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Disease Spectrum and Mortality of Punjab Urial *(Ovis vignei punjabiensis)* in Kalabagh Game Reserve

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Abstract.- The Punjab urial *(Ovis vignei punjabiensis)* is the principal mammalian game species of the scrub forest in Salt and Kala Chitta Ranges and endemic to northern Punjab, Pakistan. It is classified as endangered in the IUCN Red Data Book for mammals. Apart from its trophy value in sport hunting, it is also traditionally prized as a pet. Currently Kalabagh Game Reserve (KGR) is supporting the largest population of the Punjab urial. Disease conditions were noted during 2001-2002 in urial in the Salt Range. Previous information about diseases was also collected in the wild and in captive populations to find out which diseases affect Punjab urial. At KGR in different sites and seasons abundance of ticks was observed. Altogether, 15 disease conditions were identified in urial with or without mortality. Of the recorded cases, age-wise distribution showed the highest prevalence among adults followed by yearlings. The apparent density dependence of previous die-offs in KGR was perhaps due to low resource availability when there were many urial, or to increased opportunities for contact with domestic livestock at high population density. Strict veterinary control of livestock and control of an direct and indirect contact between the potentially infectious livestock and urial, together with an appropriate management of urial density, may be the effective measures for the prevention and control of disease in the area.

Key words: Urial, *Ovis vignei punjabiensis*, Kalabagh, ticks.

INTRODUCTION

Many large herbivores in Asia are under threat from poaching, habitat fragmentation and competition with domestic livestock. Conservation of Asiatic ungulates is often hampered by poor knowledge of basic population dynamics and weak quantification of specific threats. Wildlife conservation programs require knowledge and understanding of all related problems that may hamper population growth. Diseases are one such problems of potential significance for the survival of a species (Bhowmi, 2000). The objective of this investigation was to, collect previous information about disease of Punjab urial in the Salt Range, and in captive populations of Punjab. The Punjab urial is distributed between the Jhelum and Indus rivers in Pakistan, below an altitude of 1500 m (Schaller and Mirza,1974). It is listed as endangered in IUCN Red List of 2004. Like other wild sheep (Aleem, 1977; Schaller, 1977), Punjab urial is gregarious and sexually highly dimorphic: adult males weigh about 40 kg and have large curly horns that can reach 80-100 cm in length, whereas adult females weigh about 25 kg and their horns are straight and only about 12 cm long. Females give birth to one or two lambs in early April. Although all harvesting of Punjab urial is illegal, mature males are a sought-after trophy, while lambs are traditionally prized as pets. Ownership of a pet urial is a status symbol in Pakistan (Awan, 2001).

Habitat loss and fragmentation are the most commonly identified causes of imperilment but disease may be the factor that finally results in extirpation or extinction. A disease, even of mild severity, has a more profound influence on mountain sheep *(Ovis canadensis)* population dynamics than any other factor (Gross *et al*., 2000). Schrag and Weiner (1995) suggested that the importance of disease in conservation is likely to increase as humans restrict traditional movement patterns, concentrate animals in small areas and increasing rates of contact with exotic organisms. Festa-Bianchet (1988) reported, while conducting a study on bighorn sheep *(Ovis canadensis canadensis*), that parasites tax their host metabolism and may obtain resources that could otherwise be used for reproduction. Festa-Bianchet and Samson

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(1984) concluded that parasites may be both a cause and result of stress. Spraker *et al.* (1984) suggested that stress, mostly from human disturbance caused increased level of cortisol resulting in inhibition of the inflammatory process and increased susceptibility to bacterial pathogens in bighorn sheep.

External parasites are found in nearly every country in the world. Their importance as agents and vectors of disease has long been recognized. Randolph (2000), and Randolph *et al.* (2002) described transmission dynamics of many pathogens vectored by various tick species (*Ixodes* spp.) such as piroplasms (*Babesia* spp.), spirochaetes (*Borrelia* spp.), rickettsia (*Anaplasma* spp.) and viruses (tick-borne encephalitis and loupping ill viruses). It was hypothesized that the ticks' density was lower in burnt area than in the unburnt sites in KGR and during monsoon ticks concentration in unburnt sites forced animals to move to the lower areas.

Study area

Kalabagh Game Reserve (KGR) was the study area. The Malik family, Nawab of Kalabagh Estate and owners of the Kalabagh Game Reserve (KGR) established this in the early 1930's. The KGR is located about 25 km southeast of the town of Kalabagh, Mianwali District in a small massif that forms the most westerly extension of the Salt Range. The topographic features described by Schaller (1977) as "the Salt Range rises gently from a plain before entering a rugged maze of small plateaus and tilted beds of rock, finally culminating in a series of rounded ridges at an altitude of about 1000 m. An *Acacia* woodland with scattered *Salvadora oleoides* and *Zizyphus nummularia* covers the slopes, and the shrub *Dodonaea viscosa* caps the ridges". Protection against poachers has been vigorously enforced within the reserve where urial have been protected for the last 70 years by the Malik family who have currently, employed more than 30 game guards. Currently reserve is supporting 450-500 urial and about 150 chinkara *(Gazella bennettii).* Livestock grazing within the KGR is strictly prohibited in a core area of 20 km^2 with the greatest urial density, and is limited to a few cattle and sheep in other parts of the reserve where urial occur. Human access is limited to a few unpaved roads in the lower elevation areas where urial are rarely observed. No wood or grass cutting is allowed in the core urial habitat.

Weather data (mean monthly temperature and mean monthly precipitation) were obtained from the Meteorological Department weather stations at Mianwali, 30 km southwest of KGR. The climate of the area is sub-humid sub-tropical continental type. Average annual rainfall and mean minimum and maximum temperature are given in Figure 1.

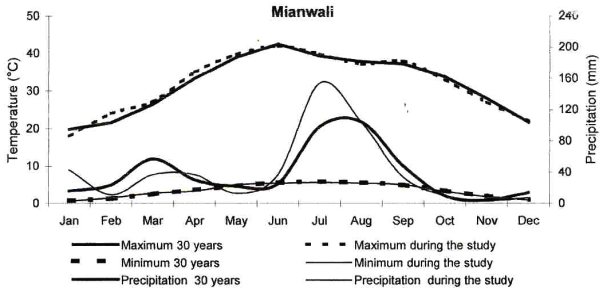

Fig. 1. Month wise mean temperature and precipitation averaged 30 years (1961-90) and during the present study.

Methods

Data on the prevalence of disease were collected while conducting surveys for population estimates in April, October and December each year, throughout the Salt Range from December 1999 to June 2002. The densities of host-seeking ticks of all stages were determined for four consecutive seasons from summer 2001 to 2002 at KGR according to the procedure of Randolph *et al.* (2002) by dragging a 1m^2 white woolen blanket over the ground for 5m and counting all the attached ticks, repeated 20 times to give a total sample area of 100 m^2. The three sites were selected across a variable vegetation cover and terrain of the study area: (l) on the higher slopes and ridges in the south with open canopy *Acacia modesta* and *Olea ferrugenia* and undershrubs of *Dodonaea viscose* and *Cymbopogon jwarancusa;* (2) lower slopes with dense and tall cover of *Cymbopogon* and other grasses and (3) undulating and more or less plain eastern portion of the reserve, area of livestock grazing (burnt in 1998 and resultantly low vegetation cover). It was observed that in monsoon season urial shift day activity in this eastern portion

of the reserve.

As it is difficult to study disease occurrence on free ranging animals, previous information about disease in the Salt Range and in captive populations of Punjab urial were also collected from the local government veterinary officers, 10 years of post-mortem data on disease surveillance and records of divisional diagnostic lab of livestock. Veterinary diagnoses, however, relied on pathological lesions and seldom included histopathological findings.

RESULTS AND DISCUSSION

Altogether, 15 disease conditions were identified in urial with or without mortality. Of the recorded cases, age-wise distribution showed the highest prevalence among adults followed by yearlings. From the documented post-mortem (n=18) deaths, 8 (44%) were due to pneumonia, 2 (11 %) were due to entritis and 3 (17%) due to heat stroke, while others were due to snake bite or accidental.

Maximum average density of 815 and 184 ticks /100 m^2 was observed in summer (monsoon) season in unburned and burnt sites, respectively (Fig. 2). Six ticks were collected from a yearling wild male in August 2002 and were identified as *Hyalomma* species. Two ticks were collected from peri-anal area, one from the ears and three from the belly. Feeding ticks may physically aggravate the urial. In an attempt to rid themselves of these parasites, animals were observed to rub them off.

There was considerable seasonal variation in tick abundance in KGR. Apparently unfed ticks started questing in spring and accumulated on the vegetation and their abundance was declined in May and June then in monsoon major resurgence was observed in July and August and then again declined in fall and winter. Randolph *et al.* (2002) suggested that ticks are very susceptible to desiccation, more active and good survival in high humidity conditions. In the unburned sites with dense ground cover (site 2) have comparatively more moist and resultantly having higher density of ticks than the burned sites (site 3). Randolph and Storey (1999) reported that in moist habitats tick survival is good and ticks are able to quest unhindered at their selected height on the vegetation. The ticks were less common in areas where tall grasses were sparse, burnt 3 years back and mostly grazed by livestock.

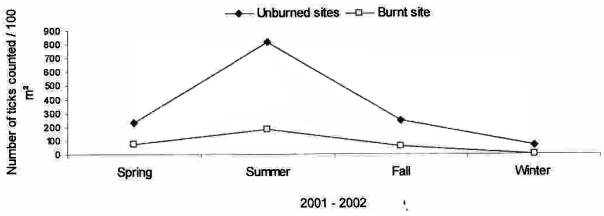

Fig. 2. Variation and seasonal patterns of questing ticks counted on vegetation at KGR.

External parasites

Six sarcoptic mange symptoms were detected from adult rams at KGR in fall 2001 and 2002. Animals irritated by warble f1y and nasal bot flies were observed at several occasions, dashing erratically, jerking the head up and down and finally resting in a patch of tall grass after lowering their head.

Three deaths have been reported since 1966 in literature in KGR: in 1970, 1983 and 1996 (Fig. 3). In January 1970 many animals were killed at KGR by an unknown disease (Schaller and Mirza, 1974) and similar outbreaks have since occurred regularly, though fewer urial have died. Roberts (1985) reported that in 1983 an unknown epidemic, possibly introduced by ticks, cut the urial number from 750 to 300 at KGR. In 1992 and again in 1995 and 1996 a skin disease, tentatively diagnosed as sarcoptic mange, was reported to be affecting the urial and to be causing mortality, particularly among older males after the rut (Frisina *et al*., 200l), and in 1996 the population crashed by 50% due to sarcoptic mange and some unknown disease (Malik Fawad khan, pers. comm.). The epidemics in the KGR have been suggested to originate from pathogens transmitted by livestock, but no definitive evidence exists to support this because no skin scrapings or biopsies were taken from the dead or dying animals. The history of scabies epidemiology in human and wild animal populations reveal a common pattern consisting of periodic outbreaks with cycles ranging from 10 to 30 years, influenced by a variety of host, parasite and external factors (Perez *et al*., 1997).

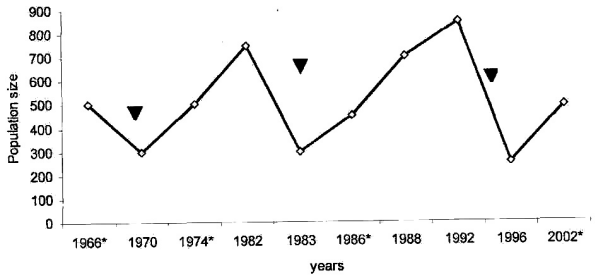

Fig. 3. Estimated number of urial KGR 1966-2002.

*Estimates made after conducting detailed survey of the reserve. Other estimates are reported in literature by the owner and are shown as trends instead of exact numbers. Triangles refer to die-offs.

The veterinarian at KGR reported sarcoptic mange and ringworm in livestock. Frisina *et al.* (2001) suggested that this disease is transmitted to urial by rubbing the trees or rocks that are already infected by the 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.

Internal parasites

Schaller (1977) reported *Eimeria arloingi, Trichocephalus ovis, Oesophagostomum* sp. and *Cystocaulus oeratus* species in faeces and the veterinarian at KGR also reported intestinal worms, lungworms and liver flukes infecting livestock and urial. However, under extensive range conditions these parasites are unlikely to cause significant disease in the urial unless they are stressed by malnutrition (Frisina *et al*., 2001).

Viral diseases

Four cases (two adult rams, one adult ewe and one young one) of symptomatic lesions of contagious ecthyma (sore mouth) were observed in April and May 2002 in KGR and Chhumbi Surla Wildlife Sanctuary, respectively, but no mortality was attributed to this disease. Three cases of unconfirmed Foot and Mouth Disease (FMD) were observed at KGR during the course of study. Wild boar *(Sus scrofa)* occurred throughout the range of urial and could be the major source of this viral disease. As Frisina *et al.* (2001) reported that FMD infected pigs excrete huge quantities of virus, far more than livestock and greatly increase the risk of infecting wild ungulates.

Bacterial diseases

Two deaths in free ranging urial were apparently due to diarrhoea. Martin *et al.* (1996) reported universal presence of some strains of *Pasteurella hemolytica* in all ungulates and there are five primary factors that cause pneumonia in mountain sheep *viz*., presence of *Pasteurella* spp. of bacteria, indigenous to mountain sheep, which with other factors can predispose sheep to pneumonia, the presence of stress *e.g.* depleted forage or human disturbance, the presence of lungworms, the presence of viruses and exposure to a virulent strain of *Pasteurella* spp. from livestock.

The history of last 30 years at KGR apparently shows that when the urial population increased well above 500 heads the disease rate increased and population crashed to almost half that seems to be linked with density. The apparent density dependence of die-offs may be attributable to low resource availability when there were many urial, or there were increased opportunities for contact with domestic livestock at high population density. The second apparent reason is more convincing for KGR. Hoar *et al.* (1996) cited that large populations of bighorn sheep are more likely to contract disease and/or parasites than small populations. Barlow (1996) suggested that many wildlife diseases were density dependent; developing into epidemics once the host population had reached a threshold density.

RECOMMENDATIONS

Strict veterinary control of livestock and control of all direct and indirect contact between the potentially infectious livestock and urial, together with an appropriate management of urial density, may be the effective mean of prevention and control of disease in the area.

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