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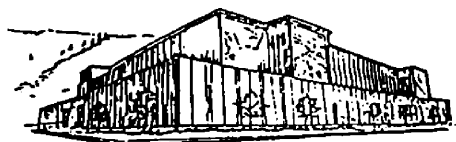
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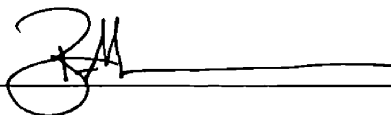
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**ARGALI (*Ovis ammon*) CONSERVATION IN WESTERN
MONGOLIA AND THE ALTAI-SAYAN**

by

Ryan L. Maroney

B.A., New College, Sarasota, Florida, 1999

Presented in partial fulfillment of the requirements

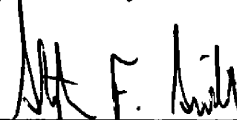
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2003

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ARGALI (*Ovis ammon*) CONSERVATION IN WESTERN MONGOLIA AND THE ALTAI-SAYAN

Chairperson: Dr. Stephen Siebert §F§

Management of argali subspecies in Mongolia historically has been tied to improving biological research and anti-poaching activities within the framework of trophy hunting. Argali populations in areas where trophy hunting does not occur, such as protected areas, have received little attention, and conservation or management plans for these areas generally do not exist. Furthermore, diverse social and environmental conditions require bioregional and site-specific conservation strategies within a national argali management plan. In this study, results from interviews with pastoralists in Siilkhemiin Nuruu National Park in western Mongolia indicate that local people revere argali and are generally aware of and support government protections, but may not be inclined to reduce herd sizes or discontinue grazing certain pastures for the benefit of wildlife without compensation. A preliminary survey of argali distribution in the park also identified key winter forage areas upon which to focus management efforts. Because past protectionist approaches to argali conservation in western Mongolia and the greater Altai-Sayan ecoregion have not achieved effective range management or anti-poaching enforcement, alternative management policies should be considered. Results from this study suggest local receptiveness to management programs based on community involvement and direct benefit.

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PREFACE

Following the 1992 transition from a command to market economy, Mongolia plunged into an economic depression from which it has still not recovered. Over a third of Mongolians live in poverty and per capita income and GPD remain below 1990 levels (Finch, 2002). During the last decade, foreign donor aid contributed on average 24% of GDP per year (Finch, 2002), and Mongolia became one of the highest recipients of foreign aid dollars on a per capita basis (Anon., 2002). A significant portion of this donor aid has been directed toward biodiversity conservation and, with this support, the Mongolian government has developed an extensive network of protected areas.

The number of protected areas has increased from 11 areas covering 3.6% of the country prior to 1992, to 48 areas covering 13.1% of the land area in 2000 (Myagmarsuren, 2000). Moreover, protected area numbers are expected to continue to increase as the Mongolian government moves toward its goal of placing 30% of its total landmass under some form of protection (Myagmarsuren, 2000). A four-tier system of protected areas was adopted by the Mongolian Parliament in 1994, including the following designations: Strictly Protected Areas, National Parks, Nature Reserves, and Natural and Historic Monuments (Wingard and Odgerel, 2001). The Mongolian government, however, has yet to initiate management or conservation activities in many of its protected areas (Reading et al., 1999a).

Nearly a third of Mongolians practice some form of pastoralism and the country's 27 million livestock outnumber the population tenfold (Anon., 2002). With Mongolia's high livestock numbers and its citizens' predominately pastoral livelihoods, grazing

issues affect nearly every aspect of the economy across the country. Although grazing rights of pastoralists are recognized within protected area regulations, certain zones within protected areas are managed primarily for wildlife. Special Zones within National Parks, for example, can be accessed for grazing only by special permit during instances of pasture shortage (Wingard and Odgerel, 2001). Once Mongolia transitions from the current system of paper parks to a regulated and enforced network of protected areas, conflict between residents and protected area administrators will likely increase (Bedunah and Schmidt, 2000, in press).

Some protected areas, such as the Great Gobi Strictly Protected Area, occupy marginal grazing land and their associated resource use limitations do not represent a significant loss to herders. Many protected areas, on the other hand, such as National Parks, support not only wildlife populations but thousands of herders and their domestic livestock (Wingard and Odgerel, 2001). As a result, range management is one of the most pressing issues facing biodiversity conservation in Mongolia's protected areas.

Range management is not new to Mongolia and grazinglands have been extensively managed here since feudal times in the thirteenth century through the collective period which ended in the early 1990s' (Fernandez-Gimenez, 1997; Sneath, 1999). The earliest management of pasture resources likely occurred when a new set of nobles emerged from Chinggis Khan's armies and took control over large territories of Mongolia. These new power elite, acting in accordance with adopted legal codes of the time, controlled and managed localized pasture usage (Sneath, 1999).

Between 1691 and 1911, Manchu rule brought about the destruction of the Mongol Khans and isolated Mongolia from the outside world (Sanders, 1987). Tibetan

Buddhism occupied a central role in cultural identity during this time, and powerful lamas and nobles maintained considerable local autonomy, and controlled and coordinated livestock production on the most fertile grazinglands (Humphrey et al., 1993; Sneath, 1999). Two centuries after rising to power, the Manchu's' control over much of Outer Mongolia began to decline in the early twentieth century (Sanders, 1987).

Officially declaring independence for Outer Mongolia in 1924, Mongolia's new government, strongly backed by the Bolsheviks, embarked on a series of economic and social reforms including outlawing organized religion and requiring collectivization of all livestock (Sanders, 1987). Responding to the destruction of monasteries, purging of nobles and religious leaders, and the attempted forced collectivization of livestock, Mongolians revolted and slaughtered some 7 million head of livestock in 1932 (Gilberg and Svantesson, 1996). Following this uprising, the Soviet-run Mongolian government backed away from plans for collectivization, but continued to pursue intensification of livestock production by improving water access, encouraging specialization, and providing some supplemental feed (Sheehy, 1996).

In 1944, Sambuu, an employee of the Ministry of Animal Husbandry and later president of the Mongolian Peoples' Republic, published what was to become a famous handbook for herdsmen (Sanders, 1987). Sambuu wrote "Advice to Herdsmen," in response to the inability of many new herders, who were former serfs provided with livestock seized from the wealthy following the destruction of the feudal system, to properly manage and care for their grazinglands and animals (Sanders, 1987). Sambuu's handbook provides in-depth instructions on caring for livestock, improving bloodstock,

selecting pasture, and a variety of other issues including the benefits of adopting the collective work model (Sambuu, 1943 *phide* Sanders, 1987).

With the introduction of a series of Soviet-style, 5-year development plans in 1948, far reaching production and structural goals for Mongolia were established (Major, 1990). A second attempt at collectivization occurred in the 1950s with some success, and by 1963, nearly all livestock herders were members of a local collective or *negdel* (Sheehy, 1996). Pastoralists lost control of much of their personal livestock, with only 25% of herds remaining in private hands, but benefited in numerous ways from becoming members of the *negdel* (Potkanski, 1993). Collectivization and increased Soviet-subsidies allowed for a new level of social welfare previously unavailable to most Mongolians, including free health care services and education, emergency fodder during harsh winters, access to veterinary programs, mechanized transportation for seasonal movements, retirement pensions, and stable markets in which to sell livestock products (Potkanski, 1993; Bruun, 1996).

Following Mongolia's economic transition in 1992, Soviet-style collectives broke down and no regulatory institution has yet filled the void (Mearns, 1993; Schmidt, 1995; Bruun, 1996). Consequently, the last decade has seen minimal or no range management in most of Mongolia and increased pasture degradation is noted for many areas (Fernandez-Gimenez, 1997; Reading et al., 1999a). Future range management will require local government institutions to reassert some control over stocking rates and seasonal use patterns of communal lands. Furthermore, management policies for Mongolia's rangelands based on past, extensive livestock practices that integrate

economic, social, and environmental parameters may offer a more viable option than western intensive production models (Sheehy, 1996).

As a natural resource management extension agent with the U.S. Peace Corps from August 2000 to September 2002, I was fortunate to participate in a variety of research, conservation and development projects in western Mongolia while working with the Mongol Altai Nuruu Special Protected Areas Administration. Despite the diverse assistance provided to protected area management in western Mongolia, Altai argali research activities have occurred only sporadically and no range management or conservation planning has taken place in protected areas for argali. Following the creation of Siilkhemiin Nuruu National Park in late 2000, preliminary discussions with park managers and biologists indicated an interest in conducting research to support the development of a management plan for the park's argali. The research and observations presented here were conducted in response to management concerns between the fall of 2001 and the summer of 2002.

1. Introduction

Management and conservation activities for argali (wild sheep) (*Ovis ammon*) in Mongolia historically have been linked to trophy hunting—a contentious issue involving large sums of money, law suits and corruption (Hofer, 2002; Amgalanbaatar et al., in press). Although government sanctioned trophy hunting has occurred since the 1960s (Luschekina and Fedosenko, 1994), the Mongolian Ministry for Nature and Environment (MNE) has yet to adopt a national management plan for argali (Amgalanbaatar et al., in press). In the absence of formal plans, national conservation and management strategies have focused on increased law enforcement and continued development of protected area administrations (see Mallon et al., 1997; Amgalanbaatar and Reading, 2000; Working Group, 2000). These efforts, however, largely have overlooked the direct involvement of or impacts on pastoralists within argali habitat.

In recognition of these shortcomings, recent discussions to reform Mongolia's trophy hunting practices have led to proposals for Community Based Wildlife Management (CBWM) programs for trophy hunting (Schuerholz, 2001; Amgalanbaatar et al., in press). Although the market-based approach to management and conservation that underlies trophy hunting proposals allows for local involvement in a select number of viable trophy hunting locales, it does not address significant argali populations in protected areas where trophy hunting is not permitted.

Uncertainties in *Ovis* taxonomy further impair the development of argali management strategies. Two argali subspecies are officially recognized in Mongolia, Gobi argali (*O. a. darwini*) and Altai argali (*O. a. ammon*). However, their distributions remain unclear due to incomplete surveys and general uncertainty surrounding the

designation and differentiation of argali subspecies in the region (Geist, 1991; Feng, 2000; Tserenbataa et al., 2000). Recent research studies employing mtDNA analysis are inconclusive with regard to the genetic relationship of Mongolia's three geographically identified argali forms (Altai, Khangai, and Gobi), but concur that distinct management consideration for specific geographic populations is warranted (Feng, 2000; Tserenbataa et al., 2000).

In light of these findings and acknowledging the need for regional and site-specific conservation and management strategies for argali, this study addresses Altai argali in non-trophy hunted areas of western Mongolia and adjacent countries. The Altai-Sayan ecoregion, as defined by Olson and Dinerstein (1998), encompasses much of recognized *O. a. ammon* distribution and serves as the setting for this discussion (Figure 1).

2. Background

2.1 *Altai argali*

The Altai subspecies of argali is the largest wild sheep in the world and occurs in the Altai mountains of Mongolia and adjacent regions of Russia, China and Kazakhstan (Fedosenko, 1985; Geist, 1991; Mallon et al., 1997; Weinberg et al., 1997; Sung et al., 1997; Amgalanbaatar and Reading, 2000). Although the Altai argali is one of the most sought after species of wild sheep by trophy hunters and commands high fees, its general biology and current population status remain poorly understood (Mallon et al., 1997; Reading et al., 1999b, 2001; Amgalanbaatar and Reading, 2000; Schuerholz, 2001). Argali populations were once more common throughout large tracts of the Altai.

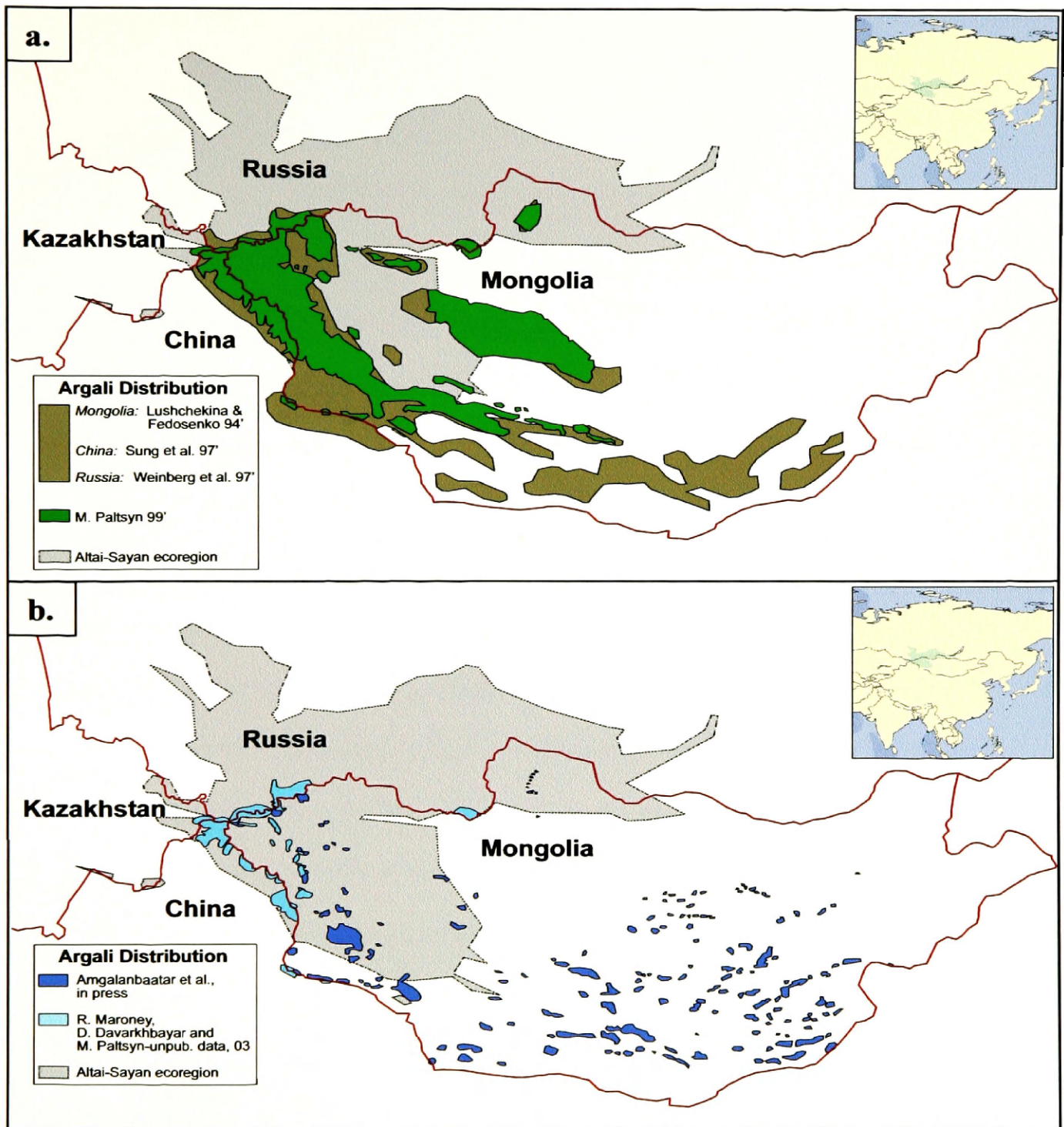


Figure 1 Known distribution of argali subspecies (*O. a. ammon* and *O. a. darwini*) in Mongolia and the Altai-Sayan ecoregion between 1994 and 2003, illustrating the overall reduction and fragmentation of habitat. Mongolia's three geographic argali forms are visible in the western (Altai), central (Khangai) and southeastern (Gobi) portions of the country. Inset a. depicts argali distribution in Mongolia and adjacent countries reported in the 1990s by Lushchekina and Fedosenko (1994), Sung et al. (1997), Weinberg et al. (1997), and M. Paltsyn (unpub. data, 1999). Inset b. illustrates revised argali distribution for Mongolia by Amgalanbaatar et al. (in press) with updated distribution shapes for portions of the Altai-Sayan ecoregion by Maroney et al. (unpub. data, 2003).

However, habitat disturbance and deterioration resulting from competition with domestic livestock and poaching appear to have contributed to population declines, habitat reduction and fragmentation and, in some cases, localized extirpation of Altai argali in Mongolia, China, Russia and Kazakhstan (Fedosenko, 1985; Lushechina and Fedosenko, 1994; Mallon et al., 1997; Sung et al., 1997; Weinberg et al., 1997; Reading et al., 1997, 1999c, 2001; Amgalanbaatar and Reading, 2000; Paltsyn and Spitsyn, 2002; Abaturov et al., in press; Amgalanbaatar et al., in press).

Considerable controversy concerning the status of argali subspecies exists in Mongolia. Accounts of declines in argali populations based on limited data or anecdotal information are known from as early as 1913 (Carruthers), but have become more common in recent years. Past surveys were conducted at irregular intervals and were based on a variety of questionable and inconsistent methodologies that make comparisons over time and between areas difficult, if not impossible (Lushechina and Fedosenko, 1994; Reading et al., 1997, 1999c, 2001; Institute of Biology, 2001; Schuerholz, 2001; Johnson, 2002; Amgalanbaatar et al., in press). Contradictory survey findings, in conjunction with accounts of population declines, have often been dismissed by the Mongolian government and hunting companies, and obfuscate the status of argali populations in Mongolia (Lushechina and Fedosenko, 1994; Reading et al., 1998). Wild ungulates are known to undergo natural population fluctuations over time and quick recoveries of argali are documented in areas with favorable conditions (des Clers, 1985; Mallon et al., 1997; Schuerholz, 2001). Furthermore, natural fluctuations may cause some population declines from which argali have the potential to recover (Mallon et al., 1997; Schuerholz, 2001).

Prompted by national and international concern over the status of argali in Mongolia, in 2001, the Mongolian Academy of Sciences undertook the first nation-wide argali survey employing a standardized random distribution sampling technique (Institute of Biology, 2001; Schuerholz, 2001). Although potentially biased for reasons noted by Schuerholz (2001), the survey reported a significantly smaller argali population than any previous official national estimate (Institute of Biology, 2001; Amgalanbaatar et al., in press). National survey findings support other reports (see Luschekina and Fedosenko, 1994; Mallon et al., 1997; Weinberg et al., 1997; Reading et al., 1998, 1999c, 2001; Working Group, 2000; Amgalanbaatar and Reading, 2000; Schuerholz, 2001; Paltsyn and Spitsyn, 2002; Abaturov et al., in press; Amgalanbaatar et al., in press) that marked declines in argali populations have recently occurred across much of its range, that threats to argali conservation are increasing, and that appropriate steps toward better management and conservation are needed.

The Altai argali subspecies is now considered to be at extremely high risk in western Mongolia due to dramatic declines or localized extirpations, highly fragmented habitat, and high and increasing densities of humans and domestic livestock (Mallon et al., 1997; Reading et al., 1999c; Amgalanbaatar and Reading, 2001; Schuerholz, 2001; Amgalanbaatar et al., in press). Similar conditions are documented for Altai argali in adjacent countries, with population declines or extirpations noted in the Ukok Plateau, Mogun-Taiga, Sailugem and Chikhacheva ranges (Fedosenko, 1985; Weinberg et al., 1997; Paltsyn and Spitsyn, 2002; Abaturov et al., in press).

National governments and international regulatory bodies have sought varying degrees of protection for *O. a. ammon* based on these and other findings. The Altai argali

is designated as Vulnerable by the IUCN (Hilton-Taylor, 2000); carries Appendix II status by the Convention on International Trade of Endangered Species (CITES) and is listed as Threatened on the U.S. Endangered Species List (Johnson, 2002). The governments of the Peoples' Republic of China and Russia list *O. a. ammon* as Endangered (Sung et al., 1997; Weinberg et al., 1997), while Mongolia has accorded it Threatened status (Shiirevdamba, 1997).

A number of protected areas have been established in the Altai-Sayan ecoregion specifically for argali and snow leopard conservation; and proposals exist for the creation of a transboundary biosphere reserve in the ecoregion (Badenkov, 2002). Yet, large portions of known argali distribution remain outside of the current network of protected areas (Mallon et al., 1997; Reading et al. 1999a, 2001; Amgalanbaatar et al., in press), and a number of biologists have questioned if even existing protected areas can safeguard argali because the areas lack sufficient funding, resources, training and personnel to carry out basic management activities (Mallon et al., 1997; Reading et al., 1999a, 1999c; Amgalanbaatar and Reading, 2000; Schuerholz, 2001; Paltsyn and Spitsyn, 2002; Abaturov et al., in press).

Development of conservation plans in the Altai-Sayan ecoregion are complicated by transboundary zones, large human and domestic livestock populations, high cultural and ethnic diversity, and fragmented wildlife habitat. Until more direct investments in biodiversity conservation are possible in areas that lack argali trophy hunting opportunities, management and conservation initiatives may have to rely on a system of incentives and benefits other than the financial compensation provided by CBWM trophy hunting programs. Integrated approaches to management and conservation that recognize

local livelihood security needs and incorporate the ecological knowledge of resident people can lead to more informed and effective management and conservation programs (Brecht et al., 1991; Johnstad, 1998; Reading et al., 1999a, 1999c; Kleiman et al., 2000; Huntington, 2000; Fernandez-Gimenez, 2000; Siebert and Belsky, 2002; Schmidt et al., 2002). In this study, results from interviews with resident pastoralists of a protected area in western Mongolia provide insight into local resource use patterns and community concerns, and attitudes toward wildlife. A preliminary survey of argali distribution conducted in the protected area also identified important habitat upon which to focus management efforts. These findings may facilitate dialogue and development of integrated management approaches and community based conservation programs for argali and other wildlife in the Altai-Sayan ecoregion.

2.2 Study Area

Siilkhemiin Nuruu (Sailugem Range) National Park (SNNP) is located in Mongolia's westernmost province of Bayan-Olgii (Figure 2). SNNP was created in 2000 primarily for the protection of Altai argali and is divided into two sections, which cover a combined area of 140,080 ha (Myagmarsuren, 2000). Spanning portions of Ulaankhus and Nogoön Nuur provincial counties, SNNP and is one of four protected areas under the management the Mongol Altai Nuruu Special Protected Areas Administration (MANSPAA) in Bayan-Olgii province. As with many protected areas in the region, MANSPAA and its three rangers in SNNP have had little involvement in the area due to limited resources.

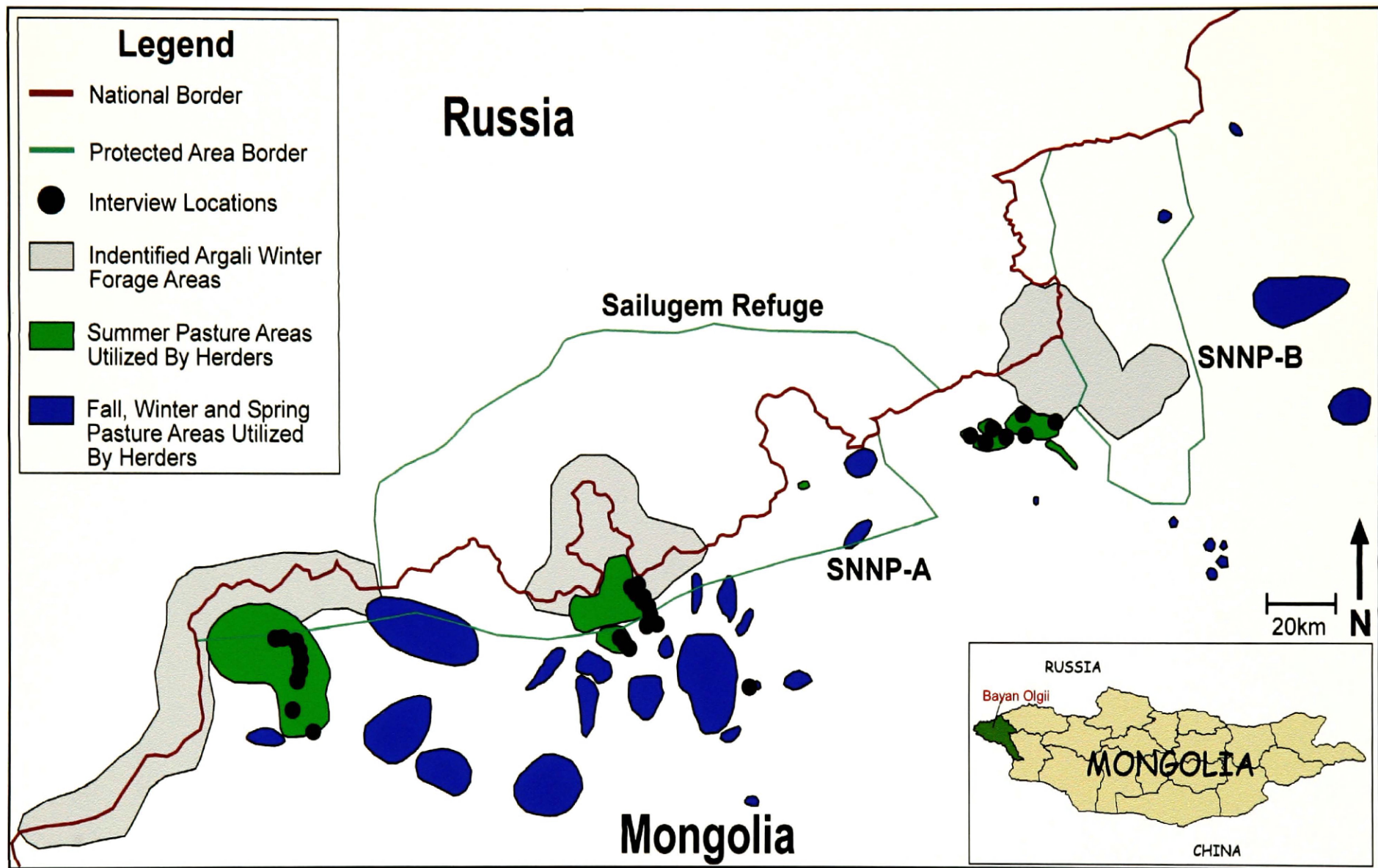


Figure 2 Siilkhemiin Nuruu National Park (SNNP) is divided into A and B zones. SNNP-A zone is adjacent to Russia's Sailugem Refuge. Interview locations, predominate seasonal pasture usage of herders interviewed, and identified argali winter forage areas (Shar Yamaat=left, Shar Nokhoi=center, Ulanchuluu=right) are illustrated. Seasonal movement patterns of pastoralists prevent direct observation of argali for many in SNNP.

The Sailugem mountains form part of the Mongolian-Russian border and intersect the Chikhacheva Range at the borders of the Altai and Tuvan republics. This alpine and mountain steppe environment is characterized by high plateaus, broad valleys, and undulating hills ranging in elevation from 2473 m at the Bor Borgusen river to 4029 m at Ikh Turgen peak. Weather in this region is characterized by a strong continental climate with severe winters, a short growing season, and approximately 300-400 mm of annual precipitation (Hilbig, 1995). The Sailugem and Chikhacheva ranges were once considered some of the best wild sheep hunting grounds in Central Asia as reflected in Demidoff 's (1900) and Carruthers' (1913) accounts of hunting trips to the region.

Pastoralists have grazed livestock in the region that makes up SNNP for over 3000 years, and extensive petroglyph sites throughout the eastern portion of the park document the rich history of former inhabitants' interaction with wild ungulates and other wildlife dating back to the late Pleistocene (Jacobson et al., 2001). In the mid 1800's, Kazakh nomadic pastoralists from Xinjiang began entering the area that is now far-western Mongolia, and have seasonally grazed livestock there for several generations (Finke, 1999). Kazakhs now comprise the largest ethnic minority group in Mongolia and in Bayan-Olgii province they constitute over 90% of the population (Finke, 1999; Bayan-Olgii Office of Statistics, 2002). In addition to local herders, several Mongolian National Border Posts are located along the length of SNNP and many are inhabited year round by soldiers, their families, and livestock herds.

The number of privately owned livestock has greatly increased in western Mongolia since the end of collective herding in 1992, and rangeland degradation has occurred in many areas (Mallon et al., 1997, Reading et al., 1998; Bedunah and Schmidt

2000, Schuerholz, 2001). These trends are present in the counties where SNNP is now located (Figure 3), and overgrazing is an increasing concern for many pastoralists there. Following *zuud* (drought and severe winter) in 2000 and 2001, however, livestock numbers decreased by almost 20% from 1997's peak levels (Bayan-Olgii Office of Statistics, 2002). Increases in total livestock numbers and resulting pasture degradation across much of Mongolia following the economic transition of the early 1990's are the result of a number of interrelated factors including the loss of markets, unemployment in urban centers and the breakdown of community regulatory organizations (see Mearns, 1993; Schmidt, 1995; Brunn and Oddgaard, 1996; Fernandez-Gimenez, 1997; Sneath, 1999).

Recent emigration and re-immigration of Mongolian Kazakhs and the effect of such movements on herder and livestock density in rural areas of western Mongolia are largely misunderstood. In 1989, approximately 123,000 Kazakhs made up roughly 6% of the total Mongolian population (Finke, 1999). During the period beginning with Kazakhstan's independence in the early 1990's through 2001, 60,100 Mongolian Kazakhs emigrated to Kazakhstan, of which about 10,000 have since returned to Mongolia (Bayan-Olgii Office of Statistics, 2002). Consequently, re-immigration by Kazakhs is not a major factor in the overall increase in livestock numbers experienced in much of western Mongolia, and should not be viewed as a significant cause of increased pressure on Altai argali as suggested by Mallon et al. (1997) and Reading et al. (1998). In fact, out-migration of Mongolian Kazakhs to Kazakhstan reduced the total number of individuals who might have otherwise migrated from urban to rural areas following the economic transition, as was commonly documented in other provinces of Mongolia

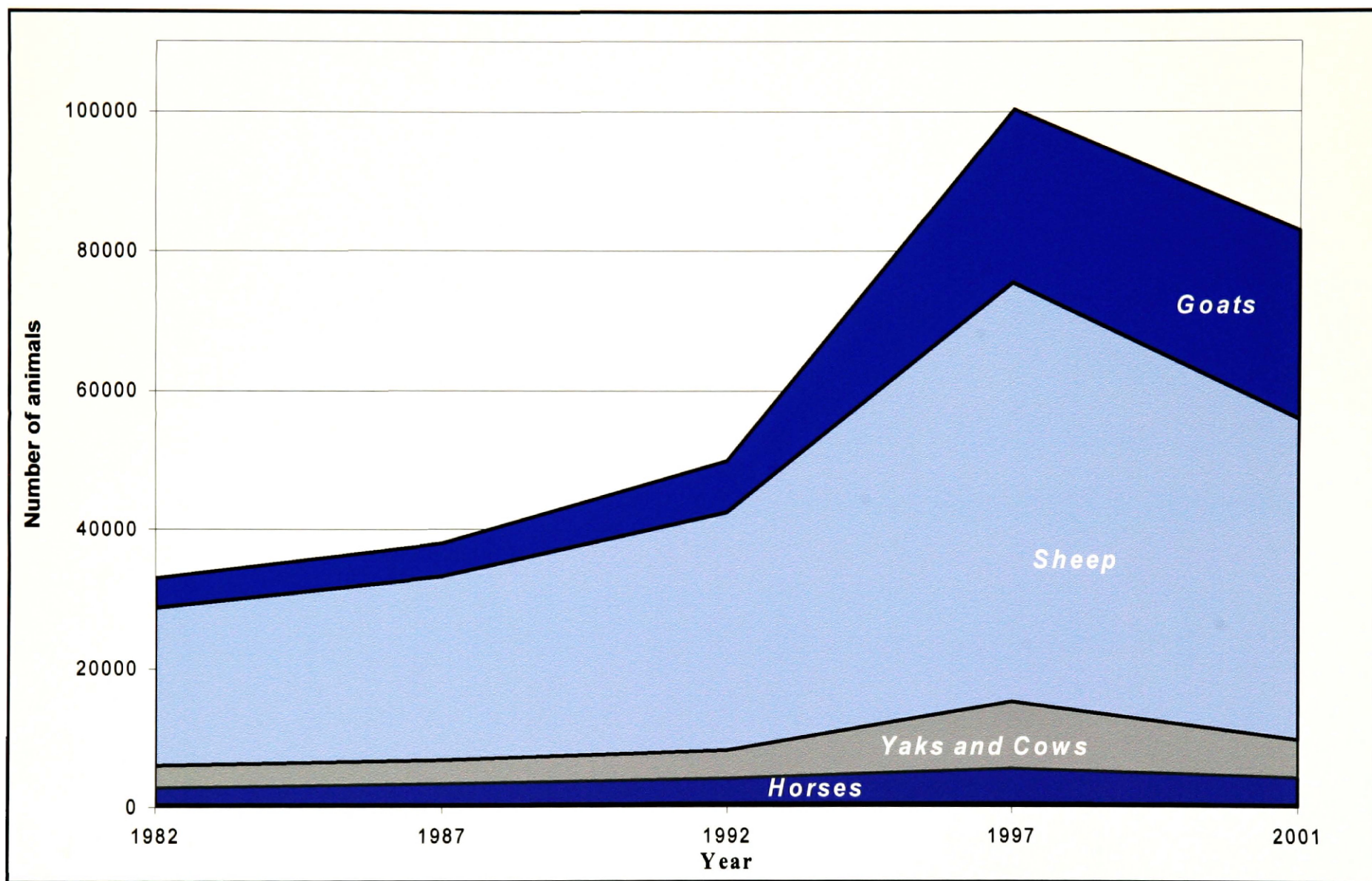


Figure 3 Change in number and composition of livestock within administrative units that make up SNNP (1st, 2nd & 3rd Bags of Ulaankhus *Soum*, and Ulaanchuluu *Bag* of Nogoön Nuur *Soum*) between 1982-2001. Camel numbers increased from 348 in 1982, to 369 in 2001. Human population in 2001 for this area was 4615, an increase of 578 individuals since 1982 (Bayan-Olgii Office of Statistics, 2002).

(Finke, 1999). Mongolian Kazakh pastoralists can be viewed as typical of most herders in western Mongolia (Finke, 1999).

Resource use regulations in national parks in Mongolia are designated into Special, Travel and Limited Use Zones (Wingard and Odgerel, 2001). The MNE, however, has not yet finalized the boundaries of these zones in SNNP. Mongolian law stipulates that livestock grazing can occur within a park's Limited and Travel Zones, and even permits limited grazing in otherwise restricted Special Zones during pasture shortages (Wingard and Odgerel, 2001). In addition to park zones, military regulations prohibit all activity within 5km of the Mongolian-Russian border (Colonel Yo. Ganhuu-pers. comm., 2002). During the consecutive *zuud* years of 2000 and 2001, local herders petitioned and received grazing access to border areas in SNNP and continued to graze these areas in 2002 and 2003. With park zonation unclear and access to border regions approved, uncontrolled livestock grazing is widespread in all regions of the park.

Argali in SNNP make seasonal, transboundary migrations and are known to winter in Mongolia predominately on relatively sheltered southern slopes (Davarkhbayar et al., 2000). As is true for much of western Mongolia, habitat disturbance and overgrazing have displaced many argali to marginal pastures in SNNP (Davarkhbayar et al., 2000; Institute of Biology, 2001; Schuerholz, 2001; Amgalanbaatar et al., in press). In addition, poaching of argali is a noted problem in SNNP (R. Maroney-unpubl. data), although the full extent of the problem is unknown. Enforcement of the hunting ban is incomplete and irregular; in fact, there has been only one fine for argali poaching in the northern portion of Bayan-Olgii province near SNNP in the last ten years (Bayan-Olgii Office of Statistics, 2002).

Adjacent to SNNP, the Sailugem or Khosh Agach Refuge (241,300 ha) is located on the Russian side of the Sailugem range and was created in 1973 for protection of argali (Figure 2) (Paltsyn and Spitsyn, 2002). Poaching by both local residents and visiting Russian hunters is commonly reported for this area; however, lower stocking rates create significantly less grazing competition between argali and domestic livestock than found in SNNP (Paltsyn and Spitsyn, 2002; Abaturov et al., in press). Cooperation between the governments of Mongolia and Russia for management of these protected areas currently does not occur.

Population data for argali in the Sailugem and Chikhacheva ranges are limited with many surveys conducted in a sporadic manner often in the summer or early fall when argali are either not in the area or are widely disbursed and difficult to locate. Davarkhbayar et al. (2000) estimated that 540-650 argali inhabit the Sailugem and Chikacheva Ranges. From the Russian side, local biologists (Paltsyn and Spitsyn, 2002; Abaturov et al., in press) estimated 550-600 argali inhabiting this same region. A standardized system to obtain baseline population data for monitoring trends has not been established for SNNP, and past surveys have not been coordinated between Mongolian and Russian biologists.

3. Methods

3.1. Questionnaire survey

I developed a 36 point questionnaire regarding local perceptions and general ecological knowledge concerning Altai argali that provided respondents with an opportunity to share their knowledge, opinions and experiences pertaining to a variety of

wildlife and range management issues (Appendix 1 & 2). Interviews lasting approximately 25 minutes were conducted with 98 individuals from distinct family units in SNNP between August 6-10, 2002 (Figure 2). Individuals were selected for interview based on their summer quarters' proximity to a predetermined course through the most densely inhabited areas of SNNP. During previous fieldwork in SNNP, some pastoralists were hesitant to discuss open-ended questions concerning wildlife poaching or grazing conflicts. By utilizing a questionnaire format and incorporating questions in which respondents are asked to rank general categories of threats to wildlife, herders could address controversial issues without self implication. Additionally, all respondents were informed that their responses would be confidential and anonymous. Many Kazakh herders in SNNP find speaking Mongolian either difficult or uncomfortable, therefore, interviews were conducted in Kazakh by two assistants trained in interview methodology. I observed all interviews and participated in discussions when appropriate.

3.2. Argali group composition counts

A team of three experienced observers conducted a preliminary survey to determine argali population distribution and group composition along the length of SNNP A-Zone during the rut in late November 2001. We observed argali groups from vantage points reached by vehicle or on foot using binoculars and spotting scopes and recorded sex and age characteristics when possible. We determined the location of observation points using GPS equipment and plotted the approximate position of argali groups on a 1:100,000 scale topographical map based on recorded compass bearing and estimated

distance to the group. Duplicate counts were identified and discounted when similarities between group composition in relation to location appeared questionable.

4. Results and Discussion

4.1. Questionnaire survey

A large majority (91%) of pastoralists in SNNP believed it is important to protect argali and 93% expressed interest in receiving further information on protected areas and their environmental regulations (Table 1). Following interviews, several individuals even indicated a willingness to participate in argali conservation efforts. When respondents were asked why they thought conservation of argali was important, most remarked that argali are “rare and magnificent animals” deserving of protection. A minority (6%), considered protection of argali unnecessary and viewed them as a nuisance that could limit access to certain pasturelands. Typical comments from this latter group included:

These argali are not our responsibility and do not need our protection. They only come into Mongolian border territory and really belong to the Russians.

Results indicate pastoralists in SNNP are generally aware of and support environmental laws concerning argali. Most (94%) respondents knew they were in a protected area and 77% were aware that argali are a protected species (Table 1). Interviews with Mongolian pastoralists conducted in 1998, by Bedunah and Schmidt (in press) in Gobi Gurvan Saikhan National Park, also documented a large majority (83%, n=77) of pastoralists were aware of the local protected area. However, only 37% of their respondents had any knowledge of land use regulations associated with the park’s Special

Table 1 Pastoralists' knowledge and views concerning grazing competition between livestock and argali, environmental conservation, argali movement patterns and community networks in SNNP ($n=98$).

<i>Question</i>	<i>Yes</i>	<i>Uncertain</i>	<i>No</i>
Is it currently possible for argali and livestock to co-exist in the same area?	28%	12%	60%
Do argali in SNNP stay in Mongolia all year?	2	16	82
Do herder and livestock movements affect argali movement patterns?	51	18	31
Is it important to protect argali here?	91	3	6
Do you know that you live in a protected area or its buffer zone?	94	0	6
Do you know that argali are a protected animal both in Mongolia and Internationally?	79	0	21
Would you like more information about the protected area network and environmental laws here?	93	0	7
Does any form of land use management currently exist to avoid grazing conflicts?	34	3	63
At present, do local herder communities or local county governments work together in any way?	7	3	90

Note: some rows' percentages do not add to 100 due to rounding.

Table 2 Pastoralists' responses to selected questions concerning argali conservation and grazingland use in SNNP ($n=98$).

<i>Question</i>	<i>Increase</i>	<i>Unchanged</i>	<i>Decrease</i>	<i>Uncertain</i>
Do you desire more, less, or the same number of livestock for your family?	55%	38%	3%	4%
Do you think the number of argali in your area is currently increasing, decreasing, or stable?	40	26	21	13
Is argali range currently increasing, decreasing, or unchanged?	7	58	18	16
Has the condition of rangeland improved (increased), decreased, or remained unchanged in the last five years?	21	18	56	4
If the number of herders and livestock continue to increase in this area, will the population and range of argali increase, decrease, or stay the same?	12	45	29	14

Note: some rows' percentages do not add to 100 due to rounding.

Zone (Bedunah and Schmidt, in press). Once Special Use Zones are defined and managed for argali in SNNP and herder's access becomes restricted, it is likely that the 6% of pastoralists currently opposed to argali conservation will find increased support for their views.

Only 18% of respondents thought that argali range had decreased and most believed that argali numbers were either increasing (40%) or stable (26%) in SNNP (Table 2). These findings support the general perception documented by McCarthy (2000), who found a majority of herders (n=57) in Mongolia's three western provinces believed that argali populations were increasing (37%) or stable (37%), while only 26% thought argali number were declining. It is significant to note that a majority of pastoralists surveyed in western Mongolia believe that argali numbers are either stable or increasing, contrary to reports by Mongolian and foreign biologists.

This discrepancy can be partially explained by considering argali displacement by herders and livestock, herder seasonal movement patterns and general ecological knowledge. Argali are highly mobile and easily displaced by the seasonal movements of herders and livestock (Harris and Bedunah, 2001; Schuerholz, 2001). Therefore, it is unlikely that many pastoralists are able to observe argali unless they make an effort to do so. Outside of formal interviews, a number of herders reported that they cannot regularly view argali, because "*argali move away from people and do not return until we move to different seasonal pastures.*" Known spatio-temporal land use patterns of pastoralists in SNNP support this claim, revealing that many herders do not come into direct proximity of argali because they only inhabit argali winter forage areas during the summer and early fall (Figure 2). As many herders' seasonal movements preclude regular observation of

argali, it is probable that these pastoralists do not have sufficient experience to speak accurately about population trends. Gender issues also factor into general awareness levels and ecological knowledge of pastoralists in SNNP. A high proportion of the respondents who were uncertain of argali population and range trends were women. Of the 21 women interviewed, half (52%) indicated they were not informed enough to comment on argali because they seldom discuss issues involving wildlife with the men of their families and do not often venture far from their homes.

Pastoralists that use remote areas when argali can be regularly observed, however, likely have more informed views on trends in argali population and range. In speaking with a herder who has observed argali and other wildlife from one such winter home during the course of his lifetime, he described with regret the current status of argali:

Argali have become frightened of humans and livestock and don't mingle with our flocks anymore. Large rams are becoming less common and there are many mountains that no longer have argali.

Even without regular observation of argali, most (82%) pastoralists are aware of general argali movement patterns (Table 1), and, as mentioned previously, realize that humans and domestic livestock can displace argali. A majority of respondents (60%) believed that argali and livestock could not co-exist in the same area (Table 1), and half (51%) of the pastoralists acknowledged that herder and livestock movements affect argali movement patterns (Table 1). When respondents were asked how an increase in herder and livestock numbers would affect argali in the area, however, the largest number (45%) believed argali population and range would remain unchanged (Table 2).

Only a small number (14%) of those interviewed reported to have hunted or knew specifically about a case of someone hunting argali in the area; while, in a separate question regarding the types of hunters, over half (52%) of the respondents claimed no knowledge of argali hunting. While some pastoralists have limited experience with argali and likely do not know about hunting issues, several respondents in informal discussions following interviews conceded that their concern over speaking of hunting a protected species prevented them from openly discussing issues of poaching. It is likely that some respondents chose not to answer questions concerning poaching because they feared reprisal even though all respondents were notified prior to interviews that the information obtained through the questionnaire would be confidential and anonymous. These findings differ from reports by Reading et al. (1998, 2001) and Amgalanbaatar et al. (in press), who found discussions with herders in other areas of Mongolia concerning poaching of argali open-natured, and the findings illustrate the variety of perceptions within Mongolia towards government authority.

Respondents willing to rank categories of poachers perceived Russian border soldiers (52%) to be the most common group hunting argali, followed by 41% who considered non-resident Mongolian and Russian visitors the second largest group (Table 3). Respondents recognized fellow pastoralists as poachers with 25% ranking herders as the most common poachers, while 22% believed herders were the second largest group (Table 3). When asked to rank threats to conservation of argali in the area, the largest number (38%) of respondents indicated that natural predators are the leading threat. Responses were mixed, however, and many considered both poaching and overgrazing serious threats (Table 4).

Table 3 Ranking of the number one and two most common groups to poach argali in SNNP as perceived by pastoralists. Percentages reflect variation in responses between groups.

<i>Rank of Group</i>	<i>Herders</i>	<i>Visitors</i>				<i>Foreign Trophy Hunters</i>	<i>Border Soldiers</i>				<i>n</i>
		<i>M</i>	<i>R</i>	<i>B</i>	Σ		<i>M</i>	<i>R</i>	<i>B</i>	Σ	
1	25%	4%	0%	4%	8%	2%	6%	52%	4%	63%	48
2	22	13	13	16	41	13	0	19	6	25	32

M = Mongolian, *R* = Russian, *B* = both

Note: some rows' percentages do not add to 100 due to rounding.

Table 4 Ranking of threats to conservation of argali as perceived by SNNP pastoralists. Percentages reflect variation in responses between groups (*n*=98).

<i>Rank of Threat</i>	<i>Overgrazing</i>	<i>Poaching</i>	<i>Predators</i>	<i>Natural Disasters (Zuud)</i>	<i>Uncertain (no response)</i>
1	25%	29%	38%	0%	9%
2	31	36	18	2	13
3	32	18	32	1	17

Note: some rows' percentages do not add to 100 due to rounding.

A majority (63%) of respondents indicated that no form of land use management is in place to avoid grazing conflicts, and 90% reported no cooperation between local county governments or resident pastoralists (Table 1). Accordingly, community involvement in conservation activities will likely be difficult to pursue, as many pastoralists make decisions on movement patterns and resource use independently or only with small family groups.

4.2. Argali group composition counts

We recorded 238 argali in 12 distinct groups over four observation days in the eastern and central portions of SNNP A-Zone. Of the 225 argali observed, we documented 29 adult males, 138 adult females, and 58 lambs. We observed 3 groups in the eastern section of Shar Yamaat and 9 groups in the central, Shar Nokhoi area. Both locations appear to be important argali winter forage areas within SNNP (Figure 2).

Mean group size was 20.0 (range 1–119, standard deviation 34.0), with a lamb to female ratio of 42:100, and male to female ratio of 21:100. The low proportion of male argali observed could be due to oversight error or misclassification of young males as females, but could also document selective poaching for rams in this population. Previous argali surveys (n=5) summarized by Reading et al. (1997) for other areas of the Mongolian Altai document an average mean group size of 16.5 (range 5.8–39.2), average lamb to female ratio of 22.8:100 (range 11:100–48:100), and average male to female ratio of 76:100 (range 52.6:100–92.5:100). Direct comparison between results is problematic, however. Strong bias exists in some surveys that were conducted during times of day when argali are bedded down and difficult to locate, outside of the rut when

animals are dispersed over large areas and in areas with highly variable degrees of difficult or inaccessible terrain (Schuerholz, 2001).

Border soldiers blocked our access to several research sites because of recent incidents of cross-border livestock theft. Future cooperation with border post soldiers is necessary to ensure access to argali habitat for further surveys. Border soldiers could also be involved in monitoring activities and anti-poaching programs. Toward this end, MANSPAA has already made working agreements with regional military directors to involve soldiers in conservation efforts.

Further monitoring programs are necessary to more accurately determine argali population structure and identify core habitat in SNNP, and could benefit from community involvement. It is unrealistic to expect national surveys to occur at regular intervals in the near future or to provide useful information for management decisions—especially in areas where trophy hunting is not feasible—given the Mongolian MNE’s lack of support for research activities. Instead, various local managers, park rangers, soldiers, and herders should be provided with training and support to conduct simple and standardized annual group composition counts to establish data for monitoring population trends (Wegge, 1997; Frisina and Ulziimaa, 1998). Efforts should be made to coordinate this monitoring work with the managers of the Sailugem Refuge in Russia.

The repeated group count methodology described by Virk (1999) for community based wild ungulate monitoring in Pakistan is recommended as a model for future monitoring programs in SNNP. In this method, multiple-day observations from fixed vantage points can provide data on group composition for each survey day, allow for statistical analysis of each data set, and permit estimates of minimum population size for

the area of observation (Virk, 1999). If supported by MANSPAA, information gained from regular, simple and locally initiated wildlife surveys can provide a more valuable tool for management decisions and evaluation of conservation strategies than estimates based on extrapolated population densities (Wegge, 1997; Virk, 1999; Harris et al., 2001). Additionally, information collected from non-hunted argali populations can serve as a useful benchmark for managers of areas that permit hunting (Amgаланбаатар et al., in press).

4.3. Management implications for SNNP

Forage competition with livestock, disturbance associated with people and livestock, and habitat loss resulting from range deterioration are significant threats to the future of Altai argali populations in SNNP. These threats are not specific to SNNP, but are occurring throughout the Altai-Sayan ecoregion. Management of rangeland for the benefit of wildlife is often difficult as it generally involves restrictions or changes on the resource use patterns of resident pastoralists (Amgаланбаатар et al., in press). As protected areas begin to be managed for wildlife, increased conflict between herders and protected area authorities can be expected (Harris and Bedunah, 2001; Bedunah and Schmidt, 2000, in press).

When livestock numbers were lower, habitat partitioning between argali and domestic herds occurred and provided some degree of combined or multiple use range management for livestock and wildlife in the region (Schuerholz, 2001). However, seasonal movements of herders and livestock now increasingly encroach on argali habitat that was previously lightly grazed or ungrazed by livestock. This change in livestock use

largely displaces argali into marginal areas inaccessible or otherwise unsuitable to livestock (Luschekina and Fedosenko, 1994; Mallon et al., 1997; Schuerholz, 2001). High argali mortality rates are likely to occur during harsh winters when they are displaced into areas without sufficient winter forage, or if existing argali winter forage areas are not managed appropriately (Schuerholz, 2001). Consequently, identification, protection and, in some cases, reclamation of historic argali winter forage areas should be a key component of conservation and management programs for argali (Fedosenko, 1985; Luschekina and Fedosenko, 1994; Harris and Bedunah, 2001; Schuerholz, 2001).

To successfully develop and implement a multiple use management strategy to protect wildlife habitat within SNNP, real benefits must be provided to local stakeholders willing to work toward shared conservation goals. As demonstrated in this case study, many pastoralists revere argali, are aware of national environmental laws and recognize that some level of range partitioning is necessary to provide argali with sufficient pasture resources. These herders have a strong conservation ethic concerning the importance of protecting argali, but more than half (55%) desire additional livestock and less than a third (29%) believe an increase in livestock numbers will negatively impact argali population and range. As a result, many pastoralists may not be inclined to limit or discontinue grazing certain pastures for the benefit of argali. Moreover, even if pastoralists were so inclined, community institutions are not in place to coordinate such range management. Development of effective programs and community incentives to reconcile pastoralists' cultural value for argali with their material needs and desires for increased domestic herds is likely the greatest challenge facing argali conservation in SNNP.

A public education campaign that acknowledges the cultural respect of pastoralists for argali and draws attention to recent declines for argali in the greater region could encourage local stewardship and reduce incidents of poaching (Amgalanbaatar and Reading, 2000), but would not address the underlying economic factors influencing pastoralists' decisions concerning resource use patterns and herd sizes. Indeed, much of the biodiversity loss which occurs in Mongolia and elsewhere is perpetrated by individuals who value nature, but act in what they believe is their own economic self-interest to support themselves and their families (Ferraro and Kiss, 2002). Programs that provide direct compensation to create economic incentives are often more successful in achieving their conservation goals (Bruner et al., 2001; Ferraro and Kiss, 2002), and argali trophy hunting has the potential to provide considerable funding (Schuerholz, 2001; Harris and Pletscher, 2002; Hofer, 2002; Amgalanbaatar et al., in press).

If CBWM trophy hunting programs are successfully established and managed, they could subsidize argali conservation programs outside of hunting reserves. Alternatively, protected areas that can support sustainable argali trophy hunting operations could petition the MNE for revision of environmental law to sanction CBWM trophy hunting programs in protected areas or their buffer zones, as suggested by Bedunah and Schmidt (in press). In either case, development of sustainable trophy hunting programs will take considerable time. In the interim, management activities in protected areas are needed and incentives could be developed to encourage community groups to form and work with protected area administrations and other government bodies toward conservation of argali and argali habitat.

Many herders in Mongolia are familiar with and value the benefits that previous soviet-era community institutions provided before their breakdown in the early 1990s. During socialist times, the *negdel* (local collective organization) coordinated joint management of livestock production and provided for both economic and social needs of community members (Bruun, 1996). The development of community institutions in SNNP could provide benefits to local pastoralists and facilitate the development and implementation of collaborative management strategies and should be initiated by MANSPAA. Additionally, identifying and working with key informants from these communities could increase success rates of collaboration and provide MANSPAA with detailed information concerning SNNP's wildlife.

Elsewhere in Mongolia, herders living in protected areas in the Gobi and other regions of western Mongolia have recently formed community groups to improve their livelihoods and better interact with protected area administrations (Schmidt et al., 2002; Bedunah and Schmidt, in press). The conservation and development projects described by Schmidt et al. (2002) and Allen and McCarthy (1999), have employed a diverse set of strategies and incentives that have met with positive results in these communities. Some of the benefits these projects have provided to community groups committed to conservation, and applicable to SNNP, include: the development of performance based business opportunities, the creation of locally owned and operated information and resource centers and the support of community requested training for livelihood improvement (Allen and McCarthy, 1999; Schmidt et al., 2002).

4.4. Management implications for the Altai-Sayan ecoregion

Community based strategies for conservation and management of wildlife can be effective, but too often are based on oversimplified assessments of large and diverse regions and their resident communities (Belsky, 1999; Wilshusen et al., 2002). Generalized approaches can result in gross inefficiencies and ineffectiveness, and their failings often provide impetus for movement toward more authoritarian policies, ultimately reducing the potential for long term conservation (Wilshusen et al., 2002). Considering Altai argali within the Altai-Sayan ecoregion as a separate management unit will allow for the development of bio-regional as well as site-specific multiple use management plans. Of the noted threats to conservation of Altai argali, habitat loss and deterioration caused by grazing competition is likely the most significant (Schuerholz, 2001), and range management of these communal lands is essentially a community oriented process requiring collaborative approaches (Schmidt et al., 2002). Management plans for argali in the Altai-Sayan should be developed collaboratively with resident communities and participation encouraged with direct benefits. Moreover, protected area administrations and local government organizations should act to facilitate this process to ensure that management and conservation goals are adequately addressed.

5. Conclusion

Opportunities for collaboration exist both within SNNP and across the border in Russia. The transboundary nature of the argali populations in the Sailugem and Chikhacheva ranges necessitate joint management and research efforts between Russian and Mongolian governments. Core winter forage sites, lambing grounds and other

seasonal pasture areas of Altai argali in both countries, and in other portions of its range, require further identification and protection. This could be achieved if Mongolian and Russian pastoralists and border soldiers are encouraged to work with park rangers and protected area biologists toward reducing incidents of poaching, as well as gathering information on the distribution and status of argali in the transfrontier zone.

Developing and implementing effective community based management and conservation strategies to resolve grazing conflict between pastoralists, protect important wildlife habitat, bridge transboundary zones, and ensure the livelihoods of resident pastoralists will be extremely difficult, but the alternative of employing solely protectionist approaches has not proven successful in many areas of Mongolia and will inevitably result in increased conflict between resident pastoralists and government authorities. Anti-poaching measures and protection of core wildlife zones are necessary, but should not be the only interaction protected area administrators or government officials have with herders. A policy shift from a primary focus on law enforcement activities toward more integrated management incorporating participatory approaches and providing direct local benefits offer the potential to improve conservation effectiveness while developing links between communities and governments.

EPILOGUE

As international interest mounts in the Altai-Sayan ecoregion, donor organizations will likely continue to invest in regional biodiversity conservation efforts. Such investments could provide support to MANSPAA and other regional protected area administrations interested in using processes of consensus and collaboration to pursue protected area management and biodiversity conservation. This preliminary study may prove useful in facilitating initial development of integrated management plans for wildlife in western Mongolia and the greater Altai-Sayan ecoregion. However, it is important to recognize site-specific ecological, cultural and historic conditions and the subsequent assumptions and constraints which can occur when lessons from one site are applied to another. Nonetheless, a wealth of knowledge exists from other regions of the world, and experiences drawn from natural resource management efforts by community groups elsewhere may have relevance to the development of wildlife conservation strategies in Central Asia.

Ongoing community based natural resource management initiatives are particularly well documented in Africa. Perhaps most prominent of these programs is the CAMPFIRE movement, a CBWM project begun Zimbabwe in 1989, and supported through regulated trophy hunting (Hasler, 1999). Programs that utilize participatory approaches to conservation and management of natural resources have been equally well documented with Africa's sedentary and nomadic pastoralists (see Waters-Bayer and Bayer, 1994). For example, Berger (1993) recorded and evaluated efforts to encourage creation of local institutions for planning, implementing and assessing natural resource

management in Kenya, with special focus on involving Maasai nomadic herders in the development of wildlife and livestock management strategies.

It is important to critically assess opportunities and constraints that may occur with translocation and application of model community based natural resource management projects, such as CAMPFIRE, to other areas (Brosius et al., 1998). Additionally, it is essential to understand successes and limitations of prospective models in their original, site-specific context. For example, although CAMPFIRE has been implemented on a broad scale and has successfully achieved a number of its objectives, critiques of the program have repeatedly noted its major analytical failing—that the full transference of legal rights and management functions to the local level has yet to occur and thus sustainable management of wildlife by resident people has yet to occur as well (Hasler, 1999).

Existing models provide practical reference for development of new conservation and management programs, but ultimately require adaptation to suit the needs of specific communities and their unique environments. In western Mongolia, integrating social, economic, and environmental parameters into management programs for grazinglands and wildlife may not be feasible without concurrent development of provincial and county level government institutions' capacity to provide guidance over seasonal use patterns and stocking rates of communal lands.

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APPENDIX 1: QUESTIONNAIRE

Herder Survey on Altai Argali (*Ovis ammon ammon*) #____ Siilkhemiin Nuruu National Park

• Researcher's Name: _____
• Date: _____ GPS _____

• Site Name, Soum, Bag: _____
• Km to Border Post: _____

?	#	Questions	Response
Herder Household Information	1	# of people in household & their age	
	2	Herd size and composition	<ul style="list-style-type: none"> • Total: _____ • Goats _____ • Sheep _____ • Horses _____ • Camels _____ • Yaks/Cows _____
	3	Do you desire more, less, or the same number of livestock for your family?	More Same Less
	4	How many years herding? How many years living in this place? Previous Employment?	<ul style="list-style-type: none"> • Herding _____ • Here _____ • Former Job _____
	5	Seasonal movement patterns and locations	<ul style="list-style-type: none"> • Winter _____ • Spring _____ • Summer _____ • Fall _____
	6	How has the # of livestock in this area changed in the last...?	<ul style="list-style-type: none"> • 5 years + or — or stable • 10 years + or — or stable • 15 years + or — or stable • 20 years + or — or stable
	7	Have you or your family members gone to Kazakhstan and then returned?	• Yes or No
	8	Do you think a majority of the people who went to Kazakhstan in the 90's came back?	• Yes or No

	9	Does any form of land use management currently exist to avoid grazing conflicts? What kind of disputes?	<ul style="list-style-type: none"> • Yes or No • Type of dispute: _____
	10	Is cattle rustling from Russia a problem here?	<ul style="list-style-type: none"> • Yes or No
Habitat Information	11	At present, do local herder communities or local county governments work together in any way? If so, has this collaboration been successful?	<ul style="list-style-type: none"> • Yes or No • Yes or No
	12	What is the current condition of pastureland here? (1-5 where: optimum=1 and overgrazed=5)	1 2 3 4 5
	13	Has the condition of rangeland improved (increased), decreased or remained unchanged over the last years?	<ul style="list-style-type: none"> • 5 years + or — or stable • 10 years + or — or stable • 15 years + or — or stable • 20 years + or — or stable
	14	Why has this trend occurred?	
	15	Is depredation of livestock a problem here? (does it occur here?) If so, what predators?	<ul style="list-style-type: none"> • Yes or No • Wolf, snow leopard, Feral dogs, Other _____
Altai Argali Information	16	Do you think the number of argali in your area is currently increasing, decreasing, or stable?	<ul style="list-style-type: none"> • Increasing Decreasing Stable
	17	How have the # of Argali changed in this area over the last years? Why has this trend occurred?	<ul style="list-style-type: none"> • 5 years + or — or stable • 10 years + or — or stable • 15 years + or — or stable • 20 years + or — or stable • Why? _____ _____
	18	Is argali range increasing, decreasing, or unchanged?	<ul style="list-style-type: none"> • Increase Decrease Stable
	19	If the number of herders and livestock continue to increase in this area, will the population and range of argali increase, decrease, or stay the same?	<ul style="list-style-type: none"> • Increase Decrease Stable

Altai Argali Information	20	Is it currently possible for argali and livestock to coexist in the same area?	<ul style="list-style-type: none"> • Yes or No
	21	Have you seen argali killed by predators? If so, what predator and when?	<ul style="list-style-type: none"> • Yes or No • If so, by What _____ When _____
	22	Do argali in SNNCP stay in Mongolia all year? If no, when and where do they go in their seasonal movements?	<ul style="list-style-type: none"> • Yes or No • Where: _____ • When: _____
	23	Do herder and livestock movements affect argali movement patterns?	<ul style="list-style-type: none"> • Yes or No
	24	What group(s) hunts argali here? Please rank the groups in order.	<ul style="list-style-type: none"> • _____ Hunting by local herders • _____ Hunting by visitors (Mongolian, Russian, or Both) • _____ Hunting foreign trophy hunters • _____ Hunting by Border Soldiers (Mongolian, Russian, or Both) • _____ Other: _____
	25	Have you ever hunted or heard about anyone hunting argali here?	<ul style="list-style-type: none"> • Yes or No • Hunted: When _____ Where _____ How? _____ Why – sport, food, pest, other _____ • Heard: When _____ How _____ Where _____ Why – sport, food, pest, other _____
	26	Hunting argali is....?	Prohibited Regulated Unrestricted
	27	Do you drive argali away on purpose?	<ul style="list-style-type: none"> • Yes or No
28	Is it important to protect argali here? Is it important to protect argali in Mongolia? Why?	<ul style="list-style-type: none"> • Yes or No • Yes or No • Why: _____ 	

Altai Argali Information	29	Prioritize threats to argali by ranking	<ul style="list-style-type: none"> • ____ Overgrazing • ____ Hunting • ____ Loss to predators • ____ Other: _____
	30	Have natural disasters (ZUD) been a problem here. If so, when have they affected Argali?	<ul style="list-style-type: none"> • Yes or No • When: _____
	31	Was winter fodder given to Argali in hard winters during socialist times in this area? If so, should this practice continue?	<ul style="list-style-type: none"> • Yes or No • Yes or No
Conservation Information	32	Do you know that you live in a National Park or its buffer zone?	<ul style="list-style-type: none"> • Yes or No
	33	Do you know that argali are a protected animal both in Mongolia and Internationally? Why do you think it is protected?	<ul style="list-style-type: none"> • Yes or No • Why? _____ _____
	34	Do you know of the park rangers that MANSPAA has in this area?	<ul style="list-style-type: none"> • Yes or No
	35	Can you read Mongolian well enough to understand Mongolian environmental law?	<ul style="list-style-type: none"> • Yes or No
	36	Would you like more information about the protected area network and environmental law here?	<ul style="list-style-type: none"> • Yes or No

APPENDIX II: MONGOLIAN TRANSLATION OF QUESTIONNAIRE.

Herder Survey on Altai Argali (*Ovis ammon ammon*) #_____

Siilkhemiin Nuruu National Park

- Судлаачийн нэр: _____ • Аль аймаг,сум,баг: _____
 • Огноо: _____ GPS: _____ • ХЦ-ийн ростоос хэдэн км : _____

?	#	Questions	Response
Малчдын амьдралын судалгаа	1	# ам бүлийн тоо нас хүйс	
	2	Хэдэн төрлийн малтай вэ?	<ul style="list-style-type: none"> • Бүгд: _____ • Ямаа _____ • Хонь _____ • Адуу _____ • Тэмээ _____ • Сарлаг/Үхэр _____
	3	Танай гэр бүлд одоо байгаа мал тань хүрэлцээтэй уу?	өсгөх хэвийн болгох багасгах
	4	Хэдэн жил мал малласан бэ? Хэдэн жил энэ газарт амьдарсан бэ? Өмнө нь ямар ажил эрхэлдэг байсан бэ?	<ul style="list-style-type: none"> • Малчин _____ • Энэ газарт _____ • Ямар ажил _____
	5	Улирлаар нутагладаг газруудын байршил	<ul style="list-style-type: none"> • Өвөлжөө _____ • Хаваржаа _____ • Зуслан _____ • Намаржаа _____
	6	Тухайн нутагт малын тоо толгойн өсөлт жилүүдэд ямар байсан ...?	<ul style="list-style-type: none"> • 5 жил + — хэвийн • 10 жил + — хэвийн • 15 жил + — хэвийн • 20 жил + — хэвийн
	7	Танай гэр бүлийнхэнээс Казакстан руу нүүж яваад буцаад нүүж ирсэн нь байна уу?	• Тийм / Үгүй
	8	Казахууд 90-ээд оны эхээр их нүүдэл хийсэн,эдгээрээс буцаж ирэгсэд их байсан уу?	• Тийм / Үгүй

	9	Газар ашиглалт, бэлчээрийн маргааны зохицуулалт гэж байна уу? Зөрчилдөөн нь 2 хүний хооронд уу, 2 багийн хооронд уу, эсвэл 2 айлийн хооронд уу?	<ul style="list-style-type: none"> • Тийм / Үгүй • Зөрчилдөөний талууд: _____
	10	Энэ газар нутагт Оросын талаас мал хулгайлах явдал гардаг уу?	<ul style="list-style-type: none"> • Тийм / Үгүй
Газрын судалгаа	11	Одоогоор орон нутгын удирдлагууд, эсвэл малчдын нөхөрлөлүүдийн хамтарч ажиллах, амьдрах хэлбэр бий уу? Хэрвээ тийм бол энэ нь хэрэгжиж байна уу?	<ul style="list-style-type: none"> • Тийм / Үгүй • Тийм / Үгүй
	12	Одоо энд бэлчээр газар ашиглалт ямар байна вэ? (1-5 үнэлнэ үү: маш сайн=1, маш муу=5)	<div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div>
	13	Газар ашиглалт, бэлчээрийн хүрэлцээ өнгөрсөн жилүүдээс ямар байна вэ? Жилээр тооцно уу.	<ul style="list-style-type: none"> • 5 жил + — хэвийн • 10 жил + — хэвийн • 15 жил + — хэвийн • 20 жил + — хэвийн
	14	Газар бэлчээрийн хүрэлцээ яагаад өсч, буурсан бэ? Юу нөлөөлсөн бэ?	
	15	Махчин амьтад мал агнаж идэх явдал байдаг уу? Иддэг бол ямар амьтад их иддэг вэ?	<ul style="list-style-type: none"> • Тийм / Үгүй • Чоно, Ирвэс, Зэрлэг нохой, Бусад _____
аргалийн судалгаа	16	Өнөөдөр энэ газар нутагт аргалийн өсөлт хэр явагдаж байна?	<ul style="list-style-type: none"> • Өссөн Буурсан Хэвийн
	17	Энэ газар нутгийн аргалийн өсөлт ямар байсан бэ? Жилээр тооцно уу. Яагаад аргалийн тоо толгой өсөж буурах болсон бэ?	<ul style="list-style-type: none"> • 5 жил + — хэвийн • 10 жил + — хэвийн • 15 жил + — хэвийн • 20 жил + — хэвийн • Яагаад? _____
	18	Аргалийн эзэмшил нутаг багассан уу, эсвэл нэмэгдсэн үү?	<ul style="list-style-type: none"> • Нэмэгдсэн Буурсан Хэвийн

Алтайн аргалийн судалгаа

19	Хэрвээ энэ газар нутагт хүн мал өссөн бол аргалийн байршил, нутаг, түүнчлэн тоо толгойд нөлөөлсөн үү?	<ul style="list-style-type: none"> Нэмэгдсэн Буурсан Хэвийн
20	Өнөөдөр бэлчээрт аргаль мал 2 хамт зохицож амьдарч чадах уу?	<ul style="list-style-type: none"> Тийм / Үгүй
21	Махчин амьтад аргаль идсэн явдалыг харсан уу? Хэрвээ иддэг бол ямар махчин?	<ul style="list-style-type: none"> Тийм / Үгүй Ямар амьтан _____ Хэзээ _____
22	Аргалийн сүрэг жилийн турш дандаа Монголын нутагт байдаг уу? Хэрвээ үгүй бол ямар улиралд хаашаа явдаг вэ?	<ul style="list-style-type: none"> Тийм / Үгүй Хаашаа: _____ Хэзээ: _____
23	Аргалийн сүрэг, малчны нүүдэллэлт 2 зохицдог уу?	<ul style="list-style-type: none"> Тийм / Үгүй
24	Ямар хүмүүс аргалийг ихээр агнадаг вэ? Аль нь ихээр агнадагийг балаар ялгаж тэмдэглэнэ үү. 1-ээс дээш тоогоор дугаарлана уу.	<ul style="list-style-type: none"> _____ Нутгийн малчин иргэд _____ Жуулчин анчид (Монгол, Орос, Бусад) _____ Гадаадын жуулчин анчид _____ Хилийн Цэргийнхэн (Монгол, Орос, Бусад) _____ Бусад _____
25	Та аргаль агнасан уу, эсвэл аргаль агнасан тухай сонссон уу?	<ul style="list-style-type: none"> Тийм / Үгүй Агнасан бол: Хэзээ? _____ Хаана? _____ Яаж? _____ Яагаад? – сонирхолоор, хоол, дургуй болоод, бусад _____ Сонссон бол: Хэзээ? _____ Яаж? _____ Хаана? _____ Яагаад — сонирхолоор, хоол, дургуй болоод, бусад _____
26	Аргаль агнах явдал нь...	<ul style="list-style-type: none"> Хориглогдоно Тусгай зөвшөөрлөөр Чөлөөтэй хэрэгжинэ
27	Аргалийг та үргээж, хөөдөг үү?	<ul style="list-style-type: none"> Тийм / Үгүй

Алтайн аргалийн судалгаа		
28	Энэ нутагт аргалийг хамгаалах шаардлагатай уу? Монголд аргалийг хамгаалах хэрэгтэй уу? Яагаад?	<ul style="list-style-type: none">• Тийм / Үгүй• Тийм / Үгүй• Яагаад: _____
29	Аргалийн сүргийг хамгаалах явдалд юу чухал вэ? 1-ээс дээш тоогоор дугаарлана уу.	<ul style="list-style-type: none">• _____ Бэлчээрийн асуудал• _____ Агналт• _____ Махчдын нөлөө• _____ Бусад: _____
30	Энэ нутагт ган зуд тохиолдсон уу? Хэрвээ тийм бол улмаар хэдэн аргаль үхсэн бэ?	<ul style="list-style-type: none">• Тийм / Үгүй• Хэзээ: _____
31	Социализмын үед өвөл аргальд өвс тэжээл, давс өгдөг байсан уу? Хэрвээ тийм бол энэ нь ач холбогдолтой уу, цаашдаа байлгах шаардлагатай юу?	<ul style="list-style-type: none">• Тийм / Үгүй• Тийм / Үгүй

Хамгаалалтын тухай судалгаа		
32	Та ТХГ нутаг эсвэл түүний орчны бүст амьдардаг гэдгийг мэдэх үү?	<ul style="list-style-type: none">• Тийм / Үгүй
33	Та аргалийг Монгол болон дэлхийд ховордсон амьтан гэдгийг мэдэх үү?	<ul style="list-style-type: none">• Тийм / Үгүй• Яагаад? _____
	Яагаад?	
34	Та энэ газар нутгийн ХЗ-ны байгаль хамгаалагч байдаг гэдгийг мэдэх үү?	<ul style="list-style-type: none">• Тийм / Үгүй
35	Та монголоор байгалийн тухай хууль эрхийн актуудыг уншиж, ойлгож чадах уу?	<ul style="list-style-type: none">• Тийм / Үгүй
36	Та байгалийн тухай хуулиуд, ТХГН-ын тухай шинэ мэдээлэл авмаар байна уу?	<ul style="list-style-type: none">• Тийм / Үгүй