The real threat to saiga antelopes

SIR — The saiga antelope has been the subject of recent heavy press coverage, catalysed by the publication of a report into its status[1]. The tenor of the coverage has been that the species is on the brink of extinction due to poaching for its horns (for example, ref. 2). It is claimed that the species has declined alarmingly since the break-up of the Soviet Union, when illegal horn exports increased dramatically. Here we present up-to-date data on the status of the species which do not support the claim that the population has declined. The data do give serious cause for concern, however, about the low proportion of adult males in all four saiga populations, leading to the possibility of a sudden crash in numbers.

Four populations of the subspecies *Saiga tatarica tatarica* exist, three in Kazakhstan and one in Kalmykia (Russian Federation). The subspecies *S. t. mongolica* is found in Mongolia in very small numbers. The populations of *S. t. tatarica* declined to very low levels by 1920, but recovered under protection and have been hunted and managed primarily for meat since 1950. Given this history, a healthy trend would be for the population to grow rapidly, reach high levels and then decline to a relatively stable level under sustainable exploitation. Thus, the fact that a population is now lower than at its peak is not necessarily a cause for concern if the population is stable at more than 50% of carrying capacity. The total population has varied around 1 million since regular annual censuses were established in 1978 (Fig. 1*a*). The Ustyurt and Ural'sk populations have increased slightly since 1975, the Betpakdalinsk population fell in 1974–75 and since then has shown no clear trend. In Kalmykia, the population rose to a peak in 1971–78, then declined until 1987. The decline stabilized during 1988–93 (with the exception of 1991). These population figures give no indication of a plunge in numbers after 1990.

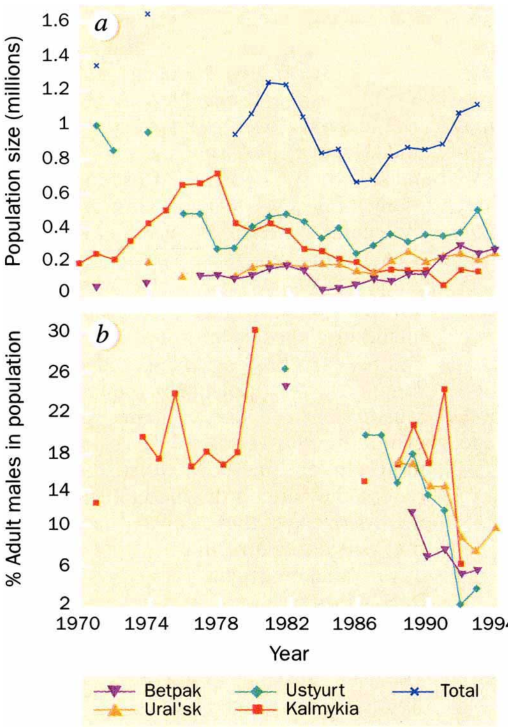

FIG. 1 *a*, Estimates of the size of *Saiga tatarica tatarica* populations, 1970–94. Data for Kalmykian subpopulation are from Teer *et al.*[6]; data for Kazkhastan include the most recently available estimates. Betpakdalinsk is in central Kazakhstan, Ustyurt between the Caspian and Aral seas, and Ural'sk to the north of the Caspian Sea in west Kazakhstan. Kalmykia is to the west of the Caspian Sea. The standard errors for the Kalmykian estimates are between 11 and 14% in all years except 1991 (22%) and 1993 (34%), but standard errors are not available for the Kazakhstan estimates, so caution is required in their interpretation. *b*, Proportion of adult males in the four sub-populations, 1969–94. Data for Kalmykia and for Kazakhstan up to 1987 are from observations of herds, Kazkhstan data after 1988 are from hunted specimens. Kalmykian data are from Teer *et al.*[6]. The change in collection methods means that these data are not comparable after 1988. In particular, there has been no test of the reliability of the ostensibly unselective hunting procedure. Given this proviso, the data do still show a worrying trend in sex ratio in all populations.

A major concern about selective poaching for horns is that the proportion of adult males in the population may become very small. The data indeed show that the proportion of adult males in the population declined over the period 1988–93 in Kazakhstan and fell sharply in 1992 in Kalmykia (Fig. 1*b*). A lack of males can affect the population dynamics of a species in various ways[3]. The saiga is a polygynous rutting species and thus the most likely mechanisms are juvenile mortality caused by lengthening of the parturition period and reduced female fertility caused by a lack of mating opportunities. Female fecundity is strongly affected by the unpredictable climate in the region and so it is hard to distinguish trends. However, no clear recent trend is visible in the data (Fig. 2). Models have shown[3,4] that the effect of a lack of males on population dynamics can be strongly nonlinear, and thus that the lack of a clear correlation between female fecundity and sex ratio should not be taken as evidence that the populations are secure.

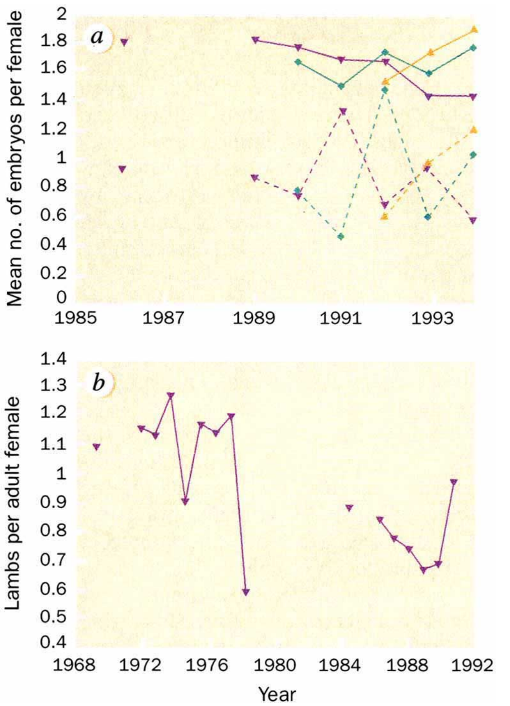

FIG. 2 *a*, Mean number of embryos per female in the three Kazakhstan populations, 1986–94. Juveniles are shown as a dashed line, adults as a solid line. *b*, Mean number of lambs per female in Kalmykia, 1969–93. Data are from Teer *et al.*[6]. Note that the Kazakhstan data are expressed in terms of embryos per female and thus only show fertility rate, whereas the Kalmykian data, presented as lambs per female, comprise both fertility and perinatal mortality of juveniles. Key as for FIG. 1.

Although interest in the saiga antelope by the conservation community is welcome, it is inadvisable to 'cry wolf' if there is no immediate threat to the saiga from male-biased poaching. As these data have shown, the lack of adult males has yet to make a strong impact on population size. The concern must be, however, that, because the effects of a lack of adult males are likely to be nonlinear, any population decline due to this factor will be very rapid. Having said this, it is important to guard against using poaching as a convenient and relatively easily tackled scapegoat that can mask other important threats facing the saiga. In particular, the steady decline of the Kalmykian population since the late 1970s could be attributed to accelerating desertification in the region, caused by more intensive human use of the area[5],

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and thus to the reduction in availability of suitable habitat. If this is a major threat to the saiga, it too should also be tackled urgently. The Mongolian subspecies is apparently not affected by poaching, but is urgently in need of protection because of its very small size (about 336; ref. 1). Concentrating solely on the problem of poaching sidelines this population.

If poaching is not yet affecting population sizes, one reason may be the recent reduction in legal hunting, and particularly in the proportion of males in the legal hunt. Thus, a key issue not being addressed is the acquisition of large revenues from saiga poaching by commercial traders, revenues which are being denied to the government cooperatives and local people who bear the costs of saiga preservation. As horns did not form a large proportion of the cooperatives' revenues before 1990, this lost opportunity goes unacknowledged. If saigas are to continue to form a valuable and respected resource for the residents of their range areas, the revenues should be accruing to the correct parties.

Clearly, poaching must be brought under control rapidly both to secure the future of the population and to allow legal harvests to continue. However, we would like to present the story of the saiga antelope as a positive one. It is rare to find a species that reached near-extinction but recovered in 30 years, and which was then harvested for 40 years in an apparently sustainable way. The products of that harvest were both sold to local people as cheap meat and went to support the general economy. The population was well researched and regularly censused. Only in the last five years has the financial situation for the management authority become problematic and poaching a serious problem. This rare example of a successful, sustainable management system should be supported by the international community before it is lost, and managers should be enabled to use the new markets for horn effectively, to secure the future of the saiga antelope and its users.

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Touching the phantom limb

SIR — Despite a vast clinical literature on phantom limbs (for example, refs 1, 2), there have been no experimental studies on the effect of vision on phantom sensations. We used a mirror to resurrect the phantom visually in order to explore intersensory effects[3].

Nine arm amputees were studied (see table). A tall mirror was placed vertically on the table, perpendicular to the patient's chest, so that he could see the mirror reflection of his normal hand 'superimposed' on the phantom. In the first seven patients, when the normal hand was moved so that the phantom was visually perceived to move in the mirror, it was also 'felt' to move; that is, a vivid kinaesthetic sensation emerged. (These sensations could not be evoked with the eyes closed.) In patient D.S., kinaesthetic sensations were evoked even though he had not experienced movements in the phantom for the preceding 10 years. Repeated use of the mirror over a 3-week period (15 min per day) resulted in a permanent 'telescoping' of the hand in this patient.

In six of these patients, a similar revival of movements in the phantom occurred if the experimenter's hand was substituted for the patient's normal hand. No such effects were seen in four normal 'control' subjects given identical instructions.

Five patients (R.L., P.N., R.T., B.D. and J.P.) experienced painful involuntary 'clenching spasms' of the phantom hand ("As though the nails were digging in the phantom," as J.P. told us). Remarkably, in four of them, the spasms, which normally lasted for an hour or more, could be relieved immediately on looking into the mirror and opening 'both' hands simultaneously. (R.T. compared 8 eyes-closed/eyes-open trials; P.N., 8 trials; R.L. 6 trials and J.P. 12). No eyes-closed trials were effective in relieving spasms.

When motor commands are sent from the premotor and motor cortex to clench the hand, they are normally damped by error feedback from proprioception. In a phantom, such damping is not possible, so the motor output is amplified further and this outflow itself may be experienced as a painful spasm. Visual feedback from the mirror may act by interrupting this loop.

The elimination of spasms was unequivocal in all four patients. Interestingly, the associated pain also disappeared. Given the notorious susceptibility of pain to 'placebo', however, double-blind experiments would be needed to determine whether the effect on pain is a specific consequence of the visual feedback.

In two patients (J.P. and L.C.), touching the normal hand evoked precisely localized

CLINICAL DETAILS OF PATIENTS TESTED

Patient	Age	Pathology	Location	Time of testing
J.P.	31	Self inflicted amputation	To right forearm 5 cm below elbow	5 months after amputation
R.L.	56	Melanoma infiltrating brachial plexus	Right upper limb disarticulation at shoulder 1 year after onset of melanoma	2 months after amputation
P.N.	48	Arm crushed in car accident	Left arm 8 cm below elbow	7 months after amputation
R.T.	55	Sarcoma infiltrating ulnar nerve	Left arm 6 cm above elbow	7 months after amputation
P.N.N.	40	Airplane propeller cut off arm	Right arm above elbow	8 years 3 months after amputation
D.B.	23	Car accident, crush injury	Left arm, disarticulation of shoulder	3 years after amputation
D.S.	28	Brachial plexus avulsion	Left above-elbow amputation 1 year after avulsion	9 years after amputation
B.D.	29	Brachial plexus avulsion	Right above-elbow amputation 2 years after avulsion	3 months after amputation
L.C.	23	Crush injury following train accident	Right forearm below elbow	19 days after amputation

All patients underwent a thorough neurological evaluation by one of us (V.S.R.) to rule out central nervous system pathology and to ensure that their 'mental status' was normal. None of the patients (except L.C.) could produce voluntary movements in the phantom. When D.S., J.P. and D.B. were touched on the lower-face region, ipsilateral to the amputation, sensations were referred to the phantom fingers, as occurred in some of the patients we had previously studied[4,5]. D.S. also had magnetoencephalographic evidence of 'remapping' in the cortex[5,6]. B.D. did not show any inter-manual referral of sensations whether or not he used the mirror box. Also, he could not generate any movements in the phantom, whether or not he used the box, and there was no relief from pain. ("It's frustrating, doctor. I can see it move; I want it to move; but it doesn't feel like it's moving!") Thus, the procedure may not work on all patients and the reasons for the variability remain to be explored.