

***Status of the Punjab urial (*Ovis orientalis [vignei] punjabiensis*)
population in the Kalabagh, Salt Range of Punjab Province,
Pakistan***

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***A report to the United States Fish and Wildlife Service Division of
International Conservation and World Wide Fund for Nature-Pakistan.***

August 2001

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Introduction

The Malik family, Nawab of Kalabagh Estate and owners of the Kalabagh Game Reserve (KGR) in Punjab Province, Pakistan requested assistance from the United States Fish & Wildlife Service (USFWS) in determining the population status of Punjab urial (*Ovis orientalis [vignei] punjabiensis*) on their private reserve. The request was part of an effort to assess the potential for declaring the Kalabagh Game Reserve an official community-based sustainable-use hunting program sanctioned by the Government of Pakistan. The Malik family also asked for recommendations to aid in preventing diseases from domestic livestock being passed to the urial population.

In April 2001 the United States Fish and Wildlife Service (USFWS) Division of International Conservation and World Wide Fund for Nature-Pakistan (WWF-P) arranged for a team consisting of Mr. Michael R. Frisina, wildlife biologist, Montana Fish, Wildlife & Parks, Dr. Michael H. Woodford, wildlife veterinarian and chair, IUCN Veterinary Specialist Group, and Mr. Ghulam Ali Awan, conservation biologist, WWF-Pakistan to visit the KGR to conduct a survey of the urial population and to assess the disease threat. This report summarizes data resulting from the April visit and provides management recommendations.

Conservation Status

The taxonomic status of urial is unclear, especially designation of the various subspecies. In a synthesis of available information Hess et al. (1997) considered the urial at Kalabagh as the Punjab subspecies. Punjab urial are found as small, scattered populations throughout the Kala Chitta and Salt Range (Hess et al. 1997). The taxonomic status of urial populations living along the west bank of the Indus River is uncertain (Schaller and Mirza 1974). All urial except for the subspecies Ladakh urial (*Ovis vignei vignei*) which is listed in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendix I, are listed in CITES Appendix II. Punjab urial are listed as endangered in the IUCN Red List (IUCN 2000).

The Punjab Wildlife Protection, Preservation, Conservation and Management Act of 1974 protects Urial in Punjab Province from hunting, except under specific circumstances. Various wildlife protection legislation enacted by the Pakistan National Government and Punjab Provincial Government is summarized by Hess et al. (1997).

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Urial at Kalabagh have been protected for the last 60-70 years by the Malik family who currently employ about 30 game guards.

Study Area

Established in the early 1930's, the KGR is located about 25 km southeast of the town of Kalabagh, Mianwali District, Punjab Province in a small massif that forms the most westerly extension of the Salt Mountain Range (Figure 1). For many generations this land has been the private property of the Nawab of Kalabagh. Prior to the early 1930's the urial were afforded no special protection and few were present at that time according to Malik (2001). With shooting prohibited except for limited trophy hunting by special permission, the urial increased and in 1966 the population was estimated to number 500 animals (Mountfort 1969). Although declining in other portions of the Salt Range (Awan 1998), the urial population at Kalabagh has increased under protection with the population estimated to be 700 in 1988 and 850 in 1992 (Hess et al. 1997).

Historically, the Salt Range supported a varied and abundant spectrum of wildlife. Punjab urial, chinkara (*Gazella bennettii*), chukar (*Alectoris chukar*), see-see (*Ammoperdix griseogularis*), grey (*Francolinus pondicerianus*) and black (*Francolinus francolinus*) partridges were in plenty due to the nature of the vegetation and topography. Important carnivores included Indian wolf (*Canis lupus pallipes*), leopard (*Panthera pardus*), jungle cat (*Felis chaus*), Asiatic jackal (*Canis aureus*), red fox (*Vulpes vulpes*), and yellow-throated marten (*Martes flavigula*). However, habitat destruction and uncontrolled hunting in the recent past has led to a marked reduction in the numbers and range of most species. Currently, urial and chinkara are the only large wild ungulates on the KGR. Wild boar (*Sus scrofa*) are also present.

Livestock grazing within the KGR is limited to a few cattle and sheep that graze a short distance from the game guard headquarters at Jaba (Figure 2).

The Salt Range is an east-west trending thrust front about 175 km long and contains the second largest known mineral salt (sodium chloride) deposit in the world. The salt deposits are due to evaporation of the ancient Tethys Sea and formation of the Indus Plains from a collision of the Indian Plate with the Asian Plate resulting from continental drift 40 million years ago (King and Vincent 1993). Elevations in the Salt Range vary from 250-1,520 m. Sakesar Peak is the highest point at 1,524 m.

The dominant habitat type in the area is dry sub-tropical, semi-evergreen scrub forest (Roberts 1991). The important plant species are *Acacia modesta*, *Olea ferrugenia*, *Salvadora oleioides*, *Zizyphus nummularia*, *Dodonaea viscosa*, *Prosopis glandulosa*, *Justicia adhatoda*, and *Calotropis procera*. Shrubs are

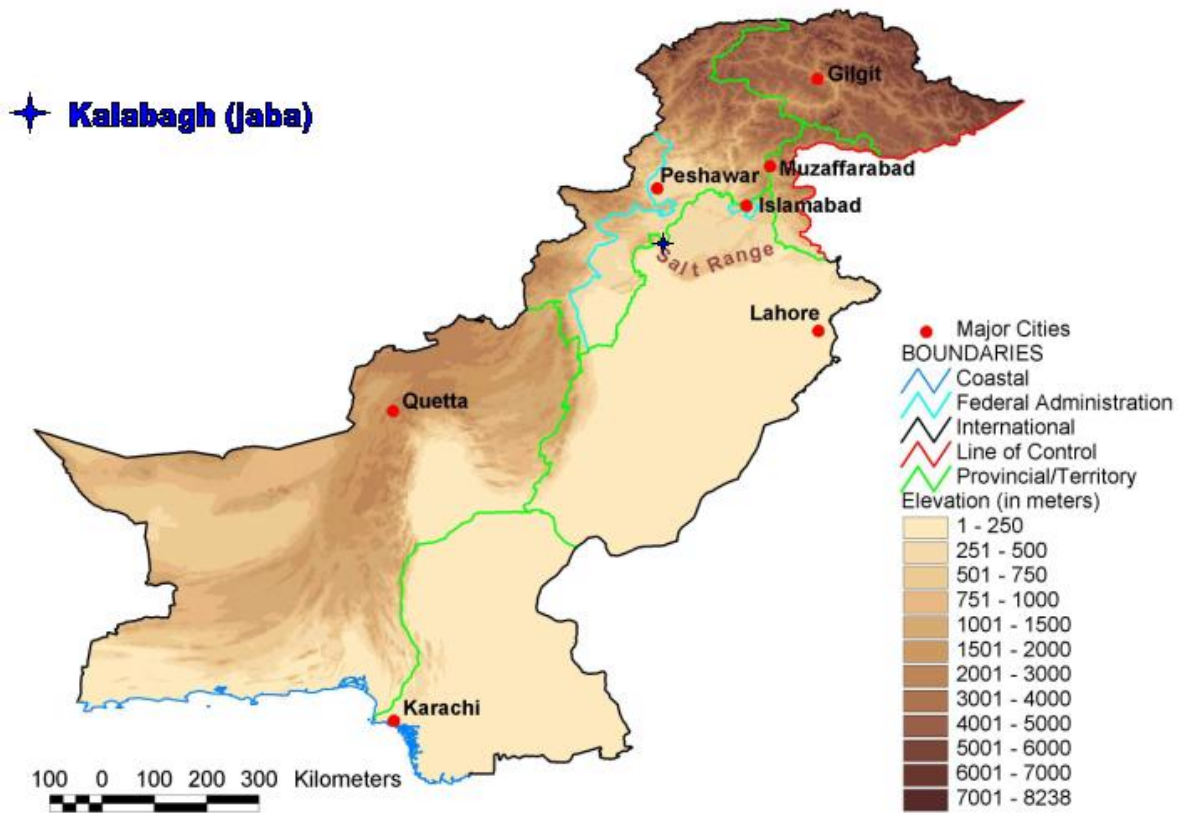


Figure 1. Map of Pakistan showing the location of the Kalabagh Game Reserve.

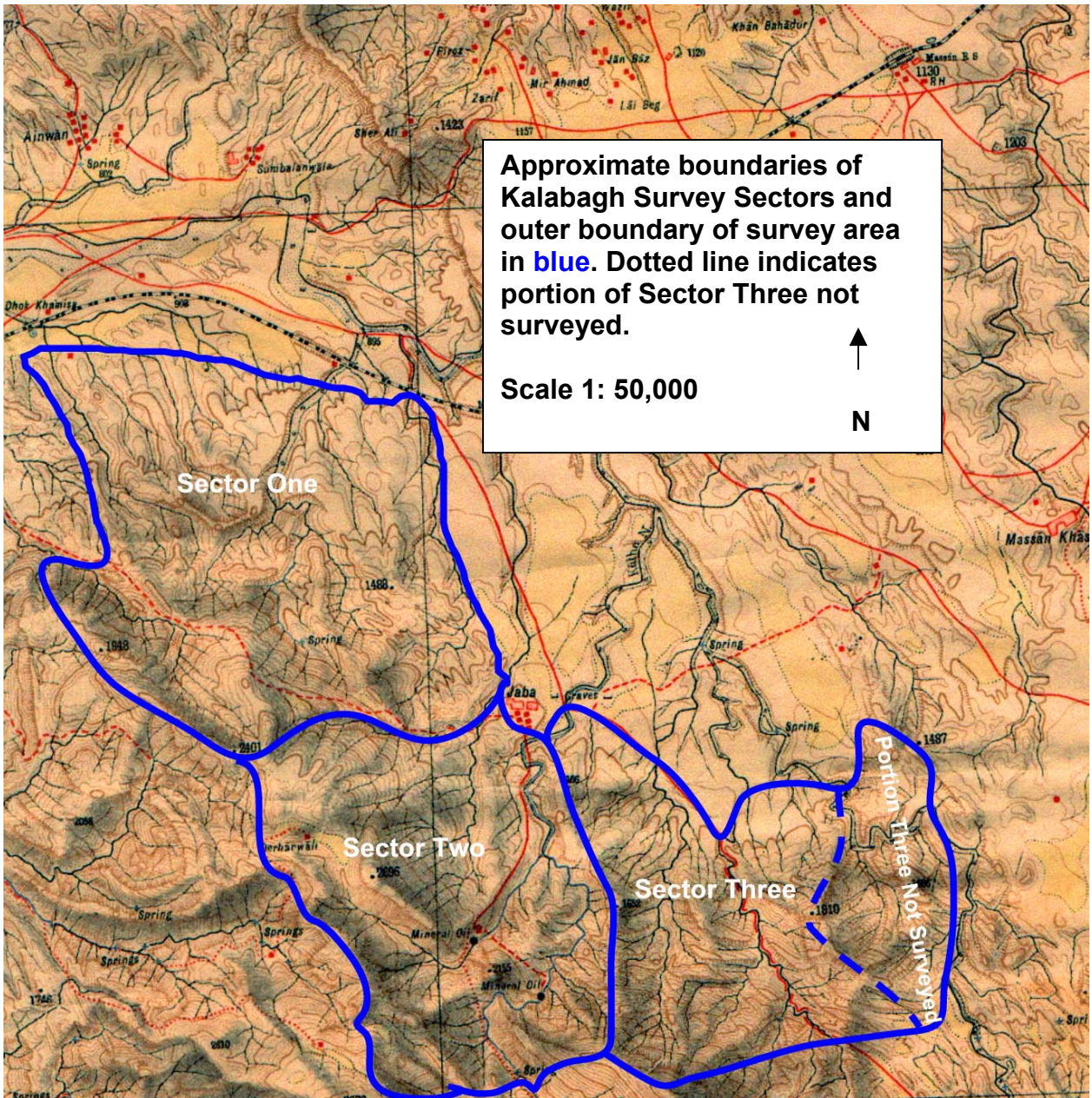


Figure 2. Topographic map of the Kalabagh urial survey area showing approximate location of the three Survey Sectors.

sparse, mostly scattered *Zizyphus nummularia* and *Maytenus royleanus* except in some ravines and on the high ridges where *Dodonaea viscosa* is prominent. The predominant ground cover consists of grasses, importantly *Cymbopogon jwarancusa*, *Eleusine compressa*, *Heteropogon contortus*, *Aristida adscensionis*, *Cynodon dactylon* and *Saccharum* species.

Methods

All surveys were conducted from the ground while hiking and urial were spotted from observation points and along ridgeline travel routes. Drop-off points, base camp locations, and observation points were documented using GPS technology. Animals were observed with the aid of 8X and 10X binoculars. Relatively short sight distances made use of spotting scopes unnecessary. One group of 4 to 6 experienced observers went into the field together each day for 3 days (April 5-7, 2001) to observe sheep.

The Kalabagh urial habitat was divided into three sectors for survey purposes (Figure 2). Each sector was of a size and layout affording efficient coverage by the observation group in one field day of effort. The size of each sector was determined from extrapolating areas from a 1:50,000 scale topographic map (Table 1).

Table 1. Size of the Kalabagh urial range and survey area by Sector¹.

Sector	Hectares	Km ²
1	847	8.5
2	635	6.4
3 Portion Surveyed	454	4.5
3 Portion Not Surveyed	202	2.0
Total Portion Surveyed	1,936	19.4
Total Area	2,138	21.4

¹For location of sectors refer to Figure 2.

Every effort was made to avoid counting the same animals more than once. To minimize error, distances traveled and areas covered were carefully planned before hand. When the possibility existed that the same animals were observed more than once, only their first recording was reported.

Each urial observed was classified into one of the following categories: adult ewe, lamb, or ram. Rams were further classified by size, using horn length as an indicator of age, as follows: Class I (1-3 years old), Class II (3-4 years old), Class III (5-6 years old) and Class IV (>6 years old).

Location and altitude of sheep observation sites were recorded using GPS.

Ram trophies previously harvested by hunters in the late 1960's and early 1970's and currently stored at Kalabagh were assigned an age by counting the number of annual growth rings using the method described by Geist (1966).

Information as to disease and its potential threat to urial was gathered from interviews with local veterinarians, tribal leaders, shepherds, game guards and other people with local knowledge. Pertinent literature was also consulted on diseases and their epidemiology.

Results & Discussion

During the survey in April, 259 urial were observed (143 ♀, 20 lambs, 96 ♂). The 96 ♂ were classified as 30, 19, 19 and 28 Class I, Class II, Class III and Class IV rams, respectively.

Population Abundance

During the 3-day Survey 86 urial were observed per day in the field, indicating urial are abundant at Kalabagh. Urial were widely scattered throughout the area many observed as single animals or in small groups of less than 5.

Population Density

During April 2001 a density of 13 urial per Km² was observed on the KGR. Comparing data from an October 1970 survey with data from an April 1974 survey Schaller (1977) reported urial densities at Kalabagh of 11 to 13 per km². However, Schaller's (1977) total census area was about 40 km² as compared to our total census area, which was about 21 km² (Table 1, Figure 2). We only included habitat commonly used by urial in our survey, lower elevation areas used primarily by chinkara, but in which urial are rarely observed were not included. Area for each sector was estimated using field notes and GPS coordinates correlated to map coordinates on a 1:50,000 scale topographic map.

Population Structure

The observed April population structure at Kalabagh is summarized in Table 1.

Table 1. Urial (*Ovis orientalis*) population sex and age structure as observed at Kalabagh, April 2001.

N	Percent			Percent Rams by Size Class ¹			
	Ewes	Lambs	Rams	I	II	III	IV
259	55.2	7.7	37.1	31.2	19.8	19.8	29.2

¹I = 1-3 years old, II = 3-4 years old, III = 5-6 years old, IV = > 6 years old.

Rams

The largest proportion of rams in the population was Class I (31.2 %), indicating good survival of lambs and yearling rams during recent years. Mature Class IV or trophy-type rams were the second most abundant male population segment (29.2%), indicating good survival of males into older age classes. Class II and Class III rams each comprised 19.8 percent of the male population segment, also indicating good survival.

Ewes and Lambs

During early April ewes are having their lambs at Kalabagh. During the survey we found several recently born lambs and observed many ewes off by themselves apparently preparing to have lambs. This is why the percentage of lambs (7.7 %) observed is low. Lambs born the previous year were classified as either yearling (Class I) males or placed in the adult ewe category. Our observations indicate this survey might have been conducted at or near the peak of the lambing, obviously a poor time period to census the total lamb segment of the population.

More than half of all urial observed (55.2 %) were ewes. Had the survey been conducted after lambing was completed and the lambs had been old enough to travel with their mothers, the percentage of lambs observed would have been higher and the percentage of ewes observed lower.

For the aforementioned reasons, data from this survey cannot be used to calculate an accurate lamb ratio for spring 2001. However, the high frequency of lambing activity we observed during the survey and high proportion of Class I rams in the population indicates a productive population.

Population Viability for Sustainable Harvesting

Data from this survey, although limited, indicate the urial population at Kalabagh is viable for both population and genetic processes (e.g. Soule 1987). Currently, the urial population at Kalabagh is not hunted. Prior to implementation of the Punjab Wildlife Protection, Preservation, Conservation and Management Act of 1974, the population was trophy hunted for many years on a limited basis (6-10 Class IV males per year) (Malik 2001). Eight Class IV males harvested at Kalabagh by trophy hunters (prior to the 1974 Act) were aged using horn characteristics as described by Geist (1966). The mean age was 9.6 years at death and ranged from 8 to 11. These data indicate rams are living to old age and were harvested near the end of their natural lifespan.

Currently the Kalabagh area is under consideration for designation as a Government sanctioned community-based sustainable use hunting area. If successful, trophy hunting will be reestablished with a portion of revenues used for conservation and management of the urial population. One requirement for initiation of the trophy-hunting program is establishment of an initial hunting quota that will not negatively affect the population. For similar species and populations, Harris (1993), concluded that annual harvest of trophy males in numbers equivalent to 1 or 2 percent of the total population size can be maintained without negative consequences.

The only recent population data available for the Kalabagh population is that collected during this April survey. April is a poor time of year to census a urial population as ewes are scattered due to lambing, recently born small lambs are difficult to observe, and rams are scattered across their range. The result is a significantly lower number of total animals observed by sex and age class than

would be observed during a time of year when ewes and rams are more visible such as the fall breeding season. Thus using data from this survey to estimate a suitable sustainable hunting quota provides a very conservative number of animals appropriate for harvest, but may be suitable in a situation such as this where the purpose is to establish an initial safe quota.

Using the approach described by Harris (1993) and assuming the 259 urial observed during this survey is the total population, an initial trophy hunting quota for fall 2001 could be up to 5 trophy males. Harvesting of males within a limit of 10 to 20 percent of the replacement of the trophy-sized segment is consistent with Wegge (1997) as a safe and conservative harvest level for stable or increasing wild sheep and goat populations. During this survey we observed 19 Class III (5-6 year old) males, which is the population segment of replacement animals for harvested Class IV males.

A trophy harvest quota of 5 Class IV males is a conservative and appropriate harvest level for sustainable management, but should be considered a maximum number until additional population monitoring is conducted during the fall breeding season when a population estimate can be developed for monitoring population trend. Because of the aforementioned observational biases, data collected during this April survey was not used to make a population estimate.

Disease Risks

Roberts (1997) states that “the isolated (urial) population in the Kalabagh Reserve is very vulnerable both to disease and to tribal clashes...”, but he did not specify what disease. The remarks recorded hereafter arise from observations made in the field during April 2001. Information was also gathered from conversations with Government veterinary officers, tribal leaders, village chieftains, shepherds, game guards, and from compilation of disease epidemiology. While the accuracy of most of the information is without question, it must be remembered that since it was not possible at this time to collect any pathological specimens from the wild Caprinae, any diagnoses based on hearsay evidence must be considered presumptive.

Very little is known of the susceptibility of the urial in Pakistan to the diseases of domestic livestock that share their range. However, some idea of the likely risk of disease transmission can be obtained from previous accounts in the literature and from recent observations by Pakistani field biologists. Age, gender, reproductive activity (rut), pregnancy, lactation, nutrition (drought and resulting competition for grazing by domestic livestock), disturbance (hunting pressure, both legal and illegal) all have a bearing on an animal’s immune status and its ability to resist the challenge of a disease agent.

External Parasites

In 1992 and again in 1995 and 1996 a skin disease, presumptively diagnosed as sarcoptic mange, was reported to be affecting the Kalabagh urial and to be

causing some mortality, particularly in the older males after the rut (November/December). At the same time a heavy infestation with ticks was noted in the dead and dying animals. The source of the infection was said to be the domestic donkeys that were used to carry supplies to the Game Guards at remote posts in the Reserve. Unfortunately, no skin scrapings or biopsies were taken from the dead or dying urial or the donkeys, so the diagnosis remains presumptive since it was never confirmed.

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 on rocks and tree stumps that have previously been contaminated by infected domestic livestock. The mange mite probably occurs naturally on and in the skins of healthy urial and only causes overt clinical disease when the animals are stressed by malnutrition.

Unless debilitated by concurrent disease and/or malnutrition wild animals rarely carry heavy infestations of ectoparasites (ticks, etc.).

The Government Veterinarian at Kalabagh reported that sarcoptic mange and ringworm are common in the domestic livestock in the area and considered that the very close contact required for transmission to the wild sheep rarely if ever occurs at Kalabagh.

Warble flies and nasal bot flies, both of which parasitise domestic sheep and goats, probably also infect the wild sheep but are not known to cause significant disease in healthy animals.

Internal Parasites

Intestinal worms, lungworms and liver flukes all infect the domestic sheep and goats in the Kalabagh area and are probably to be found in the wild sheep, too. Under extensive range conditions as occur on large landscapes these parasites are unlikely to cause significant disease in the urial unless they are stressed by drought and malnutrition.

Domestic livestock can be easily treated for sarcoptic mange, ticks, intestinal worms and lungworms by strategic injection with an avermectin anthelmintic. Treatment for liver flukes requires the administration of a specific flukicide.

Bacterial disease

Anthrax

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.

Viral diseases

Rinderpest

Rinderpest is still 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 (*Capra falconeri*) in Chitral (1966) and Marco Polo sheep (*Ovis poli*) in the Pamirs (1907). The Global Rinderpest Eradication Programme (GREP) of the UN Food and Agricultural Organization (FAO) renders it very unlikely that rinderpest will present a threat to the urial.

Peste des Petits Ruminants (PPR) or Goat Plague

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

PPR is spreading rapidly throughout Pakistan and is causing great losses of domestic sheep and goats. The flocks of nomadic herdsmen are said to be a source of infection with this dangerous virus.

Foot and Mouth Disease (FMD)

FMD is enzootic (endemic) in Pakistan and affects all cloven-hoofed domestic and wild animals. Unconfirmed cases have been reported in urial in Pakistan and in these cases the affected animals were said to recover. In areas where wild boar occur 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 pigs excrete huge quantities of virus, far more than sheep or cattle, and greatly increase the risk of infecting sympatric wild ungulates. Vaccine for FMD is available for domestic livestock.

Sheep Pox, Goat Pox and Contagious Ecthyma

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 they proved susceptible. If detected in domestic sheep and goats, great care should be taken to avoid contact of the infected animals with the wild sheep. Vaccines are available.

Conclusions and Recommendations

1. The urial population at Kalabagh is viable for both population and genetic processes and a sustainable use trophy harvest quota of 5 rams from the Class IV age group could be established for the 2001 hunting season without negative impact to the population.
2. An intensive survey using the protocols developed for this survey should be conducted during fall 2001 to establish a baseline for determining population trend and future trophy hunting quotas.
3. A detailed analysis of the Kalabagh urial population's habitat should be conducted. This should include describing the variety and extent of plant communities present, the diversity of plant species present, and the ecological condition of soils and vegetation. The aforementioned information is essential for determining habitat carrying capacity for urial.
4. All trophies harvested should be aged and standard physical measurements taken of the carcasses and horns. Field necropsy for disease, parasites, and assessing animal health at time of death should be performed on all harvested trophies. This might require special training, but provides essential data for population management.
5. No clinical signs of infectious or contagious disease were detected in the Kalabagh population of urial in April 2001.
6. Most of the diseases common to domestic livestock at Kalabagh present a potential threat to the urial population. However, this threat can be controlled or eliminated by strategic use of available medication and vaccines for the domestic livestock that may come into contact with wild sheep.

With few exceptions, the susceptibility of the wild Caprinae to the common diseases of contiguous domestic livestock is largely unknown. One can, however, safely predict that anthrax (an environmental contaminant) where it occurs would be fatal to the urial. PPR (and rinderpest, too), could cause very severe losses.

Since it is not at present possible to vaccinate widely dispersed wild ungulates in mountainous terrain, the best and probably only ways 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 and 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 regular vaccination of domestic livestock, especially the sheep and goats against PPR, is strongly recommended. The health and productivity of the domestic livestock would benefit greatly from such regimes.

Most important of all is to limit, or better to eliminate, all direct and indirect contact between the potentially infectious domestic livestock and wild sheep. In the case of the Kalabagh Reserve, this would entail preventing all contact between the hand-reared urial and the domestic sheep and goats, and not allowing the Game Guards to take lactating domestic goats to remote ranger posts unless the animals have been previously treated for internal and external parasites and vaccinated against PPR. A small proportion of the 3,500 sheep and goats, the 900 head of cattle and the Game Guards' transport donkeys maintained at Kalabagh has occasional contact with the wild urial at present. This contact should be reduced or eliminated.

Acknowledgements

The authors acknowledge the USFWS Division of International Conservation for funding the survey. We especially thank Dave Ferguson for his confidence in us and for providing constant encouragement and support. Dave Ferguson also reviewed the draft manuscript. The WWF-Pakistan and WWF-Pakistan Conservation Advisor Richard Garstang supported the project and provided GIS technical assistance. Christopher Shank (IUCN Pakistan) supported the project in many ways; his assistance with scheduling and travel was especially helpful. We thank the Malik family of Kalabagh for their generous hospitality. Without their support, this project would not have been possible. Game guards Muhammad Ramzan, Muhammad Araf, Omar Hayat, and Jalandhar provided essential field support. Liakoat Ali and Muhammad Ashraf of the Punjab Wildlife Department also assisted with the survey.

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