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MANAGEMENT PLAN FOR WILD ARTIODACTYLS IN
NORTH WEST FRONTIER PROVINCE, PAKISTAN

By

Mohammad Muntaz Malik

B.S., University of Peshawar, NWFP, Pakistan, 1969

Presented in partial fulfillment of the requirements

for the degree of

Master of Science

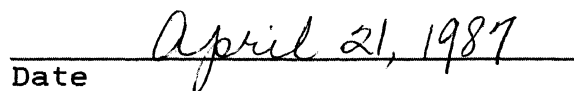
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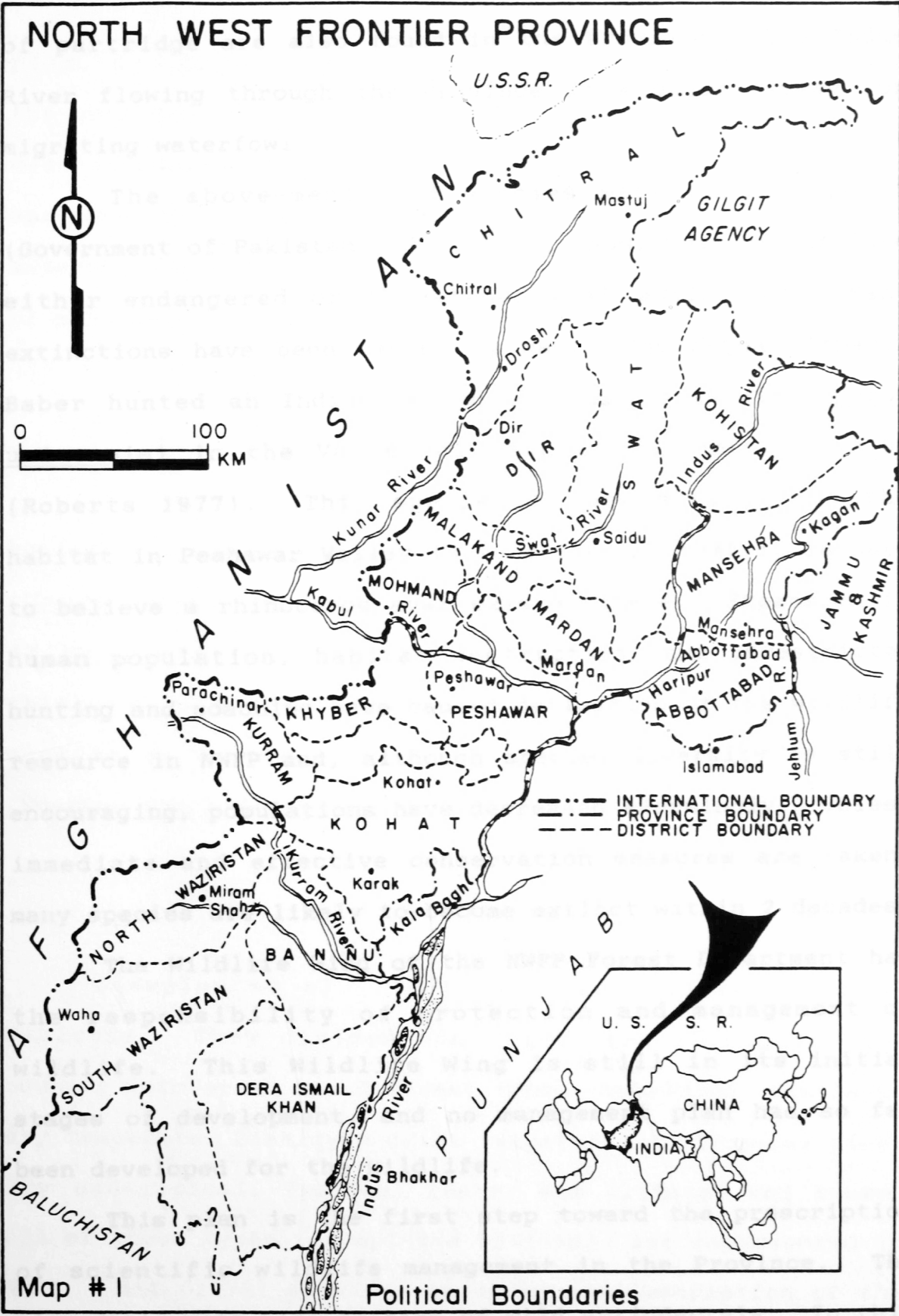
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CHAPTER I

INTRODUCTION

The North West Frontier Province (NWFP) of Pakistan lies between $31^{\circ}4'$ and $36^{\circ}57'$ N latitude and $69^{\circ}16'$ and $74^{\circ}7'$ E longitude. The Province extends over an area of $74,521 \text{ km}^2$, excluding the Federally Administered Tribal Areas which cover an area of $27,220 \text{ km}^2$. In the north, the Province adjoins the Afghanistan Pamirs. The south is bounded by parts of Baluchistan and Punjab provinces. In the east are the Gilgit Agency and Kashmir and Punjab provinces; the west is bounded by Afghanistan (see Map 1). Peshawar is the provincial capitol. Variation in altitude is great, about 300 m at Dera Ismail Khan (D.I.Khan) in the south to 7690 m at Tirichmir in the north. Topography, climate, and land use differ greatly, as do flora and fauna.

The fauna of NWFP has affinities to both Palearctic and Oriental regions. Besides numerous species of small mammals, non-game birds, and reptiles, the wildlife of the Province includes Primates (two species), Canids (four), Ursids (two), Mustelids (eight), Vivirids (three), Hyaenid (one), Felids (eight), Suid (one), Cervids (three), and Bovids (five). Five species of pheasant and five species



of partridge are also found in the Province. The Indus River flowing through the Province is a major flyway for migrating waterfowl.

The above-mentioned species were once abundant (Government of Pakistan [GOP] 1970). Now, most of them are either endangered or threatened with extinction. Many extinctions have been caused by man. The Mughal Emperor Baber hunted an Indian one-horned rhinoceros (Rhinoceros unicornis) in the Valley of Peshawar around 1526 A.D. (Roberts 1977). This species is now extinct and the habitat in Peshawar Valley is so different that it is hard to believe a rhinoceros ever existed there. Expansion in human population, habitat destruction, and unrestricted hunting and poaching have caused decimation of the wildlife resource in NWFP and, although species diversity is still encouraging, populations have decreased alarmingly. Unless immediate and effective conservation measures are taken, many species are likely to become extinct within 2 decades.

The Wildlife Wing of the NWFP Forest Department has the responsibility of protection and management of wildlife. This Wildlife Wing is still in its initial stages of development, and no management plan has so far been developed for the wildlife.

This plan is the first step toward the prescription of scientific wildlife management in the Province. The plan deals with nine species of wild artiodactyls. In this

plan, I discuss the habitat, distribution, and status of the artiodactyls in the Province. Past management has also been discussed. I highlight the problems of conservation and make management recommendations for each species. A separate chapter has been devoted to the overall objectives of management and management recommendations.

Wild Artiodactyls in NWFP

The wild artiodactyls in NWFP belong to the families bovidae, cervidae, and suidae. They include Himalayan ibex (Capra ibex), markhor (Capra falconeri), urial (Ovis orientalis), gray goral (Naemorhedus goral), Indian chinkara (Gazella gazella), hog deer (Axis porcinus), muntjak or barking deer (Muntiacus muntjak), musk deer (Moschus moschiferus), and Indian wild boar (Sus scrofa).

Habitat

Champion et al. (1965) described forest types of Pakistan. They divided the vegetation throughout the country into seven broad forest types--subalpine, Himalayan dry temperate, Himalayan moist temperate, subtropical pine, dry subtropical, tropical thorn, and littoral and swamp. All of these types, except the littoral, are represented in NWFP. Beg (1975) provided an elaborate description of the wildlife habitats of Pakistan. He divided the vegetation

of the country into 10 major types, and divided and subdivided these types into smaller habitat units, providing information on the associated wildlife species. Beg's major habitat types were cold deserts, alpine scrub and pastures, subalpine forests, Himalayan moist temperate forests, dry temperate forests, subtropical pine forests, dry subtropical semievergreen forests, tropical thorn forests, tropical dry-deciduous forests, and tropical littoral and swamp forests. All but tropical littoral forest are represented in NWFP. Roberts (1977) gave a very good account of habitat types and associated mammals in Pakistan.

In this plan, I have extracted information from all these sources in writing an account of wildlife habitats in NWFP with respect to wild artiodactyls. However, I have relied rather heavily on Robert's classification. A brief discussion of habitat types and the associated artiodactyls follows.

A. Permanent Snow and Cold Desert

1. Permanent Snow and Cold Desert

This habitat type is found in the northernmost region and at the highest altitudes in northern Chitral. The vegetation is more xerophytic than the alpine zones in the rest of the Province. Typical plant species in this habitat include Salix denticulata, Juniperus communis, Mertensia

tibetica, and Potentilla desertorum. The Himalayan ibex is found on the periphery of this habitat type.

B. Alpine Zone

2. Alpine Meadows

This habitat type is found above the conifer forest tree line in all the mountain regions of the districts of Mansehra, Swat, Dir, Kohistan, and Chitral. Vegetation is comprised of Poa spp., Draba trinervia, Polygonum affine, Potentilla spp., Saxifraga sibirica, and Euphorbia kanaorica. This habitat type is inhabited by Himalayan ibex.

3. Subalpine Scrub and Birch Forest

This habitat type is confined to a narrow zone below the alpine meadows throughout the higher mountain ranges of the Himalayas in the districts of Mansehra, Kohistan, and Dir Kohistan. Typical plant species include Betula utilis, Rhododendron anthopogon, Juniperus communis, Sorbus aucuparia, and Poa spp. This habitat is inhabited by musk deer and markhor.

C. Montane Temperate Forest

4. Dry Temperate Conifer Forest

This habitat type is found in Hindukush mountain

ranges in lower Chitral District and the inner Himalayan ranges in the districts of Mansehra, Kohistan, Swat, and Dir. This is an area of low summer rainfall. The habitat is confined to more sheltered slopes between 1225 m and 3300 m. The dominant vegetation includes Picea smithiana, Pinus wallichiana, Cedrus deodara, Pinus gerardiana, Indigofera gerardiana, Sambucus ebulus, Sorbaria tomentosa, and Plectranthus rugosus. This type serves as partial winter habitat for markhor.

5. Himalayan Moist Temperate Forest

This habitat type is encountered in the outer Himalayan ranges in the districts of Mansehra, Abbott Abad, Swat, and Dir, between 1500 m and 3000 m elevation. This is an area of high monsoon rainfall. The vegetation includes Quercus dilatata, Acer caesium, Populus ciliata, Taxus baccata, Pinus wallichiana, Cedrus deodara, Picea smithiana, Abies pindrow, Berberis ceratophylla, B. lycium, Lonicera alpigena, Viburnum nervosum, Skimmia laureola, and Fragaria spp. The lower reaches of this habitat type are inhabited by gray goral.

D. Subtropical Pine Forest

6. Subtropical Pine Forest

This type is confined to the lower altitudes in outer Himalayan ranges in the districts of Mansehra, Abbott Abad, and Swat, between 1000 m and 1970 m. The dominant vegetation includes Pinus roxburghii, Quercus incana, Berberis lycium, Carissa spp., and Cotoneaster spp. Gray goral inhabit this habitat type.

E. Alpine Dry Steppe

7. Steppic Forest in Northern Latitudes

This type is found in the side valleys in lower parts of Chitral District and parts of Kohistan and Dir districts, between 1200 m and 2400 m elevation. Associated plant species include Juniperus macropoda, J. polycarpus, Pistacia integerrima, Quercus ibex, Pinus wallichiana, Plectranthus rugosus, Artemesia maritima, Hippophaes rhamnoides, Ephedra intermedia, Berberis sp., and Saphora mollis. This habitat is inhabited by markhor and urial.

8. Steppic Forest in Intermediate Latitudes

This type is found in Waziristan, Kurram, and Malakand agencies and Swat District. The dominant vegetation includes Juniperus macropoda, Fraxinus xanthoxyloides, Pinus

gerardiana, Artemesia maritima, Rheum emodi, Ephedra nebrodensis, Rosa webbiana, and Pistacia mutica. This habitat supports markhor and urial.

F. Tropical Deciduous Forest

9. Tropical Deciduous Forest

This habitat is confined to a very narrow strip in Khanpur/Makhnial foothills adjoining Margalla National Park. The typical plant species include Acacia modesta, Bauhinia variegata, Cassia fistula, Salmalia malabarica, Sterculia villosa, Pistacia integerrima, Mallotus philippinensis, Punica granatum, Dadonea viscosa, Carissa spinarum, Adhatoda vasica, and Zizyphus spp. Barking deer is the only wild artiodactyl associated with this habitat in NWFP.

G. Dry Subtropical Semievergreen Forest

10. Dry Subtropical Semievergreen Forest

This habitat extends almost throughout the foothills in the Province between approximately 500 m and 1000 m. However, it does not extend into Chitral District. Typical vegetation consists of Acacia modesta, Olea cuspidata, Monotheca buxeifolia, Dadonea viscosa, and Zizyphus spp. Associated wild artiodactyls

include urial, Indian chinkara, barking deer, and occasionally wild boar.

Degraded forms of this habitat in Khyber, Mohmand, Malakand, and Waziristan agencies, and Sheikh Buddin and Sakra hills in the districts of D.I.Khan and Mardan, support straight-horned markhor.

H. Tropical Thorn Forest

11. Indus Plains

This habitat is found in the plains of D.I.Khan. In Peshawar Division, this habitat has yielded to extensive agriculture. The vegetation includes Tamarix aphylla, Prosopis spicigera, Acacia nilotica, Salvadora oleoides, Capparis decidua, Tecomella undulata, and Suaeda fruticosa. Wild boar and Indian chinkara inhabit this habitat.

I. Riverain Plain

12. Riverain Plain

This includes the area along main rivers in the plains including the Indus, Kabul, and part of the Kurram river. These areas become inundated by flood waters every year during summer months. The vegetation includes Tamarix dioca, Saccharum spontaneum, Phragmites communis, Typha

elaphantica, T. angustata, Arundo donax, and Erianthus spp. This habitat is used by wild boar and hog deer.

History

The history of wildlife management, including the management of wild artiodactyls, in NWFP can be traced back to the 1890s when certain rules were formulated to regulate the hunting of markhor, ibex, musk deer, and urial in the District of Chitral. At that time, Chitral was a semi-autonomous state governed by a ruler (Khan 1975). Not only were rules formulated for the protection and hunting of big game, the concept of game reserves was introduced when the ruler and other influential leaders set aside areas as their personal game reserves. Chitral Gol, the present national park, was one such reserve. No written laws were adopted in the adjoining state, Swat, but hunting was only by permission from the ruler. In the settled areas of the Province, some degree of wildlife protection was achieved through the Indian Forest Act of 1927 and the Hazara Forest Act of 1936 (Rao 1984) which regulated grazing by cattle.

The rules set forth under the Indian Forest Act of 1927 empowered forest officials to exercise control over grazing, cultivation, cutting of trees, and hunting within reserved or protected forests, but did not affect other areas (U.S. Fish and Wildlife Service 1978). After

independence in 1947, the West Pakistan Game Department was entrusted with the responsibility of game management, and the Department performed its job with a skeleton staff. Unfortunately, most emphasis was placed upon small game protection, and the artiodactyls and carnivores remained largely neglected. Increased interest in wildlife conservation was shown by the Government during the late 1950s, and, as a result, an ordinance known as "West Pakistan Wildlife Protection Ordinance 1959" was issued. Chinkara and barking deer were the only artiodactyls found in the NWFP that were declared protected.

The provisions of the Wildlife Protection Ordinance were inadequate and ineffective. The turning point in conservation efforts was 1965 when the Pakistan Government requested the World Wildlife Fund to send a team of experts to Pakistan to assess the wildlife conservation needs of the country and suggest ways and means to achieve the conservation objectives. Two teams of the World Wildlife Fund visited Pakistan in 1966 and 1967 and recommended setting up a National Wildlife Enquiry Committee to study the problem in detail and suggest various management measures. The Committee was set up in 1968 with the following objectives:

1. To carry out a survey of the natural and semi-natural vegetation in order to ensure that, in the planned development of national parks, an adequate sample of each

is preserved.

2. To assess the status and population of wildlife of the provinces and recommend measures for protection and improvement.

3. To examine the existing game and conservation laws and suggest improvement in the present laws or the enactment of new ones.

4. To recommend improvements in methods of enforcing laws affecting the conservation of vegetation and game.

5. To recommend measures to ensure the survival of all the important species and their habitats in Pakistan.

6. To review the working of Zoological and Botanical Survey Departments in order that they may be fully effective in a continuing review of the requirements of conservation.

7. To review the present arrangements for training of graduates and field staff with qualifications in the management of wildlife and of vegetation as a wildlife habitat, and make recommendations on the facilities required for training and research (GOP 1970).

These objectives set forth for the Committee were elaborate, well thought out, and provided the real basis for problem analysis. The Wildlife Enquiry Committee submitted its report in 1970 and made the following major recommendations (GOP 1970):

1. Creation of special areas as national parks, wildlife sanctuaries, and game reserves.
2. Introduction of scientific management of wildlife.
3. Institutional and administrative arrangements.
4. Training, education, and research in the field of wildlife management.
5. Development of public relations and tourism.
6. Provision of a legal framework for wildlife management.

Grimwood (1970) made similar proposals for effective wildlife conservation in Pakistan. His proposals included inventory, establishment of national parks and reserves, control of hunting and trade in wild animals, wildlife conservation legislation, establishment of a wildlife department, research, and public education.

Long before these recommendations were written, the West Pakistan Game Department had been abolished and its functions and staff were transferred to the Provincial Forest Department. In the NWFP Forest Department, this staff consisted of 1 subdivisional officer, 3 game inspectors, and 45 wildlife watchers. This staff had no scientific background in the field of wildlife management. They had vast jurisdiction over an important resource but lacked the necessary knowledge and equipment, including transport facilities. Consequently, the wildlife protec-

tion situation became worse and the wild artiodactyls reportedly suffered severely from poaching.

During 1969, the formerly semiautonomous states of Swat and Chitral were merged into the general administration of the country, but almost 6 years elapsed before wildlife legislation was extended to those states. This had another adverse affect on wildlife, and the hunters who had been restrained from hunting earlier indulged actively in poaching. However, during 1972, a project was launched in Chitral for management of wildlife (NCCW 1978). Under this project, 3 wildlife rangers, 3 deputy rangers, and 20 wildlife watchers were appointed in the District for protection of wildlife. The same year, through an executive order from the Deputy Commissioner, Chitral Gol, Drosh Gol, Purit Gol, Gehrait Gol, and Agram Besti were declared game reserves. Except for Agram Besti, which supported ibex, the rest of the game reserves were meant for providing protection to markhor (Khan 1975) and urial.

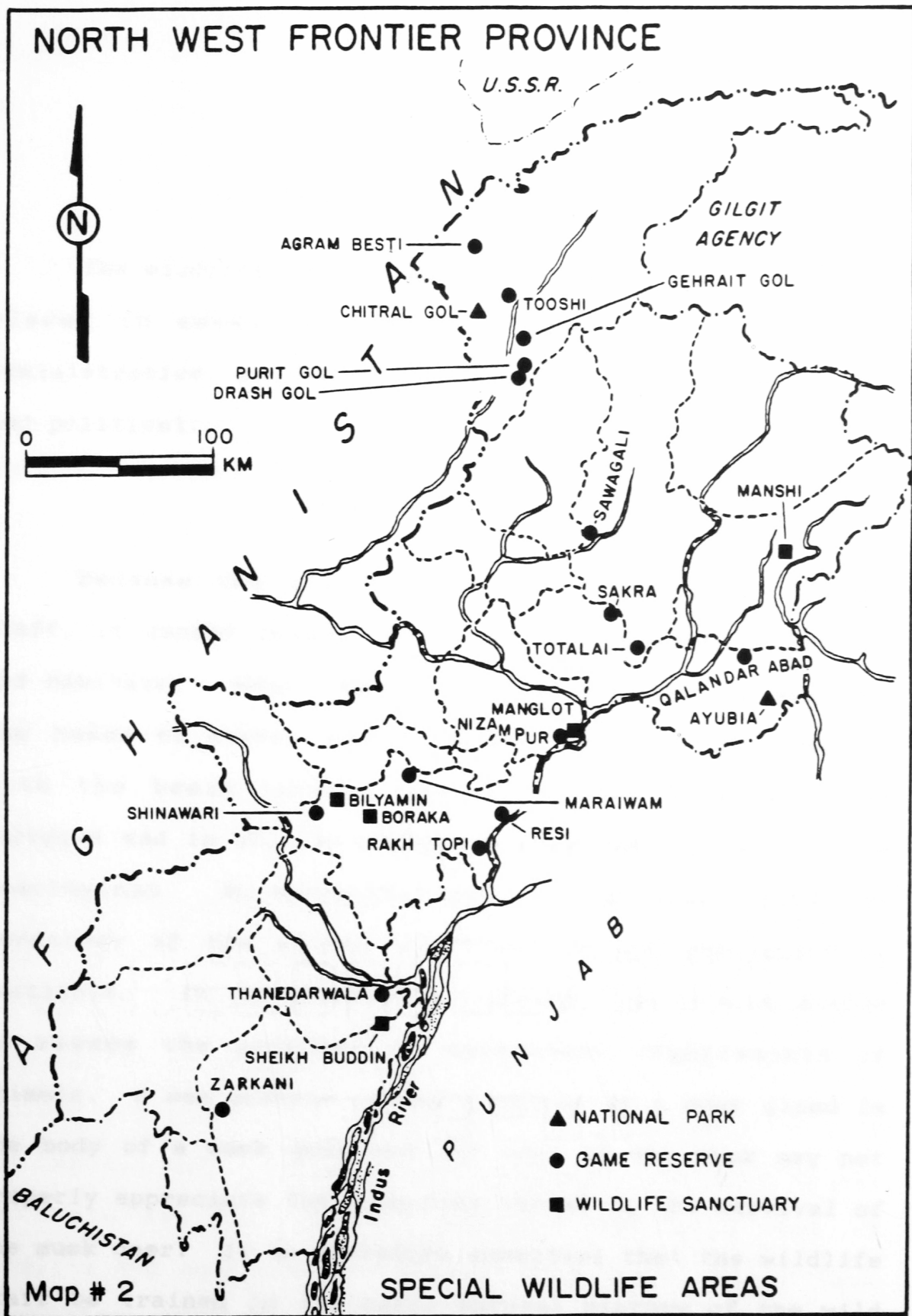
In partial implementation of the recommendations of the Pakistan Wildlife Enquiry Committee, a separate Wildlife Wing was created in the NWFP Forest Department during 1975. This Wing was given the task of wildlife management in the Province. The staff strength was increased so that the field-related staff included 1 conservator of wildlife, 6 divisional forest officers, 6 range officers, 12 deputy rangers, and 96 wildlife

watchers. The same year, the NWFP Wildlife Act was promulgated. This Act treated wildlife as property of the Government. Hunting seasons and methods were prescribed. Four of the nine artiodactyls--musk deer, barking deer, hog deer, and chinkara--were declared protected animals, and their hunting or killing was completely prohibited. Straight-horned markhor were also declared protected. Four other artiodactyls--Kashmir (flare-horned) markhor, Himalayan ibex, urial, and goral--were placed on the list of big game animals, and their hunting was permitted subject to a permit for a fee of 5500 rupees per animal (Govt NWFP 1975). Wild boar was considered a pest on the agricultural crops and was not included in the Act, therefore everyone was free to kill this animal. Another reason for this was that Islam does not encourage the husbandry of wild boar.

The Wildlife Wing began functioning with great enthusiasm. The provisions of the Wildlife Act were enforced to the fullest possible extent, and the status of many wildlife species, particularly the artiodactyls, improved and the activities of poachers diminished. Additional areas were established as game reserves and sanctuaries for the protection of musk deer, goral, and urial. Preliminary surveys of wildlife were conducted and public relations campaigns were started. Unfortunately, these activities were seriously hampered early in 1978 when

the Wildlife Wing became paralyzed by retrenchment, resulting in the loss of the conservator of wildlife and three divisional forest officers. Efforts were continued to keep the activities of the Wing normal. The lost status of the Wildlife Wing was restored in 1982, and the strength of the field staff was almost doubled. A ban on hunting of all mammals (excluding hare, jackal, and wild boar) was imposed in 1981 and continued for 4 years. Limited hunting of flare-horned markhor continued on special permits. These permits were issued only to foreigners and in a period of 10 years about 10 permits were issued.

Until June 1985, the number of protected areas for one or more of the wild artiodactyls had increased to 1 national park, 2 wildlife sanctuaries, and 10 game reserves (Map 2). The total staff strength had increased to 300. Under the present organizational structure, the Conservator of Wildlife, who is responsible to the Chief Conservator of Forests NWFP, is in charge of all the wildlife management activities in the Province. Wildlife in each of the five civil administrative divisions is controlled by a divisional forest officer of wildlife (DFO Wildlife); the Malakand Division has two officers. A training program for the staff has been started, but maximum emphasis is on the protection of fauna.



CHAPTER II

PROBLEMS OF CONSERVATION

The wildlife conservation problems in the NWFP can be placed in seven categories: technical, enforcement, administrative, socioeconomic, economic, lack of awareness, and political.

Technical Problems

Because the Wildlife Wing lacks adequately trained staff, it cannot conduct the necessary surveys of animals and habitats. When, where, how, and for what to look are the bases of survey work. Unless the staff is familiar with the basic natural history of the animals to be surveyed and is able to recognize them, any survey will be meaningless. No management plan can be drawn unless an inventory of the animal distribution and population is available. In the absence of training, one is also unable to assess the problems or management requirements of animals. A man unaware of the presence of a musk gland in the body of a musk deer and the cost of the musk may not properly appreciate the potential threat to the survival of the musk deer. It is therefore essential that the wildlife staff be trained in the basic natural history of the wild

animals and survey techniques suitable for each species. Then an inventory of the distribution and population status of the artiodactyls can be carried out to provide data to the managers who could then plan appropriate management strategies. Most probably, limited knowledge about the local distribution of the artiodactyls is resulting in continued poaching that is never detected. In the presence of proper knowledge about the dispersal of a species, staff can be employed or some readjustments can be made to provide protection to the wildlife in those areas. Posting of full-time staff may not be possible in all areas. In such areas, some sort of public relations can be developed to achieve the protection objectives to some degree. We must overcome this technical problem.

Law Enforcement Problems

NWFP Wildlife Act of 1975 is a very effective tool in wildlife protection provided it is enforced completely in letter and spirit. Whereas it regulates the taking of game animals, it also prescribes strict penalties for those who violate its provisions. However, the enforcement of this Act has not been completely satisfactory. Two main causes for this are the lack of adequate staff and lack of mobility and equipment for the existing staff. Both these obstacles are due to limited resources available for

wildlife management in the Province. In order to protect existing artiodactyls and other wildlife, antipoaching capabilities of the Wildlife Wing will have to be improved, so that enforcement of the law is insured throughout the Province.

For any violation of the provisions of NWFP Wildlife Act, the Act prescribes a penalty of up to 2 years of imprisonment or up to 1000 rupees or both. There is hardly a case in which a court has awarded imprisonment to an offender under this Act, and the amount of the fine is very often far less than the value of the animal involved or even the amount of the fee for a shooting or possession license. The absence of any real punishment has resulted in an increase of habitual offenders. Normally, the offenders are expected to prefer settling the case with the wildlife officers and avoid facing trial in the courts, but the history of past decisions of the courts has encouraged them not to opt for settling the case. This ultimately amounts to a damaging loss of authority for the Department.

There are other situations where the Wildlife Department is not able to produce enough evidence against the offenders in the courts. Very often the offenders cannot be caught in the act of violating the law but are charged at a later time because of indirect evidence. This indirect evidence is usually not entertained by the courts for want of authenticity. Another factor which reduces the

effectiveness of antipoaching activities is delayed decisions by the courts. Some cases take more than a year to be decided, not because these are complicated but because the courts are burdened with numerous other cases. The combined effect of these legal flaws is a significant increase in wildlife offenses, or at least no decrease in offenses.

Administrative Problems

Wildlife management in the NWFP is the responsibility of the Wildlife Wing of the Forest Department. Although under the control of the Chief Conservator of Forests, the Wing has a separate administrative identity. Consequently, the Conservator of Wildlife and his staff are isolated in terms of information exchange and career development and constitute a sort of foreign body in the Forest Department. In spite of the keen interest of the Chief Conservator of Forests in wildlife conservation and the cooperation of the Conservators of Forests and other officers of the Forest Department in this regard, the degree of coordination at the field level has been less than desirable. Sometimes policy conflicts also arise when an area of wildlife importance happens to be a commercial forest. In such cases, the priority goes to the policy yielding financial returns. This seems logical in the face of the developing economy of the Province which normally cannot afford to set

aside huge amounts of productive land only for use by wildlife. But the conservation of wildlife is also an important responsibility of the Government and its functionaries, and it is an obligation of all the concerned agencies to transfer the wildlife resource to the next generation in an improved condition. There is need for revising management objectives and goals in the forestry sector as a whole and balancing the policies to achieve maximum conservation. A review of the fitness of some forests for commercial exploitation may help save the habitat of many wild animals and also economically important watersheds, particularly in dry temperate regions like Chitral.

Socioeconomic Problems

This is by far the most serious problem because it is responsible for habitat deterioration. This problem will be discussed under the components livestock grazing, firewood collection, and encroachment upon wildlands for agriculture or habitation.

Livestock Grazing

The rural economy in the NWFP is entirely dependent upon agriculture and livestock rearing. People rear cattle to get dairy products as well as farm power to plow their fields and thresh the crops. Horses and donkeys are kept

as beasts of burden. Sheep and goats are reared partially for milk, wool, and meat, but mainly to sell them for meat in the general market. Each farming family has to keep a certain number of domestic animals for farming and dairy products. The kind and number of animals depends upon the size of the farm and the number of members in the family. This obligatory rearing of livestock results in huge numbers of domestic animals (running into tens of millions), sheep and goats being the most abundant. The livestock depend upon the forests and other wildlands which also form habitat for wildlife. The excessive number of livestock on rangelands is a chronic problem which has caused deterioration of rangelands in the country as a whole (Khan 1970, 1971). Under the prevailing socioeconomic conditions, people would not prefer wildlife over livestock. Such conflict over range use also exists between livestock producers and wildlife advocates in other countries. Usually this is the result of a limited approach directed only toward immediate interests rather than a balanced resource management policy (Khan 1971). Of all the domestic livestock, sheep and goats compete most closely with wild artiodactyls for food. Studies conducted in Chitral Gol by Aleem (1976, 1977) and Khan (1979) found that the markhor preferred the same plant species favored by sheep and goats. Overgrazing by sheep and goats caused retrogression in the herbaceous vegetation and the markhor

were forced to disperse, using only secluded corners of habitat. Ahmed (1982) reported the food plants eaten by musk deer in summer. These are the plants also eaten by the nomadic herds of sheep and goats during the same season. The effect of livestock grazing is most obvious in the critical seasons, i.e., in the winters when the higher elevations are covered with snow and the wild artiodactyls descend to lower altitudes for food; and in summer when hundreds of thousands of domestic sheep and goats invade the subalpine and alpine pastures and the wild animals that have been starving in winter are forced to use less productive sites.

Firewood Collection

The entire rural population and almost half the urban population in the Province is dependent upon wood for fuel purposes. This energy source is required for daily cooking needs as well as to keep the houses warm in winter. The wood is collected from the forested mountain slopes irrespective of the depletion of the resource. The people have the rights and privileges to collect the dry fallen wood but they very often resort to cutting of green trees. The forests not only have to meet the firewood requirements of local populations but must also sustain the burden of commercial exploitation to meet the fuel requirements of urban populations. It is usually the hardwoods like oak

(Quercus ilex), olive (Olea cuspidata), and acacia (Acacia modesta) that are preferred as firewood, and these are also the plants that provide food and cover for most of the wild artiodactyls. In Chitral, the cutting of oak is seriously depleting the winter food source of markhor (Khan 1975). In areas where the trees already have been felled, the people are uprooting the shrubs and grasses off the fragile mountain slopes for fuel purposes, unwittingly starting an erosion process that may never be remedied. In the northern parts of Chitral, this uprooting of vegetation is common because there is no other fuel source which could keep people warm in intense winter cold. In the scrub forest area in other parts of the Province, cutting of trees for firewood is going on to an even greater degree due to the proximity to markets in big towns. The ever-increasing urban population is exerting more and more demand for fuelwood, and if immediate measures are not taken to seek alternatives, the last available habitats for wildlife will turn into barren, eroded hillsides.

Encroachment

The human population of NWFP was estimated at 10,879,000 in 1972 and 13,060,000 in 1981 (GOP 1985). This indicates a 2.2% annual increase. Due to this increase in human population, the fertile agricultural lands and the wildlands are being converted to human habitation, and the

cities, towns, and villages are continually expanding. More and more land is being brought under cultivation, and the distance of wildlife habitats from the areas of human habitation is rapidly decreasing. This effect can readily be seen in Chitral where numerous houses have been constructed along the road leading to Chitral Gol and the process is still in progress. In subalpine and alpine pastures, more and more land is being tilled for potato cultivation in Hazara and Swat. The expansion of human habitation and agriculture is obviously resulting in shrinkage of the habitat of wildlife, particularly that of wild artiodactyls.

Economic Problems

One of the greatest obstacles in getting financial support for wildlife management programs is the inability of the wildlife resource to yield immediate financial returns, particularly where conservation is the main objective. Any investment in this sector is therefore considered uneconomical. On the other hand, forestry, mining, livestock rearing, and irrigation schemes pay back the investment quickly with huge interests due to their positive effect on the economy. Such profit yielding sectors take priority in planning and investment. Consequently, the wildlife programs are not included in the priority list of the developmental agencies. In many

places, the habitat of wild artiodactyls is being destroyed due to harvesting of trees for timber, firewood, and mining. It is ironic that international aid-giving agencies who are highly active in selling their programs in developing countries for reforestation, watershed management, soil conservation in highly eroded areas, and reintroduction of locally extinct species, do not provide assistance in conservation programs.

Lack of Awareness

During my tours of wildlife areas in the Province and meetings with hunters, graziers, farmers, planners, and educators, I usually am confronted with questions like: "Why do we need to protect the wild animals when our religion allows us to hunt? Why should we prefer wild animals over livestock in the use of grazing lands? We have so many other human welfare problems to solve, how can we waste money on wildlife programs where you do not see any tangible results? I went to _____ area and did not see any urial or markhor; how will any investment in those species be justified? What was your revenue last year and what are the targets of revenue this year?" All these questions speak of the lack of awareness of the people with regards to wildlife or environmental conservation. Unless these people are able to appreciate the very existence of

the problem, we cannot expect to have their support in the solution of that problem. Unfortunately, this lack of awareness is also found in people who are sensitive to many problems. We need to enlighten the educated people if wildlife conservation is to succeed.

Political Problems

Political considerations play a vital role in the implementation of any conservation program and its ultimate success. There are certain areas in the Province that are politically sensitive, and the launching of any program demanding anything from resources already used by the local people may need serious thought before it is even planned. But apart from this, there are some interests of a political nature that influence the projects. These interests may put the least viable project high on the priority list, above more viable projects. The interests may include the general interest of the government, the interest of the ruling political party, a single minister, or any other member of the assembly elected by the people. In fact, all the public departments and their functions must be governed by the larger interest of the people, but political consideration is one very important factor governing the policies of the government and its functionaries. When the interest is localized, the interest of only one person can

fool the people and get their favor just by leading them in a false approach towards the implementation of conservation projects. Wildlife conservation efforts, particularly those of wild artiodactyls, will remain confronted with such interests in many places in the Province for many years. Managers need to give special thought to this aspect and handle the situation appropriately.

CHAPTER III

MANAGEMENT OBJECTIVES AND RECOMMENDATIONS

Management Objectives

The overall management objective should be the protection, preservation, conservation, and management of the wild artiodactyls of NWFP. This should be done in such a way that reduced populations are restored and wild game is utilized to achieve "human goals" on a sustained basis without threatening species survival. A commitment should be made to transfer a healthy resource to future generations for their benefit and enjoyment. This should involve the following:

1. Protection and preservation of endangered species of artiodactyls in order to save them from extinction and build up their population to remove the danger of extinction. These species will include musk deer, barking deer, Indian chinkara, straight-horned markhor, and hog deer.

2. Replenishing the existing suitable wildlife habitats with the species of artiodactyls that were present there but are either locally extinct or on the verge of extinction. These species are musk deer, hog deer, Indian chinkara, and barking deer.

3. Protection and conservation of the artiodactyl

species, including flare-horned markhor, urial, Himalayan ibex, and gray goral, and providing limited sport hunting opportunities to the hunters who can pay high fees for the hunting permits.

4. Involving the local people in conservation programs through provision of incentives and environmental education.

5. Improving the depleted wildlife habitats.

Management Recommendations

Leopold (1933) described the sequence in wildlife management as:

1. census--measuring or counting the stock available;

2. measuring the productivity of the stock;

3. diagnosis--factors influencing the stock and productivity, and selecting one or more of such factors for control; and

4. control of selected factor(s)--this may include control of hunting, predators, food and water, cover, disease, etc.

Peek (1986) reviewed wildlife management in the United States and found that the sequence set by Leopold was still valid. Grimwood (1970) prescribed that the successive steps in development of wildlife conservation programs should be (a) inventory; (b) selection and setting

aside of suitable areas as national parks or reserves; (c) introduction of control on hunting, killing, or capturing of wild animals and on trade in their products; (d) introduction of legislation; (e) formation of a wildlife department; (f) research; and (g) education of the public at all levels to emphasize the need for wildlife conservation. Riney (1982) prescribed almost the same sequence as Grimwood.

In NWFP, the Wildlife Department already exists as the Wildlife Wing of the Forest Department, and wildlife legislation, known as NWFP Wildlife Act, has been in place since 1975. Thus, only a few improvements will be suggested. Much information on the status and distribution of all the artiodactyls is available but is in need of further refinement. Similar is the case of control on hunting and creation of national parks, wildlife sanctuaries, and reserves. A management structure is already available, and certain problems of conservation have been identified for the sake of improving management of wild artiodactyls. The management recommendations will largely include prescriptions to overcome problems in light of the management objectives. The recommendations are as follows:

1. A team of 54 should be trained for wildlife surveys under a crash program. This team may include six wildlife watchers, two deputy rangers, and one range

officer from each wildlife division in the Province. The participants should be selected on the basis of their fitness and enthusiasm for work. The training period should be 3 months and the participants taught identification and natural history of wild artiodactyls as well as that of some carnivores and birds. They should be taught how to record observations in the field and carry out inventories of the status and distribution of animals. Basics of vegetation and classification of habitat should be taught. The course should also include a detailed approach toward various conservation problems and impart sufficient knowledge to the trainees to investigate such problems while conducting surveys. They should be told how to maintain records of their observations and plot their data on maps. Criteria for potential national parks, wildlife sanctuaries, and reserves should also be highlighted. The course should be arranged at Peshawar in collaboration with the Pakistan Forest Institute (PFI) or at Abbott Abad in collaboration with PFI and the Sarhad Forest School (SFS). Apart from classroom lectures, the training should include field exercises in Hazara, Kohat, and Swat districts. The participants should also visit Islam Abad and Lahore zoos to become acquainted with the wild animals and birds.

2. An inventory of the distribution and population status of the wild artiodactyls should be carried out by

the trained staff throughout the Province. The survey team should also identify the areas with potential for declaration as national parks, sanctuaries, and reserves. The prevailing conservation problems should also be determined and, upon the recommendation of the survey team, appropriate conservation measures should be adopted. These measures may include declaration of certain areas as special wildlife areas, appointment of essential protective staff, etc.

3. The PFI, the Zoological Survey Department (ZSD), and the University of Montana (UM) should be requested to initiate research on the management requirements of the wild artiodactyls in various geographic regions of the Province and make their recommendations to the Wildlife Department for refinement of its management plan. Detailed species specific management plans should be prepared in light of the results of inventory and research findings.

4. Control of artiodactyl hunting should be improved and the antipoaching abilities of the protection staff should also be enhanced. This may be done through establishment of special areas such as national parks, sanctuaries, and reserves; increasing the staff strength; and providing adequate equipment to the staff including binoculars, spotting scopes, camping gear, and firearms. Mobility of the staff should be improved through provision of appropriate vehicles for the terrain and rank of the

official. All the range officers and deputy rangers should be provided motorcycles for quick movement in their respective areas. Wherever possible, the wildlife watchers should be provided an animal transport (horse, pony, or camel) or a bicycle. Watch huts should be constructed to accommodate the staff within the wildlife areas. The Government should also be requested to sanction a special monthly wilderness allowance for the staff equal to 50 percent of their pay. This will provide them incentive for further hard work. Rapid promotion for extraordinary performance can be another incentive. Public relations should also be improved so that any poaching will be reported. Although the above-mentioned facilities will be costly, their short-term as well as long-term benefits will be encouraging. Attempts should be made to prepare small projects on the district level in consultation with chairmen of the district councils and draw funds from the councils' budgets instead of relying entirely on the provincial development program.

5. Efforts should be made to get one special wildlife magistrate for each wildlife division. This magistrate should have powers for summary trial of wildlife offenders, should work in close cooperation with the Wildlife Department, and should hold his court in various parts of the division in rotation. If this is not possible, then the Government should be asked to assign the

trials of wildlife offenders to only one magistrate in a district or tehsil headquarter, and invest him with summary trial powers for the speedy disposal of cases. The officers of the Wildlife Department must have proper liaison with the magistrates and deputize intelligent deputy rangers for prosecution purposes. Suitable amendments in the Wildlife Act should also be proposed so that whenever offense is proven, a minimum punishment is prescribed. It will then be obligatory upon the court to award that punishment to the convicted offenders.

At present, most of the field staff is not fully aware of the provisions of the Wildlife Act. In order to give the field staff a full grasp of the contents of the Act, the Act should be translated into Urdu, and a sufficient number of copies should be printed and distributed among the staff. Sometime during the first week of every month, all the field staff of every range visits the range office to collect monthly pay. The range officers should make use of that day and hold a special 1-day session every month to teach and discuss with the staff the provisions of the Wildlife Act. Staff members should be encouraged to ask for an explanation of any point not clear to them.

One way to reduce poaching is to publicize the provisions and penalties prescribed under the Wildlife Act. Although the field staff may do this during their routine public meetings, the officers at the divisional and provin-

cial level should use the services of radio, television, and newspapers to publicize the Act. This can also be done through seminars and radio or television talks. Sending circulars to various government and autonomous offices may also be a good approach in this direction. Publishing in newspapers any exemplary punishment awarded by a court in an offense case can be an effective deterrent for the poachers.

6. A definite need exists for an integrated land use management program in the forestry and agriculture sectors. Particularly in forestry, the concept of multiple-use should prevail if wildlife conservation interests are to be safeguarded. In this regard, officers of the Wildlife Wing should always try to convince the authorities of the Forest Department of the need for wildlife conservation measures, especially when these supercede forestry needs.

The best thing would be to give the Wildlife Wing the status of an independent department under the direct control of the Secretary of Forests rather than under the Chief Conservator of Forests. This arrangement would have many advantages. The Wildlife Department would get a larger share of the annual budget and would be able to expand and improve its activities. Having lost the umbrella cover of the Forest Department, the Wildlife Department would have to strive very hard to prove its

worth to the government as well as to the public. The policy regarding wildlife conservation would also change favorably, and the use of forested areas for timber and wildlife production would become balanced. Creation of an independent department would also have a very good publicity effect and the people, as well as international agencies, would realize the importance the NWFP Government attaches to wildlife conservation. The Department would have confidence in negotiating issues of bilateral interest with outside agencies, and ultimately wildlife would be benefitted.

Additional budget allocations would be required to create an independent Wildlife Department but the additional requirement could be minimized by merging the Fisheries and Wildlife wings. At present, both Wildlife and Fisheries are wings of the Forest Department and both are facing almost identical problems. On the other hand, the nature of duties of the field staff is almost the same in the two wings. The Fishery watchers have to protect fish in the rivers, lakes, and streams while wildlife watchers have the duty of protecting waterfowl and all the other wildlife found in that habitat. As the rivers, streams, and lakes are widespread throughout the wilderness area, the similarity of duties of both the wings can be realized. Except for the fish hatcheries, having fishery and wildlife watchers results in duplication of efforts. I

have analyzed the manpower resources of both wings and found that merger of the two into an independent Fish and Wildlife Service would create a highly efficient department parallel to any other organization of its kind within or outside the country. Serious seniority clashes should not occur, and very little refinement would be needed. A proposal in this regard has already been submitted to the Chief Conservator of Forests and should be pursued.

7. Livestock grazing beyond the carrying capacity of range lands is seriously damaging them by reducing productivity, worsening range condition, and accelerating soil erosion. It also depletes the food resources of wild artiodactyls. But at the same time, livestock is a vital component of the rural economy and therefore grazing cannot be halted altogether. No short-term or quick action is desirable in this regard. The NWFP needs long-term planning to attack this problem from various directions. While time consuming and costly, it must be done in the larger interest of the country. An integrated approach by the Wildlife Wing, the Agriculture Department, the Animal Husbandry Department, cooperative societies, the Agriculture Development Bank, and the Range Management Branch of PFI is required. The Agriculture Department should enhance its activities in the problem areas and its engineering units should try to mechanize agriculture as soon as possible. This can be done by providing equipment for

leveling fields, cultivation, harvesting, and threshing. Where heavy tractors cannot operate, mini tractors can be provided. Cooperative societies can play a role; in some areas one tractor could meet the demands of a whole village or even several villages. The Agriculture Development Bank can provide soft loans to some people. But in general, equipment must come as aid because individuals cannot afford to purchase it. Priority areas must be selected. The Agriculture Department should seek help from international agencies such as World Bank, World Food Program (WFP), FAO, and others. The Animal Husbandry Department should, through its extension services, convince the people of the folly of keeping a large number of poor quality and low producing dairy animals, as against a few good quality and high producing animals. The Department should also help the people obtain good breeds of animals and dispose of the present poor stock. Establishment of dairy farms in problem areas may be a good practical demonstration for changing the attitudes of people in favor of livestock farming. Through extended watershed management programs over a limited number of high problem areas, the people may be asked not to graze livestock in the mountains; instead they may be provided dairy products free of cost for some years. The World Food Program has a good deal of experience in running similar projects. Range management experts should come forward and let people know what range

management means. They should help people to plan the use of rangelands, but the best contribution would be to introduce better forage and fodder species to improve the productivity of range. Other range improvement works can also be undertaken.

Other local efforts could be to organize communities to safeguard their range against use by outsiders, and discouraging collection of grazing fees by a few families, reducing the hazard of nomadic grazing.

One of the basic purposes of setting aside certain areas as national parks, sanctuaries, and reserves is to make it possible to have control over grazing. The wildlife managers will be expected to control grazing in those special areas through one or more of the above-mentioned approaches. Although these measures seem novel, still we must adapt to them sooner or later--hopefully before it is too late. Under the land reforms, the government has acquired vast alpine pastures. Demarcation of these lands and their transfer to the Wildlife Wing, along with the rest of the rangelands, may be helpful in some sort of grazing regulation.

8. Trees and shrubs are important elements of wildlife habitat because they provide food and thermal protection as well as hiding cover to many wild artiodactyls. But the trees and shrubs are in heavy demand for timber and firewood. At many places they have already

been overexploited, and ruthless cutting is still going on. This is a subsistence requirement and cannot be stopped through a simple administrative order. But if it continues, vast areas will soon resemble the barren slopes in upper Chitral and parts of Gilgit. The problem, like the previous one, needs a long-term plan and quick action. It should also involve a multilateral approach by departments, including the Forest and Wildlife departments, the Agriculture Department, the Water and Power Development Authority (WAPDA), the Irrigation Department, the Ministry of Natural Resources, and the cooperative societies. The Forest Department needs to re-examine its policy of forest exploitation for timber and firewood purposes, and determine, without regard to revenue targets, whether all the forests now under exploitation are really fit for the purpose. Can the forests of dry, temperate regions sustain the combined pressure of domestic timber requirements and commercial exploitation without seriously jeopardizing soil conservation and long-term domestic timber needs? The Forest Department can help conserve the resources by providing alternatives. Assistance from international agencies may be sought to establish industries which can provide cheaper construction material to replace timber. Energy plantations should be raised wherever possible to relieve the pressures on native forests. Priority should be given to areas like Chitral that face severe fuel problems and where

the mountain slopes have already turned barren. The Natural Resource Ministry in the Federal Government should be asked to extend the supply of natural gas to human habitations in the problem areas and increase the supply of kerosene oil at subsidized rates. Where installation of a natural gas pipeline is not possible, the gas may be supplied in compressed cylinder form. This will involve a huge expenditure, but we should weigh it against what we have already lost and what we may still lose. The WAPDA should try to construct small hydroelectric plants wherever possible and the Agriculture Department should install and provide expertise in the installation of bio gas plants in areas where suitable temperatures prevail. People should be encouraged to adapt farm forestry to not only save their crops against wind erosion but also to become self-sufficient in timber and firewood. Reforestation and habitat improvement programs should also be started, though on a limited level at first. Cooperative societies could be very helpful in implementing habitat improvement programs.

The Wildlife Wing could strive to control woodcutting in special wildlife areas through the use of one or more of the above approaches. Habitat improvement on a limited scale should also be undertaken in Chitral and other suitable places. But the key factor should be to convince local people of the graveness of the problem and its future

consequences, and then get their support in remedial measures. This is the only way to succeed.

9. Concerned government agencies, including the Forest Department, should exercise control over encroachment on government land by the people. The Revenue Department and the courts should also help stop encroachment by speedy decisions. Demarcation of reclaimed lands and their transfer to the appropriate department will also help check the encroachment.

10. When priorities are assigned to developmental projects on the basis of financial returns, wildlife will continue to lose. The officials of the Wildlife Wing should seek public support for conservation and development programs. They should also try to convince the planners that the priority should be assigned on the basis of vulnerability of the resource rather than on financial returns. Wildlife is a valuable resource and unless special allocations are made for its development, we may lose it quickly. In case of appropriate investment, the same resource will not only be developed but will provide both tangible as well as intangible benefits, and these latter benefits may be more valuable. However, within safe limits, the Wildlife Wing must increase revenue returns. This can be done by increased vigilance and detection of offense cases and enhancement of fees for the possession of birds as pets. Small game shooting fees must be increased

to 500 rupees. These prohibitive fees will serve a dual purpose. Either there will be an increase in revenue or there will be more conservation. In either case, the benefit will go to wildlife. In the case of wild artiodactyls, limited sport hunting of flare-horned markhor and Himalayan ibex is possible. Four permits for markhor hunting and 10 for ibex hunting should be issued every year to generate some income and prove to the government as well as the people that the wise management of the wildlife resource can bring handsome revenues. Our attitude should be flexible according to the status of a species. A wildlife manager should neither act as a preservationist nor as a utilitarian in the strict sense. His decision should be governed by the status of the species. He must behave as a preservationist for endangered species but as a conservationist for species that can sustain hunting.

Development projects for rehabilitation of endangered species, including musk deer, hog deer, Indian chinkara, and barking deer should be submitted to IUCN or WWF for financial and technical assistance.

11. An extension program should be initiated in the Province whereby the message of wildlife conservation will be transmitted throughout the Province. The wildlife staff should have meetings, both formal and informal, with the people; with the help of photos, slide shows, discussions, and speeches, they should try to win their support for

conservation. Newspapers, pamphlets, brochures, radio, and television--all should be used in conveying the importance of wildlife and the steps taken by the government to conserve it. Wildlife conservation societies should be organized in villages in areas adjoining important wildlife habitats. Organization of groups similar to Defenders of Wildlife should be encouraged; nature clubs may be formed in the leading schools and colleges. Attempts should be made by officers of the Wing to arrange periodic seminars for the officers at the district level to provide them necessary information on wildlife and seek their cooperation in conservation efforts. At the provincial level, arrangements should be made to hold periodic conferences for people from all spheres of life to discuss matters relating to wildlife. A wildlife museum should also be constructed in Peshawar and the establishment of a zoological park may be expedited.

This extension program will be a continuing process, and the staff can undertake much of it with the available resources. The only thing required on the part of the staff is untiring efforts and steadiness. This is also very time consuming and will take time away from some other duties.

12. The wildlife staff at all levels may be advised to keep regular contacts with the people in their respective jurisdiction. They should develop cordial relations

with all sectors of society, irrespective of their standing. However, members of the assemblies and other political leaders must be paid due regard. The officials should treat themselves as public servants rather than as bosses. In this way they can win the favor of the common people as well as those in political circles. The personal contacts of the staff may result in development of their department and, in turn, the development of the wildlife resource.

13. Although captive breeding and reintroduction of wild animals is a controversial issue at this time, it is an important tool for the wildlife manager's use in rehabilitating depleted populations. In NWFP, efforts should be made to reintroduce barking deer, hog deer, and Indian gazelle in suitable habitats where they are known to have existed before their extermination. The stock for reintroduction should preferably be obtained from the wild in Punjab Province. The other alternative would be to get the stock from zoos and wildlife parks. These animals would be transferred to previously constructed enclosures at the site of release, where they should be kept until acclimatization. They should then be allowed to escape simply by opening the gates of the enclosures. The feed in the enclosure should be maintained for several days after the animals are released, in case they need it. Before release, it should be ensured that the area is properly

protected against poachers, dogs, and possible predators. It should be a continuous process. An evaluation may be carried out after 5 years, and if the project is unsuccessful it may be dropped. Similarly, captive breeding of musk deer should be started after having properly trained two officials in China, where the Chinese have developed skills in captive breeding of this deer and extraction of musk without killing the deer. If this program is a success, it will reduce poaching pressure on the wild musk deer.

14. Habitat improvement measures should be adopted in special wildlife areas like Chitral Gol National Park and Sakra Game Reserve. Here the planting of species like oak and acacia should be attempted; in Sakra, water ponds should be developed. Reseeding of native grass species and legumes, as well as winter green shrubs, may also be undertaken after the approval from the Range Management Branch of PFI.

15. For any program to be a success, the involvement and support of the people is essential. In the management of artiodactyls in NWFP, participation of people should be ensured. These people may include hunters, heads of local departments, and particularly the local inhabitants in the vicinity of a wildlife area. Their participation should be encouraged through seeking their advice and support in planning, implementation and execution of projects, and sharing successes and failures with them. Their best and

most fruitful participation can be had when we ensure them that the wildlife resource actually belongs to them and its conservation will bring tangible as well as intangible benefits to them. In order to make this belief firm, the government should spend most of the fees realized from shooting licenses on the welfare programs of these people, and this money should be spent directly by the Wildlife Wing in consultation with a committee of these people. This decision should not be very difficult for the government because a similar decision regarding distributing to local people a major portion of the revenue realized from forest harvesting in Swat, Dir, and Chitral, has recently been made and is being carried out.

In urban areas where many people may be interested only in sport hunting or in pure conservation, they should be encouraged to organize themselves into groups or societies; then they may be brought into project planning and implementation.

16. The Wildlife Wing should never hesitate to ask assistance from any national or international agency in research, program planning, or financial support if it is in need of additional resources and skills. For research requirements, PFI, ZSD, USFWS, and UM can provide useful help; for financial matters, WWF--Pakistan, WWF International, IUCN, etc., are the concerned agencies.

Priority Reserves

This plan provides for surveys to determine the distribution and population status of wild artiodactyls in the Province and identification of areas having potential for management as national parks, wildlife sanctuaries, or reserves. However, certain areas of wildlife importance are already known and need to receive improved management on a priority basis. Recommendations and brief discussions of priority areas follow.

1. Singoor, Molan, and Ramboor gols cover the flanks of the Chitral Gol National Park. Singoor Gol lies to the north and Molan and Ramboor gols lie to the south of the Park. Markhor and urial from Chitral Gol enter these side valleys and may be poached due to lack of protection. Declaring these gols as game reserves is important to provide protection to the markhor and urial. This will benefit other wildlife as well through improved protection against poaching. The markhor population in Chitral Gol, being the only of its kind in the country (or the world), needs special protection and management. As a part of this management, Singoor, Molan, and Ramboor gols should be declared game reserves, and adequate staff should be appointed for protection.

2. Sakra Game Reserve in Mardan District supports straight-horned markhor, urial, and goral. These animals received protection in the territory of Mardan District but

no protection is available in the portion of the Sakra Mountain Range lying in Swat District. Many cases of poaching have been reported in that area. It is recommended that the boundaries of Sakra Game Reserve be extended to include the portion of the Mountain Range in Swat District.

3. Law enforcement in Rakh Topi/Sohban Game Reserve should be improved to provide proper protection to urial and chinkara, because this Reserve has a good potential for increasing the population status of both species.

4. One potential area for a musk deer reserve needs to be identified in Kohistan or Dir districts on a priority basis because, at present, no specific musk deer habitat or population is receiving enough protection.

Size of Reserves

Here the term "reserve" is used in a general sense and includes national parks, wildlife sanctuaries, and reserves. Sizes of reserves in NWFP must be determined by the biological requirements of species, land tenure systems, and socioeconomic condition. Biological considerations include the habitat conditions, size of home ranges of individuals, migration patterns, distance from the nearest similar habitat, and the intensity of hostility on the intervening environment matrix (Harris 1984). Size will also depend on the present and projected population of the species. Size of the reserve would set an upper limit

to the number of animals (Wilcox 1980). Small isolated reserves may act as small islands and may lead to rapid extinction of the species (Terborgh and Winter 1980).

The land tenure system is another consideration. Availability of a suitably sized habitat under public ownership, presence of commercial forest, or any other conflicting operations may set limits to the size of the reserve.

The socioeconomic conditions of the local people is another important factor determining the size of a reserve. People may have rights entitling them to the use of the habitat, extraction of timber and firewood, and grazing of livestock. These rights may or may not be in harmony with the wildlife management policy and, depending upon the degree of conflict, will determine the size of the reserve.

CHAPTER IV

MANAGEMENT

Markhor (Capra falconeri)

Family: Bovidae

Subfamily: Caprinae

Ellerman and Morrison-Scott (1951) recognized seven subspecies of markhor, five of which occur in Pakistan (Roberts 1977). Schaller and Khan (1975) proposed dividing these subspecies into two groups based on similarities in horn shape. They called these subspecies flare-horned markhor (Capra falconeri falconeri) and straight-horned markhor (Capra falconeri megaceros). In this plan I use the classification proposed by Schaller and Khan (1975).

The adult flare-horned markhor is a massive, handsome animal standing 85-100 cm at the shoulder (Prater 1980), with a body length of 149-185 cm (Roberts 1977). It carries long horns diverging in an open spiral above the head. Lydekker (1898, as quoted in Schaller and Mirza 1971a) estimated weights as 83 kg, 92 kg, and 108 kg, for three adult male markhor. The coat color of markhor varies from brown to blackish brown and gray. Males have blackish beards and long ruffs of hair on their necks and chests. Females are about half the size of adult males and have horns about 25 cm long.

The rut starts during mid-December and continues through the first week of January. The young are born in May and June. Litter size is one or two and age of a female at first reproduction is 2 years (Aleem and Malik 1977).

The straight-horned markhor is similar to flare-horned except that its horns grow straight in a tight spiral or they have a slightly open spiral toward the base of the horns and then a light spiral. The horns, however, do not flare outward as in the other subspecies.

The rut starts in late October and lasts about 1 month. The gestation period is 162-170 days. The age of the female at first reproduction was observed to be 3 years by Roberts (1977).

Distribution

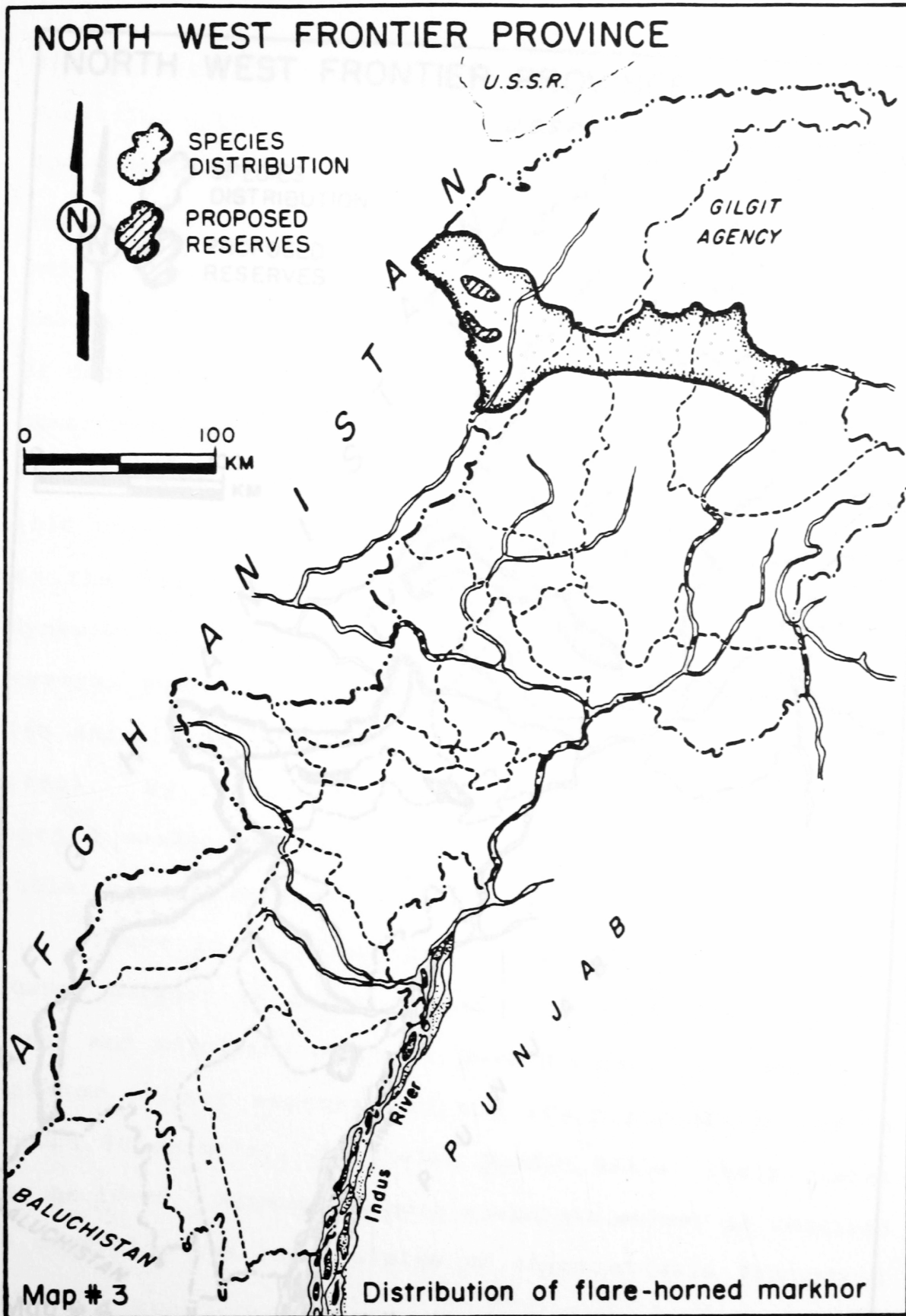
Markhor have a limited geographical distribution. Their range is between that of ibex and wild goats (Capra hircus). They are mainly found in Pakistan but are also present in India, Afghanistan, and Russia (Schaller 1977). Ecologically, the markhor is confined to areas of steppe forests merging into Artemisia steppe on precipitous slopes (Roberts 1969). In NWFP, flare-horned markhor are found in Chitral, Dir, Swat, and Hazara Kohistan. In Chitral, they inhabit only the lower part of the District, south of Barrinus town on both sides of the Chitral River up to

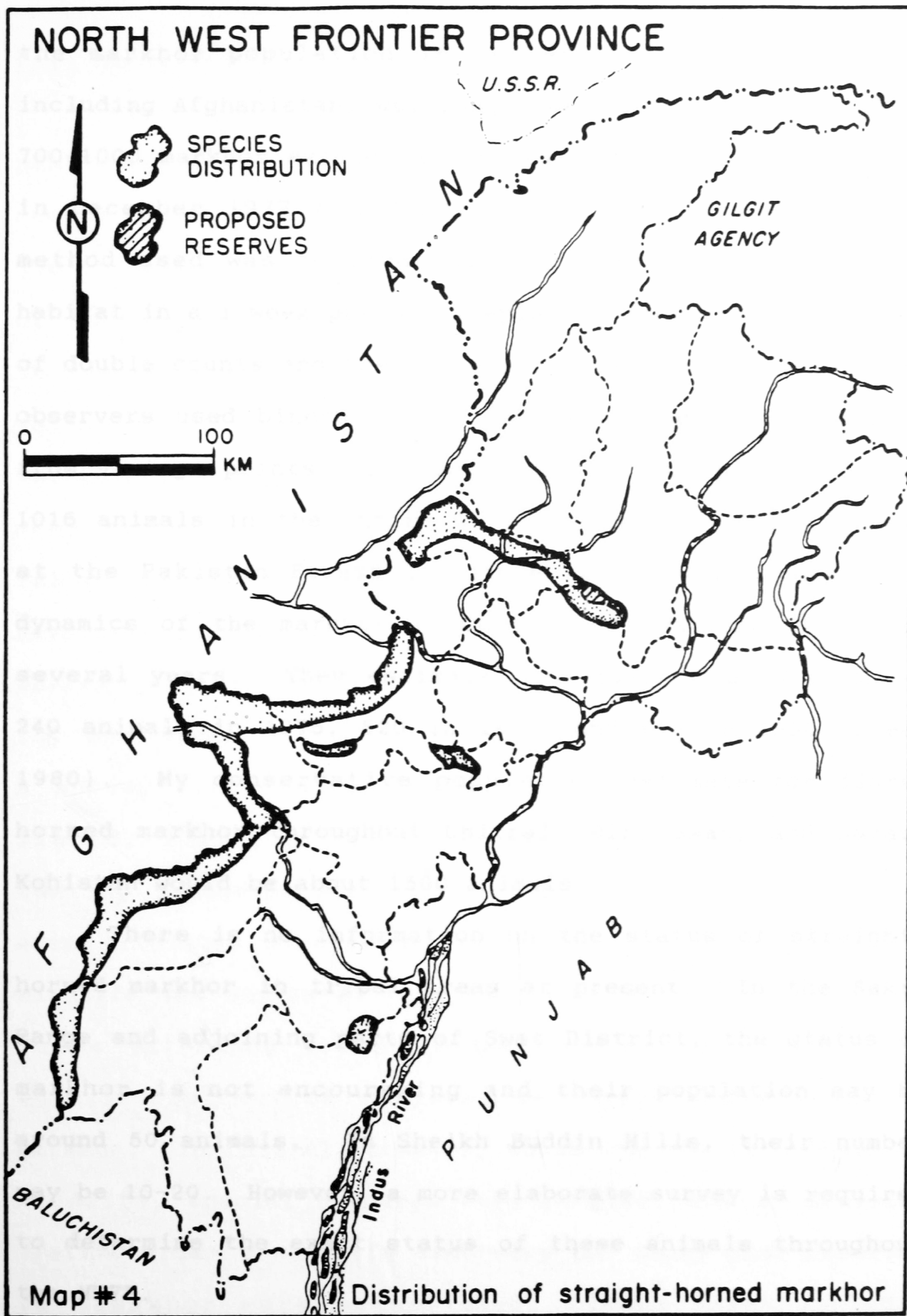
Arundu where the River enters Afghanistan. They also spread southward into Dir and westward into Swat Kohistan and Indus Kohistan (Roberts 1977). Map 3 shows the distribution of flare-horned markhor in NWFP.

Straight-horned markhor were once found over a large area in NWFP. They ranged from the Indus, a few kilometers north of Terbela Dam, westward up to the Afghanistan border, southward past the Khyber Pass, and again westward to the Sufaid Koh Range (Schaller and Khan 1975). They were found in the Sakra Range near Mardan; the hills near Marghezar in Swat; and Sheikh Buddin hills near Pezu, D.I.Khan (Roberts 1969 and 1977, Schaller and Khan 1975). They are still found in the Sakra Range and parts of Bunair subdivision of Swat, as well as in Sheikh Buddin, though the numbers are much reduced. In the Tribal belt, they still occur in Malakand Agency, the hills around Darra Adam Khel, Orakzai Agency, and parts of Kurram and Waziristan agencies. Map 4 shows the distribution of straight-horned markhor in NWFP.

Status

Roberts (1969) estimated the entire population of flare-horned markhor in Chitral and the Kohistan areas of Dir, Swat, and Indus as well below 1000. Schaller and Khan (1975) estimated 125-150 animals in Chitral Gol and a total of 500-600 in all of Chitral District. Their estimate of





the markhor population in its entire western habitat, including Afghanistan, was 1500. According to Khan (1975), 700-1000 markhor existed in Chitral. I conducted a survey in December 1977 and January 1978 (unpublished). The method used was to count all the markhor throughout its habitat in a 1-week period, keeping in mind the possibility of double counts and the non-observability of animals. The observers used binoculars to locate and count the markhor from vantage points. The estimated markhor population was 1016 animals in the entire Chitral District. Researchers at the Pakistan Forest Institute have studied population dynamics of the markhor in Chitral Gol National Park for several years. They estimated the markhor population as 240 animals in 1975, 520 in 1979, and 615 in 1980 (Aleem 1980). My conservative population estimate for flare-horned markhor throughout Chitral, Dir, Swat, and Hazara Kohistan would be about 1500 animals.

There is no information on the status of straight-horned markhor in tribal areas at present. In the Sakra Range and adjoining parts of Swat District, the status of markhor is not encouraging and their population may be around 50 animals. In Sheikh Buddin Hills, their number may be 10-20. However, a more elaborate survey is required to determine the exact status of these animals throughout the NWFP.

Past Management

Flare-horned markhor enjoyed better management in the past compared to straight-horned markhor. The former were mostly found in the states of Chitral, Swat, and Dir, where the rulers afforded them protection to maintain the sport of hunting for themselves and other privileged families. In Chitral, particularly, all the famous markhor valleys were assigned to different families of the ruling caste. The ruler, locally known as Mehtar, maintained his personal game reserve in Chitral Gol--the present national park (Khan 1975). Although the ruling families and their favorites heavily hunted the markhor, they deserve credit for managing populations for a sustained yield and protecting some areas against poaching by the general population. A survey conducted by me in Chitral in 1977-78 (unpublished) indicated that the markhor population in old hunting preserves was significantly higher than in other areas. States were merged in 1969 and the management of wildlife was entrusted to the Forest Department. With no rules extending to the former state-owned areas, the wildlife protection suffered seriously and so did the markhor. In Chitral, however, which was the stronghold of wildlife, special measures were adopted, and by administrative order a wildlife sanctuary and three game reserves for markhor were established. These areas included Chitral, Drosh, Gehrait, and Purit gols. Staff was

provided for protection, though it was insufficient to meet the actual need. During the past 5 years, two more game reserves, in Tooshi and Goleen Gol, were established; Chitral Gol was given the status of a national park. Special attention was given to the management of markhor in Chitral Gol and the following steps were taken to improve conservation of markhor:

1. The staff was increased from 5 to 15 persons.
2. Watch huts were constructed at important vantage points to house the staff.
3. Livestock grazing and wood cutting were banned.
4. In lieu of grazing and wood cutting, the people of villages around Chitral Gol were compensated by doubling their timber quota to be harvested in areas outside Chitral Gol and they were given job preferences (Malik 1985).
5. An amount of 2.2 million rupees was allocated to purchase the private lands in Chitral Gol.
6. Two annual permits for shooting markhor were sanctioned to Shikar Safari Club International for a hunting fee of 10,000 U.S. dollars per animal and an additional donation of 5000 U.S. dollars for conservation work (Malik 1986).

Similarly, protection in Tooshi and Goleen game reserves has also improved. In other places like Swat and Kohistan, not much has been done to date except to provide a small staff for protection.

Straight-horned markhor remained relatively neglected. Although Sheikh Buddin was declared a sanctuary, it could not be protected against heavy grazing pressure. Also, due to the presence of only a skeleton staff, some poaching took place.

The Mardan part of the Sakra Range has also been declared a game reserve recently, but the staff needs to be strengthened and equipped with equipment for surveillance and arms.

Legally, straight-horned markhor enjoy the status of a protected animal while flare-horned markhor can be hunted under special permits. Since 1975, about 10 special permits have been issued for markhor hunting, all of them to foreigners.

Conservation Problems

1. Habitat destruction.

In Chitral, coniferous forests are the important source of thermal cover for markhor. These forests, which are already of poor productivity, have to sustain an annual extraction of about 0.5 million cubic feet of timber either for the domestic requirements of right holders or for commercial purposes. It is feared that indefinite continuation of this policy will render the fragile mountain slopes treeless. When this thermal cover is gone, markhor will leave the area. Their absence from the adjoining

areas of upper Chitral seems primarily due to the lack of thermal cover. This problem has become more complicated because of the new policy of the government to pay 60% of the revenue drawn from the forest to the local people. It will, therefore, be difficult now for the government to halt commercial extraction of timber. The situation is similar in Kohistan District.

Firewood collection in markhor habitat is another problem. The oak trees, which are a source of winter fodder for markhor, are ruthlessly cut for firewood. Straight-horned markhor are faced with even greater problems due to wood cutting. Their habitat is already sparsely vegetated and any further removal of vegetation will be disastrous.

Heavy grazing pressure by livestock is evident on markhor habitat throughout the Province. Countless goats and sheep are directly competing with the markhor for food.

2. Poaching.

Poaching, particularly of straight-horned markhor, is also a factor leading to the decline of the species. Shortage of staff is one of the reasons for poaching, but several other factors, including lack of proper punishment to the offenders, adversely affects the antipoaching activities.

Management Objectives

1. To build up the markhor population and bring it to a stage where it would flourish and provide sustained sport hunting without danger of becoming extinct.

2. To cater to the interests of hunters by allowing limited sport hunting of markhor in selected areas.

3. To involve the local population in the conservation program by providing incentives, i.e., by spending a part of the hunting fee on the welfare of those people.

Management Recommendations

1. A detailed survey of the distribution and status of straight-horned markhor should be conducted throughout the Province, and areas having potential as game reserves or sanctuaries should be identified.

2. Ecological studies on straight-horned markhor should be undertaken to determine the management requirements of the species.

3. The existing boundaries of Sakra Game Reserve should be extended to include the remaining part of the Sakra Range in Swat District. Its protection should be improved by strengthening the staff and equipping it appropriately to face the special situation involved with protection in that area. Efforts should be made to give job preference to people of the villages closest to the game reserve. It will be highly important to gain the

cooperation of the people of Babozai, Shamozi, Singao, Mian Khan, Chor Banda, and Sakha Dhand villages in conservation efforts.

4. A specific study should be conducted to determine the population of domestic sheep and goats in the Sakra Game Reserve and to find ways to protect the Reserve from them.

5. Protection of the Sheikh Buddin Wildlife Sanctuary should also be improved by increasing the staff and providing them with the proper equipment needed because of the special location of the Sanctuary. Here also, a study similar to that done in Sakra, of the grazing problem should be undertaken and the cooperation of the people living on the Bannu side of the Sanctuary should be especially sought.

6. Grazing should not be permitted in Chitral Gol National Park except by cattle, and the acquisition of the private property in the Park should be finalized as soon as possible.

7. Periodic surveys of the markhor population in Chitral should be carried out, and the population should be monitored properly.

8. A study of markhor ecology with specific reference to its behavior toward predators, especially the snow leopard, should be carried out with the help of the University of Montana.

9. Protection of other game reserves in Chitral, including Drosh, Purit, Gehrait, and Goleen gols, and Tooshi, should be improved by assigning adequate staff to these areas.

10. The permission of the Government should be obtained for spending the revenues realized from markhor hunting on the welfare of the local people, to provide them an incentive to protect this species. If we are once successful in getting people to cooperate in markhor conservation, most of the conservation problems will be solved automatically.

11. A habitat improvement program should be launched in Chitral Gol. In this program, oak should be planted on suitable slopes. If this is a success, the program will be extended to other areas including Tooshi and Gehrait Gol.

12. To provide better protection to the markhor in Chitral Gol and those crossing over to its adjoining areas outside the national park, Singoor Gol in the north and Molan Gol and Ramboor Gol in the south should be declared game reserves.

13. Game reserves and sanctuaries for markhor should also be established in suitable areas of Swat Kohistan and Hazara Kohistan.

14. The policy of issuing 2-4 annual permits for hunting of flare-horned markhor should be continued, and efforts made to get additional support from international

organizations for implementation of the conservation program. Population surveys should be used to modify the number of permits issued as needed.

15. Wildlife in general and markhor in particular are found in areas where people are generally poor and the natural resources are either lacking or too difficult to exploit. An extension program should be launched in the villages and towns around markhor habitat to teach people how the wildlife can become one of their biggest natural resources by adopting proper management techniques and policies.

Himalayan Ibex (Capra ibex)

Family: Bovidae

Subfamily: Caprinae

The Himalayan ibex is a sturdy, thickset, wild goat standing 95-100 cm at the shoulder and having a head and body length of 145-165 cm. A mature adult male may weigh 85-90 kg. Mature males have large, scimitar-shaped horns roughly triangular in cross section. The front surfaces of these horns are flat with prominent, rounded ridges. The record length of ibex horns shot in Chitral in 1920 was 131 cm (Khan 1975). The coat consists of coarse, brittle hair with dense underfur in winter. The winter color is yellowish white with a tinge of brown and gray. The old males sometimes look almost white on the neck and

shoulders. In summer, the color is chocolate brown with circular patches of yellowish-white hair in the middorsal and rump regions (Roberts 1977). The females are smaller in build and possess small horns. Both sexes develop a beard.

The rut occurs during December and January and the young are born in May or June (Roberts 1977). The gestation period is 5 months, litters consist of one or two young, and age of females at first reproduction is 3 years (Rasool 1982).

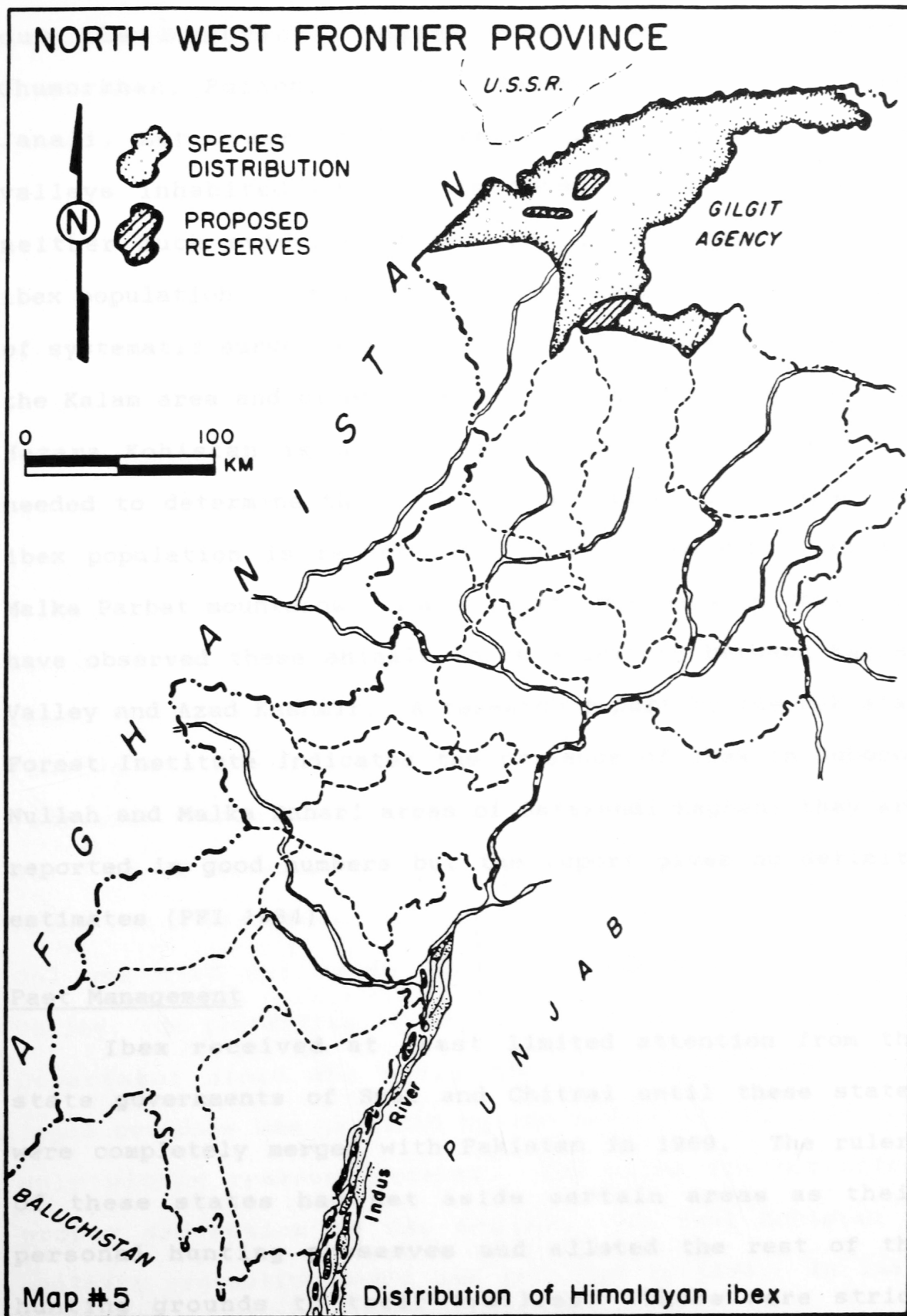
Distribution

Himalayan ibex are found at and above 2570 m from sea level in the dry, temperate conifer forests and in sub-alpine and alpine meadows. They inhabit nearly all of the western Himalayan and Karakoram mountain ranges (Rasool 1982). Beg (1975) described alpine scrub and pastures in Gilgit and Chitral as the habitat of ibex. Roberts (1977) reported the occurrence of ibex in Pakistan from 3660 m to 6710 m, occasionally descending to 2135 m. In their summer ranges in Chitral, ibex usually remain between 4000 and 5000 m or even higher (Schaller 1977). In Chitral, ibex occur throughout the higher mountain ranges starting 20 km north of Chitral town. From Goleen Gol north, they are distributed in all the mountain ranges up to Bashqar Gol in the east and their occurrence continues into Gilgit and

Swat Kohistan. In this District, ibex can also be seen in almost all the inner valleys along the Yarkhon River, in Shah Janali, in all the valleys east of Tirich Mir, and throughout the entire Arkari Valley. They extend to Gabore and Dorah Onn on the Afghanistan border to the northwest. Ibex certainly extend into Swat Kohistan and are also reported in Indus Kohistan (Roberts 1977), also known as Hazara Kohistan. Some ibex populations are found in the Kaghan Valley of Hazara in the higher mountain ranges bordering Azad Kashmir. Here, the ibex seems to migrate occasionally from Kaghan Valley into Neelam Valley and vice versa. Information on the distribution of ibex in Dir District is generally lacking, although sightings have been reported. Map 5 shows the distribution of this animal.

Status

Schaller (1977) determined a density of 1.8 ibex/km² in Besti Valley of Chitral in 1972, and 0.7/km² in 1974 in the same area along a different route. He found only a few ibex in the Broghil area around Chintar Glacier and Qaramber Lake. Khan (1975) gave an estimate of 1000-2000 ibex for all of Chitral. Khan et al. (1978) estimated the population in Chitral at 4000. The present status of ibex in Chitral District is fair. My conservative estimate of the population is 3000-4000. This estimate is based on the reports of wildlife watchers employed in key areas through-



out the District. Agram Besti, Goleen, Bashqar, Chumorkhan, Raizon, Tirich, Atahrak, Zaiwar, Ujnu, Shah Janali, Lut Oveer, and Kankhoon gols are some of the valleys inhabited by ibex in Upper Chitral. There is neither much evidence of decline nor improvement in the ibex population over the past 5 years, probably due to lack of systematic survey and monitoring. The status of ibex in the Kalam area and other parts of Swat Kohistan, as well as Hazara Kohistan is not clear and detailed surveys are needed to determine this. In Kaghan Valley of Hazara, the ibex population is reported to be 40-50 around Kalah and Malka Parbat mountains. The wildlife watchers in this area have observed these animals to be migratory between Kaghan Valley and Azad Kashmir. A research report by the Pakistan Forest Institute indicates the presence of ibex in Dubbook Nullah and Malka Pahari areas of Batakundi Kaghan; they are reported in good numbers but the report gives no definite estimates (PFI 1984).

Past Management

Ibex received at least limited attention from the state governments of Swat and Chitral until these states were completely merged with Pakistan in 1969. The rulers of these states had set aside certain areas as their personal hunting preserves and allotted the rest of the hunting grounds to their families. There were strict

orders for the general public not to shoot any animal. Although the ruling families practiced indiscriminate shooting themselves, they saved the animals from total extinction by safeguarding them against hunting by the general public. After the merger of the states in Pakistan, it took 6 years to formulate and extend the wildlife protection laws to these merged areas. This lapse of time was disastrous for almost all the wildlife (Khan 1975). Ibex, due to its distribution over a wider range, probably suffered most because detection of poaching was difficult. Also, no staff was available to look after the wildlife. In Chitral, fortunately, the hunting of ibex was banned in 1971 through an order by the Deputy Commissioner (Khan 1975), and the Agram Besti area was declared a game reserve for its protection. Protection measures were improved gradually since 1975, and by 1985 a protection staff of 40 persons had been appointed in ibex habitat. Agram Besti was given the status of a sanctuary and Goleen Gol was also set aside as a game reserve. In Kaghan Valley, the protection of ibex has been the job of the Game Department since the early days of independence. Some legal coverage was provided by the Forest Act of 1927, but only within reserved forests. The rules did not afford proper protection to the animals. In Swat Kohistan, a skeleton protective staff was provided in 1975. In 1983, measures for the protection of wildlife in Hazara Kohistan

were taken. Ibex was included in the list of game animals under the NWFP Wildlife Act of 1975 (Government of NWFP 1975), and hunting was allowed only with a permit obtainable from the Wildlife Wing for a fee of 5500 rupees. Although no permits have been issued since 1975, hunting was totally banned in 1981 for a period of 3 years. In 1985, the government decided to issue permits for hunting five ibex annually. The permits were to be administered by the Shikar Safari Club International. To date none of the permits have been purchased.

Conservation Problems

The wildlife manager will be confronted with the following problems in the conservation of ibex.

1. Habitat destruction.

Survival of ibex is threatened due to rapid deterioration of its habitat. Already sparsely vegetated, this habitat is rapidly losing its bushy cover of juniper and artemisia because the inhabitants cut them for firewood. In places where no shrubs are left, people are digging even the roots of juniper and artemisia. This further loosens the fragile mountain slopes and aggravates a hazardous erosion problem. If not checked, this will lead to serious problems for people as well as ibex. This situation needs immediate attention because the local people, particularly in Chitral, need an adequate supply of firewood during

winter for survival. The people will continue digging the last roots out of the ground until none are left. Unless alternatives are available, no extension lectures or advice will have any positive influence in restraining them from moving toward the point of no return.

2. Grazing.

Intense grazing pressure by large numbers of livestock is another factor leading to habitat destruction. The carrying capacity of the mountain rangelands in ibex habitat is far less than the number it must currently support. As a result, the quality and quantity of vegetative cover is depleted and soil erosion starts. This adversely affects ibex by limiting food supply and worsening the overall habitat conditions.

3. Poaching.

Ibex are widespread throughout their habitat in Chitral. Consequently, they are more widely persecuted by poachers. Human resources of the Wildlife Wing are not enough to guard the vast habitat and the villagers are usually not cooperative in detecting poaching cases. Poaching may be one of the causes of only an insignificant increase in the ibex population. The number of unconfirmed poaching reports is higher in winter than during the summer. This may be due to deep snow cover on high altitudes forcing the ibex to descend to lower elevations. Shortage of a meat supply in upper Chitral District can

increase the temptation to poach ibex.

Management Objectives

1. To develop and maintain a good population of ibex in all the geographical zones of its occurrence in the Province in order to take a sustained harvest for sport purposes without the risk of threatening the survival of the species.

2. To allow sport hunting on a limited scale to generate the interest of hunters in a conservation program. This hunting must be commensurate with the present population of the ibex and should be conservative until the population has increased to a desirable level.

3. To involve the local people in the management program by providing them certain incentives and proving to them the benefits of wildlife conservation.

4. To help solve the socioeconomic problems of local people, particularly the problems associated with habitat use, e.g., grazing and firewood collection.

Management Recommendations

1. A survey of the distribution and population status of ibex should be carried out in the districts of Chitral, Swat, Dir, Kohistan, and Mansehra. In this survey, areas should be identified for declaration as sanctuaries or reserves. Other problems of conservation, if any, should also be highlighted. The survey teams

should also have the specific task of determining which areas of the habitat are burdened with the people's rights of livestock grazing and woodcutting and which parts are relatively or absolutely free of such rights. The teams may make their own recommendations for the achievement of management objectives in the form of a mini-management plan.

2. The Pakistan Forest Institute and the Zoological Survey Department of Pakistan should be requested to study the biology of ibex in relation to other factors in the habitat including livestock grazing, wood collection, hunting, and predation; their findings and recommendations should be made available to the Wildlife Wing as soon as possible.

3. Protection of Agram Besti Reserve should be further improved by employing at least one person as a wildlife watcher from each of the villages of Besti and Ovir, both situated at the entrance to the reserve.

4. In NWFP, ibex are most numerous in Chitral District, therefore much of the attention should be focused on the protection and development of the ibex population in this District. Whereas the wide distribution of ibex is an encouraging sign, it poses certain problems of protection because the ibex are exposed to more poachers. Complete protection over all the habitat cannot be insured due to limited staff. Therefore, it is essential that a network

of special areas like game reserves and sanctuaries be established to provide refuge to this animal. At present only two such areas exist--Agram Besti Wildlife Sanctuary and Goleen Gol Game Reserve. It is recommended that three more areas be designated as game reserves for ibex. These areas should include Zewar and Shah Janali gols in Torkho Tehsil and Bashqar Gol in Mastooj Tehsil. Additional staff should be provided for protection of these new reserves, preferably from among the local people.

5. In Chitral District, some goat herds are brought for summer grazing into Goleen Gol Reserve and other parts of upper Chitral by the people settled in the lower parts of Chitral. Efforts should be made to ban the entry of exotic goat herds in these areas.

6. In order to regulate grazing and woodcutting, the government should be requested to transfer to the Wildlife Wing the control of all the government lands other than those declared as reserved forests or set aside for any other purpose.

7. A dire need exists for firewood in all the villages and towns around ibex habitat, particularly in Chitral. People are digging out the roots of all plants from the fragile mountain slopes. If no alternative is made available, not only the ibex habitat but also human settlements will face inevitable destruction. As a step toward solving this problem, efforts should be made to

extend the watershed management programs to upper Chitral. Although arid, steep, and stoney mountain slopes may not be suitable for growing most plant species, good stands of poplar (Populus spp.) and willow (Salix spp.) can be grown along the river and on the lower slopes. These plantations will meet the firewood requirements of the local people and will relieve the pressure on mountains.

8. Livestock kept by people in upper Chitral is exceptionally lean and of low productivity. An extension program in range management may help reduce livestock numbers to some extent.

9. The policy of issuing five annual permits for ibex hunting should be continued and permission of the Finance Department should be obtained to spend most of the fees so realized on the welfare of the local people. An effort should also be made to promote more cooperation from international agencies for ibex conservation programs. IUCN, WWF, FAO, UNDP, and the International Snow Leopard Trust, as well as several hunting clubs, may be interested in supporting the conservation projects.

10. Include local people in the management of ibex by organizing conservation societies at the local level and nominate honorary game wardens from among them. The honorary game wardens should have the same powers as vested in an officer of the Wildlife Wing by the NWFP Wildlife Act.

Goral (Naemorhedus goral)

Family: Bovidae

Subfamily: Caprinae

The goral is a stocky, goat-like animal standing 65-71 cm high at the shoulder with a body length of 105 cm and weight of 25-28 kg; general body coloration is dark grayish-blue (Roberts 1977). The goral is considered to be a goat antelope and is sometimes placed in the tribe Rupicaprinae as opposed to the goats and sheep which belong to the tribe Caprini (Schaller 1977, Prater 1980). Both sexes have small conical horns curving backwards, the curve becoming more pronounced at the tips. These horns are marked by rings or ridges in their proximal region (Roberts 1977, Prater 1980). The animal has large, bell-shaped ears (Roberts 1977).

The rut takes place at the end of the monsoon season and early in the winter. The gestation period is reported as 6 months and the young are usually born in April. The litter usually consists of only one young (Roberts 1977).

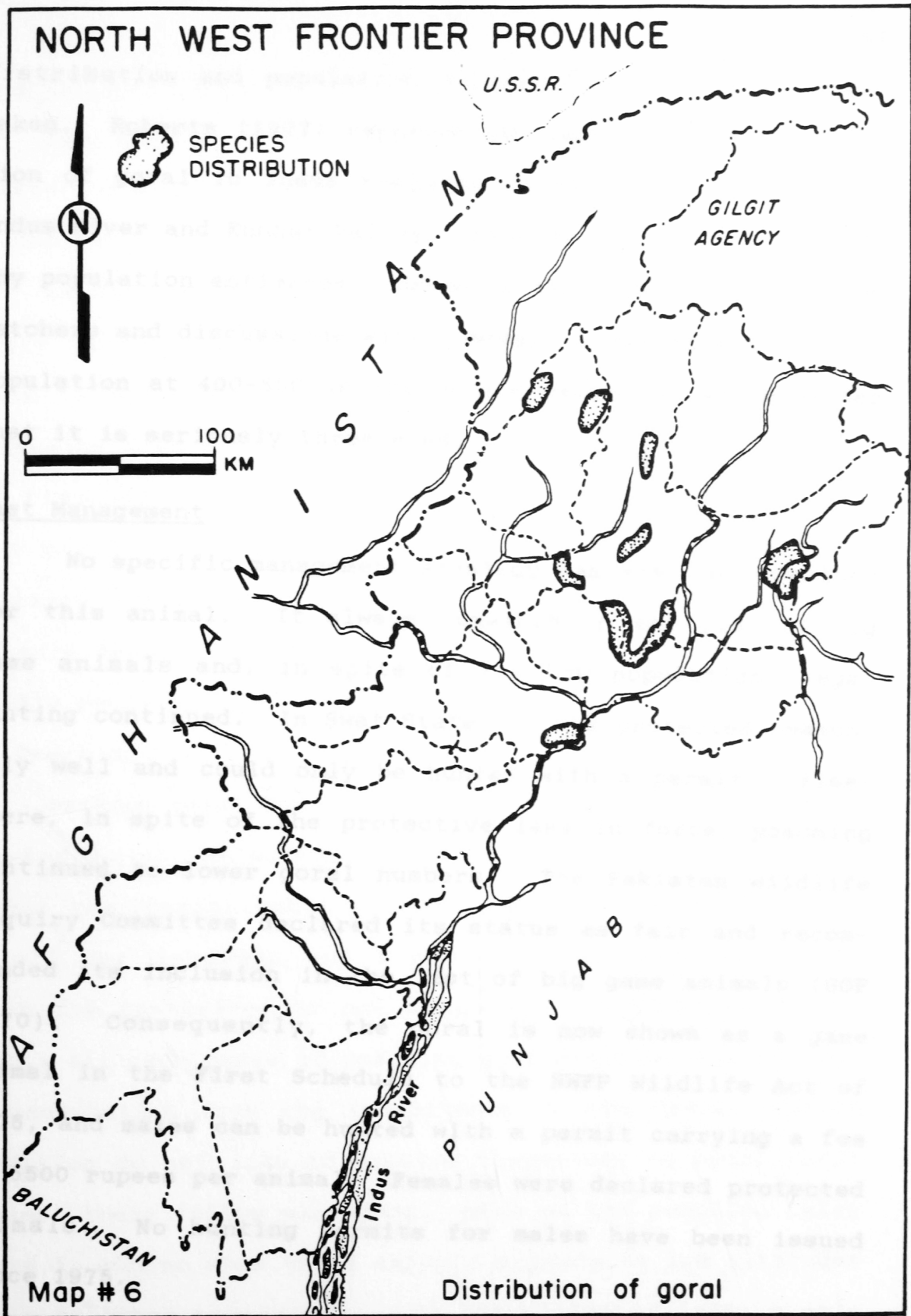
Distribution

The goral is widely distributed in the outer Himalayan foothills of NWFP where it occurs on forested slopes and rugged, precipitous cliffs interspersed with grassy meadows and shrubbery between 600 and 3000 m above sea level.

In Swat District, it can be found on steep hillsides in Chir pine zones in Bunair Valley and in Marghezar Hills. It may also occur in suitable habitats in the Monkial area. The steep and rugged mountain range of Sakra in Mardan supports some populations of goral where it is found along with straight-horned markhor; sometimes goral are also found in village cultivations around Palodheri. Goral were once numerous in this range but their numbers have been drastically reduced due to overhunting (Raidullah Khan pers. comm.). Roberts (1977) quotes Ikramullah Khan for the possible occurrence of goral in Chirat Hills near Pabbi in Peshawar District. In Hazara, they used to be found around Kawai in Kaghan Valley (Bashir Hussain Shah pers. comm.) and still occur on steep slopes within dense shrubbery cover in the forests of Shogran, Malkandi, and Bichla Manur. They are also found in Siran Valley, including forests around Kund and Shaheed Pani. Goral are also known to occur in parts of Dir District and the Indus Kohistan Tract (Roberts 1977). They have not been recorded in Chitral District and Gallis Tract of Abbott Abad District. Map 6 shows the distribution of goral in NWFP.

Status

Very little is known about the status of goral in NWFP. Due to their inconspicuous nature and the precipitous slopes and thick shrubbery they inhabit, systematic



distribution and population surveys have not been undertaken. Roberts (1977) reported the main surviving population of goral in Indus Kohistan in the tract between the Indus River and Kunhar Valley. However, he did not provide any population estimates. Based on the reports of wildlife watchers and discussions with hunters, I estimate the goral population at 400-500 in the entire Province, and consider that it is seriously threatened.

Past Management

No specific management strategy has ever been devised for this animal. It always remained on the list of big game animals and, in spite of its low population, legal hunting continued. In Swat State, it was protected reasonably well and could only be hunted with a permit. Elsewhere, in spite of the protective laws in force, poaching continued to lower goral numbers. The Pakistan Wildlife Enquiry Committee declared its status as fair and recommended its inclusion in the list of big game animals (GOP 1970). Consequently, the goral is now shown as a game animal in the First Schedule to the NWFP Wildlife Act of 1975, and males can be hunted with a permit carrying a fee of 5500 rupees per animal. Females were declared protected animals. No hunting permits for males have been issued since 1975.

Conservation Problems

The major conservation problems include habitat destruction and poaching.

1. Habitat destruction.

Except in the government reserved forests and community forests (Guzara forests), the goral habitat elsewhere is subject to speedy deterioration through ever-increasing pressure from livestock grazing, grass cutting, and firewood collecting. Domestic goats compete heavily with goral for browse on steep cliffs. The removal of shrubbery for firewood and fodder in places like the Sakra Mountain Range reduces hiding cover. Thus the habitat is rapidly becoming less hospitable.

2. Poaching.

Perhaps goral has been one of the most heavily persecuted animals. Selection of small, isolated cliffs and the strong territorial habit of goral make its location known to all the herdsmen and firewood collectors who either poach for themselves or act as guides for other poachers. Almost all such cases of poaching go undetected due to lack of cooperation from the inhabitants of the areas, who by tradition do not like to involve themselves in court cases against their fellow villagers. Much of the poaching takes place in winter when these animals migrate to low altitudes close to human habitations. In the winter of 1983, a male goral came down near the village of Palodheri at the foot

of Sakra Range. It was stoned by the villagers and eventually slaughtered.

Management Objectives

The following broad objectives of management are proposed.

1. To determine the distribution of goral in the Province, estimate its numbers, and establish a population monitoring program.

2. To develop and maintain at least one healthy population of goral in each of the geographical units of its occurrence in the Province, with the ultimate objective of taking a sustained harvest through sport hunting.

3. To seek the cooperation of the local people in conservation efforts.

Management Recommendations

1. Systematic surveys should be conducted throughout the known and potential habitats of the goral to find its distribution, estimate its numbers, and establish a monitoring program. Areas having potential for development as special wildlife areas to act as natural breeding and dispersal centers should be identified. The first phase of surveys should be started in Chirat Hills of Pabbi, Sakra Range of Mardan, Shogran and Malkandi forests of Kaghan Valley, and one locality in Hazara Kohistan simultaneously. The timing of these surveys may be decided according to

locality in consultation with local hunters and graziers whose services will be actively utilized in gathering the information. Survey schedules for the remainder of the habitats should be prepared in light of the experiences gained during the first phase, keeping in mind surveys of other species.

2. Efforts should be made to establish at least one special wildlife area, e.g., game preserve or wildlife sanctuary, in each geographical unit in the area identified as suitable for this purpose during the survey work. During phase 1, these areas may be established in Chirat, Kaghan Valley, and Hazara Kohistan. In such special areas, poaching should be strictly controlled by appointing full-time wildlife watchers, preferably local residents. Cooperation of the local people should be sought by providing incentives similar to those proposed in preceding chapters.

Besides antipoaching measures, habitat restoration work should also be undertaken in areas where habitat is depleted. This must involve a two-part approach. As a short-term measure, efforts should be made to restrict grazing, grass cutting, and firewood collecting at least in a part of a special area that should not be less than 300 ha. Forestry operations, if any are underway in the area, should be made commensurate with the habitat requirements of management. As a long-term measure, attempts should be

made to reestablish vegetative cover through artificial planting and reseeding of suitable species of plants and grasses. Advantage should be taken of the forest nurseries, either for the available planting stock or for growing transplants of desired species.

3. Research on the biology and ecology of the goral should be undertaken to establish specifically the management requirements of the species. In view of the shortage of research staff, collaborating with a foreign university and providing facilities to a master's degree candidate for this research would be advisable.

4. Although the aspect of people's support has been dealt with elsewhere in this paper, in certain areas the only big game near human settlements is goral. Sakra Range is an example of this. Due to the strong territorial nature of goral, seeking the cooperation of the inhabitants of settlements around goral habitat is absolutely essential. While this is very difficult, repeated contacts with village elders and graziers by all levels of the Wildlife staff would play a significant role in achieving this objective. Even small incentives to graziers can help save a valuable animal. Although the goral is not a preferred trophy, a way can be found to attract a limited number of hunters from abroad, probably in conjunction with hunts for other game, who will be charged a hunting fee, part of which can be spent on the welfare of the local

inhabitants.

Barking Deer (Muntiacus muntjak)

Family: Cervidae

Subfamily: Muntiacinae

The muntjac or barking deer is a small cervid with a bright yellowish-red coat that sometimes darkens to a reddish chestnut (Prater 1980). The adults have a height of 41-60 cm at the shoulder; body length measured from tip of the nose to the base of the tail is 80-100 cm (Roberts 1977). The average weight of males is 21-23 kg (Prater 1980), but some authors give a wide range of weights. This deer has small antlers borne on bony pedicles. The antlers, which bear a small tine on the base, rarely exceed 16.5 cm. The upper canines are well developed but much less so than those of the musk deer. The females develop smaller tusks (Roberts 1977) and have tufts of bristly hair instead of antlers (Prater 1980). The animal gives a call which resembles the barking of a dog.

Barking deer breed during all seasons but the rut mainly takes place in cold weather (Prater 1980). The gestation period is 180 days, and the litter usually consists of only one young (Roberts 1977) but two young are sometimes born (Prater 1980).

Distribution

The habitat of barking deer in Pakistan is confined

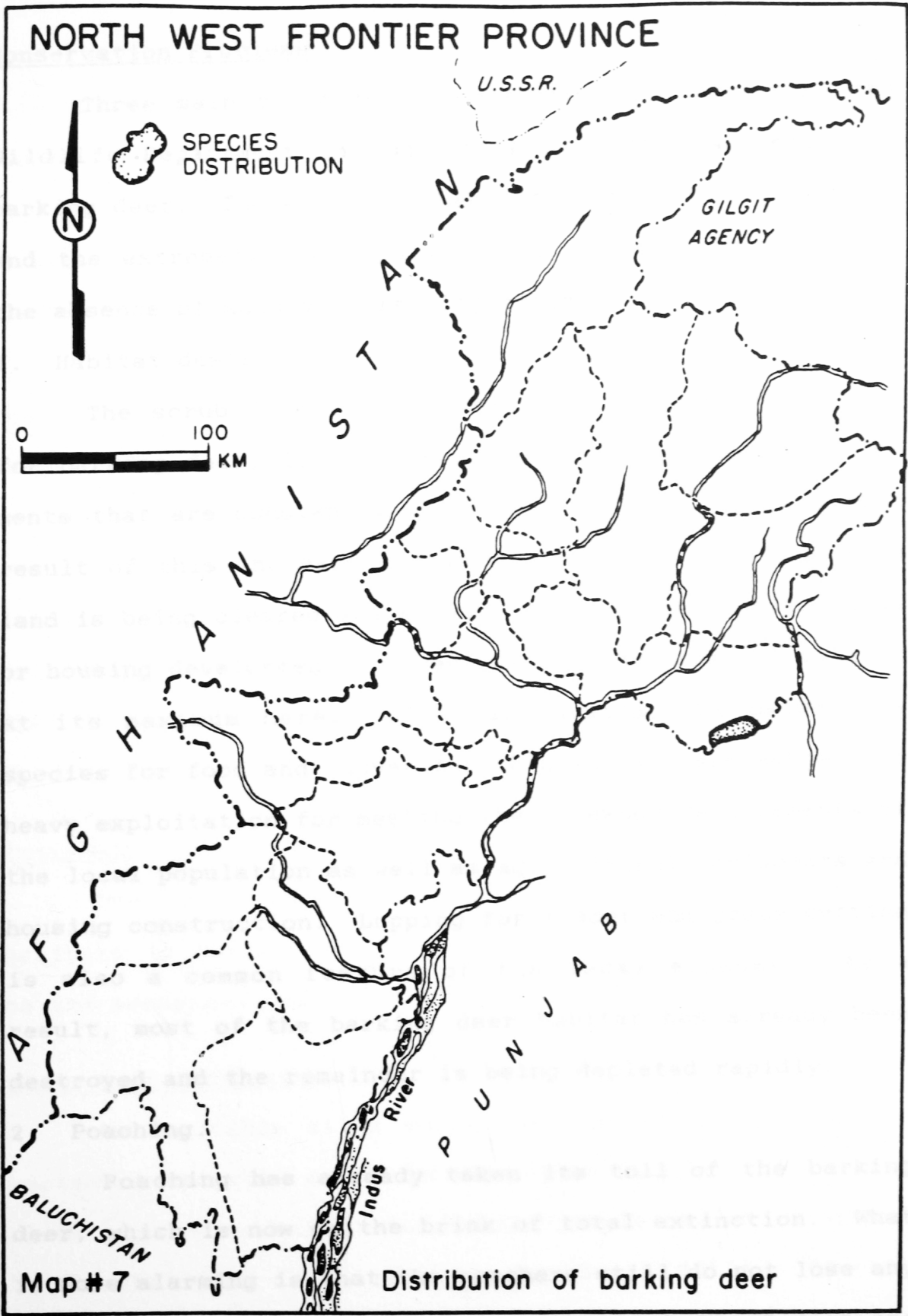
to the Himalayan foothills in remnants of tropical, dry, deciduous forest (Roberts 1977). In NWFP, barking deer were once numerous in the scrub forest around Khanpur (Raja Iftikhar of Khanpur pers. comm.). They are now found only in the Neelan Bhuto Forest of Makhnial Range. The adjoining Margalla Hills support a good population. Map 7 shows the distribution of barking deer in NWFP.

Status

This deer has become extremely rare in NWFP. Only stragglers enter Neelan Bhuto Forest of the Makhnial Range in Abbott Abad District from the adjoining Margalla Hills. It has become extinct in the remaining areas of the Province because of excessive hunting and habitat destruction. Detailed distribution and population surveys for barking deer have not been carried out.

Past Management

The barking deer was declared endangered by the Pakistan Wildlife Inquiry Committee in 1970 (GOP 1970). It was included in the Third Schedule to the NWFP Wildlife Act of 1975, whereby it has been given the status of a protected animal and can neither be hunted, killed, nor captured. No specific management measures have ever been adapted for this animal and protection has not been adequate. Consequently, it has become nearly extinct in the Province due to illegal hunting.



Conservation Problems

Three main conservation problems are confronting the Wildlife Department in connection with the management of barking deer. These include habitat destruction, poaching, and the extremely low population of the deer resulting in the absence of adequate breeding stock.

1. Habitat destruction.

The scrub forest zone, which is the primary habitat for barking deer, is interspersed with large human settlements that are constantly increasing in size. As a direct result of this increase in human population, more and more land is being cleared and brought under either agricultural or housing development. Livestock grazing pressure is also at its maximum here. Olive and acacia, the major tree species for food and cover for this animal, are subject to heavy exploitation for meeting the firewood requirements of the local population as well as agricultural implements and housing construction. Lopping for fodder and grass cutting is also a common feature of the local economy. As a result, most of the barking deer habitat has already been destroyed and the remainder is being depleted rapidly.

2. Poaching.

Poaching has already taken its toll of the barking deer, which is now on the brink of total extinction. What is more alarming is that the poachers still do not lose any opportunity to stalk these deer with the help of dogs and

shoot them if possible. So far, the resources of the Government have not permitted the appointment of an adequate protective staff in the deer area. This situation will pose a serious problem in any future management program.

3. Small population.

Habitat destruction and overexploitation have brought the barking deer to near extinction, and at present the Province does not support any viable population that could be used for further development. Complete protection of the barking deer habitat in Neelan Bhuto Forest and adjoining areas may help in establishing a viable population from the spill over from Margalla Hills National Park. However, this may take 5-10 years of no hunting and the elimination of habitat destruction.

Management Objective

The reintroduction of barking deer into suitable habitats in Haripur Tehsil of Abbott Abad District should be the management objective.

Management Recommendations

Two suitable sites should be selected in the better protected reserved scrub forests of Haripur. One of these sites should be in Makhnial or Khanpur Range, and a second in Sirikot, Sarainemat Khan, or Bagra Hills. Special fenced enclosures should be constructed at each site.

Barking deer obtained from zoos or elsewhere should be kept in these enclosures. When acquainted with the site, they can be released gradually. Before releasing the deer, the local people should be approached and their cooperation sought in reintroduction efforts. Deer conservation societies should be organized that have representation from influential local and village elders as well as the officers of civil administration for those areas. On the departmental level, special staff personnel should be appointed to protect the area against hunting and wood cutting. Restrictions on grazing of livestock may not be possible. The release area should be thoroughly surveyed for predators and, if necessary, a limited predator control program may also be conducted until the deer population is established. The success of the reintroduction program should be closely monitored by regular inventory and a final evaluation should be carried out 5 years after the initiation of the program; further management decisions should be made accordingly.

Hog Deer (Axis porcinus)
Family: Cervidae

The hog deer probably received its name due to its hog-like movements (Prater 1980). The hog deer's pelage is brown, sometimes dark brown, and the white-tipped guard hairs impart a speckled appearance to the coat. Adult

males stand 61-71 cm high at the shoulder and the body length from tip of the nose to base of the tail is 107-112 cm (Roberts 1977). Males have antlers borne on a conspicuous bony pedicle. The main beam has a small tine at its base. Toward the end, the main beam bifurcates into a longer foretine and a shorter hindtine (Prater 1980). The antler length is 30.5-35.5 cm (Roberts 1977). The males shed their antlers between January and April.

The rut takes place from August to October. The gestation period is 8 months. Usually one young is born but twins have also been recorded. The majority of fawns are born during the spring and summer months (Roberts 1977).

Distribution

In Pakistan, the hog deer is confined to riverine forests in the plains, particularly in areas with a thick growth of Saccharum spontaneum and Saccharum munja (Roberts 1977). In NWFP, hog deer have been known to occur in pockets along the Indus River in the D.I.Khan District where it was found associated with grasses of Saccharum spp. and reeds between the main river and the flood protection embankments, below Chashma barrage down to the boundary of Punjab Province (Bashir Khan pers. comm.). This deer was wiped out by overhunting about 20 years ago (Sanaullah Khan pers. comm.). The hunting was usually done

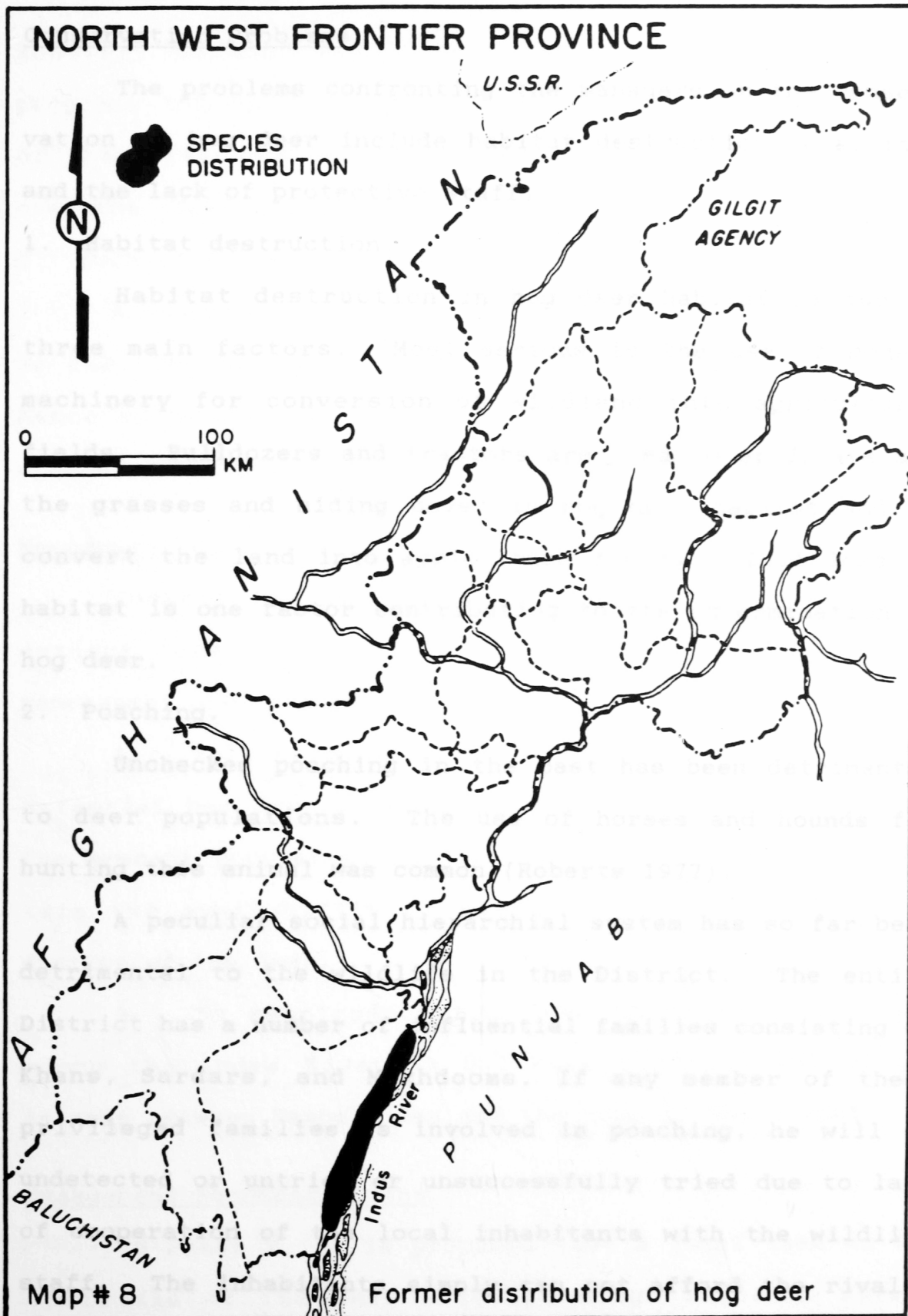
in large parties on horseback and using greyhounds. Hog deer are still found in the adjoining areas of Punjab between Darya Khan and Kundian (Farooq Khan pers. comm.). Map 8 shows the distribution of hog deer in NWFP.

Status

Although no definite field survey has been conducted to determine the present status of the hog deer, the information collected from local inhabitants and hunters suggests that it is already extinct in the NWFP. There is, however, a need for a field investigation of the distribution and status of this deer all along the Indus River in D.I.Khan District and in the tract between Tarbela Dam and the town of Kheir Abad in Peshawar Division.

Past Management

Hog deer received legal protection in 1959 under the provisions of the West Pakistan Wildlife Protection Ordinance (Government of West Pakistan 1968). The National Wildlife Enquiry Committee also declared it an endangered species (GOP 1970), and it is listed as a protected animal in the Wildlife Act of NWFP (Govt. NWFP 1975). In spite of all this legal protection, adequate field protection could not be given to this beautiful stag, and illegal hunting continued unchecked until the deer was exterminated from the Province. Except for the legal protection, no specific management was ever prescribed for hog deer.



Conservation Problems

The problems confronting the managers in the conservation of hog deer include habitat destruction, poaching, and the lack of protective staff.

1. Habitat destruction.

Habitat destruction in hog deer habitat is due to three main factors. Most serious is the use of modern machinery for conversion of wildland into agricultural fields. Bulldozers and tractors are used to eradicate all the grasses and hiding cover in hog deer habitat and to convert the land into agriculture fields. This loss of habitat is one factor contributing to the extermination of hog deer.

2. Poaching.

Unchecked poaching in the past has been detrimental to deer populations. The use of horses and hounds for hunting this animal was common (Roberts 1977).

A peculiar social hierarchial system has so far been detrimental to the wildlife in the District. The entire District has a number of influential families consisting of Khans, Sardars, and Makhdooms. If any member of these privileged families is involved in poaching, he will go undetected or untried or unsuccessfully tried due to lack of cooperation of the local inhabitants with the wildlife staff. The inhabitants simply can not afford the rivalry of a Khan, Sardar, or Makhdoom. The same system can,

however, be used effectively for wildlife development programs through concerted efforts in gaining cooperation of these families and taking advantage of their influence over the local people as well as local government.

3. Lack of protective staff.

Another problem is the shortage of protection staff. So far, the hog deer habitat has been a low priority and hence no staff was appointed. For any future program, special staff will have to be appointed in this area.

Management Objectives

Because the hog deer is already considered to be extinct from the Province, the following objectives of management are proposed.

1. To carry out an intensive survey of the potential hog deer habitat in the Province and determine the present population of the deer, if any, and to ascertain the availability of suitable habitat for reintroduction of the deer.

2. To reintroduce hog deer in suitable habitats along the Indus River in D.I.Khan District and in the islands between Tarbela Dam and the town of Khair Abad.

Management Recommendations

In Phase I, it is proposed that a joint team of the officials of the NWFP Wildlife Wing, Pakistan Forest Institute, and Zoological Survey Department carry out a

detailed survey of the hog deer habitat all along the Indus River, both in D.I.Khan District as well as parts of Mardan and Peshawar districts. This survey should be carried out in winter and spring months because during summer and fall, the Indus is in flood. The availability of habitat during the time of flood should also be considered with reference to average flood levels. It is recommended that the survey parties make use of horses and hounds for easy traversing of the habitat and detection of hog deer. If possible, limited use of helicopters would be useful in determining the general location of potential survey sites. The survey team could also benefit from the use of three motor boats available from the Wildlife Wing.

The Punjab Wildlife Department could also be requested to join the surveys, as the river bed is almost a common property and hog deer can swim across the river easily.

A very cautious judgement of the availability of suitable habitat for reintroduction of hog deer should be made and the extent of this habitat be assessed. In addition, data on habitat use by man and his livestock will also be collected. This will include livestock numbers by kind, rate of harvest of reeds and grasses, and the rate of conversion of wild land to agricultural fields. Key hog deer habitats in the provinces of Punjab and Sind can be used as suitability indices.

Results of this survey may require very careful evaluation. If there are any sites where hog deer are still present, special protection arrangements may be made by providing adequate staff. In case there are no deer, but suitable habitat is available for a reintroduction program, then as a first step towards reintroduction a large "meet the people" campaign could be started by the staff of the Wildlife Wing, including officers at high levels. They should seek the cooperation of hunters, agriculturists, and other influential people of the areas around reintroduction sites. Once the commitment of cooperation from these people is received, the reintroduction work can be initiated. As introduction or reintroduction of the species in an area has always been a controversial issue, all necessary precautions will be taken in this regard. The proposal is to construct at least one large enclosure at each site. These enclosures may have a chain link fence and the area of the enclosure must not be less than 2.5 ha. The deer procured from zoos or elsewhere may be housed in these enclosures until they become adapted to the new conditions. They can then be provided the opportunity to escape the enclosure gradually, but in case of any danger or shortage of food, etc., they should be able to retreat to the enclosure at least until 1 month after release. It would be advisable to let them escape during late fall or early winter so that by the time

fawning starts, they are well acquainted with their surroundings. The use of wild stock is strongly recommended for reintroduction. In this case, construction of enclosures may not be needed. It would also be advisable to radio collar each reintroduced deer before release and then monitor its movements. This would provide useful information for further management practices as well as to help study the biology, including survivorship of these animals.

The reintroduction should continue for at least 3 years at the minimum rate of 10 pairs a year, and the success of the entire program should be evaluated after 5 years from the initiation of the first release. If the program is found to be successful, it should be continued for another 3-year period to raise good breeding stock. If it is not a success, then perhaps it should be abandoned, depending on the causes of failure. An effective formula should be worked out for regulating cutting of reeds and grasses in hog deer habitat. This may involve special regulation by the Government, including purchase of rights.

Musk Deer (Moschus moschiferus)

Family: Cervidae

Subfamily: Moschinae

The musk deer can be readily identified in the field by its short front legs and long hindquarters giving an

arched appearance to its back. Ears are long and the dark brown coat is speckled with gray. Both the sexes lack horns and the male has a pair of enlarged canines which protrude down from the upper jaw for about 7.5 cm. All four toes have considerable flexibility which enables this deer to walk freely in snow or hold fast on slippery rocks (Singh 1980). Musk deer differ from other cervids in that they have gallbladders and the females have only two mammae (Roberts 1977). Unlike the other cervids, they do not possess a pit gland but instead have a caudal gland and a musk gland (Prater 1980). The tail is usually naked and very short; it is completely buried in the long hair of the caudal region.

The adult male may stand 45-48 cm high at the shoulder. One specimen was reported to have a body length of 94 cm and a weight of 11 kg (Roberts 1977).

Females attain puberty before 1 year of age (Blanford, cited in Asdell 1964). The rut takes place in November and December (Roberts 1977). The gestation period is 160 days (Asdell 1964), and the young are born in May and early June (Roberts 1977). Litter size is one or two.

Distribution

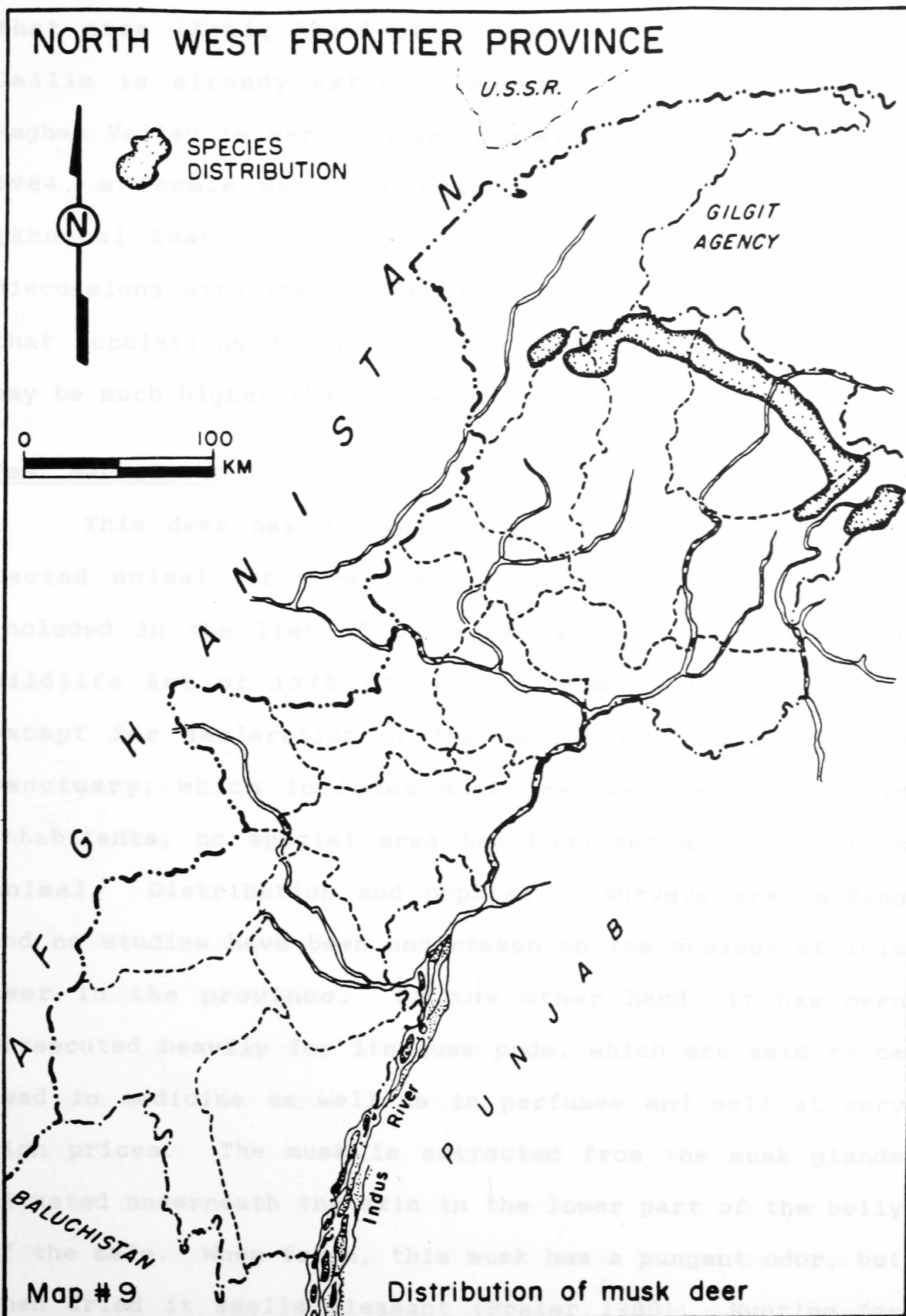
Musk deer occur in the northwestern Himalayas in the subalpine zone at about 2500 m in association with dense birch forests and dwarf juniper scrub, where they prefer

steep slopes and deep gullies (Roberts 1977, Ahmad 1982). In NWFP, musk deer have been known to inhabit inner subvalleys of Shishi Valley in Chitral, including Iski Gol, Kalas, Madaglasht, Gori Gol, Tangol, and Achikoh (Khan 1975). Their presence in higher mountain ranges east of Drosh in the early 1960s was also reported by Roberts (1977). They also occur in Dir Kohistan (Ashiq Ahmed, Wildlife Management Specialist, pers. comm.) and in Monkial in Swat District. In Hazara Division, musk deer inhabited slopes around Mushkpuri in Gallis during the early 1930s, but they are now extinct in that area (Roberts 1977).

Musk deer are found in parts of Kaghan Valley in Sharan, around Naran and Batakundi. In Hazara Kohistan, they are much more widespread, but there is a need for finding the precise distribution in this area. Map 9 shows the distribution of musk deer in NWFP.

Status

Khan (1975) estimated the population of musk deer in Chitral as 20-30. As the conditions of wildlife protection in general have improved since then, it is assumed that at least an equal number still survive in that district, though no survey to find exact numbers has been made since then. However, occasional sightings have been reported by graziers. Interviews with people in Dir Kohistan conducted by the Wildlife Branch of PFI indicate a fair population in



that area (Ashiq Ahmed pers. comm.). The population in Gallis is already extinct (Roberts 1977), and that in Kaghan Valley is very sparse, numbering perhaps 20-30. In 1984, a female was seen with two young near Batakundi (Khushal Khan, Wildlife Watcher, pers. comm.). From my discussions with the people of Hazara Kohistan, I conclude that populations in the Kohistan area of Hazara and Swat may be much higher than elsewhere in the Province.

Past Management

This deer has enjoyed the status of a legally protected animal for more than 2 decades. Presently it is included in the list of protected animals under the NWFP Wildlife Act of 1975 (Government NWFP 1975). However, except for declaration of the Manshi area as a wildlife sanctuary, which includes musk deer as one of its wild inhabitants, no special area has been set aside for this animal. Distribution and population surveys are lacking and no studies have been undertaken on the ecology of this deer in the province. On the other hand, it has been persecuted heavily for its musk pods, which are said to be used in medicine as well as in perfumes and sell at very high prices. The musk is extracted from the musk glands situated underneath the skin in the lower part of the belly of the male. When fresh, this musk has a pungent odor, but when dried it smells pleasant (Prater 1980). Hunting for

musk pods seems to be the most important cause of the decline of the musk deer population. The overall status of this deer is poor and unless effective protection and management measures are taken immediately, it will soon become extinct.

Conservation Problems

Two main conservation problems confronting the Wildlife Department are grazing and poaching.

1. Grazing.

All musk deer habitat remains heavily occupied with thousands of head of livestock during the summer months. Nomadic graziers who raise large herds of cattle, horses, sheep, and goats, return to their subalpine and alpine summer pastures in late May and remain until the beginning of September, moving down to the plains again with the first snowfall. Sheep and goats in these nomadic herds can utilize any kind of slope, no matter how steep. This affects musk deer in two ways. The mere presence of a large number of domestic animals (including dogs) and the graziers is a constant source of disturbance for them and consequently they have to remain hidden most of the time. Secondly, the livestock, especially sheep and goats, deplete the forage resource of the deer, who, after long winter months of scarce fodder, need large amounts of forage to build their fat reserves. The early summer

months (May and June) are also the time when musk deer young are born. At this time, ample availability of food becomes vitally important for the lactating females. If not impossible, stopping these centuries-old grazing practices would be extremely difficult.

2. Poaching.

Another serious issue of concern to the manager of musk deer populations is poaching. During the rutting season, the musk gland attains its maximum growth and can yield as much as 30 gm of musk (Roberts 1977). This musk is in great demand for use in medicine as well as perfume. In Chitral, one musk pod was reported to sell for 750 rupees in 1967 (Roberts 1977). In India, the selling price of musk is exorbitantly high, being 3000 rupees per 11.6 gm (Singh 1980), and a full pod could fetch up to 7500 rupees. The lust for musk and money results in heavy persecution of the deer. It is mostly the nomadic graziers or Gujars who kill the deer for musk because they know the locations where these deer can be found. Graziers are believed to kill even the young deer because they reach the deer habitat in May and June, which is the fawning season for the deer. Because of the remoteness of the habitat, most of these illegal acts cannot be detected.

In India, also, the major cause of the population decline of musk deer is their persecution for musk (Singh 1980). This is a universal problem and has been discussed

by many authors (Khan 1975, Roberts 1977, Schaller 1977, Green 1985, Prater 1980, Schaller 1980). How to overcome this problem will require much study and cooperation from all the states of the Himalayan region.

No studies on the behavior of the musk deer and its response to predators have been made in the province. However, snow leopards and wolves occupying the same habitat prey upon musk deer, and the young deer may be susceptible to predation from martens, lynx, and even golden eagles (Roberts 1977). It is also possible that the packs of dogs kept by nomads harm the young.

Management Objectives

The following, in order of priority, will be the objectives of management:

1. To protect the existing population of musk deer and develop it further in order to establish a healthy, breeding population which could provide hunting on a sustained basis to the local sportsmen.

2. After recovery of the population, allow a well-planned musk farming program which could fetch enough revenue to generate the interest of local people in wildlife conservation.

Management Recommendations

1. Survey the distribution and status of musk deer throughout suitable habitats in the province with the help

of the Pakistan Forest Institute and the Zoological Survey Department. Besides finding the exact places of occurrence, the survey teams should identify potential areas for establishing wildlife sanctuaries or game reserves.

2. On the recommendation of the survey teams, as many protected areas as possible should be established for development of musk deer populations, with a minimum of one in each district where the deer is found.

3. Ecological studies on musk deer should be carried out in the province with a view toward finding the precise management requirements of the species. For such studies, the technical support of PFI, ZSD, or UM should be sought.

4. Antipoaching activities should be enhanced by providing additional staff. Preferably, this staff should be selected from among the inhabitants of the villages nearest to musk deer habitats. Temporary job opportunities should also be provided to some nomads during the summer months to serve as wildlife watchers in their respective areas.

5. Efforts should be made to expose the illegal trade in musk pods and curb it as effectively as possible. The Divisional Forest Officers (Wildlife) can work out their own strategy in this regard. Among other efforts, it should involve a liaison with customs authorities at international airports in the country.

6. With the help of the Range Management Branch of PFI, a plan should be prepared to regulate the grazing of nomadic herds in musk deer habitat, with specific provisions for deferred grazing during the months of May and June, a critical period for successful fawning and rearing of the young.

7. For the purposes of successful implementation of provision number 6 above, the Government of NWFP should be approached to transfer the control of resumed alpine and subalpine pastures to the Wildlife Wing. The National Council for Conservation of Wildlife in Pakistan has already passed a resolution intended to accomplish this.

8. The Chinese have apparently developed a technique by which they can extract musk from the musk gland of a live musk deer without harming the deer (Singh 1980). It is recommended that two officials of the Wildlife Wing be sent to China to receive training in captive breeding of musk deer and extraction of musk. Upon the return of these officials and successful completion of their training, a captive breeding program for this deer should be initiated in a suitable location. The purpose of this program should be twofold--extraction of musk and rehabilitation of depleted habitats by reintroduction of deer bred in captivity. This program may be helpful in taking pressure off the wild deer by demonstrating musk extraction techniques to people without killing the deer, thus encouraging

conservation.

9. An education program should be launched in the villages and nomad hut areas about wildlife conservation, with special reference to musk deer. This program should include meeting the people and having group discussions, lectures, and slide shows.

Chinkara (Gazella gazella)
Family: Bovidae
Subfamily: Antilopinae

This small graceful gazelle has a chestnut pelage and white underparts. Two white streaks down each side of the face are a major characteristic. The male has cylindrical black horns with prominent rings close set in the proximal region of the horn, the distal region being smooth (Roberts 1977). These horns look almost straight when viewed from the front. The usual horn length is 25-30 cm. Adult males stand 60-65 cm high at the shoulder and weigh about 23 kg. Females are smaller in build and lack prominent horns. They bear only small, smooth horns rarely exceeding 15 cm in length.

Chinkara do not have a particular breeding season but two peaks in the rut have been observed--one in autumn and the other in spring. The gestation period is 5.5 months (Prater 1980), and the litter size is one or two. A captive chinkara was observed to come into estrus after 2

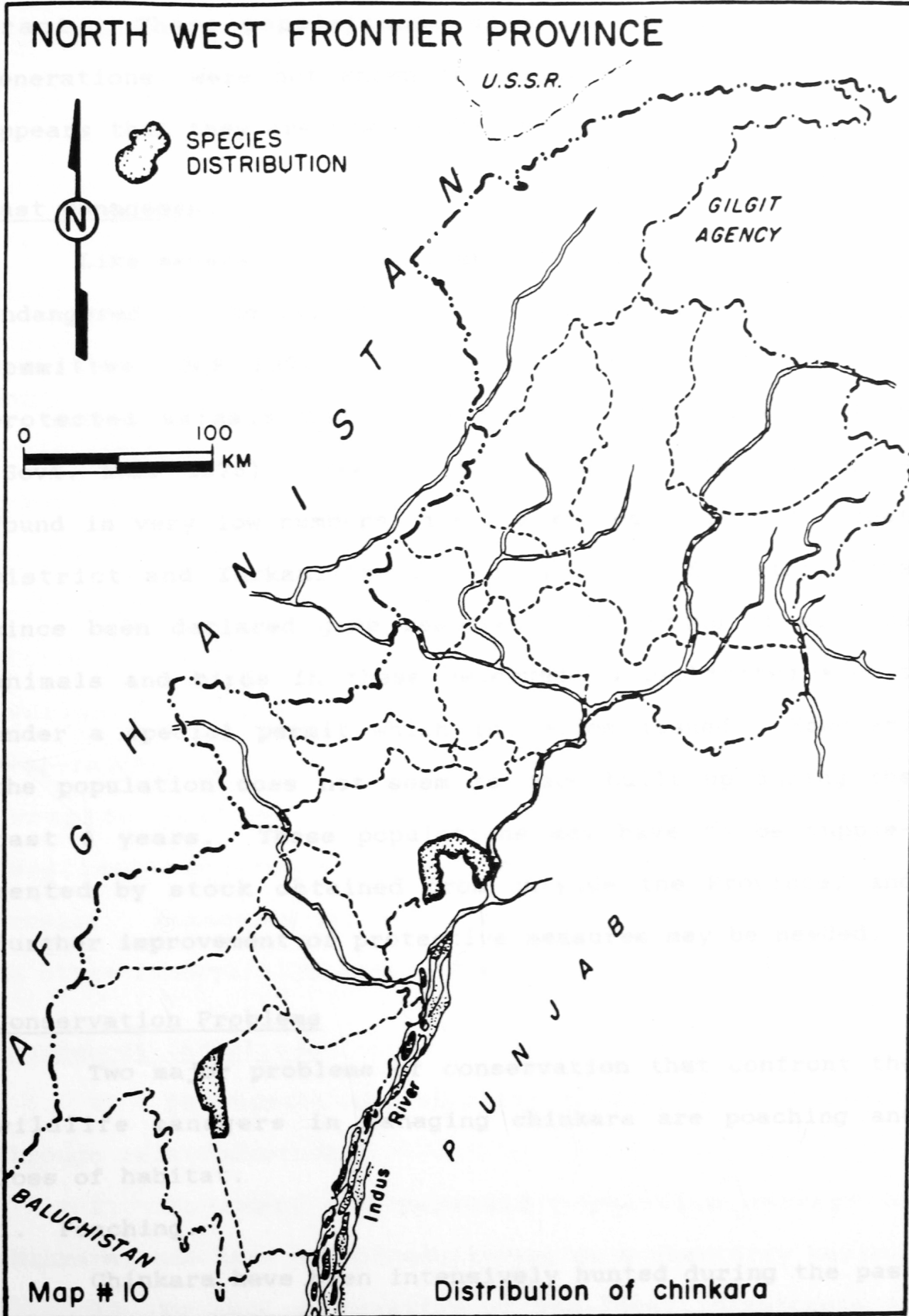
years of age (Roberts 1977).

Distribution

Wastelands interspersed by ravines and nullahs, scattered bush, and thin jungle are the usual haunts of the chinkara (Prater 1980). It has adapted to living in extensive sandy deserts, stoney plateaus, and low hilly areas up to 1500 m elevation. It was once plentiful in the plains of the D.I.Khan, Peshawar, and Mardan districts of NWFP, but has apparently been exterminated from these regions (Roberts 1977). It has also been known to occur in the Maraiwam area of Kohat District and Nizampur in Peshawar District, but is now extinct there (Muhammad Hussain Awan pers. comm.). However, two very small populations still survive in Rakh Topi/Sohban on the west bank of the Indus River in Kohat District and the Zarkani Chaudwan Tract of D.I.Khan. The Rakh Topi/Sohban population appears to be an extension of the Kalabagh population where, reportedly, chinkara are numerous. Map 10 shows the distribution of chinkara in NWFP.

Status

This gazelle has been brought to the verge of extinction in NWFP due to illegal hunting, habitat destruction, and expansion of the human population. In a survey of the chinkara in Rakh Topi/Sohban and Zarkani/Chaudwan, I estimated that 10-15 gazelles could be present in each



tract. These populations, although present for many generations, were not known to biologists until 1978. It appears that they are now on the verge of extinction.

Past Management

Like several other species, the chinkara was declared endangered in the report of the Pakistan Wildlife Enquiry Committee (GOP 1970). It is included in the list of protected animals under the NWFP Wildlife Act of 1975 (Govt. NWFP 1975). The two places where this gazelle is found in very low numbers, i.e., Rakh Topi/Sohban in Kohat District and Zarkani/Chaudwan in D.I.Khan District, have since been declared game reserves and hunting of all the animals and birds in these reserves is prohibited except under a special permit which is seldom issued. However, the population does not seem to have built up during the past 3 years. These populations may have to be supplemented by stock obtained from outside the Province, and further improvement of protective measures may be needed.

Conservation Problems

Two major problems of conservation that confront the wildlife managers in managing chinkara are poaching and loss of habitat.

1. Poaching.

Chinkara have been intensively hunted during the past several decades. Because they were easily accessible, they

sustained heavy hunting pressure. Many hunters still tell stories of their hunting expeditions and killing several gazelles a day (or night). In areas accessible to vehicles, hunting at night with the help of search lights has been a common practice. Finding the resting or hiding place of a chinkara is not difficult for professional hunters, particularly when the hunters live nearby. Once a hunter claimed that he would take me to a place where I could flush a chinkara myself, and he did it! He knew the exact bush.

2. Loss of habitat.

This gazelle can thrive in arid areas and with very little vegetative cover. Ordinarily, such habitat would be available for a long time in the future. However, the ever-increasing human population and their livestock have occupied most of the habitat in the known areas of gazelles' occurrence, resulting in habitat loss for the gazelle. Consequently, they are forced either to migrate to other inhospitable areas or fall victim to poachers.

Management Objectives

1. To augment the existing population of chinkara through reintroduction.
2. To carry out periodic population surveys of chinkara, and have strict monitoring on a quarterly basis.
3. To seek cooperation of the local inhabitants in

its protection.

Management Recommendations

1. An effort should be made to preserve the existing population of chinkara by improving its protection against poaching and habitat disturbance. Housing the protective staff in the immediate vicinity and improving its mobility by providing animal transport (camels or horses) would be advisable. This transportation should be the least disturbing to the gazelle and other fauna. Habitat disturbance can be reduced by limiting the number of grazing permits in the reserved forests. The possession of dogs in the reserved area may be banned and cutting of Saccharum spp. clumps for thatching of huts should be prohibited.

2. The population should be supplemented by reintroducing chinkara imported from Punjab Province. The procedure and precautions should be similar to those recommended for hog deer and barking deer.

3. Quarterly population surveys should be conducted in Takh Topi/Sohban and Zarkani/Chaudwan to closely monitor the population trends, and the rate of change in these trends. These surveys will also help in monitoring the success of reintroduction programs as well as any other management operation, enabling the managers to make timely decisions.

4. The cooperation of local inhabitants should be sought in protecting chinkara. In Kohat District, frequent meetings of the wildlife staff with the people in the villages of Naskora, Janak, Kot, and Badu would certainly help save this gazelle. In D.I.Khan District, people in the villages of Zarkani, Chaudwan, and Looni may be taken into confidence. Dedication of the staff in this regard will be a key factor.

5. Chinkara are known to give birth to their young in open areas and leave them lying there, helpless and unprotected, for a day or two. The likelihood is high of these young being picked up by humans or falling victim to predation by wolves (Canis lupis), jackals (Canis aureus), coracal cats (Felis coracal) (Roberts 1977), or dogs. As all these predators can be found in the tract, it is strongly urged that a study on the effect of predators on chinkara be undertaken either with the help of PFI and ZSD or UM. Radio-collaring newborn fawns would probably be the only way to accurately determine predation.

Urial (Ovis orientalis)
Family: Bovidae
Subfamily: Caprinae

The urial is a wild sheep, smaller in size than the other wild sheep of the genus Ovis. It stands a maximum of 96 cm high at the shoulder. Males have horns that curve

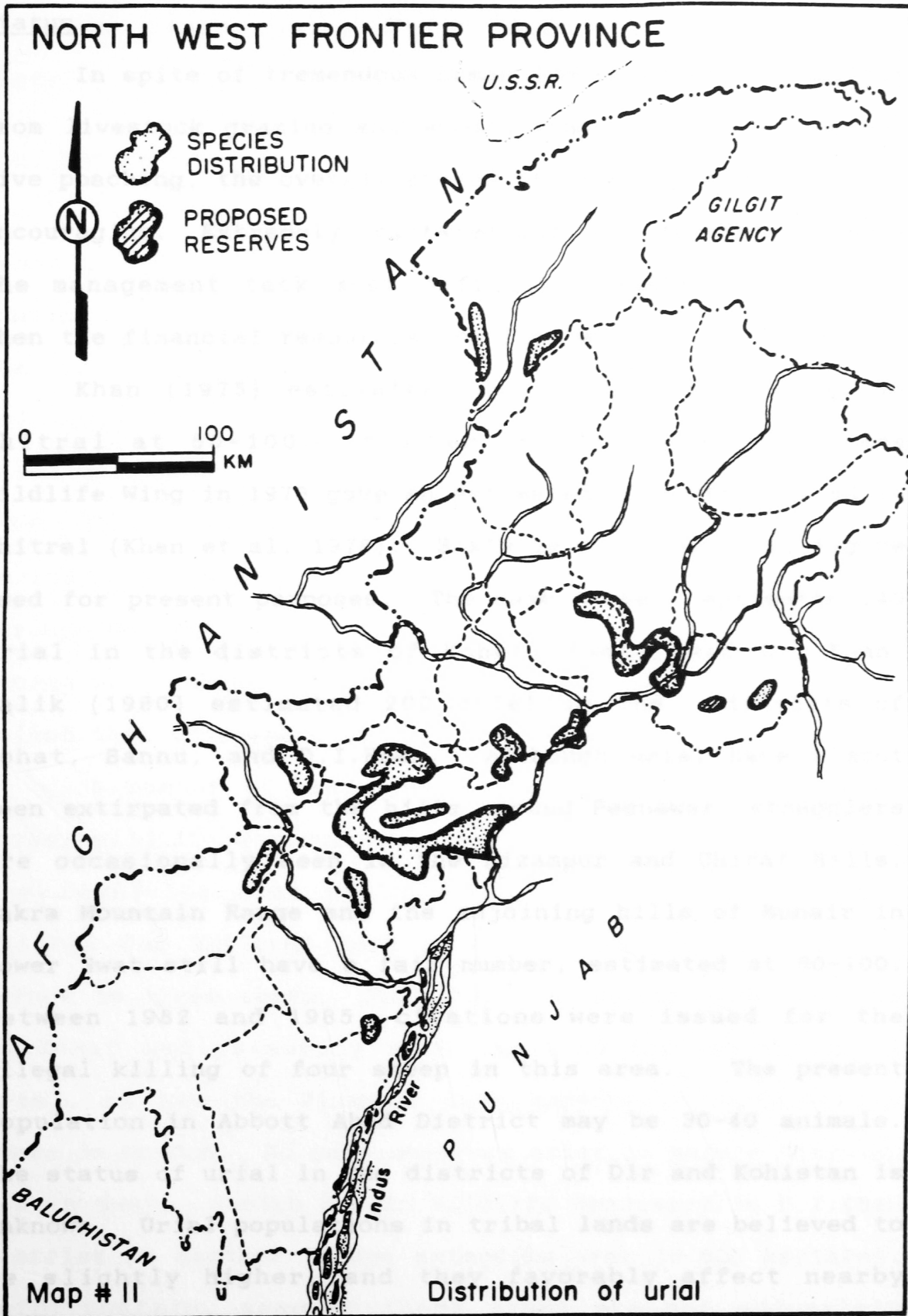
backward, down, and then forward in the form of a circular arc. The horns are massive at the base, measuring up to 31 cm in circumference. Length of the horns may be as much as 96 cm. The horns are triangular in cross section and highly wrinkled. Females have small, cylindrical horns about 12-13 cm long. The coat color is reddish gray with whitish underparts. The Punjab race has a white rump patch. Males develop a long ruff of black and white hair on the throat and chest.

The rutting season is October to November. Roberts (1977) observed the gestation period to be 134 days and the age of females at first reproduction to be 2 years. Lambing occurs during late spring and early summer. Usually only one young is born but twins are occasionally reported.

Distribution

In NWFP, urial are associated with scrub forests of olive, gurgura (Monothica buxifolia), and acacia in the southern districts, Swat, and Hazara, while in Chitral they are found in oak and dwarf juniper (Juniperus communis) scrub types in the lower parts of the District (Beg 1975, Roberts 1977). In Peshawar District, they are found in the scrub-covered hills of Nizampur and Chirat and continue into the tribal belt of Darra Adam Khel. In Kohat District, the Ibrahim Zai Hills, Gurgalot, Rakh Topi, and

Hookni Mountain Range support small populations (Malik 1980). The Sakra Mountain Range in Mardan District also harbors scattered populations of urial. They are also found in the Shinghar Hills of Bannu District and Sheikh Buddin Hills in D.I.Khan (Khan et al. 1978). Khanpur Hills, Surleh Mountain Range, and Sirikot Mountain Range in Abbott Abad District also support some remnant urial populations (Raja Iftikhar of Khanpur pers. comm.). In all these locations, the urial is associated with dry scrub forest on moderate hills strewn with boulders and ravines, and are found from 800-1600 m elevation. In Chitral, urial can be found in Chitral Gol National Park and in the valleys of Rambor, Bamburet, Birir, Ayun Dok, Sanjret, Janjrat Gol, and Kaoti Gol on the west bank of the Chitral River (Khan 1975). There, it is associated with oak and dwarf juniper scrub between 1800 and 3000 m elevation. Sometimes a small urial herd can be found quite close to a markhor herd in Chitral Gol National Park. Not much is known about the distribution of urial in the Dir and Kohistan areas of Swat and Hazara. The tribal territory of Waziristan, Kurram, and Orakzai is reported to have a good population of urial (Iqmail Hussain, Divisional Forest Officer, Peshawar, pers. comm.). Map 11 shows the distribution of urial in NWFP.



Status

In spite of tremendous human pressures on the habitat from livestock grazing and woodcutting, as well as extensive poaching, the overall status of urial in NWFP is still encouraging. Extremely scattered and thin populations make the management task most difficult, however, especially when the financial resources are limited.

Khan (1975) estimated the population of urial in Chitral at 50-100. Another survey conducted by the Wildlife Wing in 1978 gave an estimated population of 60 in Chitral (Khan et al. 1978). Sixty is a conservative figure used for present purposes. The same survey estimated 140 urial in the districts of Kohat, Bannu, and D.I.Khan. Malik (1980) estimated 200 urial in the districts of Kohat, Bannu, and D.I.Khan. Although urial have almost been extirpated from the hills around Peshawar, stragglers are occasionally seen in the Nizampur and Chirat Hills. Sakra Mountain Range and the adjoining hills of Bunair in lower Swat still have a fair number, estimated at 80-100. Between 1982 and 1985, citations were issued for the illegal killing of four sheep in this area. The present population in Abbott Abad District may be 30-40 animals. The status of urial in the districts of Dir and Kohistan is unknown. Urial populations in tribal lands are believed to be slightly higher, and they favorably affect nearby populations in settled districts by occasional emigration

to these areas, particularly during the rut in Kohat District.

Past Management

The urial is among the species which have been heavily hunted in the past. It always remained on the hunting lists in wildlife legislation. It is included in the list of big game animals under the NWFP Wildlife Act of 1975 by virtue of which it can be hunted under a permit that carries a fee of 5500 rupees for each animal (Govt. NWFP 1975). However, in 1981 its hunting was banned for a period of 3 years along with most of the other game animals through Marshal Law Order #292. I cannot recall any permit having been issued for urial hunting since 1975, the time I joined this organization.

A number of areas have been set aside as national parks, wildlife sanctuaries, and game reserves where urial are receiving some protection. In Chitral District, Chitral Gol National Park provides a very well-protected refuge to these sheep. Rakh Topi and Boraka game reserves in Kohat had primarily been declared for protection of urial, as has the Nizampur Game Reserve in Peshawar and Sakra in Mardan. No game reserves exist in Hazara Division nor in Swat. Sheikh Buddin Wildlife Sanctuary in D.I.Khan District is another refuge extending over 15,800 hectares. Unfortunately, some of these areas are not adequately

staffed. In areas other than those mentioned above, no staff is available and poachers are seldom detected. As a result, the Province is left with only patchy populations of urial. Apart from protection, no other specific management was ever prescribed. The ecology of the urial, which would form a basis for management prescriptions, has never been studied in the Province.

Conservation Problems

Poaching, livestock grazing, and woodcutting are the major problems of conservation in urial habitat.

1. Poaching.

Urial habitat is comprised of low, moderately steep hills with sparse or thinly growing scrub jungle. As a result, it is easily accessible to people for hunting and an amateur can easily become an urial hunter. Consequently, many financially sound families produce hunters. They often organize into big parties and hunt by driving the sheep to desired points where marksmen are waiting for them. The presence of several gunmen leaves little escape possibility for the sheep. Outside the Frontier Province, I once saw a hunting party with walkie talkie sets. These modern communication devices, when used in hunting, can obviously play a detrimental role.

Urial are so widely distributed that the available staff resources fall much short of the protection require-

ment, with the result that most poaching goes unchecked. Also, there are many individuals willing to stalk urial and shoot them with .22 calibre rifles which can hardly be heard at 400 m. Furthermore, most men in the Province carry guns. The sound of shots is common in cities as well as in the jungle.

2. Livestock grazing.

The entire urial habitat consists of either communal lands (village shamilats) or government lands. In both cases, the natives have free access to these lands for livestock grazing, although sometimes they may be required to obtain a permit for grazing their livestock in the reserved forests. People have a large number of livestock, particularly sheep and goats, which form the basis of their economy. The entire tract being arid and semiarid, these people have no concept of stall feeding the animals or adapting better range management practices. They rear many animals of poor quality rather than fewer of good quality, and thus they heavily tax the already low productivity of the grazing lands. The urial fares poorly in the presence of this heavy competition with livestock. In addition, the herders often become hunters and the chances of survival for the wild sheep are further reduced.

3. Wood cutting.

Another devastating element for urial habitat is the cutting of wood for domestic and commercial needs. Olive

and acacia trees produce the best firewood. Though wood collection has been practiced for generations, it has now increased manyfold due to expansion in the human population as well as the energy crisis. The habitat, which can barely produce sufficient wood for use by natives, must also bear the pressure of commercial exploitation to fulfill the requirements of adjacent towns. This situation, which has already had a tremendously adverse affect, needs some remedy.

Management Objectives

1. Improve the protection of already existing game reserves and sanctuaries.
2. Regulate possession of urial.
3. Survey the distribution and population status of urial in unsurveyed areas of Dir and Kohistan, including Hazara Kohistan.
4. Create additional protected areas for urial, particularly in Hazara and Swat.
5. Provide incentives to local inhabitants for the protection of this wild sheep.
6. Restore habitat.
7. Study the ecology of urial, with special reference to management requirements.
8. Grow energy plantations to meet the firewood requirement of people living around urial habitat.

Management Recommendations

1. At present, only Chitral Gol National Park and Topi Game Reserve are well protected. Protection of Boraka, Nizampur, and Sakra game reserves and Sheikh Buddin Sanctuary needs improvement. This should be accomplished through an increase in the staff or relocation of existing staff and providing personnel with housing facilities and means of transport, as well as field equipment. Efforts should be made to get the sanction of the Government for a special allowance for the field staff of the Wildlife Wing to provide them an incentive for good work.

2. There is a trend toward taking urial lambs and keeping them as pets. This practice is a threat to the survival of wild populations. Therefore, the possession of urial should be strictly regulated according to the provisions of the Wildlife Act.

3. Nothing is known about the presence and status of urial in the areas of Dir and Kohistan. It is recommended that a joint team consisting of representatives from the PFI, the ZSD, and the NWFP Wildlife Wing should carry out a survey of these areas to determine the distribution and status of this sheep and identify potential areas for development as game reserves or sanctuaries. This team should also highlight conservation problems. These surveys should include the simultaneous collection of similar

information for all the animals and birds found in that habitat.

4. Surlah Mountain in Hazara and the Swat side of the Sakra Range should be declared game reserves to protect urial. Resources are not adequate to provide protection over a large area. Therefore, it is advisable to select key populations and protect them, and let these areas act as a nucleus for the dispersal of animals. These areas will serve as model wildlife areas for the people and encourage their support of the program.

5. Wildlife cannot be protected for long without the cooperation of the local people in the concerned areas. This cooperation can be gained only by proving to the people the worth of wildlife as a renewable resource and providing them incentives. As a first step in this direction, the people living in the vicinity of urial habitat should be given preference in jobs. Furthermore, a carefully regulated program for limited hunting of urial can be started in selected areas and a major part of the fees thus realized can be spent on the welfare of the local people. It is further recommended that this program be launched first in Rakh Topi Game Reserve. Permission of the Finance Department of the Government of NWFP will be essential to start such a program.

6. In many parts of the Province, people have started realizing the importance of trees in their

mountains and wastelands. Taking advantage of this realization, habitat restoration work should be carried out in selected pockets starting with Sakra Mountain. Olive and acacia should be planted on the hill slopes in small patches and protected by portable fences for the first year. Planting stock could be provided by the Forest Department. Once the plants are established, the fence should be moved to another patch. The likelihood of a shortage of grass species preferred by urial in any place is minimal. However, if such a shortage is detected, guidance will be sought from the range management branch of the PFI. Although habitat restoration will be expensive and slow, it will set in motion a process that can be improved upon later. Planting should be carried out either in winter or early spring when some moisture is available. Both tree species are capable of enduring heat and shortage of moisture, though olive is much less so than acacia.

7. Although several accounts of the biology and ecology of urial in Pakistan have been given by many authors (Roberts 1967, 1977; Khan 1974; Schaller and Mirza 1971b, 1974; Schaller 1977, 1980; Aleem 1977), it appears that none of these studies (except Khan 1974) was conducted in the NWFP, where management problems are different than those in Punjab. No doubt, the general framework and essence of the studies will be similar, but studies in NWFP would provide a close look at local management requirements

for urial. For this purpose, ecological studies should be initiated in one or more locations of Rakh Topi, Bunair, and Surlah. These studies may preferably be undertaken by the PFI or the ZSD in collaboration with the Wildlife Wing. In case that is not possible, UM may be requested to send one of their master's degree students for the study.

8. An internationally funded project on energy plantations is underway in the Province. The objective is to raise fuelwood plantations in village wastelands to fill the daily energy requirements. This should relieve the mountains of the pressure they are now sustaining because of removal of vegetation for fuel. Efforts should be made to convince the officials of the Forest Department to start the plantation work around villages situated near critical wildlife habitats. If this is not possible, a separate project for this purpose should be started to act as a model for the future.

Wild Boar (Sus scrofa cristatus)
Family: Suidae

The wild boar is a large, bulky animal with a short but thick neck and rather slender legs. Males stand 85-90 cm high at the shoulder with a head and body length of 115-150 cm. The tail is short and measures 18-22 cm. A healthy adult male weighs more than 100 kg, but according to Prater (1980), the weight may be well above 230 kg. The

muzzle of the wild boar is long and sloping and terminates in a specially flattened disk supported by a pair of special bones (Roberts 1977). This organ is an adaptation for the animal's special way of foraging. The canine teeth of adult males are well developed and take the form of tusks. These tusks curve forward and outward; canines in the upper jaw are smaller than those in the lower. The tusks, which may measure up to 32 cm, are a deadly weapon against the enemy, whether man or animal. The ears are large, pointed, and set forward. The skin is covered by sparsely growing, coarse, black and brown bristles. The bristles on the nape and shoulders are longer and form a crest. The females are much smaller and their canines are much less developed.

Most breeding occurs from July through October (Roberts 1977). Age of the female at first reproduction is 1 or 2 years (Taber cited in Roberts 1977). Litter size is four to six (Prater 1980). However, as many as eight piglets have been observed to accompany a sow, apparently all her own (Roberts 1977).

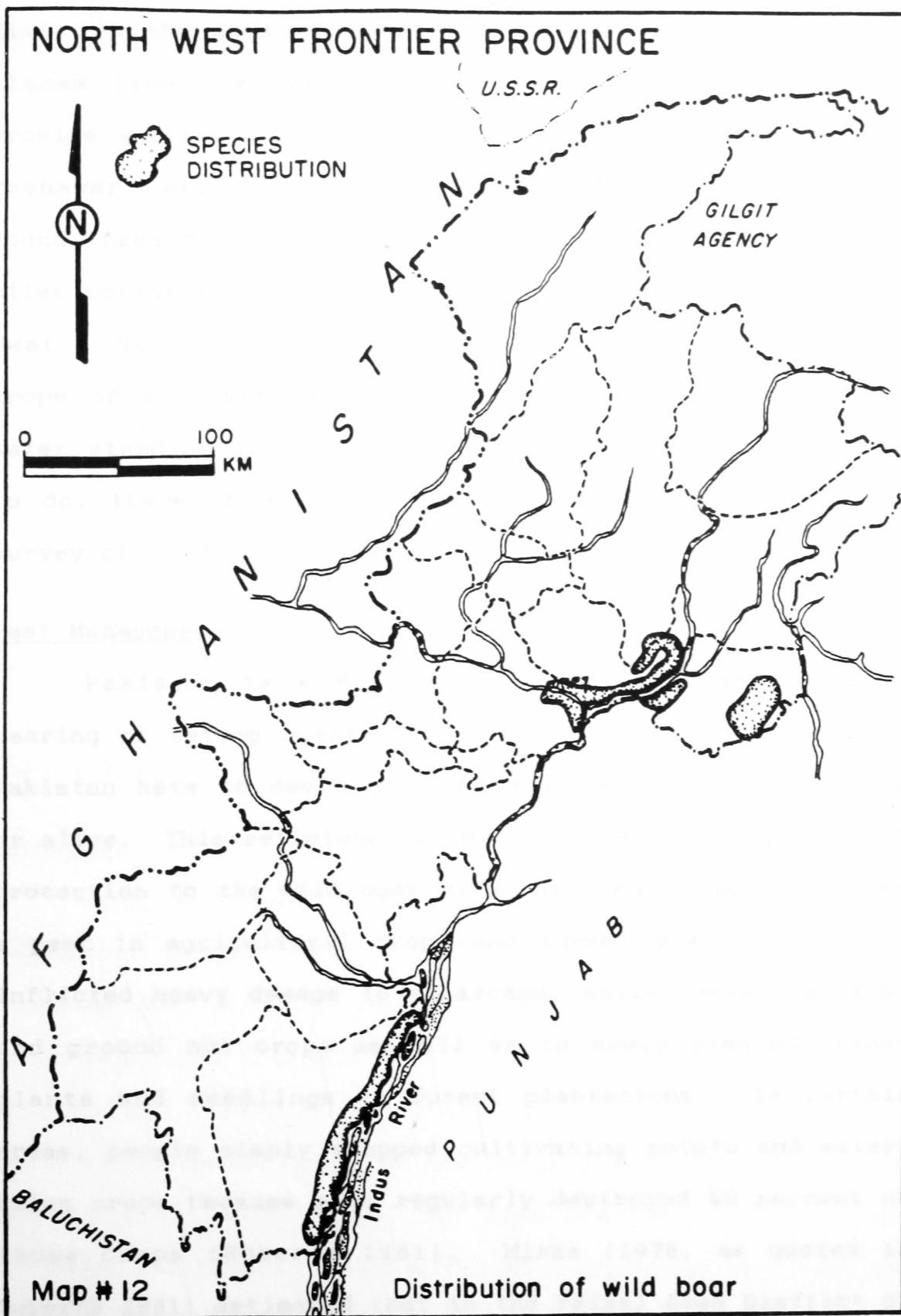
Distribution

The wild boar is typically associated with the Indus Basin riverine tracts having thick growths of grasses of Saccharum spp., which afford shelter (Roberts 1977). The animal neither penetrates deep into sandy desert nor into

the Himalayan foothills above 900 m. In NWFP, it is found in the low hills around Khanpur in Abbott Abad District. It is also distributed in the Ghazi area; on the west bank of the Indus it occurs around Peshawar, Mardan, Bannu, and D.I.Khan (Inayatullah 1973, Roberts 1977). It is also found along the Kabul River between KhairAbad and Charsadda and near Nowshehra. Two wild boars were shot by Highway Patrol police near Aza Khail about 25 km east of Peshawar on the Grand Trunk Road in 1983. Wild boar have also been reported to occur in the Totalai tract and some other parts of Bunair Subdivision in Swat. They are present throughout the riverine tract of the Indus in Swabi Tehsil from Tarbela Dam to Kund, where they take shelter in thick grass stands on the islands in the Indus and invade crops at night. During the flood season, they leave the islands and seek shelter in and around croplands. Map 12 shows the distribution of wild boar in NWFP.

Status

No detailed population survey has been conducted for wild boar in NWFP. Inayatullah (1973) estimated the wild boar population for the entire country at 80,000, but this is believed to be an underestimate. In NWFP, the menace of the wild boar is not as serious as in the Punjab. In NWFP, D.I.Khan perhaps has the largest population of this animal due to availability of good hiding cover along the Indus



River in the form of reeds and Saccharum spp. Also, at places like Rakh Meeran, thick patches of mesquite also provide shelter to the boar. The population around Bannu, Peshawar, and Mardan is comparatively low. In 1984, I found three boars lying dead in a field in Rustam about 25 miles northeast of Mardan adjoining Bunnair Subdivision of Swat. Reportedly, these animals had been damaging the crops of a farmer and he killed them by electrifying the water standing in the field. However, although difficult to do, there is a need for a population and distribution survey of wild boar in NWFP.

Past Management

Pakistan is a Muslim country and Islam prohibits rearing or eating boars. Consequently, all the Muslims in Pakistan hate to see a pig, whether captive or wild, dead or alive. This religious belief provided more than enough protection to the wild boar with the result that it became a pest in agricultural crops and forest plantations. It inflicted heavy damage to sugarcane, maize, wheat, potato, and ground nut crops as well as to newly planted transplants and seedlings in forest plantations. In certain areas, people simply stopped cultivating potato and watermelon crops because pigs regularly destroyed 80 percent of those crops (Roberts 1981). Mirza (1978, as quoted in Roberts 1981) estimated that in the Faisal Abad District of

Punjab, wild boars caused losses of 575 rupees per acre in sugarcane crops and 500 rupees per acre to maize crops. Since 1960, concerted efforts have been made to eradicate wild boar from the country as a whole. In 1962, the army was ordered to shoot and destroy the wild boar, but the operation was not a great success and had to be abandoned. Since then, a bounty of 75 rupees per pig has been offered; in the NWFP, this bounty has recently been raised to 100 rupees per pig. In the irrigated plantations of Punjab, hog fever was introduced and poison baits were extensively used to keep down the population of wild boar, but only with limited success. However, no such attempts have been made by the Government in NWFP. This animal is not included in the NWFP Wildlife Act, meaning that anyone can kill a wild boar wherever it is found.

Management Problem

Because of total avoidance by the people due to their religious belief, the wild boar population is on the increase and, while it has long been treated as a pest on crops in Punjab Province, its predation on crops in NWFP is increasing. Extensive sugarcane fields in Mardan and Peshawar and maize crops in the Swabi area not only provide good food for this animal but also shelter. In D.I.Khan District, sugarcane cultivation is increasing and completion of the Chashma Right Bank Canal will lead to further

extensive cultivation of this cash crop. This will make the problem even more severe in that District. The Wildlife Wing is issuing free permits for shooting wild boar and, even without a permit, anyone can shoot this animal and get a bounty of 100 rupees. Luckily, the population of wild boar in NWFP has not yet exploded and it is advisable to maintain it at the present low level. This will require control measures. The problem is that not many people will participate in a control program because of their religious belief.

Management Objectives

The objective of management for the wild boar should be:

1. To maintain the population at a very low level so that it neither becomes extinct nor a pest on agricultural crops.
2. Its presence in its habitat as a part of the ecosystem is essential and no action should be taken that may lead to the destruction of habitat, because the same habitat provides shelter and food to many other forms of wildlife, including waterfowl, hog deer, partridges, and many species of reptiles.

Management Recommendations

The entire management plan should be based on the understanding of the biology of wild boar with specific

reference to its fecundity. The wild boar is known to be highly fecund. It breeds during all seasons, the peak breeding season being just before and after the monsoons (Prater 1980). Most litters are born between July and October (Roberts 1977). The gestation period is about 4 months and litter size varies from four to six. Females are capable of producing their first litter at the age of 12 months. The conclusion can thus be drawn that under favorable conditions the wild boar population can build up enormously and limited control will not result in the extinction of the species. With this conclusion as the basis of management, the following recommendations are made:

1. Hunting of wild boar should continue to be permissible for all citizens of the country, and no hunting permit should be required.

2. No restrictions should be adopted concerning the sex, age, number, or place of hunting of wild boar. However, to hunt boar in an otherwise protected area, such as a wildlife sanctuary or reserve, the hunter should obtain a permit for entering the reserve. This permit will also be free, but the hunter will agree that he will not hunt any other species of wildlife in the reserve except wild boar.

3. The bounty of 100 rupees per animal should be continued for killing wild boar.

4. No special control campaign for wild boar should be launched until it is unavoidable because of an explosion of the animal population.

5. Problem areas should be identified by surveying the croplands in the vicinity of wild boar habitat. While doing so, the farmers and the concerned officers of the Agriculture Department should work together.

6. If a problem area is identified, the officials of the Wildlife Wing should be deputized to carry out control measures. These measures may include shooting, trapping, or killing with poison baits. The control team should be properly trained in various control operations, particularly in the use of poison baits. Although farmers should be allowed to shoot or trap wild boars, they should never be provided with or permitted to use poison baits, and any such act on their part should be treated as an offense under the Wildlife Act.

7. No control measure directed at the destruction of habitat, including cutting or burning of grass thickets, poisoning water, putting poison baits in shelter areas, or chemical control of vegetation should be undertaken, and in case of pressure from other groups for doing so, it should be met with resistance.

8. In the case of hunting safaris consisting of foreigners, a hunting license fee of \$500 should be charged each hunter, and he should be permitted to shoot an

unlimited number of wild boar in the Province within 1 year of the issue of the license or until 31 December of that year, whichever is earlier. This requirement should not be applicable in the case of foreigners serving in Pakistan in any capacity longer than 3 months. All these hunters should also be required to complete a form at the end of the hunt and submit it to the Wildlife Wing. This form should ask for information regarding sightings of wild boar and other wildlife encountered. Specific data concerning wild boars shot by them (i.e., body measurements) should also be requested. This information should be compiled and used as a data base for scientific purposes.

9. In the event of a marked population increase, before undertaking any large control campaign, views of the Islamic Ideology Council should be obtained about the validity of a commercial harvest or utilization of wild boar by a firm of non-Muslims or foreigners. Future action should then depend upon the response of the Council.

10. Fortunately, almost every farmer around wild boar habitat in NWFP, except in D.I.Khan, has a gun. These firearms can be effectively used in the control of wild boar even in the event of a population explosion. However, in certain cases, the Wildlife Wing may have to provide cartridges and logistics, and in all cases they should provide advice to avoid injury to any person, livestock, or other wild animal.

11. Accurate and complete records should be kept of all reports of shooting wild boars in the Province, and these records should be used as a data base in future planning.

12. Use of hog cholera, hog fever, or any viral disease for the control of wild boar should not be made under any circumstances, thereby avoiding any unforeseen and possible adverse affects of these viruses. The Food and Agriculture Organization of UNO is also strictly against this type of control measure (Roberts 1981).

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