthelmintics in the spring and autumn. This should reduce pasture contamination of the summer and winter grazing ranges. The health and productivity of the domestic livestock would benefit greatly from such a regime.

2. It is essential to obtain the agreement of the herdsmen that the provision of veterinary services must not be an excuse to allow an increase in livestock numbers beyond the agreed 100 head per household. Contact with the wild Caprinae would also be reduced since fewer, healthier domestic livestock (25,000 maximum) would be able to subsist on the lower ranges, leaving the more inaccessible upper slopes to the wild ungulates. Competition at water points would also occur less frequently, reducing the opportunity for infectious disease transmission.

3. Most of the diseases of domestic livestock described in Appendix D present a potential threat to the Urial and markhor populations at Torghar where large numbers of domestic animals share the mountain range with the wild Caprinae. However, all can be controlled or even eliminated by strategic use of available

medication and vaccines for the domestic livestock that may come into contact with them.

With a few exceptions, the susceptibilty of the wild Caprinae to many of the common diseases of contiguous domestic livestock is unknown. One can, however, safely predict that anthrax (an environmental contaminant) where it occurs would be fatal to the urial and markhor.

PPR (and rinderpest too), could cause very severe losses and PPR is probably the most dangerous disease of domestic sheep and goats to threaten the wild Caprinae at Torghar. Sheep and goat pox and orf are also potentially serious infections.

Care should be taken never to feed the domestic dogs with the lungs and livers of sheep and goats that may contain the large, water-filled hydatid cysts of Echinococcus granulosus **(*Tha eha obera*).** These cysts are the intermediate stage of a very small tapeworm that often infests domestic dogs. The microscopic eggs of the tapeworms are passed in the dog's feces and are picked up by domestic livestock on the pasture. In the sheep or goat's digestive system they hatch and make their way to the lungs or liver where they develop into large cysts. They can also infect humans, particularly children, with very unpleasant consequences.

After much discussion (during which the availability and otherwise of the Government Veterinary Services at Quilla Saifullah was mentioned), it was decided that the best way to provide a basic, mobile veterinary service to the 250 households of Torghar would be to arrange for the selection, training and deployment of three or four young, secondarily educated local boys, as "Barefoot Vets".

It was suggested that, provided funding can be found, these young men should receive basic training (possibly at the Government Veterinary Laboratory in

Quetta) for at least 3 months in disease monitoring and reporting, and the recognition, prevention and treatment of the common debilitating diseases that afflict domestic livestock in the mountain areas of Balochistan.

After basic training, each Barefoot Vet would be allocated an area in which to operate and provided with two donkeys, one for riding and one to carry medicines and equipment. Each Barefoot Vet would also be provided with basic veterinary instruments, (castration equipment, syringes, needles) and medicines, (antibiotics, injectable anthelmintics, flukicides, vaccines etc).

Training of the Barefoot Vets would include the technique of postmortem examination and the collection and preservation of suitable diagnostic specimens. These specimens would be taken to the Government Veterinary Services Station at Quilla Saifullah and eventually (if necessary) to Quetta.

It is envisaged that the Barefoot Vet would be authorized to make a small, pre-arranged charge for his services and for the medicines and vaccines used.

A further important duty for which the Barefoot vets should be trained would be for one of them to accompany each trophy hunting party in the hunting season in order to collect and preserve predetermined biological and pathological specimens from all markhor and urial shot by the sportsmen. These specimens should form part of a program for the establishment of baselines of nutritional, parasitological and pathological data that will be of great value for detecting health and nutritional trends in the wild Caprinae populations at Torghar.

SUMMARY

The maintenance of essential natural resources can be better maintained through implementation of a carefully designed management plan that addresses the goals and objectives for STEP and the TCP. Only by sustainable management of their natural resources can the people of Torghar develop a

secure future. A secure future for the TCP will hinge on codependency of people and wildlife.

The described TCP within the Torghar Hills is for the most part a self-contained discrete habitat unit for markhor and urial bounded on three sides by unsuitable habitat that naturally discourages markhor and urial migration to new areas. The fourth side where movement can occur is currently under negotiation to bring this new area under protected status.

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APPENDICES

Appendix A

Legal Description of Torghar Conservation Project Area Boundary

Balochistan Province, Quilla Saifullah District: *Beginning at Tannishpa Cross (the junction of the Kashor Road with the Sharingae Road at N31^0 06.108, E068^0 27.505--Figure A-1), thence northeasterly along the Sharingae Road to Shinari Cross (the junction of the Sharingae Road with the Shinari Road at N31^0 12.879, E068^0 30.567—Figure A-2), thence northerly and westerly along the Shinari Road to Kundar Cross (the junction of Shinari Road with the Kundar Road N31^0 19.323, E068^0 32.291—Figure A-3), thence southeasterly along the Kundar Road to Chorgai Cross (the junction of the Kundar Road with the Chorgai Road at N31^0 08.761, EO68^0 03.081 —Figure A-4), thence southerly and westerly along the Chorgai Road to Tubli Cross (the junction of the Chorgai Road with the Kashor Road N31^0 05.123, E068^0 14.400—Figure A-5), thence easterly along the Kashor Road to Tannishpa Cross, the point of beginning.*

Figure A-1. Tannishpa Cross (Kashor Road/Sharingae Road junction). N31 06.108, E068 27.505. Photo PAK 2001,18—4/18/01 Frisina.

Figure A-2. Shinari Cross (Sharingae Road/Shinari Road junction). N31 12.879, E068 30.567. Photo PAK 2001,20—4/18/01 Frisina.

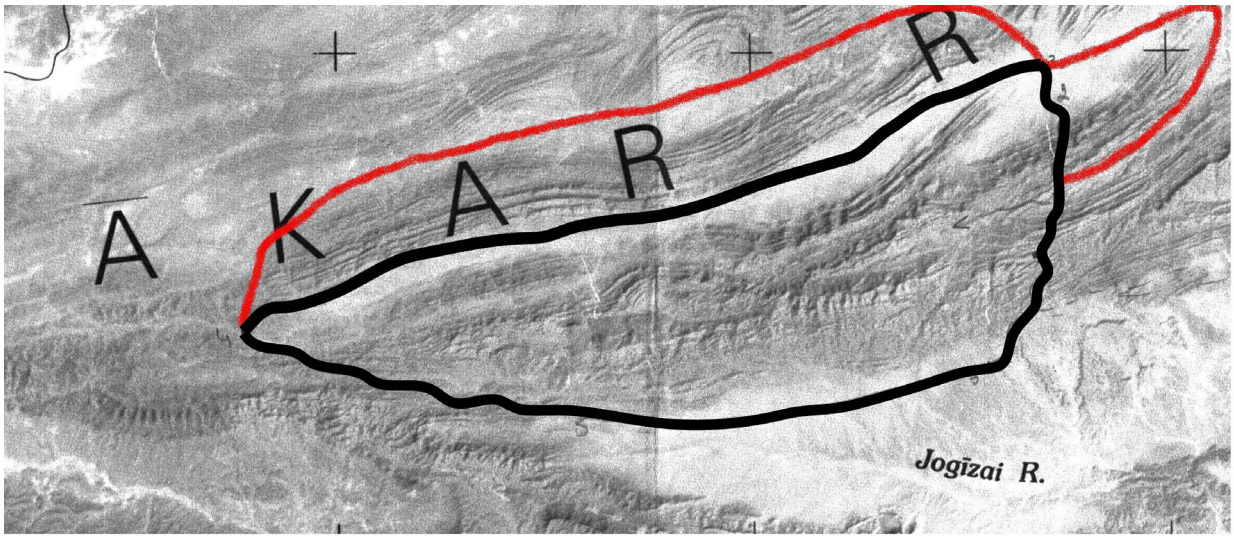
Figure A-3. Kundar Cross (Shinari Road/ Kundar Road junction). N31 19.323, E068 32.291. Photo PAK1801,18—4/18/01 Frisina.

Figure A-4. Chorgai Cross (Kundar Road/ Chorgai Road junction). N31 08.761, E068 03.081. Photo PAK 2001,1—4/18/01 Frisina.

Figure A-5. Tubli Cross (Chorgai Road/Kashor Road junction). N31 05.123, E068 14.400. Photo PAK 2001,13—4/18/01 Frisina.

Appendix-B

Map showing additions to Torghar after April 2001



Area within black line represents TCP boundaries in April 2001. Area within red line was added to the TCP after our April 2001 visit to Torghar.

Appendix C

The following management plan framework is intended to serve as a basis for developing the formal Management Plan. The goals, objectives, and strategies listed serve only as examples and should not be considered as complete or appropriately worded to meet the needs of the TCP. The most effective way to develop effective goals, objectives, and strategies is through participation of all those effected by the proposed actions. Once a consensus on goals, objectives, and strategies is reached the final step in plan development is to create a detailed management plan describing how the strategies will be applied to meet the goals and objectives.

Habitat Management Plan Framework

Goal Statement: Insert STEP established goal of conserving the biodiversity within the TCP.

Objectives: Develop a list of well defined and specific objectives. For example:

1. Through sustainable use management, protect the overall biodiversity of the TCP while maintaining a secure and diversified economic base from which the people of Torghar can maintain a secure future.
2. Maintain healthy and disease free wild and domestic animal populations within the carrying capacity of the land.
3. Etc.

Strategies: Develop a list of strategies that will allow for achieving the goals and objectives. For example:

1. Develop and implement a rotational grazing system designed to maintain the soils and vegetation in harmony with wild and domestic ungulates.
2. Regularly vaccinate all domestic livestock that reside in the TCP.

3. Through population monitoring establish annual sustainable-use hunting season quotas for markhor and urial as a means for funding STEP and the TCP.
4. Accomplish a baseline inventory of livestock range and wildlife habitat within the TCP. This baseline will serve as data base for monitoring vegetation resources.
5. Etc.

Management Plan

Develop a detailed plan for applying the proposed strategies to accomplish the listed goals and objectives for the TCP. The plan should also include a detailed time table for accomplishing the goals and objectives with specific dates for implementing strategies. An essential part of the management plan is a monitoring protocol for measuring effectives of the strategies in accomplishing the goals and objectives. The more transparent and inclusive the monitoring protocol the more readily it will serve to point necessary adjustments in the strategies.

For example:

The strategy of implementing a rotational grazing system should be described in great detail. Detail would include a map of grazing units, when they are scheduled to be grazed, rested, and deferred with agreed upon numbers of livestock indicated. The plan would also describe how the rotational grazing system meets the goals and objectives.

Appendix D

DISEASES OF LIVESTOCK LIKELY TO AFFECT THE WILD CAPRINAE AT TORGHAR

External Parasites

In recent years a skin disease, presumptively diagnosed as **Sarcoptic Mange** (scabies), (***Pun***) has been reported to be affecting the Torghar sheep and goats and may have been responsible for some mortality. Sarcoptic mange is transmitted in domestic sheep and goats by close contact and so is unlikely to be transmitted to free-ranging wild sheep unless these rub against rocks and tree stumps where infected sheep or goats have rubbed to relieve the irritation produced by the parasites. The mange mite probably occurs naturally on the skin of the domestic livestock and possibly on the skin of the urial and markhor. As long as the animals remain in good condition these and other external parasites are rarely a problem.

Lice and fleas (*Kake*) are frequently found on the skin of undernourished domestic livestock, especially in winter. They can easily be controlled by the application of parasiticidal spray or powder.

Warble flies and nasal bot flies (*Tha sar chingia*) , both of which parasitise domestic sheep and goats and probably also infect the wild Caprines but are unlikely to cause significant disease in healthy animals**.**

Clinical Signs

When external parasites become numerous enough to cause clinical signs they can be detected by observant Game Guards who will see the wild Caprinae rubbing their irritated skin on trees and rocks. The animals will appear restless and may bite at their flanks and pull out mouthfuls of hair. They will appear "moth-eaten" and will rapidly lose condition.

When nasal bot flies and warble flies are worrying sheep and goats the animals will be seen to hold their heads very low with their noses near to the ground.

Remember that sarcoptic mange and ringworm are transmissible to humans by close contact.

Internal Parasites

Intestinal worms,(*Maclaye*) tapeworms (*Chingia*) lungworms and liver flukes (*Garga*) all infect the domestic sheep and goats in the Torghar area and are probably to be found in the wild caprines, too. Under extensive range conditions these parasites are unlikely to cause significant disease in the wild caprines and unless these are stressed by drought and malnutrition.

The domestic livestock can be easily treated for intestinal worms and lungworms by strategic injection with an avermectin anthelmintic. This same medicine will

also cure mange. Treatment for liver flukes requires the administration of a specific flukicide.

Clinical Signs
Diarrhoea and rapid loss of condition are signs of internal parasitism (but see also clinical signs of Rinderpest and PPR listed below).
Swelling under the jaw (oedema) and sometimes under the belly is indicative of the anaemia that accompanies heavy infestation with intestinal worms and liver flukes. Coughing on exertion may be indicative of lungworm infestation.
In domestic goats, coughing and loss of condition may also be a sign of lungworm infestation.

Bacterial Diseases
Contagious Caprine Pleuropneumonia (CCPP) (*Lawa*) or Pasteurella pneumonia.
CCPP only affects goats and has never been reported in wild goats (markhor and ibex). Pasteurella pneumonia can infect both wild and domestic sheep and goats and is often associated with malnutrition and severe weather. Vaccines are available for both these diseases.

Clinical Signs
Loss of condition and persistent coughing on exertion may be signs of CCPP in goats or pasteurella pneumonia in sheep. The death rate in both these diseases may be high.

Anthrax (*Tak*)
Anthrax is an acute and fatal disease of domestic animals and mammalian wildlife (and humans). The spores of the anthrax bacillus can persist for many years in infected soil or in an infected water source. The disease is not normally transmitted from one animal to another except when a carnivore (or a human) eats an infected carcass. Herbivorous domestic livestock and wildlife are usually infected by eating vegetation or drinking water contaminated by anthrax spores. The location of infected areas and water sources is often well known. Protection of domestic livestock is achieved by annual vaccination.
Anthrax is more prevalent in sheep than in goats in Pakistan and presents a potential threat to the urial population.

Clinical signs
Anthrax is characterized by sudden death. Few premonitory signs of illness are shown. There is usually a bloody discharge from the nostrils and anus. The carcass rapidly distends with gas.

Remember that anthrax is a very dangerous disease of humans. The carcasses of animals suspected to have died of anthrax should not be cut up (to avoid contamination of the environment) and the meat should not be eaten. The carcass should be buried very deep, out of the reach of scavengers, or burnt.

Viral Diseases

Rinderpest

Rinderpest may still be present in Sindh Province and is the subject of an ongoing global eradication campaign. Wild sheep and goats are highly susceptible to this highly infectious and fatal disease that, in the past, has caused considerable losses of markhor in Chitral (1966) and Marco Polo sheep in the Pamirs (1907). The Global Rinderpest Eradication Programme (GREP) of FAO renders it very unlikely that rinderpest will present a threat to the wild caprines at Torghar.

Clinical Signs

Rinderpest and Peste des Petits Ruminants (see next disease) exhibit similar clinical signs in both wild and domestic animals. In typical cases these are: depression and a reluctance to feed. Affected animals lie down. Discharges are seen from the eyes and nose. Breathing is rapid and painful. Profuse, evil smelling and often bloodstained, diarrhoea develops. This soils the tail and hindquarters. Death occurs within 3-21 days of the onset of clinical signs. Large numbers of animals may be affected at the same time.
However, both Rinderpest and PPR can occur in much milder forms and in these cases the clinical signs may be less pronounced and some animals may recover. These serious diseases should be suspected whenever wild or domestic Caprinae exhibit discharges from the eyes and nose and have acute diarrhoea.

Peste des Petits Ruminants (PPR) or Goat Plague

This disease is caused by a virus closely related to rinderpest and causes an acute and usually fatal disease in sheep and goats. Urial and markhor can be expected to be susceptible to PPR and if infected by contact with domestic sheep or goats, both species could die in large numbers.
A vaccine for PPR will soon be available for domestic sheep and goats and it is strongly recommended that when this becomes freely available, all domestic sheep and goats likely to come into contact with the valuable wild caprines should be vaccinated.

Once vaccinated, domestic livestock is protected against PPR for at least three years.

PPR is spreading rapidly throughout Pakistan and is causing great losses of sheep and goats. The infection of the Torghar urial and markhor with PPR virus could result in very severe losses. The flocks of nomadic herdsmen, especially those from Afghanistan, which are said to be badly infected with PPR, are a potential source of infection of this dangerous virus.

Clinical Signs (see Rinderpest above)

Foot and Mouth Disease (FMD) (*Kuroo*)
FMD is enzootic in Pakistan and affects all cloven-hoofed domestic and wild animals. Unconfirmed cases have been reported in urial elsewhere in Pakistan and in this case the affected animals were said to recover.
In areas where wild boar (*Sus scrofa*) occurs along with wild Caprinae it is very important to limit the chance that these animals will contract FMD by making sure that they have no contact with infected domestic livestock. FMD-infected wild pigs excrete huge quantities of virus, far more than sheep or cattle, and would greatly increase the risk of infecting sympatric wild ungulates. Vaccine for FMD is available for domestic livestock.

Clinical Signs
FMD is likely to be first seen in contiguous domestic sheep, goats or cattle. These will be lame with sores between the claws of their hooves. Blisters and ulcers will be seen on the tongue and inside the mouth and the animals will salivate profusely. Pregnant animals may abort; milking animals may cease to lactate. Many animals will be simultaneously affected and much physical condition will be lost. Young animals may die while older ones will slowly recover. FMD may be mild in wild sheep and goats, which may abort and lose condition but will recover.

Sheep Pox, Goat Pox and Contagious Ecthyma (*Orf*)
These three acute and often fatal viral diseases are enzootic in the domestic flocks in Pakistan and could present a serious threat to wild sheep and goats if these proved susceptible and became infected. The virus of Orf can remain viable in scabs or soil for up to 22 years. If detected in domestic sheep and goats great care should be taken to avoid contact with the wild sheep. Vaccines are available.
Contagious Ecthyma (orf) is transmissible on contact to humans and can cause painful sores on the hands.

Clinical Signs
These diseases cause painful pustules, sores and scabs on the mouth and face of lambs and on the teats and udder of ewes. Infected lambs become stunted and the ewes may reject suckling lambs because of sore teats. This can result in fatal malnutrition of the lambs. In USA orf has occasionally caused mortality in adult wild sheep.

Appendix E

Veterinary Activities

1. Approach the National Veterinary Office (NVO) in Quetta to discuss possible training of 4/5 volunteers as Veterinary Assistants (VA).

2. Agree cost and availability of funding for training and for subsequent equipment and transport (camels?, donkeys?, motor cycles?) of volunteer VAs

3. Agree a suitable curriculum for the training course with NVO at Quetta

4. If agreement is reached with the NVO and adequate funding can be accessed, discuss project with Torghar Tribal Leaders .

5. If agreement is reached, call for young male volunteers from Torghar tribal families to attend a 3-4 months veterinary training course in Quetta

6. In consultation with Torghar Tribal Leaders, select 5 trainees (1 extra for contingency) from the volunteers

7. On completion of the Training Course, return VAs to their selected locations in Torghar

8. Arrange for regular supervisory visits and “problem-solving” meetings for VAs at Torghar. THIS IS VERY IMPORTANT! National Veterinary Services at Quetta might undertake this.