

ARGALI SHEEP CONSERVATION AND RESEARCH ACTIVITIES IN MONGOLIA

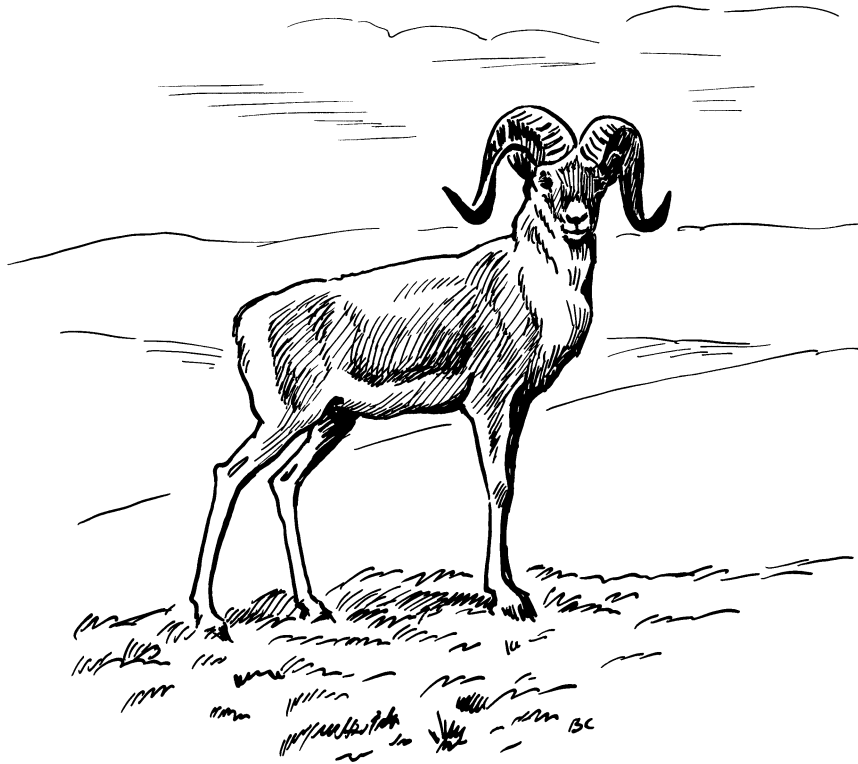
Richard P. Reading, Sukhiin Amgalanbaatar, and Ganchimeg Wingard

INTRODUCTION

Argali are the largest mountain sheep in the world, with some males in Mongolia weighing in at over 200 kg and sporting impressive, spiraling horns that reach over 165 cm long (Schaller 1977, 1998; Valdez 1982; Mallon et al. 1997). Argali have relatively long, thin legs and compact bodies, built for running speed. As such, they prefer rolling hills, plateaus, and gentle slopes to rugged mountainous terrain (Schaller 1977; Amgalanbaatar and Reading 2000). Argali inhabit the cold, arid grasslands of mountains, steppe-covered valleys, and areas with rocky outcrops in Central Asia, including portions of Mongolia (Shackleton 1997). Currently, their populations are patchily distributed in the northwestern and western Altai Mountains, the central Khangai Mountains, the Trans-Altai

Mountains and the mountain massifs and rocky outcrops of the Gobi Desert in southern Mongolia (Reading et al. 1998; Schaller 1998; Amgalanbaatar and Reading in press). A few argali apparently survive in the mountains near Lake Khuvsgul in the north of the country. Two putative Mongolian subspecies are described in the literature, the Altai and Gobi argali, although the taxonomy requires clarification (Tsalkin 1951; Dulamtseren 1970; Sopin 1982, Zhirnov and Ilyinsky 1985; Geist 1991). The northern and northwestern of these populations are contiguous with Russian argali populations, while the southern and southwestern populations are connected to populations in China (Mallon et al. 1997).

Little is known about argali, although it is clear that the species is declining and it is listed as threatened in Mongolia and internationally



(Shiirevdamba et al. 1997, Amgalanbaatar and Reading 2000). Despite this, some researchers suggest that argali are relatively widespread and not threatened. These different opinions are based on population estimates that vary from 10,000 to 50,000 animals (see review in Lushchekina 1994). More systematic, rigorous, and comprehensive surveys for and ecological research on argali are clearly required.

Mongolia's Argali Wildlife Research Center, the Denver Zoological Foundation (DZF), and the Mongolian Academy of Sciences (MAS) are cooperating on several argali sheep (*Ovis ammon*) conservation and research projects in Mongolia. We initiated research projects in an attempt to better understand the species' taxonomy, ecology, and population dynamics. The results of this work will hopefully enable us to better conserve these magnificent animals.

STATUS AND THREATS

Although argali appear to be declining, accurate population estimates are difficult. Most biologists agree that the species is experiencing marked population declines and fragmentation (Mallon et al. 1997). As such, argali are listed as "Threatened" in the Mongolian Red Book and as "Rare" by the country's newly enacted Law on Fauna (Shiirevdamba et al. 1997). Both this law and the Law on Hunting permit argali hunting pursuant to obtaining a permit from the Ministry of Nature and Environment (MNE). They are also included on Appendix II of the Convention on International Trade of Endangered Species (CITES); designated as "Threatened" on the U.S. Endangered Species List; and listed as "Vulnerable" on the 1996 IUCN Red List of Threatened Animals (Nowak 1993; Baillie and Groombridge 1996).

Argali population declines appear to be primarily a result of subsistence poaching (shooting animals illegally for food) and competition with domestic livestock for forage and habitat (Mallon et al. 1997; Reading et al. 1997, 1998, 1999a).

Mongolia's transformation to a democracy and free market economy in the early 1990s led to several changes with ramifications to argali (Bruun and Odgaard 1996; Reading et al. 1999a). As law enforcement became more and more lax, poaching activity increased (Lushchekina 1994). Today, many local people readily admit to shooting argali for meat. In addition, livestock numbers increased dramatically following privatization of herds from 26 million head in 1992 to 33 million in 1998 (Amgalanbaatar and Reading 2000). As the nation's human and livestock numbers increase, overgrazing and displacement by livestock reduces and degrades argali habitat (Sheehy 1996; *Biodiversity...* 1996; Reading et al. 1999a). Solutions are difficult, as many nomadic herders live a marginal existence, barely able to feed and clothe their families. On a more positive note, most Mongolians also want to conserve nature and wildlife, which they view as part of their cultural heritage (Myagmarsuren 2000).

Trophy hunting of argali is a contentious issue both locally and internationally (Reading et al. 1998, 1999a; Amgalanbaatar and Reading 2000, in press). Most local people and many international conservation organizations oppose trophy hunting, expressing concern for the status of the species and disdain for rich foreign hunters (Amgalanbaatar and Reading 2000). Despite the relatively small number of animals officially killed each year by trophy hunters (usually around 25, although the actual number may be as much as twice that number), many local people blame trophy hunters for argali declines. Fewer Mongolians (mostly in hunting guide companies) and foreign trophy hunters argue that trophy hunting may provide an important source of income for argali conservation, as well as local communities. Indeed, argali are greatly sought by foreign trophy hunters, who spent over US\$20 million to harvest 1,630 rams in Mongolia from 1967 through 1989 (Lushchekina 1994). However, a tiny fraction of this money went to the local communities or the conservation and management of argali.

Under the Mongolian Hunting Fee Law of 1995, revenue generated from argali trophy hunting was divided among the federal government's general funds (70%), the local Sum (or county) government (20%), and the hunting organization (10%) (Reading et al. 1999). Very little, if any, of that money went directly to conservation and the government did not actively manage argali (Amgalanbaatar and Reading 2000). This situation may be changing, as a new Hunting Law was passed in 2000 with stronger conservation and management provisions and the new Minister of Nature and the Environment appears ready to begin direct conservation management activities. In addition, a new law requires that 50% of all resource use fees be redirected to conservation. Directing resources from trophy hunting to conservation and management of the species seems to provide a win-win-win situation, as it would benefit trophy hunters, the government of Mongolia (through the revenue generated), and, most importantly, argali and the ecosystems they inhabit (Amgalanbaatar and Reading 2000). Indeed, local hunting companies have recently expressed an interest to help support conservation activities. Only time will tell if these positive words are translated into action.

CONSERVATION AND RESEARCH ACTIVITIES

Very few studies have researched argali in detail. As a result, the ecology, status, population dynamics and trends, and behavior of the species are poorly understood, and the species receives very little active management (Reading et al. 1998, 1999a). To help rectify this situation, we are working with a number of other organizations (German Technical Advisory Group [GTZ], University of Denver [DU], The Denver Museum of Nature and Science [DMNS], Nature Conservation International, the Wilds, and the University of Montana) and individuals to research argali biology and ecology, and develop active argali conservation management

programs (Amgalanbaatar and Reading in press). Our colleagues and we have been fortunate enough to work on a wide variety of argali ecological and conservation issues in Mongolia, including distribution, population dynamics, behavior, social structure, genetics, the level of competition between argali and domestic sheep and goats, and protected area use (Reading et al. 1997, 1999b; Tserenbaata et al. 2000). During most of this work, we enlisted the help of several Mongolian Pedagogical University and Mongolian State University students, including Onon Yondon, Adya Yadamsuren, Naranbaatar, Z. Chinzorig, and Bat-Erdene.

There are no easy solutions to argali conservation in the face of increased grazing pressure, but the first step is to better understand the situation. As such, we have initiated a research project to examine the extent of dietary overlap between argali and livestock. This study is comparing feeding rates, vigilance, plants in fecal material, and other aspects of the feeding ecology of argali and domestic sheep and goats (although we may expand the study in the future to examine other species of livestock). The work remains in its preliminary stages. In late 2000, we collected pilot data on argali diets and feeding behavior, refining our techniques and developing data forms. Samples of argali and ibex fecal material are being analyzed in U.S. labs. Of course, simply demonstrating dietary overlap does not prove that competition exists. Hopefully, this study will be expanded in the future to more directly explore potential competition for resources between domestic animals and argali.

Our work on potential argali-livestock conflicts is important because limited grazing is permitted in all Mongolian protected areas. As an extension of this work, we are therefore working with protected area managers, conservationists, and local herders to zone protected areas and devise management plans that are satisfactory to all stakeholders (Reading et al. 1999b, 1999c). Protected area zones are prescribed by Mongolian law (see Myagmarsuren 2000). We

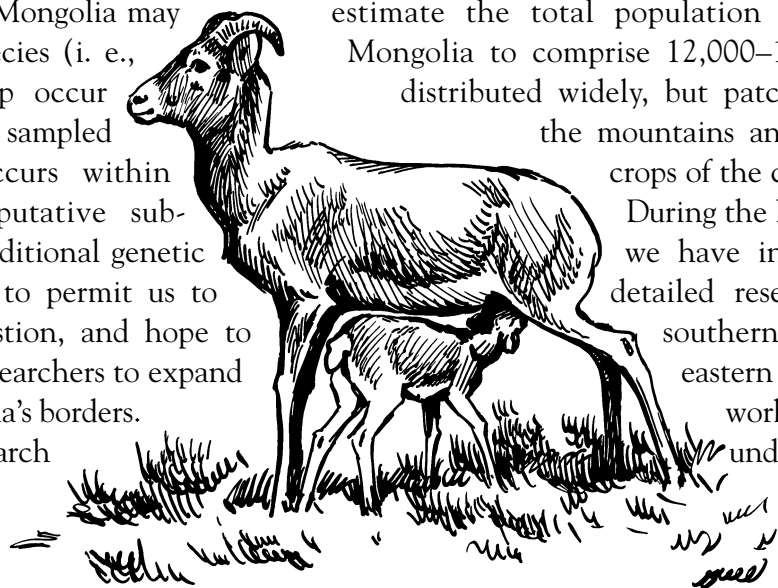
worked within these legal parameters to develop and prioritize criteria for zoning (see Reading et al. 1999c). Our first priority was to conserve the ecological integrity of the protected area, giving special consideration to endangered, rare, and focal species. Our second priority was obtaining local support, and our third priority was ensuring effective management. Argali, a threatened animal, was a focal species for mountain habitats.

Another major study, being led by Tserenbataa Tuya (MAS biologist and DU graduate student) and Dr. Rob Ramey (DMNS Curator and DZF Research Associate), is investigating the conservation genetics of argali sheep (Tserenbataa et al. 2000). Two subspecies of argali sheep, Altai and Gobi, are currently recognized; however, the subspecies question remains in dispute (Bannikov 1954; des Clers 1985; Davaa et al. 1983, Mallon et al. 1997). Our research is attempting to clarify these disagreements in Mongolia using studies of nuclear and mitochondrial DNA (mtDNA) variation. We are collecting tissue samples from throughout most of Mongolia. Thus far we have assessed the mtDNA of 53 argali from 11 populations within 3 major geographic areas. We identified 10 haplotypes (different genetic compositions), with the 2 most common found in all 3 geographic areas (Altai Mts., Khangai Mts., Gobi Desert) (Tserenbataa et al. 2000). These initial results suggest that all argali in Mongolia may represent just one subspecies (i. e., genetically similar sheep occur throughout the areas we sampled and most variation occurs within rather than between putative subspecies). We are using additional genetic samples and techniques to permit us to further explore this question, and hope to collaborate with other researchers to expand the study beyond Mongolia's borders.

Our other major research focuses primarily on argali status, distribution, and general ecology.

Toward this end, we have conducted several ground and aerial surveys from 1991 to 1998 throughout the range of argali in Mongolia during the past 10 years (Amgalanbaatar 1993; Reading et al. 1997, 1999b, and citations therein). Our most recent survey results (1995) from the Altai Mountains yielded very small sample sizes, despite substantial effort, making population estimates difficult. For example, in late summer of 1995 we spent three months conducting ground surveys in randomly selected survey blocks distributed in areas that had confirmed sightings of argali in 1991–1992, but we only sighted 56 animals. These results suggest that argali populations are becoming increasingly reduced, fragmented, and insular, especially in the Altai and Khangai Mountains (although we have even less data from the latter region). Better sample sizes in the early 1990s yielded a population estimate of about 3,000 animals in the Altai Mountains (Amgalanbaatar 1993 and citations in Reading et al. 1997). The population today is almost certainly lower than this number. In the Gobi region, we have obtained better results using aerial and ground surveys. Our estimate for this region is about 10,000 animals (Reading et al. 1997). Although argali in the Gobi appear to be faring better than in other regions of the country, populations there are apparently declining as well. Therefore, we estimate the total population of argali in Mongolia to comprise 12,000–15,000 sheep distributed widely, but patchily through the mountains and rocky outcrops of the country.

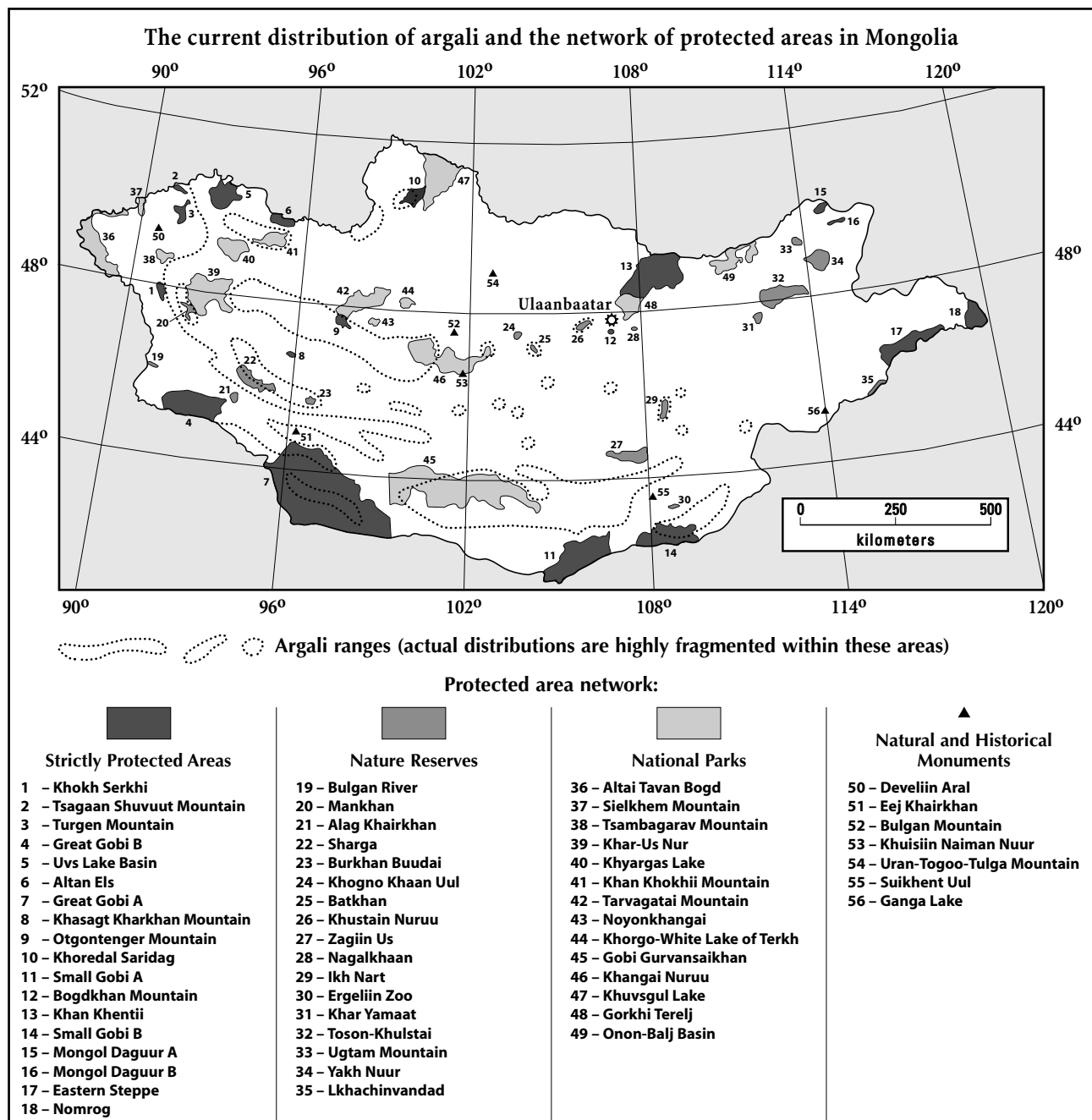
During the last few years, we have initiated more detailed research in the southern and southeastern Gobi Desert, working to better understand argali population dynamics and ecology.



We successfully immobilized and radio-collared what we believe is the first argali sheep, an 18-month-old ewe, in November of last year using narcotics loaded in a dart gun and shot from the ground (Kenny et al. in press). We tracked her periodically until her death in February due to extreme winter conditions (relatively deep snow and cold weather). We hope to collar several more argali this autumn to begin a radio telemetry study of the species. We further hope to expand the study to additional sites in subsequent

years. Data from this study will hopefully yield important information on argali movement and dispersal patterns, population dynamics, home range sizes, habitat use, causes of mortality, and more. We are simultaneously conducting behavioral studies using focal animal observations.

In addition to our research, we have worked to improve the conservation management of argali in Mongolia. We are working with country's Protected Areas Bureau and GTZ to increase the number of protected areas that include argali



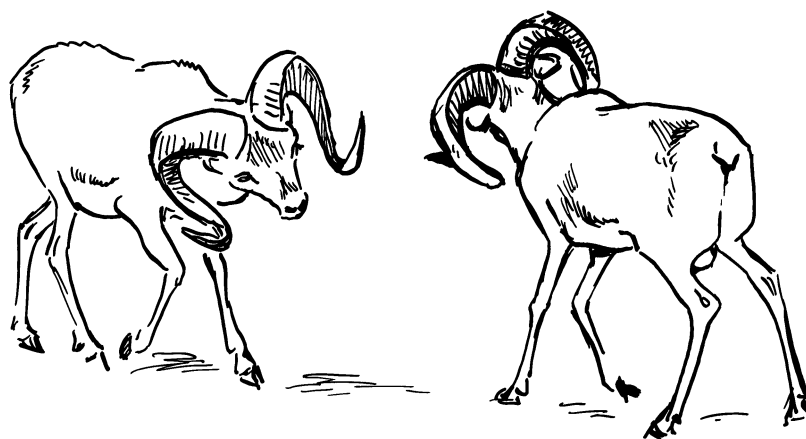
populations and, as discussed above, improve the management of existing parks (Reading et al. 1999b, 1999c). Mongolia has expanded its protected area system greatly since the end of communism, from 11 protected areas covering 56,142 km² (3.6% of the country) in 1991 to 48 areas comprising 56 units with a total of 205,306 km² (13.1% of the nation) in 2000 (Myagmarsuren 2000). Argali currently inhabit or recently inhabited 20 protected areas covering 95,697 km² in Mongolia (a considerable increase from the 3 parks protecting 54,050 km² within the range of argali in 1991). While the territory protected is substantial, not all of it represents argali habitat. In addition, most of these protected areas suffer from poaching and overgrazing (Amgalanbaatar and Reading 2000). More active management of Mongolian protected areas is urgently needed, and we are working to facilitate this process. This will, among other things, require additional training of park and MNE staff.

Finally, we are striving to develop more proactive conservation management for argali in Mongolia. We have begun working more closely with MNE officials, local hunting and non-profit organizations on trophy hunting issues. We want to ensure that a substantial portion of future funds obtained from trophy hunting go to help conserve the species and support the relevant ecological studies (Amgalanbaatar and Reading 2000). Survey and research results will

help officials better manage trophy hunting in Mongolia for the benefit of all interests and, most importantly, the argali themselves. We are also investigating other options for revenue generation, such as ecotourism. The reclusive nature of argali currently renders them less than ideal candidates for a targeted ecotourist program; however, more effective anti-poaching efforts would likely change this situation.

CONCLUSIONS

More active argali conservation and management are necessary to halt and reverse the current population decline and fragmentation. Without such action, Mongolia risks further declines in argali numbers and distribution, including the imminent loss of several populations. Perhaps the greatest challenges face argali populations in the Altai Mountains of western Mongolia, which have already been greatly reduced and fragmented as a result of poaching and apparent competition with domestic livestock for forage and habitat. We have been working on a number of projects to improve our understanding of the species and conservation management. Results from this work will hopefully help ensure the survival of argali and other species that share their habitat. Our hope is that all future generations will be able to experience the joy we feel when we watch and hear the crack of horns as argali rams battle over females.

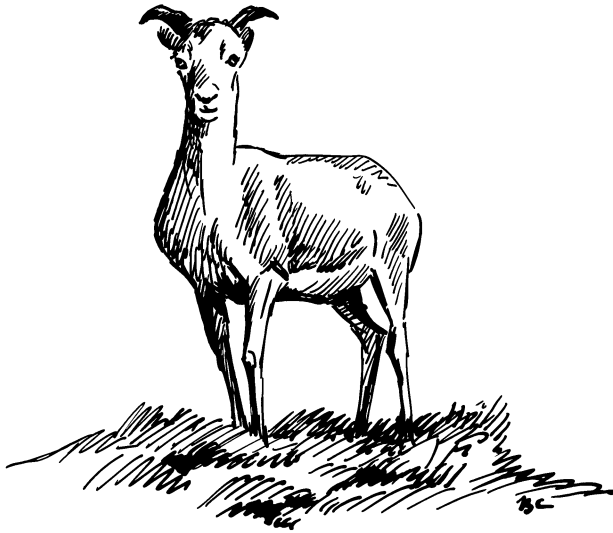


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Argali drawings by Vladimir Smirin.

AN ECOLOGICAL STUDY OF MONGOLIAN GAZELLES

George B. Schaller

One evening in 1998, biologist Badamjavin Lhagvasuren and I stood on the slope of a hill. Below us spread thousands of Mongolian gazelles or *dzeren* (*Procapra gutturosa*) all heading west. As slanting rays of the sun touched their golden hides the animals were transformed into shining points of light on the darkening steppe. We were witness to a magic spectacle, one of the last great migrations on earth.

When my wife and I first visited Mongolia's eastern steppes in 1989 with Jachin Tserendeleg of the Mongolian Association for Conservation of Nature and Environment, we saw several gazelle herds, but above all we were impressed by the steppe itself, the endless sea of grass, the vast expanse of unspoiled habitat where one could drive hundreds of kilometers without encountering a fence or even a nomad's yurt, or *ger* as the Mongolians call it.

Interest in the gazelles drew me back in 1993 and 1994. Members of the Joint Soviet-Mongolian Biological Expedition had studied gazelles in the late 1970s and early 1980s (Lushchekina et al. 1986; Sokolov and Lushchekina 1997). Their work and that of others, including my observations, made it clear that the gazelles migrated so widely that reserves alone could not protect them. To save the herds on the open steppe upon which they depend, it would be necessary to manage the whole landscape, to make certain that development would not degrade the grasslands. Oil development had already begun, and a railroad was being planned eastward into China. More people, roads, fences and livestock might soon threaten the free movements of gazelles unless an innovative landscape management plan regulated heedless development. The Ulaanbaatar-Beijing