CONSERVATION CASE STUDY OF THE GOBI BEAR

by

Peter J. Balint and Jennifer A. Steinberg

1.   INTRODUCTION

A small population of brown bears ekes out a tenuous existence in the Gobi desert of southwestern Mongolia. The predicament of these bears, known locally as *mazaalai*, exemplifies many of the problems that confound conservation biologists attempting to preserve endangered species in the developing world.

Successful interventions require not only a reasonably full understanding of the ecology of the populations at risk but also a grasp of local human factors whose complexity outsiders can easily underestimate. In the case of the Gobi bear—as in many such instances—important ecological data are missing, experts express contradictory appraisals of the information that is available, and policy options are constrained by social realities that, once understood, force conservationists to face uncomfortable trade-offs and compromises.

This chapter provides a detailed assessment of the status of the Gobi bear based on a review of the literature and on information gathered during a visit to the Great Gobi National Park (GGNP), which encompasses the bears' entire range.

## 2.	ECOLOGICAL FACTORS

The Gobi bear is unique among brown bears (*Ursus arctos*) in having adapted to desert conditions (Finch, 1999). It survives in extremely limited numbers, however, and the long-term outlook for the remaining population is uncertain at best. *Mazaalai* are listed as "very rare" in the *Mongolian Red Book* (1997) and given full protection in Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

### 2.1	Taxonomy

The taxonomic status of the Gobi bear is unsettled. Sokolov and Orlov (1992) identified *mazaalai* as a distinct species, *Ursus gobiensis*, but others (Schaller et al., 1993; McCarthy, 1996) question the validity of this designation, noting that it was based only on a morphological assessment of a limited sample.

The more commonly used classification, *Ursus arctos pruinosus* (e.g., Zhirnov and Ilyinski, 1986), is based on an assumed connection with Tibetan brown bears. However, other Central Asian subspecies are more similar in appearance to the Gobi bear and have home ranges in closer geographical proximity. These include in particular *Ursus arctos isabellinus* (found in the Tian Shan mountains to the west) and *Ursus arctos arctos* (inhabiting portions of the Altai range to the north). In the past, brown bear

populations almost certainly inhabited the entire Altai and Tian Shan ranges up to and including current *mazaalai* habitat. The Gobi bear, therefore, may be a remnant population of one or both of these subspecies (Schaller et al., 1993).

Further illustrating the lack of consensus among experts, the current *Mongolian Red Book* (1997) identifies the Gobi bear as *Ursus arctos gobiensis* and credits Sokolov and Orlov (1992) with the designation. As discussed below, Thomas McCarthy, the Western scientist who has studied the bears most closely in recent years, is presently conducting genetic analyses of hair samples to clarify the Gobi bear's taxonomy. Results of this ongoing study will have important implications for conservation decision-making. The Gobi bear population is ecologically unusual and merits protection even if only a remnant population of otherwise relatively common brown bears. It would certainly deserve greater attention, however, if confirmed as a distinct species.

2.2   Population

Estimates of the size of the remaining Gobi bear population vary between 25 and 40 animals (e.g., Zhirnov and Ilyinski, 1986; Schaller et al., 1993; *Mongolian Red Book*, 1997), but no authoritative census has been conducted. McCarthy offers 35 as a reasonable guess (McCarthy, personal communication 1998). Zeskhuu, a 72-year-old Mongolian camel herdsman who lives in the Egiin Gol oasis near the eastern end of the bears' territory, believes 40 *mazaalai* remain (Zeskhuu, personal communication 1998). His estimate is highly credible: he is a skilled amateur naturalist who has observed the desert wildlife carefully for over fifty years—for much of that time in various semi-official capacities as ranger or environmental protector.

It is not certain, however, that the remaining bears, whatever their number, form a single breeding population. They may be divided into two or perhaps three reproductively isolated subgroups that center their activities around several geographically distinct zones where the only permanent water sources are located. The harsh environment may discourage the movement necessary for gene flow among these subpopulations

2.3   Range

Mazaalai range, covering approximately 15,000 sq km in the Gobi desert, is characterized by rocky, arid plains punctuated by three jagged mountain massifs. The mountainous regions, Tsagaan Bogd to the east, Shar Khulst near the center, and Atas Bogd to the west, are aligned at approximately 43º north latitude in Mongolia's southwest corner (see maps).

The bears' known territory extends 300 to 350 km from east to west and 50 to 75 km from north to south. The three mountainous regions, each encompassing between 1000 and 1500 sq km, account for perhaps 25% of the total area; the remaining terrain is primarily super-arid desert flats paved with a natural surface of broken black stones and gravel. Vegetation in the intermountain areas, including saxaul bushes (*Haloxylon ammodendron*) and other drought-resistant shrubs (e.g., *Tamarix* spp.), is extremely sparse and rarely grows higher than 50 cm (see Zhirnov and Ilyinski, 1986).

The mountainous regions begin with barren foothills marking the approach to substantial central upcroppings. From the plateau, at an average elevation of 1000 m above sea level, Tsagaan Bogd rises to 2695 m, Shar Khulst to 1754 m, and Atas Bogd to 2695 m. Each massif harbors several permanent springs in declivities and low valleys

lying among rocky hills. In addition to providing water essential for survival, these seeps support the richer vegetation that constitutes the bears' primary natural diet and serves as nesting and denning sites.

During a visit to a small oasis in the Tsagaan Bogd foothills, park ranger Davaadagva, also a resident of Egiin Gol, pointed out bear sleeping areas formed of dried and matted grass stalks completely hidden within *Phragmites* thickets growing up to two m in height.

2.4   The Possibility of Population Isolates

Although individual bears cover considerable distances—e.g., Schaller et al. (1993) report that an animal fitted with a radio collar traveled at least 48 km in a north-south direction—activity is largely centered around the three mountainous zones and their permanent water sources.

The Shar Khulst and Atas Bogd ranges are not widely separated, and it seems likely that *mazaalai* move freely between these two areas. The largest bear group is found in this region. Through genetic analysis of hair samples, McCarthy has recently succeeded in identifying 15 of the perhaps 20 individuals that use Shar Khulst as their primary habitat (McCarthy, personal communication 1998).

Tsagaan Bogd is more isolated, however. Fifty to 100 km of arid, unrelenting plains separate this mountainous upcropping from Shar Khulst to the west. Davaadagva has been able to identify, through careful observation and measurement of footprints, five bears that frequent Tsagaan Bogd. He does not believe there is interbreeding between this tiny subgroup and the larger population studied by McCarthy (Davaadagva, personal

communication 1998). Zeskhuu notes that *mazaalai* are capable of traversing the necessary distances—in years past, he has seen signs of the Tsagaan Bogd bears in the Tost mountains 50 km beyond the park boundary to the east—but admits there are presently no indications that interbreeding with the Shar Khulst group is taking place (Zeskhuu, personal communication 1998). Both local experts agree that the sex ratio of the small Tsagaan Bogd population is skewed (only one animal is known to be female) and that no young have been seen in the area for six years.

In summary, though 35 to 40 bears may remain in the Gobi desert, the reproductive population may be closer to 20 in number. In any case, surviving bears are highly inbred (McCarthy, 1996).

2.5   Population Trends

Current census estimates for Gobi bears are subject to considerable uncertainty, but figures characterizing historical population trends are little more than guesswork. The presence of bears in the Gobi was not noted by an outsider until 1900, when Russian researcher V. Ladygin observed tracks and diggings in the areas surrounding the three massifs described above (Zhirnov and Ilyinski, 1986). The first confirmed sightings did not occur until 1943 (Bannikov, 1954). Attempts to estimate population levels with some scientific precision only began with Schaller et al. (1993), and continue now with McCarthy.

Despite the lack of reliable data, published reports (e.g., Zhirnov and Ilyinski, 1986) suggest that populations have remained steady since the early 1970s. The population may have stabilized in recent decades, albeit at dangerously low levels, now that the remaining range has been reduced to remote, hostile territory far from

anthropogenic influences. For example, Egiin Gol, the only human settlement within 200 km of Tsagaan Bogd, is home to fewer than 70 people, including children, and is itself two grueling hours by four-wheel-drive vehicle from the nearest approachable mountain spring where signs of bear are found.

Anecdotal evidence provided by village elders (Zeskhuu, personal communication 1998; see also Schaller et al., 1993) suggests that in decades past the bears' range was considerably more extensive (and, therefore, that populations were higher). Before 1970, *mazaalai* are thought to have permanently inhabited the Edrengiyn Nuruu mountains to the north and the Tost range to the east (see maps). Encroachment into these areas by traditional semi-nomadic herders and their domesticated livestock gradually reduced the population to its current number in the present restricted range.

The *Mongolian Red Book* (1997), however, gives a different estimate of population trends. This work reports that the entire population consisted of only 15 to 20 bears throughout the 1960s, that numbers peaked at 50 to 60 in the late 1980s, and that the population declined to present levels by the early 1990s (see also Shiirevdamba, this volume).

It is reasonable to assume that numbers were significantly higher before 1970, when the *mazaalai* range may have been at least three times greater than its present area. Nevertheless, inconsistent estimates by experts illustrate the difficulty of acquiring reliable information on population trends.

2.6   Habitat and Climatic Conditions

Carrying capacity for bears in this hostile environment is extremely low. If 30 bears survive in 15,000 sq km, present population density is on the order of one animal per 500 sq km. This is a reflection of the poor nutritional quality of food supplies and the exceptionally harsh climate.

According to Terbish, technician in charge of Egiin Gol's meteorological station, daytime air temperatures average 38º C in summer and -27º C in winter months. Wind speeds in the spring, when bears are weakest after emerging from hibernation, average a continuous 16 to 18 m per second. The region is extremely arid: over the previous decade, annual precipitation has averaged 50 mm, and years with no precipitation are not uncommon (Terbish, personal communication 1998).

There is considerable agreement among experts that regional ecosystems are under stress. Shiirevdamba, a Mongolian biologist and former deputy minister of the Ministry of Nature and the Environment (MNE), believes desertification driven by global climate change may be causing habitat declines in the Gobi, a view echoed by McCarthy. Terbish notes that groundwater levels at Egiin Gol have dropped 30 cm over the past decade, affecting the reliability of water supplies at the small oases frequented by bears and other wildlife in the surrounding desert. Zeskhuu, the observer with the longest view, has seen significant ecological impoverishment and loss of biodiversity since the 1940s. He attributes these changes to a consistent decline in average rainfall totals over the past 50 years.

Even here, however, there is no consensus. Davaadagva sees signs that oasis ecosystems are recovering from the extended drought of the 1980s and early 1990s. He

believes plant life has been somewhat thicker and more diverse as precipitation has increased slightly since 1993.

2.7   Life History and Ecology

Little is known with certainty regarding Gobi bear ecology (McCarthy, 1996). Information is lacking as to age of first reproduction, litter size, and other relevant variables necessary to quantify reproductive success (Steinberg, 1998). Mortality rates are also unknown. Dietary habits for early summer have been estimated through analysis of droppings (Schaller et al., 1993), but seasonal forage patterns have not been determined. Inter- and intraspecific contact and conflict have not been characterized. Breeding behavior has not been observed. Denning ecology has not been studied (McCarthy, 1996).

What information is available has been pieced together from anecdotal accounts, observations of signs of bear activity, and rare, largely ad hoc encounters between researchers and individual animals. The sketchy knowledge at hand can be summarized as follows. *Mazaalai* are relatively small for brown bears. Schaller et al. (1993) report that one adult weighed 120 kg. Davaadagva (personal communication 1998) has measured an adult hind footprint 22 cm in length, a size that matches this weight estimate. Females likely give birth no more often than once every three years, and although litters of two young are occasionally observed, one cub seems to be the norm (Zhirnov and Ilyinski, 1986). Bears are generally solitary in their movements and may be active at night or during the day (Sloth, 1994). Hibernation (in dens built up of dried

grasses or in mountain caves with southern exposure) is from November to February or March (Zhirnov and Ilyinski, 1986).

Analysis of droppings (Schaller et al., 1993) reveals that *mazaalai* eat the rhizomes of wild rhubarb (*Rheum nanum*), the berries of nitrebushes (*Nitraria* spp.), grass shoots (e.g., *Phragmites*), wild onion (*Allium* spp.), *Ephedra*, and other plants supported by desert springs. Small amounts of animal matter (reported to be approximately 1% of total intake) are also consumed, including rodents and meat scavenged from carcasses.

These results may be distorted, however. Fecal material tested was recovered from bears offered livestock feed in the spring by park rangers to supplement meager natural forage available in the weeks after they awaken from hibernation. Supplemental feed constituted 90% of the scat analyzed in the study, clearly indicating deviations from natural feeding patterns.

Although competition dynamics are unknown, *mazaalai* certainly share their hostile habitat with other large mammals. A visit to the oasis in the Tsagaan Bogd massif frequented by bears revealed footprints and droppings of Asiatic wild ass (*Equus hemionus*), wild mountain sheep (*Ovis ammon*), and wolves (*Canis lupus*). A fox (*Vulpes vulpes*) and several gazelle (probably *Gazella subgutturosa*) were sighted on the rocky plains between Egiin Gol and Tsagaan Bogd.

Some researchers suggest bear cubs may be lost to wolf predation (e.g., Shiirevdamba, personal communication 1998), but others are skeptical (e.g., McCarthy, personal communication 1998). Schaller (1995) reports convincing evidence that wolves prey on the young of wild camels (*Camelus bactrianus ferus*), another endangered animal

that inhabits a strictly protected area set aside within the Great Gobi National Park. There is certainly competition for water among large mammals at desert oases. For example, Schaller (1995) observed wild camels using aggressive behavior to prevent wild ass from approaching a watering hole. The *Mongolian Red Book* (1997) reports that bears may fight to the death over access to supplies of food and water, though local experts report no signs of such intraspecific conflict.

2.8   Research and Conservation Measures to Date

The Gobi desert habitat of the remaining *mazaalai* is remote, isolated, and inhospitable. Before 1990, scientific research into Gobi bear ecology was sporadic and largely descriptive in nature.

The first effort to investigate bear behavior in the region systematically was Schaller et al. (1993). Using foot snares baited with dried goat meat, these researchers succeeded in trapping four male bears—three in May and June 1990 and one in May 1991. The animals were fitted with radio collars and tracking was attempted. Logistical problems limited the results. One bear was never relocated, one was rarely found, and signals from the other two subjects were occasionally lost. Nevertheless, some behavior patterns were revealed. Collared bears were typically more active at night. Activity was generally centered around feeding areas, but the two bears whose signals were received with some regularity also traveled extended distances (straight-line travel for a subadult male was reported to be between six and 11 km daily). The research essentially ended in June 1991, and studies to replicate or supplement the findings have not been undertaken.

McCarthy believes trapping and handling individuals of such a tiny population may not be appropriate (McCarthy, personal communication 1998). His investigations (which are continuing with results not yet published) rely on trip cameras and genetic analysis of hair samples. He and his assistants recover hair that is shed naturally or caught on barbed wire temporarily strung for the purpose in places where bears often pass. Through this less intrusive research methodology, McCarthy hopes to identify individuals, determine inbreeding levels, and settle the taxonomic status of the population.

The MNE has undertaken two conservation measures. The first, in 1976, was to establish the Great Gobi National Park. As mentioned above, the *mazaalai* range lies entirely within the park's boundaries, and this territory has been designated a Strictly Protected Area. There is little enforcement at the site, however; the harshness and remoteness of the terrain appear to be the bears' best protection.

The second conservation measure was the institution of a supplementary feeding regime to be carried out annually in April, May, and early June when the animals are most at risk. During this period, bears have emerged from hibernation, but their primary forage plants are not yet mature. Park personnel place livestock feed pellets with relatively high nutritional value at mountain oases where *mazaalai* are active. As Schaller et al. (1993) observed, the bears utilize this food source heavily when it is available.

The spring feeding program continues at Shar Khulst. This site is home to the largest group of bears and is closer to park headquarters. Due to budget constraints, however, funding for supplementary feeding in the more remote Tsagaan Bogd area was

eliminated in April 1997, and systematic nutritional support is no longer provided for

bears in this area (Davaadagva, personal communication 1998).

2.9   Threats and Prognoses

Just as there are uncertainties concerning the history, ecology, and present status of

mazaalai in the Gobi, experts disagree about threats to the population's survival. The

Mongolian Red Book (1997) lists accidental trapping and killing by humans, disturbances

by domestic livestock, and intraspecific competition. Schaller et al. (1993) list

disturbances caused by military posts on the Mongolian-Chinese frontier, trade traffic

across the border, and the potential for hunting (since bear parts are valuable in the

Chinese market). Shiirevdamba (personal communication 1998) suggests that declining

habitat and desertification are primary threats, along with wolf predation of cubs and

hunting by locals and foreigners.

On the other hand, McCarthy (personal communication 1998) believes there are

no significant negative effects associated with human activity in the region and that wolf

predation is unlikely to be a problem. Local experts Davaadagva and Zeskhuu (personal

communications 1998) agree with this assessment. They believe the most important

threat is poor nutrition generally, with meager food supplies in the spring being the major

concern. Zeskhuu emphasizes, however, that although anthropogenic influences are no

longer a cause for concern, it was human encroachment into *mazaalai* territory in the

1960s and 1970s that reduced them to their present precarious position.

Although the population is small, inbred, and restricted to marginal habitat, the

odds for long-term survival are hard to determine. A population viability analysis using

computer modeling indicates the bear is likely to go extinct within 10 to 15 years

(Steinberg, 1998). The data underlying this assessment are incomplete, however, and the

population apparently has remained stable at current levels for at least three decades

despite modeling that predicts declining growth rates in all scenarios. Ecological factors

not included in the analysis may allow the population to persist despite limited numbers

and difficult environmental conditions.

3.   THE ECONOMIC, SOCIAL, AND POLITICAL CONTEXT

Mongolia, home to the small remaining population of Gobi bears, is a poor and isolated

nation presently struggling through the wrenching transition from Soviet-style socialism

and a command economy to democracy and free-market capitalism. With the dissolution

of the Soviet Union in 1991, and the subsequent elimination of external budget subsidies

and favorable foreign trade arrangements, Mongolia suffered a macroeconomic

contraction almost twice as deep as that experienced by the United States in the Great

Depression (*Human Development Report Mongolia*, 2000). Within months, government

revenue fell by half and imports by two-thirds.

  The social fabric was strained to the limit. The currency collapsed, savings lost

their value, inflation and unemployment soared, government pension funds ceased to

make payments to retirees, subsidies for health care and education were reduced or

eliminated, and funding for scientific research all but disappeared.

  Economists believe Mongolia will benefit in the long run from opportunities that

come with independence, democracy, and openness to outside investment (*Human

Development Report Mongolia*, 1997). Already, real wages in some sectors have returned

to 1990 levels and a wider variety of consumer goods are available. At present, however, the nation simply cannot afford to underwrite conservation projects when broad segments of its human population are struggling to survive.

3.1   Economic Factors

3.1.1   The National Economy

Mongolia's gross domestic product (GDP) is approximately US$1 billion. Average per capita income for the nation's 2.4 million inhabitants, therefore, is approximately $425 a year (*Mongolian Statistical Yearbook*, 1998; *Human Development Report Mongolia*, 2000). To get a true sense of economic circumstances, however, it is necessary, first, to take into account relative price differentials among nations and, second, to adjust for non-monetary exchanges (i.e., bartering) that make up a significant, though unmeasured, percentage of the rural economy. Taking these factors into account, per capita purchasing power parity (PPP) is estimated to be approximately $2500 per year (*Human Development Report Mongolia*, 1997).

Nevertheless, the majority of Mongolians face dire economic circumstances. Since 1991 inflation has averaged 108% per year, with price increases reaching a hyperinflationary peak of 325% in 1992. As a consequence, the exchange rate for the national currency, the tugrig, dropped from 40 to the US dollar in 1992 to 1100 to the dollar in 2000. Families now spend an average of 44% of household income on food, and many are unable to meet basic needs. According to the United Nations Development Programme (UNDP), a third of the population lives at starvation levels (*Partnership for Progress*, 1997). Most vulnerable are the unemployed, retirees, and children.

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The situation in urban areas is particularly difficult. Unemployment rose through the early 1990s as inefficient state-owned enterprises collapsed and a high percentage of newly established private concerns quickly failed. Economic declines continue. Industrial production dropped from representing 32% of the nation's economic activity in 1995 to 20% in 1997, and the number of private firms fell by 50% over the same period (*Mongolian Statistical Yearbook*, 1998).

Animal husbandry has been the foundation of Mongolia's economy for centuries, and approximately half Mongolia's population still lives as semi-nomadic herders in the country's vast and sparsely populated mountains, steppes, and deserts (Badarch et al., this volume). In this difficult adjustment period, the traditional rural way of life provided a measure of stability, guaranteeing at least subsistence to those living in the countryside, and saved the nation from complete economic collapse.

In fact, the rapid urbanization of the past several decades has been temporarily reversed as unemployed urban residents return to their roots in search of a steady food supply and a semblance of economic well-being (*Partnership for Progress*, 1997). The urbanized percentage of the population grew from 10% in 1920 to 57% in 1992 but dropped back to 52% by 1997 (*Human Development Report Mongolia*, 1997; Batjargal, this volume). In response, the number of head of livestock has risen to the highest levels in 50 years (29 million animals, up from 26 million at the beginning of the 1990s), and there are now signs of overgrazing in many areas (Tumurjav, this volume; *Human Development Report Mongolia*, 2000).

3.1.2 Local Economic Effects in the Gobi

Changes in the national economy have had profound effects in Egiin Gol. In the socialist period, the village was a government-funded research station. Work was conducted to develop vegetable plants adapted to the desert climate, gather environmental and meteorological data, and monitor the region's wild flora and fauna.

Regular small airplane flights connected the village to Ulaanbaatar. Fresh produce grown in the village's experimental gardens was sent to market in the capital, and seeds were shipped for planting in other arid regions of the country where central planners established agricultural collectives. During this period, outsiders moved to Egiin Gol, and the local population grew to 40 families, over 200 people altogether.

In 1992, as a direct result of the national economic crisis, both the air service and the budget for horticultural research were eliminated. According to Olonbayar, the current mayor, there is talk of privatizing the seed research station, but the government has yet to make a decision. In the meantime, outsiders have departed, production has dropped off, and villagers have a difficult time finding markets for the reduced quantity of vegetables they continue to harvest. They have to take their products to other settlements to sell, a roundtrip of 500 km or more on rough desert tracks, or wait for customers to come to them, a rare event. Olonbayar believes the only hope for economic revitalization is the possibility of opening an overland trade route across the Chinese border 100 km to the south. Government officials in the capital are considering such a plan (Olonbayar, personal communication 1998).

Funds have been cut for environmental protection as well. Until April 1997, the ranger station in Egiin Gol had an annual budget of approximately US$3000, of which

$800 was earmarked for expenses associated with providing supplemental feeding to the local population of Gobi bears. Now, Davaadagva receives his salary but no other funding. His pay is 20,000 tugrigs per month, approximately $20 at 2000 exchange rates. Only rarely can he afford to buy gasoline for his motorcycle to visit the park area he is supposed to be protecting. When he has the opportunity to go, he takes remains from the carcasses of slaughtered domestic animals to leave for the *mazaalai* in Tsagaan Bogd, now that budget constraints at the MNE make it impossible for park administration to provide supplemental livestock feed at the eastern end of the bears' range.

3.1.3   Economic Constraints on International Organizations

The Mongolian government presently suffers from debilitating budgetary shortfalls, but international governmental and nongovernmental organizations that support environmental protection also operate with limited resources and must decide where interventions can be most effective.

For example, WWF (known as World Wildlife Fund in the United States and Canada and World Wide Fund for Nature elsewhere) has in the last few years shifted to global ecoregional planning (Olson and Dinerstein, 1998). The organization has identified 233 areas around the world that if preserved would facilitate the survival of a wide range of representative terrestrial, aquatic, and marine species. The concept of preserving large habitat zones, rather than targeting individual species at risk, is intended to serve as the foundation for a coherent, rational, and integrated global conservation strategy that allocates resources effectively (Olson and Dinerstein, 1998).

Two ecoregions identified by WWF fall across part of Mongolian territory: the Daurian steppe in the northeast and the Altai-Sayan area of montane forest, lakes, and

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wetlands in the northwest (Wilson, 1997). The organization is devoting the bulk of its resources designated for environmental protection in Mongolia to work in these two areas. According to Chimeg, WWF program manager in Ulaanbaatar, the three-year budget covering the organization's activities in Mongolia from 1997 to 2000 totals 500,000 Swiss francs (approximately US$330,000). Eighty percent of these funds are targeted to the western ecoregion and the remaining 20% to the eastern zone (Chimeg, personal communication 1998).

WWF does not have the resources to attempt to save every endangered species or population. Chimeg notes that the outlook for the bear population in the Gobi may be so uncertain that the limited funds available would be better spent on programs more likely to have positive outcomes.

UNDP and the Global Environmental Facility (GEF) recently rejected a grant proposal submitted by the MNE requesting $75,000 for research and conservation support related to the Gobi bear (Shiirevdamba, personal communication 1998). At the same time, GEF approved funding for wild camel conservation projects. Like Chimeg of WWF, former MNE deputy minister Shiirevdamba also attributes the lack of international funding for *mazaalai* conservation to pessimism about the population's viability.

McCarthy, however, has a different view (McCarthy, personal communication 1998). Support for his current research on the Gobi bear, provided by the Wildlife Conservation Society (WCS) and the International Association for Bear Research and Management (IBA), totals approximately US$10,000 per year, and he believes this is sufficient. Expenses are kept low because the work is conducted in conjunction with

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other WCS projects in the Gobi. He argues that the MNE grant proposal mentioned above was rejected not because reviewers decided *mazaalai* are a lost cause but because the project was ill-conceived. It proposed trapping and handling of bears, satellite tracking of collared individuals, and other hi-tech interventions that McCarthy believes are not suited to the bears' situation. This may be a case where "less is more"—the best conservation strategy for this tiny population of bears, not presently facing human-induced threats, may be small-scale, nonintrusive research.

3.2   Social Considerations

3.2.1   National Effects of the Transition on Mongolian Society

Although the socialist system created an economy that was inefficient and unsustainable, and a political structure that was authoritarian and antidemocratic, its record of social achievement was striking (*Human Development Report Mongolia*, 2000). By 1990, for example, Mongolia had an adult literacy rate of 96%, compared with 81% in China and 37% in Bangladesh. Free universal health care during the socialist period led to dramatic declines in infant mortality, in deaths among mothers during childbirth, and in death rates generally. Average life expectancy reached 64 years, higher than other countries with similar levels of per capita GDP. These advances were a direct result of a substantial government commitment: from 1975 to 1990, 40% of total expenditures were devoted to social programs.

Moreover, at the beginning of the transition, Mongolia was a relatively egalitarian society. As in other Soviet bloc countries, government officials took advantage of rank and position to gain privileged access to consumer goods that were in short supply

(because of the effects of artificially low prices established by central planners), but gross income inequalities, such as those seen in India or Latin America, did not exist (*Human Development Report Mongolia*, 1997).

In the short-term at least, the transition has led to a deteriorating situation. Per capita expenditures on health care, for example, have fallen 42%, with rural areas most dramatically affected (*Human Development Report Mongolia*, 2000). Privatization of some costs of education has led to lower enrollment and completion rates among the poor, and the proportion of the population living in poverty has risen significantly, from approximately 15% in 1991 to either 20% or 36%, depending on how poverty is defined and assessed. The lower figure is based on Mongolian State Statistical Office instruments and the higher on World Bank measures (*Human Development Report Mongolia*, 2000).

The long-term outlook is for improvements that will surpass the previous society's achievements, and in any case the old system could not be sustained and restructuring was inevitable. Nevertheless, social costs of the transition have been high.

3.2.2   Local Social Effects in the Gobi

Changes at the national level were repeated in microcosm in Egiin Gol. When budget constraints forced the government to eliminate funding that had supported research and subsidized air service, the vitality—perhaps even the viability—of the community was undercut. As outsiders returned to their own regions or moved to the cities in the early 1990s, the population fell by two-thirds, from more than 200 to fewer than 70. With them went the library, the school, the movie house, and the health clinic.

Olonbayar, the mayor, observes that life in the village is drearier now as well as less rewarding economically. Townspeople seemed genuinely excited by the visit from

outsiders that provided information for this chapter, and conversations continued past two in the morning. Despite the present social and economic turmoil, those who spoke up at these gatherings accepted the need for change and expressed optimism that better times would come after the nation, and the village, passed through the difficult adjustment period. The mayor reiterated his hope that a trade route to China would be established to generate income for the village.

3.3 Political Issues

Political officials, scientists, and common people in Mongolia all express support for environmental protection. WWF characterizes Mongolia's post-transition governments as the most environmentally concerned in Asia (Wilson, 1997). Batjargal, Minister of Nature and the Environment in the first elected government, writes that the traditional nomads' understanding of interdependence between human beings and nature explains his country's strong environmental policy (Batjargal, this volume).

The conservation ethic in Mongolia has deep roots. By the time of Marco Polo's visit in the 13th century, there were already rules specifying limited hunting seasons for rabbit, deer, saiga, and gazelle. During the 18th century, areas around 16 mountains were protected from hunting, cultivation, and logging. Bogd Khan mountain near Ulaanbaatar has been continuously protected since at least the 13th century and in 1778 became one of the world's earliest formally established nature reserves (Finch, 1999; Batjargal, this volume).

Recent administrations have continued this tradition with strong and affirmative legislation. Twenty new environmental laws were enacted in 1995 and 1996 alone, and

the government has committed itself to the long-term goal of giving protected-area status to at least 30% of the nation's territory. By 1998, approximately 18 million ha, covering just under 12% of the land area, had already been set aside (Batjargal, this volume).

With the lowest population density in Asia, approximately 1.5 inhabitants per sq km, and a continuing tradition of semi-nomadic animal husbandry that alters the natural landscape considerably less than agricultural cultivation, wide sections of the country remain unscarred. With deep-seated public support for environmental protection reinforcing political commitment, Mongolia has a chance to avoid the ecological disasters that have accompanied development in other parts of the world (Wilson, 1997).

Nevertheless, in the present straitened circumstances, the government has to depend on assistance from outside donors to implement its ambitious environmental programs. UNDP and German agencies have committed a total of approximately US$2 million per year to aid in this effort (Wilson, 1997), but many deserving projects remain underfunded.

3.4 Effects of the Transition on the Status of the Gobi Bear

The social, economic, and political upheaval in Mongolia in the last decade has both positive and negative implications for the remaining *mazaalai* population. In the short run at least, what has been bad for the people of Egiin Gol may have been good for the bear. As the town's population has plummeted, human activities that disturb wildlife have been sharply reduced. Airplanes no longer fly overhead and vehicular traffic outside the area of the village itself has been curtailed, as both money and gasoline are in short supply.

On the other hand, supplementary feeding in the spring has been eliminated and pressure is building to open overland trade routes to China that would certainly have adverse effects on fragile desert ecosystems. In fact, Schaller et al. (1993) report that a Mongolian-Chinese border agreement to promote trade led to the opening of two roads through GGNP in 1992, over the objections of the MNE, but Egiin Gol residents stated there was no such traffic in their area.

Not all experts are disappointed that supplementary feeding has been eliminated in Tsagaan Bogd. Bold, a senior Mongolian scientist who did pioneering work on *mazaalai* (e.g., Bold, 1967), believes interventions that distort feeding behavior and create dependencies on artificial food supplies expose the population to added risk (Bold, personal communication 1998).

4.   POLICY ALTERNATIVES AND RECOMMENDATIONS

To return to themes articulated in the introduction, policies to protect the small remaining population of Gobi bears will have to be selected and implemented in a context where important information is missing, where expert opinions are contradictory, and where options are constrained by complex social, political, and economic factors. In the face of uncertainty, strategies should be considered that minimize the likelihood of negative outcomes. Interventions often have unintended consequences, and, in the case of the Gobi bear, there is little margin for error. Policies must also be evaluated for feasibility and sustainability. Preferred options from a conservation point of view may not be practical or politically realistic. Finally, ethical concerns have a place: What are the rights of the

bears and of the human inhabitants of the Gobi, and how are their conflicting needs to be balanced?

4.1   Direct Conservation Options

4.1.1   Major Interventions

Two high-stakes strategies to increase population size have been proposed for the *mazaalai* by the MNE: captive breeding and reintroduction into former ranges (Shiirevdamba, personal communication 1998). Either project could be carried out separately, or the two could be integrated. The best argument in favor of these options is that the severely restricted size of the present population dooms it to rapid extinction, thereby justifying radical action.

Counterarguments have greater weight, however. Removing reproductive adults from such a small population for captive breeding would make survival of the Gobi bear entirely dependent on the success of a program facing many uncertainties. First, it is unknown if bears would breed successfully in captivity. Second, it is not clear that captive-bred young could learn to survive in the exceptionally harsh environment to which they would be released. Third, GGNP personnel presently lack the necessary training and technical infrastructure to undertake such a project (McCarthy, 1996). Reintroduction into former ranges, with or without captive breeding as an intermediate step, would also require removal of reproductive adults from a population already at the lower limits of survivability. Both these proposals, therefore, risk causing the outcome they are designed to prevent—extinction of the population.

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4.1.2   Less Dramatic Efforts

McCarthy suggests a more conservative strategy, including continued supplemental feeding and stricter enforcement of existing limits to anthropogenic disturbance. Concurrently, field studies to acquire basic ecological information, such as genetic status, seasonal feeding habits, and reliable census data, should be accelerated (McCarthy, 1996).

The potential weaknesses of this approach are, first, if the population is in the midst of a rapid decline to extinction, these measures will not stop the slide, and, second, unless conducted with extreme caution, the field studies themselves may contribute to unacceptable levels of disturbance. The animals are most easily located in and around oases. If researchers focus their attention on these areas, *mazaalai* may be driven from the water sources on which they depend for survival. Nevertheless, the patient, minimalist approach based on supplementary feeding and continuing ecological research seems less of a gamble than the more dramatic interventions described above.

Zeskhuu believes that the emphasis in *mazaalai* conservation should be placed on improving the quality of food supplies. Supplementary feeding with livestock pellets is a stopgap measure that should be supplanted by programs to enhance the natural feed stock. He suggests introducing traditional *Ursus arctos* prey species, perhaps rodents or other small game, that would provide sources of high-quality protein. He believes improved nutrition would enhance reproductive success and lead to long-term population growth. In an ideal scenario, population pressures would ultimately lead the bears to expand their range, thereby substantially reducing the risk of extinction. To maintain the present population until such a program takes hold, he recommends offering *mazaalai*

supplementary food with much higher protein content than livestock pellets. He suggests

the bones of slaughtered domestic animals, for example, could be milled to make flour

that could in turn be converted to bear feed (Zeskhuu, personal communication 1998).

Although not susceptible to the severe downside risk associated with captive

breeding or reintroduction programs, Zeskhuu's strategy also faces uncertainty. Would

introduced prey species survive in sufficient numbers? If non-native prey animals were

introduced and became successfully established, would they adversely affect local

ecological dynamics? Also, would bears accustomed to an herbivorous diet adapt to the

new opportunities?

4.2   Alternatives Taking Social Factors into Account

The dilemma at the eastern end of GGNP is that policies to improve the socioeconomic

situation in Egiin Gol and policies to protect the bear population may be in direct conflict.

A cross-border trade route as envisioned by the mayor, for example, would bring

expanded vehicular traffic, increased use of scarce water resources, and heightened risk

of poaching or accidental killing. Without such a development, however, local residents

may be doomed to continuing poverty.

Policymakers have to consider the awkward question of whether the human

population should be maintained at the Egiin Gol oasis. The super-arid Gobi of

southwestern Mongolia is a marginal habitat for humans, as it is for bears. In principle, it

may be better to resettle the human population and leave the region to its wildlife.

Residents have long-standing ties to the area, however. Many fear relocation and others

are comfortable with life in the desert. Zeskhuu, for example, said he left the Gobi once,

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to go to the capital, and was glad to return to the clean air of his home village. He would not accept forced resettlement.

Alternatively, the government could offer incentives encouraging residents to move to ecologically less fragile regions of the country. Yet there are multiple problems with this approach as well. Ideal relocation sites are hard to find. As described above, urban areas, particularly provincial centers, are pockets of unemployment and poverty. On the other hand, survival in rural areas is generally only possible with substantial livestock herds and the expertise to manage them. For the most part, the people of Egiin Gol are sedentary agriculturalists, dependent for over a generation on harvesting vegetables grown in irrigated desert plots. Any resettlement would involve severe dislocation and perhaps be beyond the means of the strapped national government.

4.3   Recommendations

4.3.1   Steps That Should Be Taken at a Minimum

For reasons noted above, captive breeding and reintroduction programs for *mazaalai* are not appropriate in present circumstances. The following positive steps should be undertaken. (1) Continue nonintrusive ecological research, as outlined by McCarthy. (2) Minimize human incursions into bear habitat. (3) Expand action to improve food supplies. This should include the continuation of current supplementary feeding regimes using livestock pellets; the institution of a new supplementary feeding program using high-protein, animal-based products, as suggested by Zeskhuu; and the establishment of a project to introduce *Ursus arctos* animal prey species into bear habitat on a controlled, experimental basis.

4.3.2   A Broader Approach

McCarthy (1996) has noted the need to recruit, train, and equip a new generation of Mongolian biologists who can carry out basic ecological research and implement appropriate wildlife management strategies based on their findings. At present, Mongolian conservation efforts are characterized by limited resources, low salaries, and dependence on Western experts. As a Mongolian microbiologist observed with sadness and anger, the older generation of scientists trained in the Soviet Union in the 1960s and 1970s are not being replaced—university budgets and social incentives for young people to undergo rigorous training in the life sciences are two more casualties of the transition (Tsetseg, personal communication 1998).

A broader response, then, taking both socioeconomic and environmental factors into account, would be to recast Egiin Gol as a biological research and training station focusing on the Gobi. This plan has several advantages. The community could return to economic viability by providing support services to scientists and students, without the need for ecologically disruptive cross-border traffic or socially disruptive resettlement; national capacities would be enhanced with the development of a new cohort of Mongolian experts trained in modern methodologies; and the outlook for endangered species in the Great Gobi National Park would be improved as conservation strategies for the various habitats in this enormous protected area were integrated and rationalized. Finally, this approach would answer the normative questions in a balanced and ethical manner. Resources would be targeted so as to improve the well-being of both human and non-human populations in the region.

In the near term, funding for such an enterprise would have to come primarily from international donors, but in the longer term, as Mongolia weathered the economic and political transition, the Egiin Gol station could become a permanent field laboratory of the consortium of universities headquartered in Ulaanbaatar. The budget to support a modest beginning to the field station might be on the order of US$100,000 per year. This is less than 5% of the combined environmental aid budget set aside for Mongolia by UNDP, German Aid (GTZ), and WWF. The returns to supporting high-quality, graduate-level field training for young Mongolians studying biology and wildlife management would be greater than those to any single conservation program. Moreover, the project would be sustainable. In the short term Western universities and international environmental organizations would be encouraged to contribute as the station became established and exceptional opportunities for collaboration and exchange became available. In the longer term, as the nation's economy stabilizes and begins to grow, Mongolian universities and the Mongolian government can be expected to accept financial responsibility.

As discussed earlier, it is unrealistic to expect perfect solutions to complex conservation problems, and the proposals listed here are no exception. Establishing a biological field station in the Gobi will require broad commitment and consensus on the part of Mongolian officials and donor organizations to overcome inevitable problems associated with coordination, politics, and logistics. Moreover, even if all recommendations are successfully implemented, the *mazaalai* population, the primary focus of the present analysis, will remain at severe risk of extinction. Nevertheless, if adopted, these suggestions offer a reasonable hope that the traditional Mongolian

conservation ethic, updated by the new democratic government in its promise articulated in the *Mongolian Red Book* (1997, p. 19) "to balance social and economic development with ecosystem protection," can be realized in the harsh and unforgiving, but beautiful, Gobi desert.

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