

Management of Mongolian Gazelles as a Sustainable Resource

Peter Zahler¹, Kirk Olson², Ganzorig Khuukhenbaatar³, Boldbaatar Byamba³, George Schaller⁴, Gordon Grigg⁵, Tony Pople⁵, Nicole Payne⁶, Matt Draisma⁷, Paul Hopwood⁸, Daria Odonkhuu⁹

¹Wildlife Conservation Society, P.O. Box 485, Ulaanbaatar 211238, Mongolia, e-mail: pzahler@wcs.org

²University of Massachusetts Amherst, Amherst, Massachusetts, 01002, USA, e-mail: kolson@wcs.org

³State Specialized Inspection Agency, Ulaanbaatar 211238, Mongolia

⁴Wildlife Conservation Society, 2300 Southern Boulevard, Bronx, NY, 01460, USA

⁵Ecology Centre, School of Life Sciences, University of Queensland, Brisbane, 4072, Australia

⁶New South Wales National Parks and Wildlife Service, P.O. Box 2111 Dubbo, NSW 2830, Australia e-mail: nicole.payne@npws.nsw.gov.au

⁷83 Stoddart's Road, Warragul, Victoria, 3820, Australia

⁸Faculty of Veterinary Science, University of Sydney, NSW 2006, Australia

⁹Faculty of Biology, National University of Mongolia, Ulaanbaatar 210646, Mongolia

Abstract

An international workshop on gazelle harvesting and management was held in Ulaanbaatar, Mongolia in October, 2003. The major output from this workshop was the general agreement that no commercial hunt can be recommended at this time. This is because of the high level of poaching that is appearing to be having a negative impact on gazelle numbers. Best estimates put the existing gazelle population at about one million and decreasing. Models have suggested that this population could sustain an annual 6% commercial offtake. However, it is estimated that the illegal offtake may be near or exceed 10% annually. If so, this would explain why the population of gazelles is decreasing even without a legal commercial hunt. While there are adequate laws to deal with poaching, there is extremely poor enforcement due to a lack of funding, equipment, and will. We recommend against a commercial harvest until poaching is controlled and there is a sound monitoring system in place, and until monitoring shows gazelle populations to be stable or increasing.

Key words: Mongolian gazelle, *Procapra gutturosa*, commercial harvest, Mongolia

Introduction

The Mongolian eastern steppe is the world's largest intact grassland, with one of the world's last great migratory wonders, the Mongolian gazelle (*Procapra gutturosa*), along with numerous endangered species and a traditional nomadic lifestyle rich in Mongolian culture (MNE, 1996; Schaller, 1998). These communities historically engaged in low-impact nomadic herding. Recently this sustainable pattern has been disrupted. The deterioration of livestock production systems has increased herder poverty while rising unemployment has helped to increase poaching.

Historic and recent gazelle commercial and subsistence hunting programs have suffered because neither government nor local residents saw full economic benefits with meat being poorly handled and sold at below-market prices.

Meanwhile, it is estimated that poachers have continued to illegally slaughter more than 100,000 gazelles each year (Reading *et al.*, 1998), threatening the steppe ecosystem and traditional culture. Poorly planned development projects major roads and railroad fencing also threaten to disrupt the migratory movements of gazelles, impeding their ability to reach summer birthing grounds and winter pastures. Since gazelles play a pivotal role in structuring the steppe's ecological landscape, ensuring their survival is a requirement for maintaining steppe biodiversity, ecological processes, and traditional culture.

In order to focus attention on and develop specific solutions to these problems, a two-day stakeholder workshop on Mongolian gazelle management was held in Ulaanbaatar, Mongolia on October 16-17, 2003. This workshop focused on the ecological, economic, and legislative issues

surrounding gazelle harvesting and management. More than 100 people attended the workshop, including officials from five Mongolian ministries and government agencies; local aimag government officials; scientists from the National Academy of Sciences, National University, and a variety of other institutions; staff from local and international conservation NGOs; and international biologists from the United States, Australia and Great Britain.

Topics included hunting quotas, establishing mechanisms for monitoring, enforcement, and improving health standards. A major focus of the workshop was the presentation of the Australian kangaroo harvest system as a potential model for future gazelle commercial harvest. The results of a 2001 pilot study harvest of gazelles based on the kangaroo model was presented as verification of this potential. New management strategies were presented that incorporated the realities of the impacts of poaching and links between conservation and sustainable use. The workshop also dealt with wildlife/livestock/human disease issues, meat handling protocols, and safety regulations for a harvesting program based on international best practices and current scientific knowledge of gazelle biology and population dynamics. On the second day, working groups were formed to discuss and develop strategies to improve legislation and implementation of actions related to quotas and monitoring, enforcement, production, meat handling and safety, and disease.

Results

It was agreed that no commercial hunt of Mongolian gazelle can be recommended at this time due to the high level of illegal hunting taking place and lack of adequate infrastructure to insure hygienic standards. Such a harvest should not commence until there is a sound monitoring system in place, and until the monitoring shows that gazelle populations are stable or increasing. The recommendation that a harvest now would be premature is based on information regarding the total legal and illegal offtake compared to what is estimated to be an acceptable level of sustainable harvest.

The best estimate of the present Mongolian gazelle population is about one million; this is from an ongoing five-year field study of gazelles (Olson, 2003). Historic population estimates were much higher, but the gazelles have lost almost ¾ of their

range in Mongolia in the past 50 years (Lhagvasuren *et al.*, 2001). Although there has not been an accurate country-wide survey for gazelles, the population appears to be continuing to decrease in recent years (Reading *et al.*, 1998; Olson, 2003).

A gazelle harvest offtake model described by Millner-Gulland and Lhagvasuren (1998) suggests that an annual 6% Mongolian gazelle harvest should be sustainable; i.e., about 60,000 animals per year. Estimates given at this workshop by officials from the eastern aimags indicated that the combined 'subsistence' or 'household' use, plus poaching, easily exceeds 100,000. This 10% offtake is higher than the modeled maximum sustainable harvest estimate (6%) and, presumably, together with effects of the recent zuds, and disease outbreaks (Schaller and Lhagvasuren, 1998) accounts for the perceived decline described by Olson and others.

There is little doubt that poaching presents a grave threat to the continued existence of what is now the largest population of migratory ungulate remaining in Asia (Reading *et al.*, 1998). The ability of poaching to dramatically and negatively affect migratory ungulates has been shown by the dramatic decline in numbers of saiga antelope (*Saiga tatarica*) in Kazakhstan over the past decade (Milner-Gulland *et al.*, 2001). In Kazakhstan, overhunting caused saiga populations to crash from a high of well over one million to less than 200,000 within the span of a few years. Because of this dramatic example and the apparent decline in Mongolian gazelles, backed by data and models suggesting that a decline is occurring, workshop participants agreed that a gazelle commercial harvest cannot be recommended at this time. Instead, monitoring and enforcement are the two issues that need to be addressed immediately in regard to Mongolian gazelle management.

Monitoring

Regular and scientific monitoring of Mongolian gazelle populations is a critical need (Lhagvasuren & Milner-Gulland 1997). No commercial harvest should be undertaken until there is a scientifically defensible population estimate, and until it can be determined whether the populations are increasing, decreasing, or stable. Gazelles experience periodic population swings from effects such as bad weather and disease (Schaller & Lhagvasuren, 1998). Such changes should affect harvest levels; therefore, the

extent of these swings must be better understood and incorporated into any potential harvest quota setting protocol. The only way to collect this type of information is through regular monitoring of the population.

The cost and effectiveness of different potential monitoring methods need to be explored. These include ground surveys, aerial surveys and the use of satellite imagery (Leimgruber *et al.*, 2001). There is a need to find a suitable funding source for monitoring. There is also a need for monitoring population composition (sex ratio, juvenile and adult ratio). Such data can indicate breeding success, potential rate of increase in a population (mortality rates are also required for actual rates), and age and sex-biased mortality from disease, hunting or zuds. Finally, there is a need to establish international best practices that ensure the credibility of the monitoring protocols. Previous efforts at monitoring gazelle population size have fallen short of providing adequate design, rigor, and replication to enable follow-up monitoring to detect trends in population. It is important that future monitoring and survey efforts are designed with appropriate protocols to ensure that trends can be detected.

The two most common methods of population monitoring are aerial and ground surveys. Ground surveys can monitor population composition (i.e., sex ratio, juvenile:adult ratio), which is information that is usually unobtainable from aerial surveys. Ideally, this information would be used in conjunction with estimates of population size to parameterize population models (White & Lubow, 2002). Species composition (e.g. black-tailed vs. Mongolian gazelle) may also be more readily obtained from ground surveys (Caughley *et al.*, 1984). Unfortunately, obtaining estimates of population size from ground surveys is often problematic.

There are a number of advantages of aerial survey over ground survey. Because of these advantages, aerial surveys are the accepted method for broad-scale monitoring of large mammal populations throughout the world (e.g., Norton-Griffiths, 1978; Pople and Grigg, 1998). The primary advantage is that aerial counts are far more cost effective to cover the large distances required to adequately sample areas as large as the eastern steppe. Aerial surveys can also sample the landscape either randomly or systematically, thereby avoiding any bias due to sampling location.

There is greater potential for bias in ground counts, where surveys are restricted to roads or traversable ground (Caughley & Sinclair, 1994). Aerial counts are far more cost effective to cover the large distances required to adequately sample areas as large as the eastern steppe. A further advantage is the ability to count large numbers of animals from overhead (aerial survey), either in strip transects or using photography, rather than from the side (ground survey) where observer saturation and inability to estimate distance is common, which may result in severe bias. Aerial counts also suffer less from the problem of evasive movement (Clancey *et al.*, 1997).

Aerial counts nevertheless require correction for animals missed. A number of methods can potentially correct for this bias including double counting and line transect sampling (Pollock & Kendall, 1987; Buckland *et al.*, 1993). For large herds, aerial photography also can be used. Required survey precision (width of confidence interval) can be determined from the desired change in population size to be detected. It can also be determined from the relationship between risk of overharvest and survey precision. An appropriate survey frequency can be similarly determined. Selection of the appropriate survey frequency and precision will be constrained by survey cost. Mongolian gazelles are likely to be highly clumped and so sampling strategies such as stratification and adaptive sampling (Thompson, 1992; Khaembra & Stein, 2002) can greatly improve precision and therefore survey efficiency.

There is also a need for research to identify the number of discrete populations of gazelles in Mongolia. There are a number of relatively small groups of gazelle in the western half of Mongolia, and it is possible that some of these groups may have become isolated as increasing development create barriers to movement (Lhagvasuren *et al.*, 2001). The gazelles in the eastern part of the country may include groupings that are more discrete than previously recognized. If there are indeed multiple populations of gazelles, these populations should then be treated as separate entities from a management perspective; for example, harvest models and thus quotas should be adjusted to better fit the status and trends of each of these groups separately. It may well be that a harvest figure of 60,000 (6%) of total population may be unrealistically high if regional groups need to be managed as separate populations.

There is also a critical need to involve other countries in monitoring efforts. Although Mongolia contains between 92-96% of the global population share of Mongolian gazelles (Llhagvasuren *et al.*, 2001), Russia and China may play an important role in gazelle management as they both contain small and apparently dwindling populations of Mongolian gazelles (Lushchekina, 1999; Wang *et al.*, 1997). Transboundary monitoring will be important to help to understand movement across national boundaries, trends and threats in these herds, and possible cooperative international conservation needs.

Population surveys are not the only monitoring effort available or recommended. Another important aspect of data gathering should be to collect data from herders about their 'household' use. This is necessary to develop ways to ensure adequate allocation of the subsistence quota and to determine the total size of the commercial harvest quota. It was also recommended that local people become maximally involved in gazelle harvesting when it is introduced. People from the local soums should be involved in any commercial harvest scheme that is developed in the future; this will lead to local communities becoming more involved in conservation. Finally, there is a need to monitor enforcement officer compliance to maintain high enforcement standards.

Enforcement

There is an urgent need to enforce existing laws and to work towards new regulations. There can be no commercial harvest until new regulations are developed and the new regulations, as well as existing ones, are properly and thoroughly implemented. Because of the enormous areas under consideration, enforcement should be targeted at point of sale and processing for illegal product and in the market place and along transport routes, combined with seasonal concentrated efforts on poaching areas.

There are a number of financial and material resources which could be raised to boost enforcement: a significant royalty from commercial permits; household permits at cost; special trophy fees; rewards or incentives for reporting; and seizure of illegal product, including seizure of equipment and vehicles used in illegal trade and poaching. Financial rewards and incentives for reporting illegal activities should be paid

immediately and not delayed. The reward may best be directed to the community or organization that the reporting individual was a part of, rather than to the individuals themselves, to provide reliable results and hence share the benefits collectively to create a community based anti-poaching philosophy. Peer pressure is an important sociological means of deterring illegal activities in small communities. Penalties for breaches of the law may require a series of escalating penalties for repeat offences to more effectively curb illegal activities.

There may be a need for initial, one-time aid funding to get a successful enforcement upgrade started. Once this initial effort is underway, alternative funding sources as described above can be a major potential means of upgrading enforcement resources – a 20% local return is reasonable. However, funds raised by such activities need to be transparently returned to the gazelle management program; it appears that very little is returned at present.

It will be an important requirement for enforcement success that government agencies work together to achieve effective gazelle management and enforcement. The departments critical to this effort are: Ministry of Nature and Environment, Ministry of Health, Ministry of Food and Agriculture, and the new State Specialized Inspection Agency under the Prime Minister's office. Military cooperation was also seen as important due to use of gazelles as a meat source by border personnel. Military cooperation is especially valuable given the importance of military border posts and crossing stations as sites for targeted enforcement efforts. However, physical use of troops to contain poaching on the steppe is not recommended.

There will be a need to identify household permits by using the existing tags now in place. If commercial hunting is introduced, then commercial product, carcass, hides, and packaged meat will require additional separate identification. The Australian kangaroo harvest model, presented at the 2003 workshop, is an excellent and proven model for use of tags as a commercial harvest enforcement method (Pople & Grigg, 1998; NSW NPWS, 2001).

Other Recommendations

If and when illegal offtake has been controlled and a scientifically rigorous monitoring system is

in place that suggests that the gazelle population is stable or increasing, it may be determined that harvesting of Mongolian gazelles can once again be approved, providing an economic opportunity to the country. However, there are steps that should be taken before such a harvest occurs, even if enforcement and monitoring has been successful.

Harvest quotas should be set by the central government only, informed by the results of scientifically acceptable, replicable monitoring. This implies the need for a mechanism to be developed to determine how the total, national quota is distributed among the aimags, and into subsistence and commercial components. There is currently a need to review the whole process by which subsistence quotas are set and allocated. Whatever method is developed must be transparent, easily explicable and fair.

There will be a need to establish unit/s to be in charge of harvesting at the local level, including for training in best practice field slaughter. Herders will likely be the commercial hunters of the future, so training and improvement in household slaughter will be good preparation for the time when a commercial harvest is introduced. Therefore there is a need to develop and implement a 'Code of Practice' to ensure humane slaughter. A commercial tag system will need to be developed, preferably one similar to that used in Australia for kangaroo harvesting. Finally, a regulated processing facility that uses international best practice in meat handling and safety must be in place before any commercial venture is allowed.

In summary, we strongly recommend that a scientifically accurate, replicable survey be designed and implemented for monitoring Mongolian gazelle populations, and that enforcement laws and policies be reviewed, amended as needed, and adequately funded and implemented. Until such a monitoring system is in place, no accurate estimates of numbers or population trends can be derived and, until enforcement is adequately implemented, gazelle populations will continue to decline due to illegal overharvesting. Until overharvesting is controlled and safe harvest quotas can be set with confidence from knowledge about populations derived from regular monitoring, any harvesting of Mongolian gazelles cannot be recommended as it is unlikely to be sustainable.

Acknowledgements

We would like to extend our thanks and appreciation to the Ministry of Food and Agriculture, Ministry of Health, and Ministry of Nature and the Environment, as well as the State Specialized Inspection Agency. We would also like to extend our gratitude to the Environmental Protection Agencies of Dornod, Sukhbaatar and Khentii provinces. Funding for the workshop on gazelle harvesting and management was received from the Wildlife Conservation Society, UNDP-GEF, and the United States Agency for International Development (USAID) through their Global Conservation Program (GCP II). Thanks also due to the anonymous referees and editors for their useful comments and suggestions.

References

Buckland S.T., Anderson D.R., Burnham K.P. & Laake J.L. 1993. *Distance Sampling*. Chapman and Hall, London, U.K.

Caughley G. & Sinclair A.R.E. 1994. *Wildlife Ecology and Management*. Blackwell Scientific Publications, London, U.K.

Caughley G., Brown B., Dostine P. & Grice D. 1984. The grey kangaroo overlap zone. *Australian Wildlife Research*, 11: 1-10.

Clancy T.F., Pople A.R. & Gibson L.A. 1997. Comparison of helicopter line transects with walked line transects for estimating densities of kangaroos. *Wildlife Research*, 24: 397-409.

Khaemba W.M. & Stein A. 2002. Improved sampling of wildlife populations using airborne surveys. *Wildlife Research*, 29: 269-275.

Leimgruber P., McShea W.J., Brookes C.J., Bolor-Erdene L., Wemmer C. & Larson C. 2001. Spatial patterns in relative primary productivity and gazelle migration in the Eastern Steppes of Mongolia. *Biological Conservation*, 102(2): 205-212.

Lhagvasuren B. & Milner-Gulland E. 1997. The status and management of the Mongolian gazelle, *Procapra gutturosa*, population. *Oryx*, 31: 127-134.

Lhagvasuren B., Dulamtseren S. & Amgalan L. 2001. Mongolia. In Mallon, D.P. & S.C. Kingswood (eds.): *Antelopes. Part 4: North Africa, the Middle East, and Asia*. International Union for Conservation of Nature and Natural Resources, Gland, Switzerland.

Lushchekina A.A. 1998. Current state and perspectives of international cooperation for protection and stable use of the Mongolian gazelle. *Izvestiya Akademii Nauk, Seriya Biologicheskaya* 4: 462-466.

Milner-Gulland E.J. & Lhagvasuren B. 1998. Population dynamics of the Mongolian gazelle *Procapra gutturosa*: an historical analysis. *Journal of Applied Ecology* 35: 240-251.

Milner-Gulland E.J., Kholodova M.V., Bekenov A., Bukreeva O.M., Grachev I.A., Amgalan L. & Lushchekina A.A. 2001. Dramatic declines in saiga antelope populations. *Oryx* 35(4): 340-345.

MNE. 1996. *Biodiversity conservation action plan for Mongolia*. The Ministry of Nature and Environment, Ulaanbaatar, Mongolia.

Olson K. 2003. *Births synchrony, neonatal weights, and first year survival of Mongolian gazelles*. Master's Thesis, University of Massachusetts Amherst, Amherst MA, U.S.A.

Norton-Griffiths M. 1978. *Counting Animals*. African Wildlife Foundation: Nairobi, Kenya.

NSW National Parks and Wildlife Service. 2001. *Kangaroo Management Program 2002-2006*. NSW NPWS, Hurstville, Australia.

Pollock K.W. and Kendall W.L. 1987. Visibility bias in aerial surveys: a review of estimation procedures. *Journal of Wildlife Management*, 51: 502-510.

Pople A.R. and Grigg G. C. 1998. *Commercial harvesting of kangaroos in Australia*. Environment Australia, Canberra. <http://www.ea.gov.au/biodiversity/trade-use/wild-harvest/kangaroo/harvesting/index.html>

Reading R., Mix H., Lhagvasuren B. & Tseveenmyadag N. 1998. The commercial harvest of wildlife in Dornod Aimag, Mongolia. *Journal of Wildlife Management*, 62: 59-71.

Schaller G. 1998. Mongolia's golden horde: a million migrating gazelles. *Wildlife Conservation* 36-41.

Schaller G. & Lhagvasuren B. 1998. A disease outbreak in Mongolian gazelles. *Gnusletter* 17(2):17-18.

Thompson S.K. 1992. *Sampling*. John Wiley and Sons, New York, U.S.A.

Wang X.M., Sheng H.L., Bi J.H. & Li L. 1997. Recent history and status of the Mongolian gazelle in Inner Mongolia, China. *Oryx* 31(2): 120-126.

White G.C. & Lubow B.C. 2002. Fitting population models to multiple sources of observed data. *Journal of Wildlife Management* 66: 300-309.

Хураангуй

Цагаан зээрийн агналт, менежмент сэдэвт олон улсын семинар 2003 оны 10-р сард Монгол улсын Улаанбаатар хотноо боллоо. Үйлдвэрийн зориулалтаар цагаан зээрийг агнахыг ойрын үед зөвшөөрөхгүй байх ёстой гэсэн нэгдсэн зөвшилцөлд хүрсэн нь энхүү семинарийн гол үр дүн байлаа. Дээрх шийдвэр гарсан шалтгаан нь хулгайн агналт эрчимтэй хийгдэж цагаан зээрийн тоо толгойд сөргөөр нөлөөлж байгаатай холбоотой юм. Цагаан зээрийн одоогийн популяцийн хэмжээ нь нэг сая орчим бөгөөд тоо толгой нь багасж байна гэсэн тооцоо гарсан. Популяцийн загваруудаас харахад жилд популяцийн 6%-ийг үйлдвэрлэлийн зориулалтаар агнавал популяции тогтвортой байж чадна гэсэн тооцоо гардаг. Гэвч жил бүр популяцийн 10%-ийг хууль бусаар агнаж байна гэсэн тооцоо гарсан байна. Үйлдвэрийн зориулалтаар агналт хийгээгүй байхад цагаан зээрийн популяци багасаад байгаагийн шалтгаан энэ тооцоогоор тайлбарлагдаж байна. Хулгайн антay тэмцэх хууль тогтоомж хангалттай байгаа ч хөрөнгө мөнгө, багаж техникийн дутагдлаас болоод эдгээр хууль тогтоомж туйлийн муу хэрэгждэг. Бид хулгайн агналт хяналттай болтол үйлдвэрлэлийн зориулалтаар агналт хийхийг эсэргүйцэж байгаа байр сууриа илэрхийлж байна. Мөн түүнчлэн цагаан зээрийн популяцийг судлах удаан хугацааны мониторинг системийг байгуулсан бөгөөд цагаан зээрийн популяци тогтвортой болж өсөж байна гэдгийг удаан хугацааны давтан судалгаагаар батлах хүртэл үйлдвэрлэлийн зориулалттай агналтыг хийхгүй байх нь чухал.