

Dramatic declines in saiga antelope populations

E. J. Milner-Gulland, M. V. Kholodova, A. Bekenov, O. M. Bukreeva, Iu. A. Grachev, L. Amgalan and A. A. Lushchekina

Abstract We present new data on the size of all the saiga antelope populations; three populations of the subspecies *Saiga tatarica tatarica* in Kazakhstan, one of *S. t. tatarica* in Kalmykia, Russia, and two of *S. t. mongolica* in Mongolia. The data suggest that three populations are under severe threat from poaching and have been declining at an increasing rate for the last 2–3 years. The Ustiurt population in Kazakhstan was relatively secure but is now also under threat. There is evidence of much reduced conception rates in Kalmykia, probably because of selective hunting of adult males. The Mongolian subspecies shows no

evidence of recent decline, but is of concern because of the population's small size. The cause of the population declines appears to be poaching for meat and horns, which is a result of economic collapse in the rural areas of Kazakhstan and Kalmykia. We suggest that full aerial surveys be carried out on the Betpak-dala (Kazakhstan) and Mongolian populations, and that funding is urgently required for the control of poaching in all parts of the saiga range.

Keywords Aerial survey, Central Asia, horns, Kazakhstan, Mongolia, poaching, *Saiga tatarica*.

Introduction

The saiga antelope *Saiga tatarica* L. is a nomadic species of the semiarid rangelands of Central Asia (Fig. 1). It has two subspecies; *S. t. tatarica*, found in Kalmykia, Russian Federation, (one population) and in Kazakhstan (three populations), and *S. t. mongolica*, found in Mongolia (two populations). The ecology and long-term conservation needs of the species in Kazakhstan, Kalmykia and Mongolia were reviewed by Bekenov *et al.* (1998), Sokolov & Zhirnov (1998) and Lushchekina *et al.* (1999), respectively. Here we describe a recent set of censuses of all saiga populations, the results of which are of great concern for the conservation of the species.

Saiga population estimates

Saiga populations have fluctuated dramatically over the last century, principally as a result of hunting for meat and horns, and climatic variability (Bekenov *et al.*, 1998). The horns are borne only by males, and are used in traditional Chinese medicine (Chan *et al.*, 1995). Data on historical changes in the numbers and range of the Mongolian subspecies are minimal (Lushchekina *et al.*, 1999). The nominate subspecies was heavily hunted in the 19th century, and by the time of the Soviet revolution was reduced to a few thousand individuals. A complete ban on hunting allowed populations to recover, and regulated commercial hunting was started in the 1950s. Regulated hunting, principally for meat, continued throughout the Soviet period. Since then, a collapse in funding and infrastructure for saiga management, combined with a disintegrating rural economy, has led to uncontrolled large-scale poaching for meat and horns.

Population censuses were carried out on the four populations of *S. t. tatarica* throughout the Soviet period (1980–1994), along with much other scientific research (Bekenov *et al.*, 1998; Sokolov & Zhirnov, 1998). Aerial surveys took place in April in Kazakhstan, and July–August in Kalmykia. Transects were flown across saiga range areas, counting all individuals within each herd encountered and photographing the herds for subsequent confirmatory counts. The chance of encountering saigas was maximized by conducting the surveys when they form large migratory herds. The surveys were intended as total population counts rather than samples, and for consistency were carried out by the same teams

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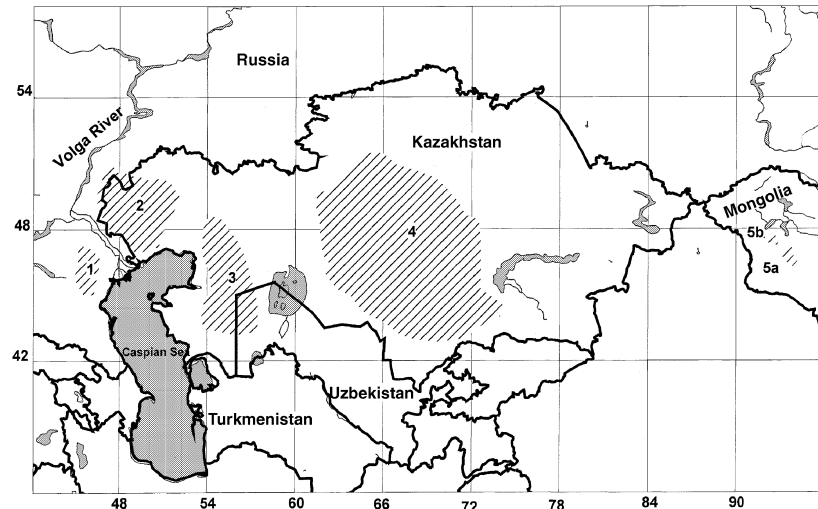
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Revised manuscript accepted for publication 28 June 2001

Fig. 1 The current range of the saiga antelope, showing the approximate range area of each of the populations, together with country borders and latitude and longitude. 1 Kalmykia, 2 Ural, 3 Ustiurt, 4 Betpak-dala (all *Saiga tatarica tatarica*), 5 Mongolia (*Saiga tatarica mongolica*), 5a Shargyn Gobi population, 5b Mankhan population).



each year. The summer surveys of the Kalmykian population included that year's calves, and so gave population estimates that were on average 58 per cent higher (SD = 19 per cent) than spring surveys (based on data from surveys conducted in both spring and summer from 1957 to 1979). *S. t. mongolica* was less regularly surveyed in the Soviet period, and vehicle surveys were used. There is doubt as to whether the large changes recorded in the estimated Mongolian population size over time reflect genuine changes in population size or measurement error (Lushchekina *et al.*, 1999).

Since 1995 the frequency and coverage of population censuses have decreased because of reductions in funding for scientific research and saiga management. The surveys that have been carried out are difficult to compare to the previous estimates, either because their coverage has been limited to a proportion of the range area, or because they have involved vehicle counts rather than aerial surveys. Surveys of all five saiga populations were carried out in spring 2000 by scientists collaborating on an INTAS (International Association for the Promotion of Cooperation with Scientists from the New Independent States of the former Soviet Union) funded project on the conservation and genetics of the species. The scientists involved were the same as those who carried out the previous surveys and for a given survey type the same methods were used, and thus these surveys were comparable to those from previous years. Full aerial surveys were conducted for all populations except Betpak-dala and Mongolia, which were surveyed using vehicles. This allows us to assess the degree of threat that the saiga is currently facing throughout its range.

The current situation

Censuses of *S. t. tatarica* suggest a dramatic decline in population sizes between 1999 and 2000 in all four populations of the subspecies (Table 1). A comparison of these results with mean total counts from 1980–1990 is given in Table 2. The period 1980–1990 was chosen because it was a time of relative stability for the saiga population, before the Soviet Union started to collapse in 1991–1992. However, all the populations except those in Mongolia were commercially hunted throughout this period, so population sizes in the 1980s were far from carrying capacity. The Kazakhstan populations did not show evidence of a decline over the period 1980–1990; the Kalmykian population declined from 1980 to 1986 and stabilized thereafter.

All four populations of *S. t. tatarica* declined dramatically from 1998 onwards, and in all cases the rate of decline was substantially higher between 1999 and 2000 than between 1998 and 1999 (Table 2). Saiga population sizes are strongly affected by climatic variability and disease (Bekenov *et al.*, 1998), although these are unlikely to be major causes of the declines. There is no evidence of mass mortality from disease in any population. The last few years have seen drought in Kalmykia, which may be a contributory factor, but the climate in Kazakhstan has been good for saigas since 1994 (no droughts or severe winters). Another potential explanation is an increase in predation pressure from wolves, which used to be shot to protect saigas and livestock, and are now increasing in number throughout the saiga's range. However, the most likely explanation of the dramatic recent declines is severe and ongoing

Table 1 Population estimates for the saiga antelope. The total estimated saiga population size (rounded to the nearest thousand animals) is given for those years in which all four populations of the nominate subspecies were censused. Numbers in bold are questionable because they are extrapolated from counts made in only half of the range area (estimate = 2 × actual count), and those in italics are the result of vehicle surveys. Vehicle surveys are not easily comparable to aerial surveys, and are much more prone to error and bias (and particularly to underestimating population size). All other values are total counts from aerial surveys, hence confidence intervals are not given. In Kalmykia, the data are from surveys carried out in July–August up to 1994 and in May for 1995–2000. Spring surveys give population estimates that are on average 58 per cent lower than summer surveys, because they do not include that year's calves. Data up to 1997 for Kazakhstan are from Bekenov *et al.* (1998) and for Mongolia from Lushchekina *et al.* (1999). Kalmykian data up to 1994 are from Sokolov & Zhirnov (1998). Data after these dates are from surveys carried out by the following organizations: Kalmykia – the Department for Conservation, Control and Management of Game Animals, the Central Laboratory for Hunting Management and the former Saiga Research Centre; Kazakhstan – the Institute of Zoology of the Kazakhstan Ministry of Education and Science; Mongolia – WWF – Mongolia and the Institute of Ecology and Evolution, Moscow, Russia, and are reproduced with permission.

Year	Populations					Total
	Kalmykia	Ural	Ustiurt	Betpak-dala	Mongolia	
1980	380,000	120,000	170,000	400,000	–	1,070,000
1981	430,000	160,000	190,000	470,000	750	1,251,000
1982	385,000	180,000	190,000	480,000	925	1,236,000
1983	280,000	150,000	180,000	440,000	–	1,050,000
1984	265,000	40,000	190,000	340,000	125	835,000
1985	222,000	50,000	190,000	400,000	–	862,000
1986	200,000	70,000	150,000	250,000	–	670,000
1987	143,000	100,000	140,000	300,000	–	683,000
1988	157,000	90,000	207,000	368,000	1700	824,000
1989	150,000	135,000	265,000	323,000	–	873,000
1990	160,000	138,000	202,000	361,000	–	861,000
1991	168,000	236,000	232,000	357,000	–	993,000
1992	152,000	298,000	254,000	375,000	–	1,079,000
1993	148,000	250,000	216,000	510,000	300	1,124,000
1994	142,000	274,000	254,000	282,000	300	952,000
1995	220,000	–	–	212,000	1300	–
1996	196,000	–	214,000	248,000	–	–
1997	259,000	–	–	–	1300	–
1998	150,000	<i>104,000</i>	246,000	120,000	–	620,000
1999	55,000	84,000	200,000	64,000	–	403,000
2000	26,000	17,500	116,000	<i>15,000</i>	3000	178,000

	Kalmykia	Ural	Ustiurt	Betpak-dala	Total
Mean 1980–1990	146,200	112,000	188,500	375,600	823,300
Pop size as a proportion of 1980–1990 mean					
1998	1.03	0.93	1.30	0.32	0.67
1999	0.38	0.75	1.06	0.17	0.43
2000	0.18	0.16	0.62	0.04	0.19
Annual decline rate (%)					
1998–1999	63	19	19	47	35
1999–2000	53	79	42	77	56

Table 2 Rates of decline of populations of *Saiga tatarica tatarica*. The mean population size in 1980–1990 is calculated from Table 1, and the 1998–2000 population estimates are given as a proportion of this. The rates of decline for 1998–1999 and 1999–2000 are also shown. The 1980–1990 mean population size for Kalmykia is multiplied by 0.58 to correct for the difference in time of year between the two sets of surveys.

poaching pressure. This is supported by observations of widespread poaching and the large amounts of saiga meat on sale in Kazakhstan and Kalmykia (pers. obs. by authors; Kokshunova *et al.*, 2000; Lundervold, 2001; Pereladova & Lushchekina, 2001).

The situation is not uniform throughout the saiga's range. Table 2 suggests that the Betpak-dala popula-

tion has suffered particularly heavy declines, with the current population estimate being 4 per cent of the 1980–1990 population estimate. This population is in an accessible area that is relatively heavily populated. Social research carried out in Betpak-dala shows that rural unemployment is at a high level and many people have lost their livestock. Poaching of saiga

for meat, and for sale in provincial towns, is therefore a key component of many people's livelihoods (Robinson, 2000). The Betpak-dala population is also the least comprehensively surveyed; it had a full aerial survey in 1996, a partial aerial survey in 1998, and has since been surveyed from vehicles. The observed population declines must be interpreted with great caution because vehicle surveys are more prone to underestimation than aerial surveys. Interpretation of trends since 1996 is made more difficult by the fact that the 1999 survey only covered half the saiga range. There is an urgent need for an aerial survey to clarify the situation.

The Ural and Kalmykia populations are similar in their status, with populations currently at 15–20 per cent of their 1980s level and showing rapid declines between 1998 and 2000. Both are in areas with relatively dense human and livestock populations and a high level of poaching. The Ustiurt population is located in a remote area with a sparse human population. This may explain why it has so far suffered the least severe declines. However, the 2000 survey and preliminary observations in 2001 suggest that it too may now be declining rapidly.

The results of the Mongolian survey are much more positive; the subspecies is in a perilous state because of its small population size, but there is no evidence of a decline. However, there is still considerable uncertainty surrounding the true population size of the Mongolian subspecies and the degree of linkage between the two sub-populations. An aerial survey is urgently required, in view of the small population size and its vulnerability to

poaching. Poaching is known to occur, and the populations are not well protected (Lushchekina *et al.*, 1999).

A further concern is the effect on saiga population dynamics of selective hunting for adult males (Milner-Gulland *et al.*, 1995). In the past poachers tended to selectively hunt males for their horns and so commercial hunting targeted females in an attempt to normalize the sex-ratio. Commercial hunting has now been suspended and poachers also hunt females, so the effects on the sex-ratio are difficult to predict. However, the proportion of adult males in the *S. t. tatarica* populations is still well below the levels observed in Soviet times (Table 3), suggesting that males are still being targeted. Until now there has been no evidence that a lack of males is causing reduced fecundity rates. However in 2000 a population survey in Kalmykia just before the rut found only 0.89 per cent adult males. Fecundity rates are very variable in Kalmykia, with 3–25 per cent of females barren and 20–70 per cent bearing twins in the 1970s–1980s (Sokolov & Zhirnov, 1998). In spring 2001, of 103 animals investigated 85 per cent were barren and 64 per cent of pregnant females were bearing twins (O.M. Bukreeva, unpublished data). This is a catastrophically low conception rate, but the twinning rate among pregnant females was high. As climate has a strong effect on twinning rate, this suggests that adverse climatic conditions were not to blame (Coulson *et al.*, 2000). Hence, it is possible that the lack of males in Kalmykia is causing the dramatically reduced conception rates, which in addition to the high hunting mortality could lead to population collapse (Ginsberg & Milner-Gulland, 1994).

Table 3 Sex-ratio data for *S. t. tatarica*, given as the proportion of adult males in the population. When hunting does not select for males, this is around 25 per cent. In Soviet times males were not selected for, and the proportion of adult males in the Kalmykian population in 1991 was 24.3 per cent. In some cases the observations included one year-old males, which were not yet sexually mature and had very small horns; in Betpak-dala in May 1997, the majority of the sample was one year-old. The time and location of the counts also affect the sex-ratio estimate; for example, while the sex-ratio in peripheral herds in Ustiurt in May 1998 was 27.3 per cent, there were many fewer males within the calving area. For this reason, data from full population surveys or from unselective hunting (such as the data for the Kalmykia and Ural populations) are more reliable than observational data. For data from previous years, see Milner-Gulland *et al.* (1995), Sokolov & Zhirnov (1998) and Bekenov *et al.* (1998).

Population	Date and type of observation	Adult males (%)	Sample size
Kalmykia	Summer 2000, population survey	5.6	26,000
	November 2000, population survey	0.89	35,000
Ural	November 1994, proportion of hunted animals	10.0	11,305
	November 1995, proportion of hunted animals	5.8	12,082
	November 1996, proportion of hunted animals	6.3	14,495
	November 1997, proportion of hunted animals	3.7	9094
	November 1998, proportion of hunted animals	9.4	3618
Ustiurt	May 1998, peripheral herds to calving area	27.3	2496
	May 1999, observation in calving area	8.8	440
Betpak-dala	May 1997, observation in calving area	10.3	1656
	November 1997, proportion of hunted animals	2.6	270
	May 1999, observation in calving area	2.4	894

Conservation actions

These results suggest that the status of the saiga antelope is seriously compromised throughout its range. Recent political changes have led to economic hardship in saiga range areas, so that wherever there are people living, saiga poaching has increased dramatically. Even in Ustiurt, where the human population is sparse, the saiga is not secure. Poaching for meat is accompanied by continuing poaching for horns for export to China. In Kalmykia in 2000, the horn price was US\$ 100 per kg (1 kg is c. 3 pairs of horns).

Scientists and conservation authorities in the range states recognize that saiga populations are under threat. There has been a moratorium on commercial hunting of the saiga in Betpak-dala since 1998, throughout the rest of Kazakhstan since 1999 and in Kalmykia since 1991 (although hunting was allowed in Kalmykia in 1996). Prior to the complete moratorium, attempts to compensate for the bias in the sex-ratio caused by poaching led to hunting of males being banned in Kazakhstan in 1991. However, this law only applied where selectivity was practical, i.e. when hunting with rifles but not when using corrals (e.g. in the Ural population). The Mongolian subspecies has never been subject to state-controlled commercial hunting.

International concern about the plight of the saiga antelope was first raised in 1995 (Chan *et al.*, 1995; New Scientist, 1995). However, the evidence at the time suggested that poaching had not caused dramatic population declines throughout the saiga's range (Table 1; Milner-Gulland *et al.*, 1995). The saiga was listed as Vulnerable on the 1996 IUCN Red List, with the Mongolian subspecies listed as Endangered (Baillie & Groombridge, 1996). The status of the species as a whole, and the nominate subspecies, were revised to Lower Risk (conservation dependent) for the 2000 Red List, because there was no evidence for declines in Kazakhstan (Hilton-Taylor, 2000). However, the IUCN-SSC Antelope Action Plan (Mallon & Kingswood, 2001) categorises the species as Endangered. This is based on the information presented here, which suggests that the species qualifies under criterion A2a: an observed decline of ≥ 50 per cent over the last 10 years or 3 generations, based on direct observation. Heightened international awareness about the plight of the saiga led to a CITES Appendix II listing in 1995; proposals to list the Mongolian subspecies on Appendix I were rejected because of difficulties in distinguishing between the horns from the two subspecies in trade. Since Kazakhstan's accession in 2000, all the saiga range states are now CITES parties. However, given that poaching for domestic consumption is now a major threat, the key requirement is funding for

national conservation actions, rather than international trade control.

The infrastructure for saiga protection and management is still in place throughout its range, but underfunding has rendered it ineffectual; the longer this situation continues, the more this infrastructure will crumble, and the harder it will be to resume effective anti-poaching activities if funding is forthcoming. Hence the main requirements are short-term financial support of the saiga management authorities for urgent anti-poaching work (as was recently given in Kalmykia by the Large Herbivore Initiative for Europe) and longer-term funding for a review of ways to engage rural people in saiga conservation. We hope that the data presented here contribute towards raising international concern for the species and to prompting the urgent conservation action that is required to prevent its continued decline.

Acknowledgements

This work was funded by INTAS project 97-11197, *The population genetics and conservation of the saiga antelope*, with additional financial support from the Large Herbivore Initiative for Europe and INTAS project 96-2056 (*Land degradation and agricultural change on the rangelands of Kazakhstan*). We thank Dr Fred Baerselman (LHIE), the staff of the Department for Conservation, Control and Management of Game Animals, Republic of Kalmykia, and the WWF-Mongolia Country Office, who helped us with data collection.

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