Evaluating the potential for participatory monitoring of saiga antelope by local villagers in Kalmykia, Russia

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ABSTRACT

Participatory monitoring, that is, monitoring which involves local people in the process of monitoring natural resources, is becoming an increasingly popular tool to engage community members in conservation whilst at the same time collecting data at low cost. However, there are few examples of participatory monitoring of migratory species within the literature, as well as few where the local people responsible for monitoring are not themselves users of the resource they are monitoring. Saiga antelope are a critically endangered nomadic ungulate of the Central Asian and Eurasian steppe, whose dramatic decline in the last decade has been mainly attributed to poaching by poor members of local communities.

This study aims to investigate the potential for participatory monitoring of the saiga in the Russian Republic of Kalmykia, a stronghold for one of the five remaining populations. A pilot project was set up and monitors were selected from villages neighbouring two nature reserves. They recorded observations of saiga on an opportunistic basis, and twice a month spent some time deliberately searching for saiga as a measure of effort. Attitudinal surveys were performed to ascertain local people's opinion of the participatory monitoring scheme, and costs were compared with those of rangers at the reserves. Both monitors and rangers were assessed in terms of their accuracy when counting saiga. Whilst some monitors saw no saiga during the data collection period, others saw a fairly high number, and there was a significant correlation between the length of the data collection period and the number of saiga seen. Local attitudes towards the scheme were overwhelmingly positive, although the sample size was small. There was no difference between the accuracy of monitors and rangers, and both groups showed a tendency to overestimate group sizes the larger they were. Although this project has only analysed the first couple of month's of the six-month pilot project, and although the group sizes are small, participatory monitoring of saiga antelope in Kalmykia seems to have potential.

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LIST OF ACRONYMS

ACDI	Altyn Dala Conservation Initiative
CWA	Centre for Wild Animals (of Kalmykia)
CITES	Convention on the International Trade in Endangered Species
CMS	Convention on the Conservation of Migratory Species
CPUE	Catch Per Unit Effort
CZBR	Chernye Zemli Biosphere Reserve
DEFRA	Department for the Environment and Rural Affairs
FFI	Fauna and Flora International
FIDE	The World Chess Association
GPS	Global Positioning System
ICDP	Integrated Conservation and Development Project
IUCN	World Conservation Union
MAB	Man and Biosphere (UNESCO Nature Reserves)
MDGs	Millennium Development Goals
NGO	Non-Governmental Organisation
SCA	Saiga Conservation Alliance
SR	Stepnoi Nature Reserve
TEK	Traditional Ecological Knowledge
UN	United Nations
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNDP	United Nations Development Programme
WCN	World Conservation Network
WTP	Willingness To Pay
WWF	World Wide Fund for Nature

CONTENTS

Tables

Figures

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1. INTRODUCTION

1.1 Problem statement

Monitoring environmental systems has long been an established part of conservation practice, as without good baseline data it is impossible to tell whether interventions are having the desired effect. Until relatively recently this monitoring was usually undertaken by scientists and other non-local agents from outside the system in question (Danielsen et al, 2000). However, since the late 1990s the importance of involving local people in all aspects of conservation has become increasingly apparent, and participatory (or locally-based) monitoring has become part of the conservation mainstream. Despite its popularity as a (usually) low-cost high-efficiency method of data collection, there are few examples of participatory monitoring of migratory species within the literature, and few where the local people responsible for monitoring are not themselves users of that very resource.

Since the collapse of the Soviet Union, populations of the nomadic saiga antelope (*Saiga tatarica*) have fallen by around 90%, due to poaching pressure for both their meat and horns, which are used in Traditional Chinese Medicine (Milner-Gulland et al, 2001). This striking decline led the IUCN to listing saigas as Critically Endangered on their Red List of Threatened Species for the first time in 2002, indicating a very high risk of extinction in the wild.

There are now only five known populations of saigas remaining worldwide (see Figure 1), one of the largest of which, numbering approximately 15-20,000 (CMS, 2006), is found in the autonomous Republic of Kalmykia in southern Russia. Within Kalmykia there are two reserves that have been established to protect the saiga; the Chernye Zemli Biosphere Reserve (CZBR), and the Stepnoi Reserve (SR), both of which employ rangers to carry out monitoring of saiga populations. However, traditional monitoring practices such as this are costly, and the area covered does not cover the known range of the Kalmykian saiga population, with the result that important information could be missed. The structure of the current monitoring methods is unknown, and it is unclear how useful the data from such monitoring could be in terms of analysing population sizes (O'Neill, 2008).

Evidence suggests that saiga poaching is driven by poverty and a lack of alternative livelihood options (Kuhl et al, in press). In Kalmykia these two problems are particularly prevalent, with 60% of the population living below the subsistence level (UNDP, 2007) and jobs difficult to find, especially in rural areas (Kh. Mandjiev, pers.comm).

1.2 Introduction to this study

A pilot participatory monitoring scheme will be established in Kalmykian villages near to CZBR or SR. This pilot will run for six months, at the end of which the future continuation or expansion of the scheme will be considered. The role of this study is to assess, in the first few months of the programme, its likely potential to have a positive impact on both saiga observation data and also local engagement with and attitude towards saiga conservation. It is hoped that these direct effects should in turn lead to a reduction in saiga mortality through poaching.

Two attitudinal surveys carried out recently in Kalmykia give reason to hope that such a scheme may have success in the Republic. During the first survey, 80% of respondents stated that they would be happy to become a saiga monitor (Kuhl, 2007), and during the most recent questionnaire many community members demonstrated a high degree of interest in conserving the saiga, but many did not trust that current conservation activities were being adequately performed (Howe, unpublished data). Around 43% of Kalmykians live below the poverty line (Kuhl, 2007), and therefore by offering local people a means of earning a small income through engagement with saiga conservation, a species many of them clearly value, their attitudes towards saiga monitoring should improve.

However, despite positive reports of participatory monitoring, it is advisable to proceed with caution. Hockley et al (2005) found that locally-based monitoring of crayfish stocks in Madagascar was not cost-effective, and therefore not sustainable in the long-term. By initiating a six-month pilot participatory monitoring programme the feasibility, costs and benefits of the scheme can be evaluated and the methods adapted before any firm commitment is made, enabling us to ensure that valuable conservation funds are well directed, but also enabling local people to make suggestions for alterations to the scheme at the end of the trial period.

Participatory monitoring schemes have, until the present time, overwhelmingly been in contexts where the community members employed to perform the monitoring are users of the resource themselves (e.g., Danielsen et al, 2007). In these scenarios the monitors can see the advantage of monitoring, since if the species is not conserved then they will lose the opportunity to utilise it and, furthermore, if their participation as monitors is paid, it offers them a new source of income relating to the natural resource that was otherwise only valuable when harvested. It is also difficult to find examples in the literature of locally-based monitoring involving migratory species (see Table 1). As the current study will employ non-resource users (but see section 3.1) to monitor the migratory saiga antelope, it presents an interesting new scenario within the participatory monitoring literature.

Type	**Examples**	**Example description**
Non-migratory species, monitors are resource users	e.g., Andrianandrasana et al (2005), Ticheler et al (1998), Noss et al (2005), Van Rijsoort & Jinfeng (2005).	Ticheler et al (1998): Fishermen were employed to record information about their catches at Lake Bangweulu, Zambia. In a year, they collected around 400,000 individual fish records, at only 40% of historical monitoring costs.
Non-migratory species, monitors are not resource users	e.g., Bennun et al (2005), Gray & Kalpers (2005), Topp-Jorgensen et al (2005).	Bennun et al (2005): Birdlife International's Important Bird Areas are designed to be locally-grounded. A pilot project in Kenya has led to IBA monitoring in 9 other African countries.
Migratory species, monitors are resource users	e.g., Townsend et al (2005).	Townsend et al (2005): In 1990 the Cofan Indians of Ecuador initiated a freshwater turtle monitoring and recuperation programme. This scheme has influenced community attitudes to the extent that turtles are now protected rather than hunted.
Migratory species, monitors are not resource users	e.g., Capt (2007).	Capt (2007): Reintroduced lynx in the Swiss Jura mountains were monitored by game wardens, who recorded obervations of lynx, or evidence of lynx within their patrol area.

Table 1: Summary table of participatory monitoring schemes in the literature, broken down by whether the monitors are users of the resource, and whether the species in question is nomadic in nature.

1.3. Aims and objectives

This study aims to assess empirically the potential for establishing participatory monitoring of saiga antelope within Kalmykia, both in terms of usefulness of data and community engagement. This aim is split into 6 objectives:

1. To establish a participatory monitoring scheme, with villagers from communities surrounding CZBR and SR collecting data on saiga observations.
2. To evaluate local attitudes towards the scheme.
3. To assess the accuracy of the data gathered.
4. To assess the validity of the data gathered.
5. To evaluate the cost-effectiveness of the local monitors compared to rangers from CZBR and SR.
6. To produce recommendations for the continuation or otherwise of the scheme beyond the initial pilot phase, and any necessary improvements.

2. BACKGROUND

2.1 Background to participatory monitoring

2.1.1 History and importance of monitoring

Monitoring is "*the process of gathering information about some system state variable(s) at different points in time for the purpose of assessing system state and drawing inferences about changes in state over time*" (Yoccoz et al, 2001).

Monitoring ecological process is important for many reasons (Danielsen et al, 2005). From a purely ecological point of view monitoring is necessary to provide a baseline against which to measure future changes in management, to provide data on little studied ecosystems, and to identify the impact of species loss on an ecosystem (Spellerberg, 2005). Monitoring is also vital to measure the effects of policy on the environment, something that is increasingly important in today's target-driven world. For example, target 2 of goal 7 (Environmental Sustainability) of The Millennium Development Goals (MDGs) (UN, 2000) is to "*Reduce biodiversity loss, achieving, by 2010, a significant reduction in the rate of loss"*, a target that is echoed by the Convention on Biological Diversity (UNEP, 2002) signed by 190 countries around the world. Without reliable, accurate and ongoing ecological monitoring it will be impossible to provide evidence for the success or otherwise of these goals. Another important motivation for monitoring is the need to thoroughly evaluate conservation interventions in order to measure their impact, and often this is not only required by the conservationists themselves but also those funding their work (Sutherland et al, 2004). Finally, and most relevantly for this project, it is increasingly considered both desirable and necessary to involve local people in the management of their own natural resources, and data from monitoring is essential in order for them to make management decisions that conform to their local priorities (Sheil & Lawrence, 2004).

Traditionally, monitoring has involved scientists or experts from outside the local community dictating what should be monitored, how to collect and record the data, and then removing that data from the area to analyse for their own personal research (Stuart-Hill et al, 2005). Mostly this is also happening in the context of a Protected Area, which usually places restrictions on local people's movements and

involvement within that area. Pimbert and Pretty (1995) estimate that of the world's 8,500 protected areas, at least 1,500 are strictly off-limits to those living around them: people who may once have used the area as a vital source of basic natural resources. This approach is not only ethically questionable but also ignores the huge wealth of Traditional Ecological Knowledge (TEK) that local people have about the natural resources that surround them, and in doing so neglects a potentially valuable source of conservation wisdom (Berkes et al, 2000).

Until the latter half of the 20th Century, conservation was dominated by a 'fines and fences' approach, with no attempt to integrate local people (who were usually seen as the problem) into management strategies. By the 1970s however, ethical concerns were being raised towards these traditional methods of conservation, but the participation of local people within conservation decision-making was still treated as an afterthought, and not one that could influence management plans (Pimbert & Pretty, 1997). But in 1992, Principle 22 of the Rio Declaration declared that:

"Indigenous people and their communities and other local communities have a vital role in environmental management and development because of their knowledge and traditional practices. States should recognize and duly support their identity, culture and interests and enable their effective participation in the achievement of sustainable development." (UN, 1992).

The concept of fully functional participation by local people (along with other relevant stakeholders) has since become entrenched in conservation practice. Indeed, this idea is so accepted in modern thinking that most conservationists now agree that long term environmental and economic success can only be achieved when community members are given responsibility and independent decision-making power over natural resource management (Pimbert & Pretty, 1997).

Parallel to the increasingly felt importance of involving local people in conservation initiatives has been the emerging criticism of conventional monitoring practices. Traditionally, monitoring relies on external personnel, who often have their own research motivations rather than pure management goals. This results in many management plans being unsustainable over the long-term, because when the original instigators pull out there is no one locally who is engaged enough with the process to be able to take over (Stuart-Hill et al, 2005). Given that employing outside expertise is usually more expensive than in-country, traditional monitoring practices can be very costly (Shiel, 2001), and this further exacerbates the problem of their

sustainability, as it is difficult for conservation organisations to keep up high levels of funding over sustained periods of time (Danielsen et al, 2005).

2.1.2. What is participatory monitoring?

Participatory, or locally-based, monitoring is that which involves local people in monitoring practices, but this involvement can take many forms. Danielsen et al (in press) recognise that monitoring programmes will usually have neither a complete top-down or bottom-up approach; rather, most will sit somewhere on a scale of different levels of local participation. As such they define five categories into which all monitoring protocols should be accommodated:

Category 1: Does not involve local stakeholders. Monitoring procedures are funded, designed, executed and analysed by external agencies.

Category 2: Local people are involved in data collection, but not design or analysis of results. In developed countries collectors are usually volunteers, but in developing countries it is customary for participants to be paid a small amount.

Category 3: Similar to category two, although here local people are also included in management-oriented decision making (but still excluded from design and analysis).

Category 4: Local participants are involved in every stage of the monitoring process, but receive advice from external sources. Data is kept within the community, although it may be copied for use by outside researchers.

Category 5: Does not involve external agencies, except occasionally in an advocacy role. Monitoring procedures are initiated, funded, designed, implemented and analysed by local people.

Within these categories, there are numerous methodologies that could be employed to monitor the environment. Danielsen et al (2005) summarise the five main types of methods used in participatory monitoring:

Patrol records. This involves filling out routine patrol sheets on key resources, habitats or on the extent of resource exploitation.

Transects. Simple dedicated transects of resources and human resource use.

Species lists. Records only presence and absence of resources on fixed-time lists.

Simple photography. On-the-ground fixed-point photography of species or habitats.

Village group discussions. Discussions are held between government staff, local members of community monitoring groups and any other relevant stakeholders.

2.1.3 Advantages and disadvantages

In 2004 the Nordic Agency for Development and Ecology (NORDECO) and Cambridge University co-hosted a conference entitled “Monitoring Matters” to examine case studies of participatory monitoring in developing countries. They concluded that, whilst more research was necessary, *“locally-based monitoring can provide valuable data, cost-effectively and sustainably, while simultaneously building capacity among local constituents and promoting practical and effective management interventions”.* So what is the evidence for this, and do any case studies contradict this finding?

An example of a successful participatory monitoring scheme was developed by Stuart-Hill et al (2005) in Namibia, named the “Event Book system”. This participatory management programme required community rangers to detail all events in a personal log book (see Figure 1), which were then analysed with the help of other community members and rangers at monthly and yearly meetings. The fact that local people, rather than scientists, analysed the results meant that findings were basic enough to be understood even by illiterate community members, and were also relevant to local interests. All data was kept by the village in order to allow

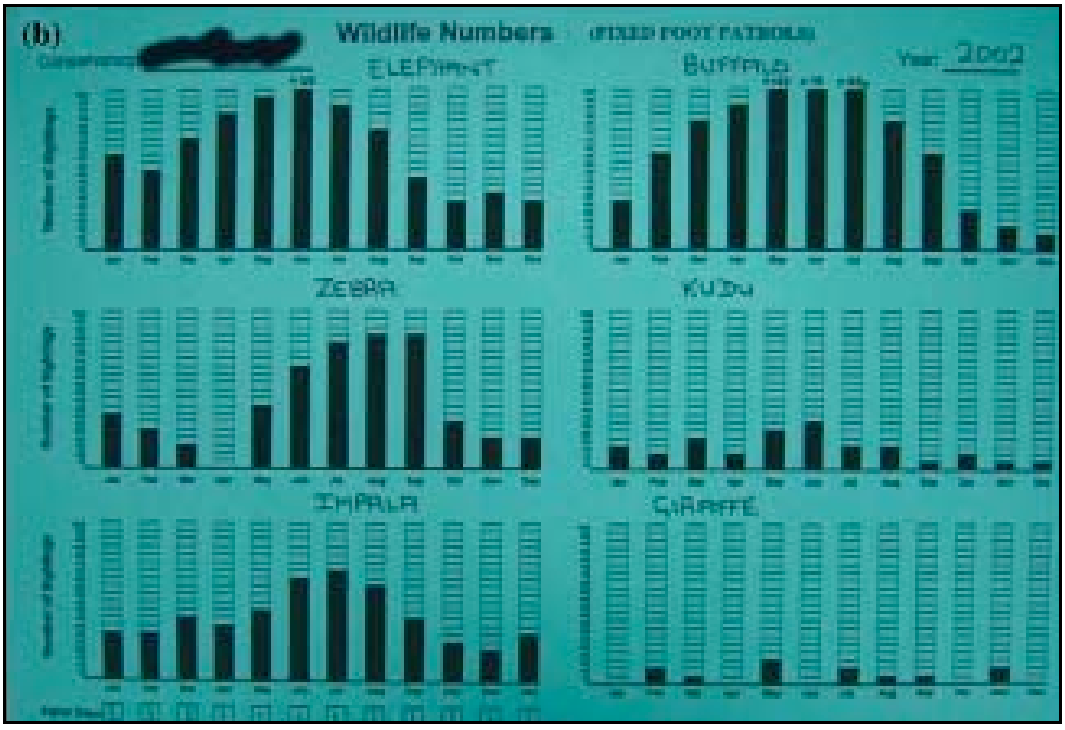

Figure 1: Photograph of original hand completed community reporting chart for a communal conservancy in Namibia (the name of which has been deleted), showing wildlife numbers observed whilst local monitors were on foot patrols (taken from Stuart-Hill et al, 2005).

local people to take complete ownership of natural resource management in their area, rather than rely on external agencies. The Event Book system has proved so successful that it has been piloted in over 30 communal conservancies across Namibia (covering over 6m ha) and is now being piloted in seven National Parks.

As well as being cost-effective, sustainable and building capacity within local communities, many other benefits of participatory monitoring have been reported. Across 1.1m ha of protected areas in the Philippines, Danielsen et al (2007) found that participatory monitoring was not only cost-effective but, when combined with traditional monitoring practices, was also capable of generating substantially higher intervention levels than conventional monitoring alone (see Figure 2). Poulsen and Luanglath (2005) found that participatory monitoring by local people around Xe Pian National Park in Laos had the additional benefit of building trust and even strong

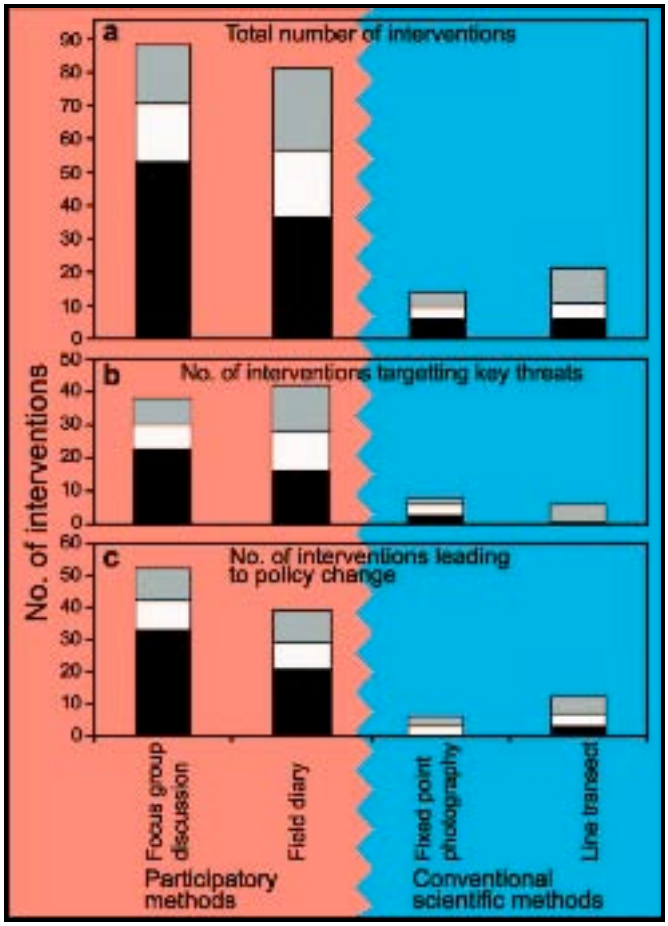

Figure 2: Effectiveness of participatory and conventional monitoring methods in terms of the number of interventions generated intended to improve the way local people (black), outsiders (white), and both groups in collaboration (grey) manage protected areas within the Philippines. Taken from Danielsen et al (2007).

friendships between staff and villagers, and also increased awareness of conservation issues in surrounding villages. Finally, and perhaps most importantly, the initiation of participatory monitoring can act as the first step on the path towards complete and sustainable community management of natural resources, for the mutual benefit of biodiversity and human welfare.

However, participatory monitoring by local community members is not necessarily the correct course of action in all monitoring situations. Hockley et al (2005) use an example of crayfish harvesting in Madagascar to demonstrate that stakeholders may not always be willing to contribute adequate time and effort to monitoring a resource as will be necessary to detect a decline (or indeed an increase) in species' numbers. If a resource is not valuable (either financially or culturally), populations are under only a moderate level of threat and if there are other income generating alternatives then it is unlikely that local people will be happy to devote much time to complicated monitoring activities. However, Hockley et al (2005) focus purely on the data-gathering element of participatory monitoring: even when, scientifically, monitoring may not contribute much to knowledge of a species, it may aid in encouraging community engagement and local ownership of a resource, which may in turn lead to compliance with harvesting regulations.

Danielsen et al (in press) suggest that when data needs to be highly accurate, participatory monitoring (especially categories 4 and 5) may not be appropriate. Indeed, Uychiaoco et al (2005) found that community measures of fish abundance were far more variable than those collected by scientists. Danielsen et al (2005) also note that locally-based monitoring is unlikely to be successful when dealing with small or cryptic species that are difficult to identify. Another disadvantage of participatory monitoring is that unless local people are connected to national or international organisations with routes to government, locally collected data is unlikely to influence policy decisions in the way that professional data has the potential to (Danielsen et al, 2005). This is worrying, especially given that one of the most important justifications for monitoring is to assess progress on biodiversity targets such as the MDGs, and then feed this information back to government in order to effect any necessary policy change. Danielsen et al (2005) suggest the establishment of a website to hold a database of current and past participatory monitoring schemes, which could act as a focal point for communicating results to government or other policy making bodies.

2.2 Background to saiga ecology and conservation

2.2.1 Saiga populations, locations and ecology

The saiga antelope (*Saiga tatarica*) is a steppe-dwelling migratory ungulate currently found in five distinct populations across Russia, Kazakhstan, Uzbekistan and Mongolia, and in very cold winters even Turkmenistan (see Figure 3), although there is evidence for a historical range from Britain to China (Bekenov et al, 1998). Two subspecies exist, the most numerous of which is *S. t. tatarica,* found in all three Kazakhstan populations as well as the Kalmykian (also known as Precaspian) Russian population. The second subspecies, *S. t. mongolica*, is only found in two small populations in Mongolia, although until the 1960s it was also found in China (CMS, 2006). The focus of this study will be on the Precaspian population in Kalmykia, Russia (population 1 of Figure 3).

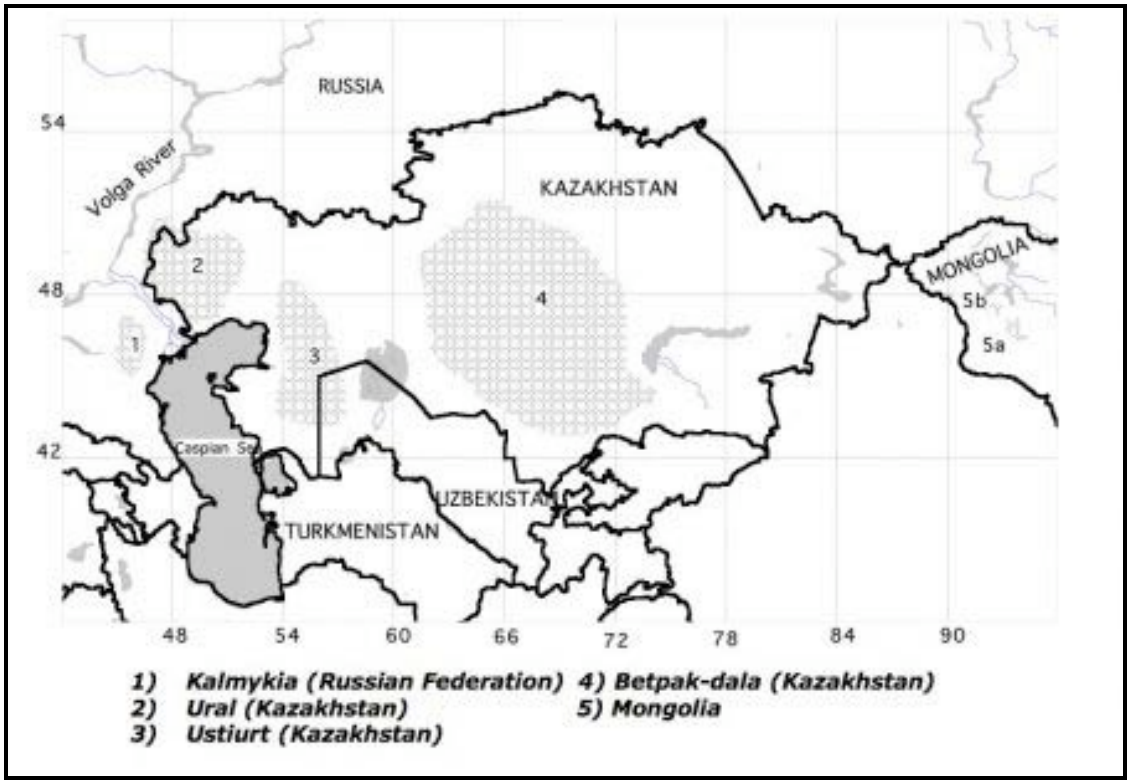

Figure 3. Map displaying current saiga population locations and ranges. From Milner-Gulland et al (2001)

At around 70cm tall, saigas are approximately the same size as a domestic goat with orange sandy coloured coats in summer and a thicker, creamy coloured coat in winter. Males typically weigh around 41kg and females around 28kg (Bekenov et al

1998). The most striking elements of the saiga's appearance however, are its protuberant nose, and the horns borne by adult males (see Figure 4).

As a nomadic species, saiga can migrate huge distances between their summer and winter pastures, as well as their favoured breeding grounds. The extent of these migrations varies with population, with the Kalmykian population travelling very little, whilst the Betpak-dala saigas have been known to travel up to 1,000km between their summer and winter pastures (Kuhl, 2003). This large range size not only means that saigas are more sensitive to habitat disruption than other species, but also increases the likelihood of human pressures such as poaching, because the animals' range inevitably crosses over with that of humans (Kuhl, 2007).

Figure 4: Saiga antelope in typical steppe habitat at the Stepnoi Nature Reserve in Kalmykia, Russia. Three males saigas can be easily detected due to their large horns, and are surrounded by females and several juveniles. Photo by A. A. Lushchekina.

Saigas are suited to flat areas with low-lying vegetation, preferring grasses and legumes as part of a varied diet that encompasses over 80 different species of plant and lichen (Bekenov et al 1998). Proximity to watering places, as well as little snow-cover (no more than 20cm deep) is also desirable. It is likely that saiga play an important role in steppe ecosystem functions, as soil fertility has been found to be significantly reduced where saigas are absent (Abaturov, 1984).

Research suggests that saigas are significantly more fecund than other ungulates, with females becoming fertile at around 7 months of age and often producing twins in their second year of reproduction (Fadeev & Sludskii, 1984). Indeed, twinning rates in saigas can be as high as 64% (Milner-Gulland et al, 2001). Saiga calves are born during April-June, with the greatest number usually born over the space of a week in mid May (Bekenov et al, 1998), giving rise to vast aggregations of female saiga in favoured breeding grounds.

2.2.2 Declines in saiga numbers

There has rarely been any point throughout history when saigas have not been hunted by man. In the 18th and 19th centuries the saiga was hunted extensively by the St Petersburg Imperial Court (Kirikov, 1966), and by the turn of the 20th century was almost extinct. Collectivisation of farms, the closing of the Chinese border for trade, and well-regulated hunting meant that saigas thrived during the Soviet period (Robinson & Milner-Gulland, 2003). Unfortunately, however, since the early 1990s there has been a return to previous hunting levels, and increasing fears about the species' sustainability (Bekenov et al, 1998). These concerns have led to the saiga antelope being listed on Appendix II of CITES in November 1994, placing international restrictions on the volume of trade. In 2002, the saiga antelope was listed on the IUCN Red List of Threatened Species as Critically Endangered, in recognition of the shocking 95% decline in numbers that the species had suffered over the proceeding 10 years (Milner Gulland et al, 2001; CMS, 2006). In 2006 a Memorandum of Understanding was signed by Kazakhstan, Uzbekistan and Turkmenistan on the "Conservation, Restoration and Sustainable Use of the Saiga Antelope". However, Russia, the largest and wealthiest range state, has yet to sign, a situation that could have serious negative implications for the future protection of the Precaspian saiga population (CMS, 2006).

Saigas are hunted for their meat and for their horns, which are sold to the lucrative and seemingly insuppressible Traditional Chinese Medicine market (Milner-Gulland et al, 2001). Since the USSR disbanded in 1991, rural areas across Russia and ex-Russian states have suffered from high levels of poverty, and as trade routes with China have been reopened many local people have turned to saigas as a much-needed source of income (Robinson & Milner-Gulland, 2003). Since it is males who bear the horns, and a greater amount of meat (as they are significantly larger than

females), they have been selectively hunted by poachers (Milner-Gulland et al, 2001) leading to imbalanced sex ratios and sub-optimal breeding patterns. Usually, a male saiga will mate with a harem of around 30 females, but with male numbers low there are now often too many females for the males to impregnate. Not only does this leave many females barren at the end of breeding season, but it has also been observed to result in a loss of fecundity in many adult females (Milner-Gulland et al, 2003). In this way, poaching has a doubly negative effect on saiga population numbers: directly through harvesting, and indirectly through its effect on breeding success rates.

Ecological factors may also play a role in the decline of the saiga antelope. For example, during 1985-86 an especially cold winter (known as a *dzhut* in Kazak) was responsible for reducing the Betpak-dala saiga population by 37% (Robinson & Milner-Gulland, 2003). Some even suggest that ecological factors have played a greater role in the saigas' fluctuating population than anthropogenic ones: Abaturov (2007) notes that during the 19th and early 20th century saigas were plagued by vast swarms of warble fly, who laid their eggs under the skin of the saigas' backs. The ensuing stress, the author claims, was the cause of the huge decline in saiga numbers, and the warble fly's subsequent extinction in the 1930s was the cause of its recovery.

There is evidence to suggest that saiga numbers have begun to stabilise since 2002, possibly as a result of increased conservation activity (CMS, 2006). However, as can be seen from Figure 5, even with this recent positive trend, saiga numbers are still at around 5% of 1980s levels. It has been estimated that the three Kazakhstan populations alone would optimally support 800,000 – 900,000 saiga (Bekenov et al, 2002), and yet the total number of saiga across all five populations today is less than 10% of this figure.

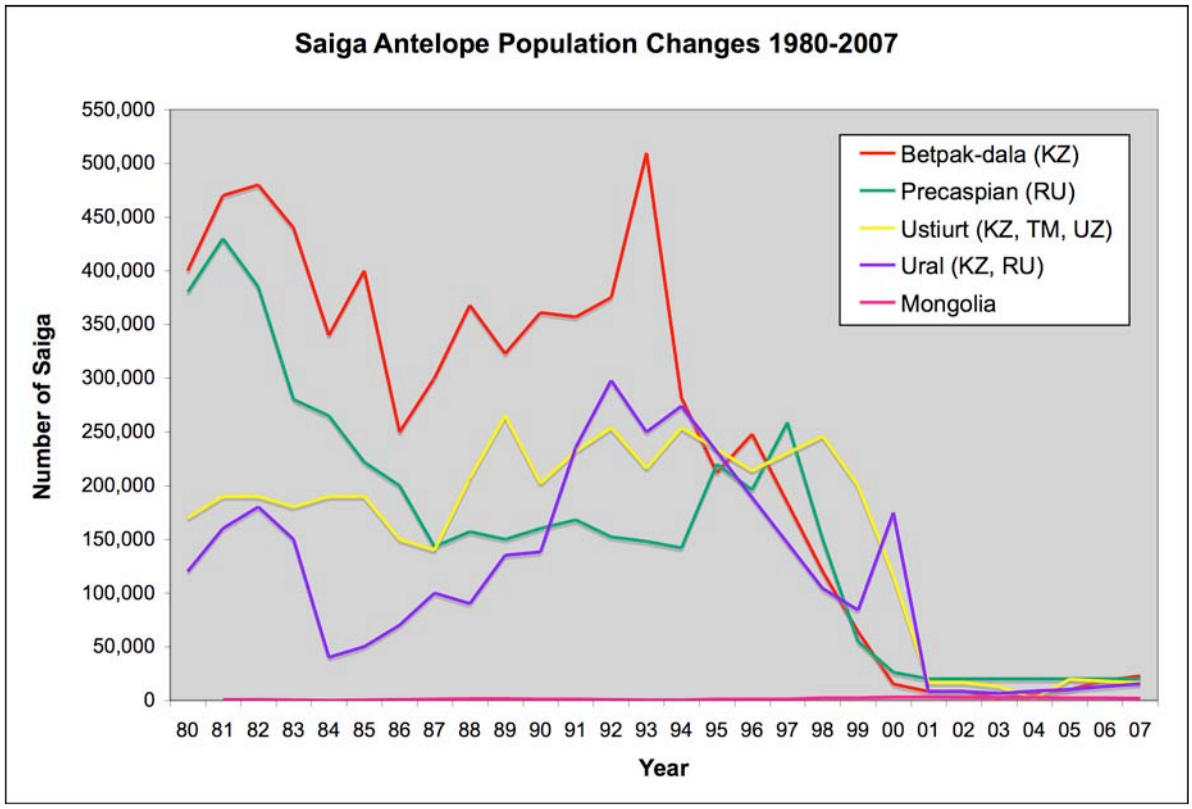

Figure 5: Graph to show changes in saiga numbers across all five populations, 1980-2007. Data for 1980-2000 taken from Milner-Gulland et al (2001), data for Kazakhstan populations taken from Duisekeev & Sklyarenko (2008) and remaining population estimates from 2001-2007 taken from CMS (2007).

2.2.3 Saiga conservation activities to date

"The seemingly particular problem of conserving and controlling the saiga population appears to be linked to that of the socioeconomic development of the whole region" (Abaturov, 2007).

Although some have questioned anthropogenic socioeconomic influences as the main or sole factor affecting saiga population numbers (e.g., Abaturov, 2007), the truth of the above statement is widely recognised. As such, a large number of saiga conservation interventions have focused on improving the lives of local people, and have sought to involve communities in conservation actions. Below is a brief outline of some of the more prominent saiga conservation initiatives across the range states, although in the interests of brevity I have focused on those aimed at the Precaspian population in Kalmykia, as this is the location for the current study.

Until relatively recently the only form of conservation undertaken within the Precaspian saiga population was monitoring work carried out by rangers in two

Nature Reserves, one in Kalmykia and one in the neighbouring Astrakhan oblast (Kuhl, 2003). In 1990 CZBR was established in the Chernozemelsky region of Kalmykia as a *zapavednik*, a nature reserve designated for scientific research. In 1993 it was made a UNESCO MAB site, and it is now run by their administration in Moscow. The adjoining SR, located in the neighbouring Russian oblast (region) of Astrakhan, was established ten years later. Whilst both sites conduct monitoring of saiga antelope as part of their daily activities, SR has a more traditional "fences and fines" approach to conservation (A. Khludnev, pers.comm.) and will actively seek to remove threats to saigas (such as wolves), whereas rangers at CZBR are, in keeping with the rules governing zapavedniks, strictly non-interventionist (Ostergren & Hollenhorst, 1999).

Kalmykia is also home to the world's most successful saiga breeding centre, the Centre for Wild Animals (CWA). Established in 2000, the CWA started with 10 saigas and now has a population of around 70. Although these animals are kept in ranch-style captivity, five males have already been released into the wild, and it is hoped that as the population grows more will be released. The CWA also acts as an environmental education centre (see Figure 6), and is frequently visited by groups of school children (Iu.A. Arylov, pers.comm).

Figure 6: Discussing saiga research inside the Environmental Education Yurt at the CWA. Photo by kind permission of Helen O'Neill, 2008.

In 2005, as part of their ongoing commitment to support international sustainable development initiatives, DEFRA's Small Environmental Projects scheme funded "Rotating Cows", an integrated conservation and development project (ICDP), aiming to create a livestock bank linking an improvement in livelihoods to the need to stop saiga poaching. Cows from a herd of rare breed Kalmykian cattle are bred at the CWA and given to households in selected villages surrounding CZBR, conditional on their ongoing commitment to reducing saiga poaching by village members. The first-born calf of each cow is returned to the CWA to allocate to another family. Local people are able to earn a small income by selling dairy products, and it is hoped that an explicit link will be formed between socioeconomic development of the region and a cessation in saiga poaching (Milner-Gulland, 2005).

The majority of conservation activities in Kazakhstan have been initiated by the government with help from local NGOs. In 2005 saiga hunting was banned, as was the purchase, storage and sale of saiga horns and products until 2011, at which time the situation will be reviewed (Duisekeev & Sklyarenko, 2008). In 2007, the Kazakhstan government allocated $1m to saiga conservation projects and this year established the Altyn Dala Conservation Initiative (ADCI) in order to protect the saiga along with its vast and diverse steppe habitat. So far the project has funded three teams of rangers to work partly as wildlife monitors but also as environmental education officers for local schools (Klebelsberg, 2008).

In Uzbekistan the Wildlife Conservation Network (WCN) and Fauna and Flora International (FFI) have funded community engagement and awareness-raising activities such as children's art competitions, the formation of a "Saiga Friends" club and meetings with government and industry (Bykova, 2007).

Recently conservation activities have also been re-established to protect the small population of saigas in Mongolia. With support from the WWF, rangers and local people have been trained to establish a community-based monitoring programme, and eco-clubs have been formed in local schools. Re-investigations of previously dismissed saiga poaching cases are also being undertaken by the law courts (Chimeddorj, 2008).

As saigas only migrate to Turkmenistan in cold winters, little formal conservation work for the species has been undertaken there. However, part of the saigas' winter

habitat is protected by the Kaplankyr State Nature Reserve, and there are further plans to establish a sanctuary near the border with Kazakhstan, with the specific aim of protecting saigas throughout their range in Turkmenistan (Saparmuradov, 2005).

Although saigas have been extinct in the wild in China since the 1960s, the Gansu Endangered Wildlife Breeding Centre is home to about 60 saigas who share a 5,850 m^2 enclosure with other endangered animals such as Przewalski's horse and the wild camel. (Kang & Xu, 2005) The Xia'erxili Nature Reserve, which lies adjacent to the border with Kazakhstan and was formally part of the saigas' migration routes, has recently been identified as a promising location for future saiga reintroductions (Lishu, 2006), but to date there is no formal reintroduction plan.

2.3 Background to the Republic of Kalmykia, Russia

2.3.1 Location and demography

The Republic of Kalmykia is an autonomous member of the Russian Federation located within southern Russia and bordering the Caspian Sea (see Figure 7). The river Volga runs through the North Eastern corner of the Republic, and the Caucasus are found to the south. It covers a land area of approximately 76,100 km^2, with a maximum north-south span of 640km and a maximum east-west span of 480km (Grin, 2000).

Kalmykia's landscape is entirely semi-arid steppe, and is in fact the site of Europe's only anthropogenically-induced desert (Lepretre, 2001). Overgrazing by sheep and cattle during Soviet times led to the destruction of the steppe habitat and widespread desertification, but following perestroika there was a huge decline in livestock numbers, and since then much of the steppe has begun to recover (Kuhl, 2007). However, approximately 50% of the country is still subject to the effects of desertification (Antonchikov et al, 2002), and water shortages are an increasing problem (Iu.A. Arylov, pers. comm.).

Figure 7: Map showing Kalmykia's position within the Russian Federation. The Chernye Zemli Reserve is located approximately half way between Elista and the Caspian Sea. Taken from Grin (2000).

The Republic suffers from very little rainfall (approximately 170 – 400mm per year). The climate is continental, with cold, relatively snow-free winters, with January average temperatures of -7ºC (max -44ºC); and hot dry summers, with average July temperatures of +24ºC (although +44ºC is not uncommon). Strong winds are common throughout most of the year (Kuhl, 2007).

The population of Kalmykia is around 300,000, with a third of citizens living in the capital, Elista (Grin, 2000). In total, around 44% of the population is classed as urban. Kalmykia is one of the poorest areas of Russia, with data from 2005 indicating income per capita as only 32.8% of the Russian national average, with 60% of people living below the poverty line. 57% of the country does not have access to indoor plumbing (UNDP, 2007), and water shortages are an ever-increasing problem (Iu.A. Arylov, pers comm.). The economy is primarily based on livestock, and as such farming is a high status profession (Kuhl, 2003).

The population of Kalmykia is ethnically diverse, comprising around 55% Kalmyks and 34% Russians, with the final 11% comprising mostly Caucasians such as Dargins and Chechens, as well as Kazakhs, Turks, and even a few Germans. The

religious composition of the Republic is similarly colourful. Kalmykia is the only country in Europe where the official religion is Buddhism (Lepretre, 2001), and this is the primary religion of the Kalmyk majority, but due to the high proportion of Russians (particularly in the capital), Russian Orthodox Christianity is also widely practised. Islam is the predominant religion of Caucasian and Turkish groups.

2.3.2 History and people

Kalmykia was founded on 14th November 1920 as an Autonomous Region, becoming a Republic of Russia in 1935. Kalmyk people had, however, been inhabiting the steppe areas of the lower Volga since the early 17th century. Descended from nomadic Oirat tribes of Western Mongolia, they migrated west from China as a result of civil war, reaching the Volga in 1608 (Lepretre, 2001). In 1771 the majority of the descendents of those who had migrated decided to return to their homelands (Grin, 2000), and it is suggested that the name “Kalmyk” comes from the Oirat word meaning “remnant”, which was attributed to those who decided to remain in Russia (Kalder, 2006).

During WWII, Elista was captured and occupied by German troops, and following the end of the war Stalin used this fact to accuse the Kalmyks (along with eight other ethnic minorities) of collaboration with the enemy. In December 1943, around 93,000 Kalmyks were sent into exile in Siberia. They remained there for 13 years until Stalin’s death in 1956, when his successor Khrushchev allowed them to return to Kalmykia. By this time the republic’s land had been split between neighbouring oblasts, and between one fifth and half the population had died due to the excessive privations deportation imposed upon them (Grin, 2000).

It has taken Kalmykia a while to recover from the effects of the deportation, but the advent of perestroika greatly aided the resurgence of their national and cultural identity, and in the last 10 years developments in the Republic have been more positive. In 1993 Kalmykia appointed its first Head, Kirsan Nikolaevich Ilyumzhinov, with 65% of the popular vote (Grin, 2000). Ilyumzhinov is also President of FIDE, the World Chess Association, and as such chess has become a national passion (see Figure 8), even on the national curriculum in primary schools. Although Ilyumzhinov’s promise of transforming Kalmykia’s economy into “a second Kuwait”

has not materialized (Grin, 2000), it is certainly no longer the depressingly empty and backwards nation it has in the past been depicted as (e.g., Kalder, 2006).

Figure 8: People playing chess in Lenin Square, Elista, with a Buddhist pagoda and prayer wheel in the background.

2.3.3 Study sites

This project will establish a pilot participatory monitoring scheme for saiga antelope, employing 25 local people from five villages within the known saiga range. Little is known of the saigas' migratory habits within Kalmykia, apart from to say that they are present within both reserves all year round (Kuhl, 2007), and certainly never migrate as far as saigas within the Kazakhstan populations. It is thought that saigas move north after calving in June-July, and then move south of the reserves during the winter (see Figure 9). However, many of these assumptions are based on data from the 1950s (e.g., Zhirnov, 1985) and anecdotal evidence.

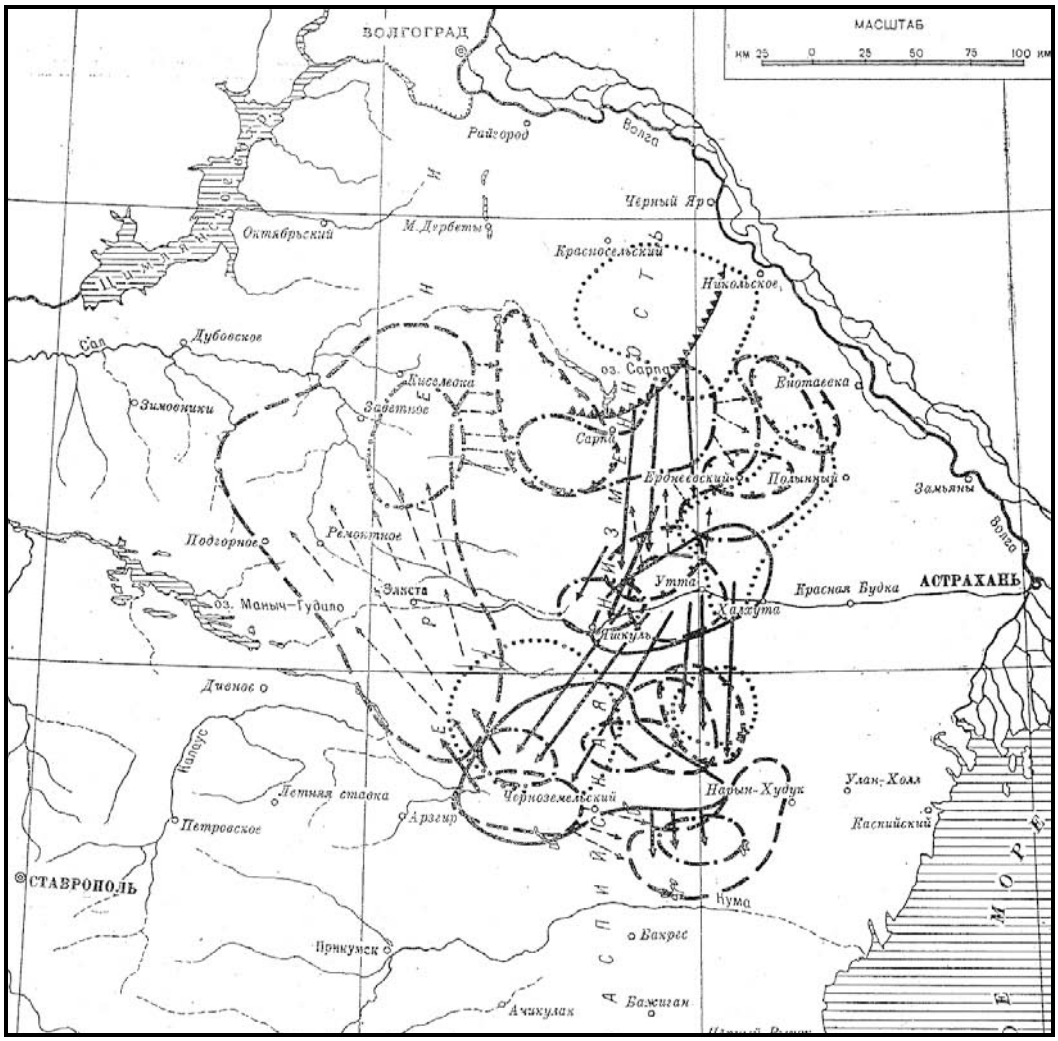

Figure 9: Map to show approximate locations of the Kalmykian saiga population in summer 1958 (Zhirnov, 1960). —— May – – – June – · – July – – – August ····· September

Villages were chosen on the basis of their proximity to the Reserves (see Figure 10) and also on their previous experience of conservation projects (see Table 2).

Village Name	Year Founded	Population Size	No. of Households	Population Status	Approx. Distance from CZBR	Previous Conservation Activities
Erdnievsky	1923	918	284	Declining	60km	Low-level media campaign
Khulkhutta	1957	533	115	Declining	20km	Rotating cows
Molodezny	1957	375	120	Declining	45km	Low-level media campaign
Tavn-Gashun	1958	385	72	Stable	25km	Rotating cows
Utta	1960	882	206	Declining	30km	Low level-media campaign

Table 2: Details of the five study villages in Kalmykia. Information obtained from locally relevant sources, except information on conservation activities, which is courtesy of Caroline Howe (unpublished data). For information on the rotating cows project please see section 2.2.3.

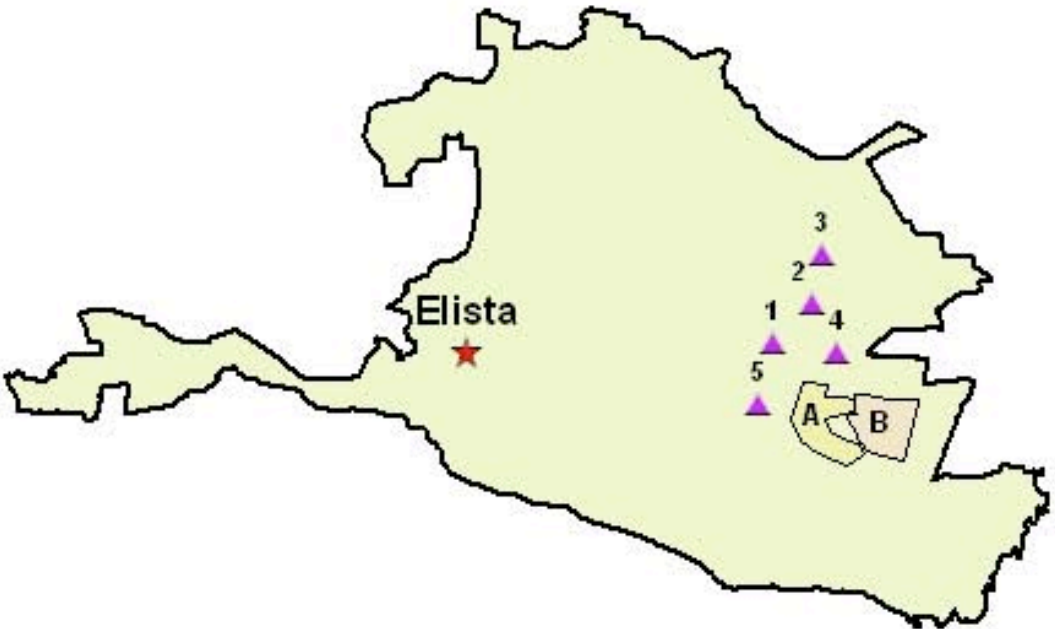

Figure 10: Map of Kalmykia showing location of the five study villages in relation to Elista, CZBR and SR. 1= Utta, 2= Molodezny, 3= Erdnievsky, 4= Khulkhutta, 5= Tavn-Gashun, A= CZBR, B= SR. Shape files for CZBR and SR provided by Helen O'Neill.

None of the villages have access to indoor plumbing, and so most households have their own well outside. Electricity is available in all five villages, although sometimes intermittent and, with the exception of Tavn-Gashun, each village has good mobile phone coverage. Utta and Khulkhutta are connected to Elista via Kalmykia's primary East-West road, the A154, and both Molodezny and Erdnievsky are situated alongside a main road that connects to the A154 at Utta. Only Tavn-Gashun is badly served, being approximately 40km from Utta on a dirt track. Each of the five villages has a school for children up to the age of 14, as well as medical facilities, although the population size of each village is currently so small that this provision seems somewhat unnecessary (indeed, the schools are often only half-full). It can perhaps be explained by the fact that all of the villages have rapidly declined in numbers since the break-up of the Soviet Union, when jobs became scarce and people started moving to cities in search of work (Kh. Mandjiev, pers. comm.).

In all but Molodezny, most inhabitants are practising Buddhists. Molodezny has a large Caucasian population, mostly made up of Dargins and Chechens (in fact there are only two Kalmyk families in the village [Iu.A. Arylov, pers. comm.]) and hence the primary religion is Islam.

2.3.4 Previous research

In addition to the conservation activities shown in Table 2, in 2006 each of the five study villages had taken part in a Darwin-funded questionnaire-based study looking into attitudes towards different conservation approaches. Between 11-34% of the households in each village were interviewed as part of the study (Howe, unpublished data), and so it is likely that this, combined with the previous conservation exposure each village had received, will have resulted in each village being more aware of conservation issues than other villages in the nearby area.

This 2006 Darwin study aimed to uncover people's attitudes towards three different kinds of conservation intervention: "fences and fines", social engagement and environmental education. Eight villages within Kalmykia and the Astrakhan oblast that had been exposed to at least one of these methods were chosen, including the five study sites chosen for the current study. Using a Willingness to Pay (WTP) model, whereby individuals choose how much they would be prepared to pay for a certain event (e.g., the continued existence of the saiga) from a payment card, this 2006 study found that opinions of "fences and fines" conservation were polarised, but that everybody was positively predisposed towards social engagement strategies.

In a previous Darwin research project in the area, Kuhl (2003) conducted questionnaires within Tavn-Gashun and neighbouring farms to uncover attitudes towards poaching and thoughts surrounding the decline in saiga numbers. The study found that around 50% of respondents blamed poaching for the recent decrease in saiga numbers, and that poaching was in general considered a very low status occupation (coming fourth from bottom out of 18 possible occupations). 91% of respondents stated that they would mind "very strongly" if the saiga became extinct. The conclusion of the study was that poverty was the primary cause of saiga poaching, fuelled by a lack of livelihood options and education.

3. METHODS

3.1 Methodology

A variety of methods was used to establish and then test the viability of participatory monitoring by local people including home visits, training, the use of questionnaires, and accuracy assessments.

3.1.1 Choosing village monitors

Usually, participatory monitoring schemes employ local people who are users of the natural resource they are monitoring (e.g., Andrianandransana et al, 2005). However, hunting saigas is illegal in Kalmykia, and therefore any legal resource use is constrained to intrinsic and aesthetic values for the species. However, Kuhl (2007) found that questionnaire respondents in Tavn-Gashun and Khulkhutta estimated that 32% and 17% of villagers respectively were either poaching themselves or in some other way involved in saiga poaching (e.g., selling saiga meat). According to Kuhl (2003), poachers are likely to be male and poorer than an average member of the community (a quarter of known poachers were unemployed). Given this high level of estimated involvement, it seems likely that some of the village monitors chosen to take part in this participatory monitoring programme may in fact be resource users of the saiga, albeit secretly.

Is it desirable for monitors to be poachers? As previously stated, local resource users are likely to have a higher value for a resource than non-users, and they therefore have a higher motivation to assist in its preservation. However, there are understandable concerns about employing the very people who poach a critically endangered species and asking them to deliberately seek it out: it is possible that by doing so we could simply validate further poaching (A. Kuhl, pers.comm). Also, it does raise the issue of rewarding those who are engaged in an illegal activity, which may unfairly penalise others who may be equally worthy of engagement and financial support and who are acting within the law.

3.1.2 Payment

When involving local people from developing countries in the monitoring of natural resources, ethical considerations dictate that they should be paid (Danielsen et al, 2005). However, in her 2006 attitudinal survey in Kalmykia, Howe (unpublished data) found that many local people were opposed to the idea of local people being paid to monitor saiga, although they were in favour of locally-based monitoring otherwise. There is also some debate about the extent to which payment can be expected to lead to coercion, e.g. with respect to the cessation of saiga poaching. Although payment is undoubtedly an influential factor, enforcement and community engagement can be more important in terms of changing behaviours (M. Sommerville, pers.comm).

3.1.3 Attitudinal surveys

Questionnaires and social surveys are increasingly becoming more popular amongst ecologists (White et al, 2005), akthough there has been little research to date into their effectiveness (Jones et al, 2008).

The advantage of using a structured questionnaire is that answers can be directly compared across respondents, and when using face-to-face interviews (as with this study), respondents can be probed for further explanations of their answers. However, it is also easy to generate biased responses, as an interviewer will rarely appear in a neutral context, and the interviewee may react by either answering in a way that they deem favourable, or react against them and deliberately answer unfavourably (Kuhl, 2003). This situation can be to some extent mitigated if the interviewer is aware of their potential effect on respondents, and makes every effort not to ask leading questions.

3.1.4 Cost effectiveness

Although the importance of monitoring for conservation is often stated (Danielsen et al 2005), the cost-effectiveness of monitoring techniques is rarely evaluated (Reilly & Reilly, 2003; Gaidet-Draper et al, 2006), which is surprising given that conservation is continually under-funded and therefore necessitates achieving results on limited budgets. Rist et al (2008) found that self-monitoring of Catch Per Unit Effort (CPUE

– i.e., how many hours spent hunting per animal caught) amongst bushmeat hunters was comparable to professional monitoring, but much more cost-effective, both in terms of time and money. However, Hockley et al (2005) modelled the costs and benefits of crayfish harvesters in Madagascar to find that participatory monitoring was not a cost-effective strategy. It is clear that not all participatory monitoring schemes will be cost-effective, and it is important to attempt to find out during pilot phases of monitoring whether or not a programme is good value for money in order to ensure long-term sustainability.

3.2 Application of methodology

3.2.1 Structure of pilot participatory monitoring programme

The main structure of the pilot had been decided before my involvement in this project began, when the Saiga Conservation Alliance decided at their annual meeting in 2007 that Kalmykia would be a good place to trial such a scheme. As such my collaborators in Russia had already started the process before I arrived, and there were some elements over which I had no, or limited, control. These included the selection of the villages themselves and initial meetings with members of village administration.

However, there were aspects of the pilot into which I was able to have an input. For example, it was important to decide before first visiting the village monitors what form the payment structure would take. The budget allowed for £3,000 over the six-month duration of the pilot, but how should this be allocated? Should monitors be paid only when saigas were in the vicinity of their village; per saiga sighting; or throughout the duration of the project? It was decided that, due to the important social engagement element of this project, paying the monitors regularly throughout the pilot was important, as otherwise some monitors would be disadvantaged from the outset due to their location, and we felt it was more important to reward them for their effort. We therefore decided to pay the monitors £20 per month each. Although we do not know how much our monitors earn per month, it is reasonable to expect that this may represent around 10% on top of their current earnings.

Another issue was how to record the absence of saigas as well as their presence. It was not considered feasible to require monitors to devote time each day to

searching for saigas, as this effort would not be rewarded with sufficient remuneration, and as they already had their own work to do there would not be sufficient time. Therefore, on most days, monitors were simply asked to record saigas if they saw them, but not to deviate from their normal routine in search of them. We also included two “control days” as part of the monitoring routine. On these days monitors would spend enough time specifically looking for saigas in order to cover their entire range area – approximately a couple of hours per day. If they saw saigas they should record their observations as usual, but if not they should also record this. The control days were fixed as the 1st and the 15th of each month. It was hoped that, by standardising control days in this way, double-counting would also be minimised, as we would have a record from every monitor on the same day. The control days also act as a measure of effort, as we know that one those days monitors have invested comparable effort into their observations.

3.2.2 Establishment of programme

With the help of regional colleagues and each village’s administration, 25 village monitors were chosen across five villages. These were Khulkhutta (5 monitors), Utta (4 monitors), Molodezhny (5 monitors), Erdnievsky (6 monitors) and Tavn-Gashun (5 monitors).

With one exception, all of the chosen village monitors were farmers. Farmers in Kalmykia are pastoralists, and as such are highly familiar with counting large groups of animals. This, combined with the fact that their farms are usually located away from the centre of the villages (and hence in areas more likely to be visited by saigas), made them a useful group to employ. In Molodezny, where requisite numbers of farmers were not able to participate (or chose not to) a driver was chosen as he spent much of his time delivering water to farms, and was therefore often in similar environments – with the additional advantage of covering a large area.

Each monitor was visited twice, ideally in their own homes but occasionally (when this was not possible), they were met in the centre of the village. The first visits occurred between 11th and 29th June 2008. During their induction to the scheme, monitors were provided with all the equipment necessary to observe saigas and record these observations: a pair of binoculars (if they had none or their own pair

was of poor quality), a tally counter, a compass, a pen and a booklet with data tables in Russian. This booklet had been designed, translated and printed in the UK prior to departure, and was based on the Event-Book system proposed by Stuart-Hill et al (2005). The datasheets (see Appendix 1) that comprised the bulk of the booklet were simplified versions of herd-count datasheets that had been used previously in Kalmykia (Milner-Gulland, 2007). In addition to these essential items, monitors were also given gifts of a saiga T-shirt and badge.

During this initial visit monitors were briefly trained in standard survey techniques, including estimation of the distance to herds and distinguishing between sex classes. Monitors were shown how to fill in their booklets and were told about "control days" on the 1st and 15th of every month. Any questions the monitors had about the booklet, the pilot programme, or their role within it, were answered. They were also told that their views would be sought after the programme had run for six months, and that these opinions would be used to shape the further development of participatory monitoring of saigas in Kalmykia. I additionally used this first visit to collect demographic information about each monitor (see Appendix 4), as well as taking a GPS reading of the farm coordinates.

Figure 11: Explaining how to complete the data booklet to Ruslan, one of the village monitors from Molodezny.

My second visit to the village monitors was conducted at least 10 days after the initial visit (between 2nd and 6th July 2008), in order to give them time to become acquainted with the system and to make a few saiga observations. I collected any observation data by either copying the information by hand or taking a photograph as, following advice from Stuart-Hill et al (2005), in order to encourage participants to take ownership of the programme and become more engaged it was important that all raw data remained with them. I answered any questions that the monitors had and corrected any misunderstandings that had led to incorrectly entered observations. As a good will gesture each monitor was given a children's book about saigas, a research poster and a photo of the monitor and me (taken at the first visit). During this second visit I also attempted to collect initial feedback from monitors about the booklets and datasheets, as well as the pilot programme in general.

3.2.3 Assessing local attitudes to the participatory monitoring scheme

A short questionnaire was designed and piloted using a couple of workers at CWA to make sure all the questions were easy for the target demographic (i.e. rural Kalmykians) to understand.

Ten respondents were surveyed in each of the five study villages, using an opportunistic method. Cafes and shops were visited, as these settings provided an efficient opportunity to interview several people at one time. Additionally, we visited people in their homes and interviewed people we met in the street. Only those 18 years old and over were interviewed, as we considered that younger people may not have adequate knowledge of the issues raised to have formed an opinion, and also may be less influential within the village, so their opinion of the merits of the participatory monitoring scheme would be less important.

Respondents were approached and asked if they would be willing to complete a short questionnaire about attitudes to saiga conservation. If they agreed they were presented with the questionnaire (see Appendix 2) and pen in order that they could complete it themselves. An interpreter and I were present throughout the questionnaire's completion, however, in case there were any problems, and respondents were encouraged to say if they had any questions.

After collecting some demographic information (gender, age, occupation and length of time the respondent had lived in the village) the questionnaire ascertained their depth of knowledge regarding saigas and their conservation, and then asked the respondent specifically about their knowledge of the current saiga monitoring programme (i.e., the rangers employed at CZBR and SR). If they were aware of the current monitoring they were asked to give their opinion of its successfulness on a five-point Likert scale. In order to make sure all respondents had the necessary information to compare traditional monitoring with the village monitoring scheme they were next briefly informed of the rangers' work, followed by an outline of a "suggested" scheme to pay local people to monitor saiga. The scheme was presented as a potential rather than a definite one as it was suspected that respondents might not present their true opinions if they thought that I was already engaged in setting up such a programme. They were asked to rate this scheme on the same five-point scale that was used to rate the current monitoring, and were finally given an opportunity to indicate whether they would support the scheme, and whether they thought their opinion was representative of their village. Following completion of the questionnaire respondents were thanked for their time and given a saiga badge as a thank you gift.

3.2.4 Assessment of saiga count accuracy

In order to establish whether the village monitors' accuracy when counting saigas is comparable to that of rangers', and because logistical and time constraints did not allow for real-world saiga counts by both groups at the same time, both monitors and rangers were instead presented with five photographs of saiga herds (see Appendix 3). These photos had been taken only a few weeks before the presentation period at CZBR, and so provided a very good indication of scenes the monitors were likely to witness themselves. The photos were enlarged to 7x5 inches and laminated for protection from wear and tear.

Photos were chosen that depicted saigas at different distances and in different landscapes, and most importantly to show a range of saiga herd sizes. It was sometimes difficult to assess exactly how many saiga were in each photo (particularly for larger herd sizes), but the given numbers are probably as accurate as it is possible to be, since saiga were counted by looking at the photos on a computer, which could therefore be enlarged to make counting easier. Numbers

were also checked several times by independent observers. They are:

Photo A: 13 saiga

Photo B: 85 saiga

Photo C: 5 saiga

Photo D: 17 saiga

Photo E: 72 saiga

Photo C was always presented first in order to ease respondents into the experiment, but subsequent photo order was randomised for each participant to mitigate potential order effects. The photo was held face down until the participant was ready to begin, and upon it being revealed a stopwatch was used to time for 30 seconds. If respondents felt confident of the number of saiga before the time had elapsed they called out their estimate and the photo was removed. If 30 seconds passed and no answer had been given the photo was turned over and participants were asked for their answer. Where possible the photos were presented on a table with the respondent seated square-on, but if this was not feasible another flat surface was used (such as a bed or the bonnet of a car). Light conditions varied across participants as they were visited at different time of the day, but if natural light was not sufficient I ensured that electric lighting was used in order that no participant should be disadvantaged.

3.2.5 Cost effectiveness assessment

In order to ascertain the relative costs and benefits of the participatory monitoring approach when compared to traditional monitoring (represented by the rangers at the two nature reserves) it was necessary to obtain data from both sets of rangers. Data collected included the number of rangers employed, salary costs, the approximate area covered by each ranger per shift, hours worked and time off. Salary data for the village monitors was already known, and other equivalent information was obtained during initial visits to monitors (see section 3.2.1). This data is not intended to demonstrate that one method of monitoring is “better” than the other – rather it is hoped that via this assessment both will be found to have their strengths and could therefore be used together as complementary monitoring approaches.

3.2.6 Validating observations

To validate village monitors' observations (i.e., to show that what they recorded is likely to be a true reflection of saigas present in the area) rangers from SR were asked to spend a few days monitoring saigas around Tavn-Gashun, one of the study villages. This sighting data was compared with sighting data from the village monitors (obtained during the second visit – see section 3.2.1).

3.3 Statistical analysis

R 2.7.1 for Mac was used to analyse differences and interactions (R Development Core Team, 2007) using a mixture of ANOVAs, linear regressions and chi-squared tests. Throughout $p<0.05$ was chosen as the level of statistical significance, although where a result was nearly significant at this level this has been noted in the text. Maps were drawn using ArcMap (Environmental Systems Research Institute, 1992-2005) and Microsoft Excel was used for graphical presentations of data.

4.1 Establishing the participatory monitoring programme

4.1.1 Demography

Upon induction to the scheme, basic demographic data were collected from the village monitors (see Appendix 4). All monitors (n=25), with the exception of one, were farmers, and all but one were male, although two had agreed that female relatives would continue monitoring if they were absent. The mean age of monitors was 44 (±8.1) and the mean number of years' experience of livestock farming was 13.32 (±9.3). See Figure 12 for the monitors' locations.

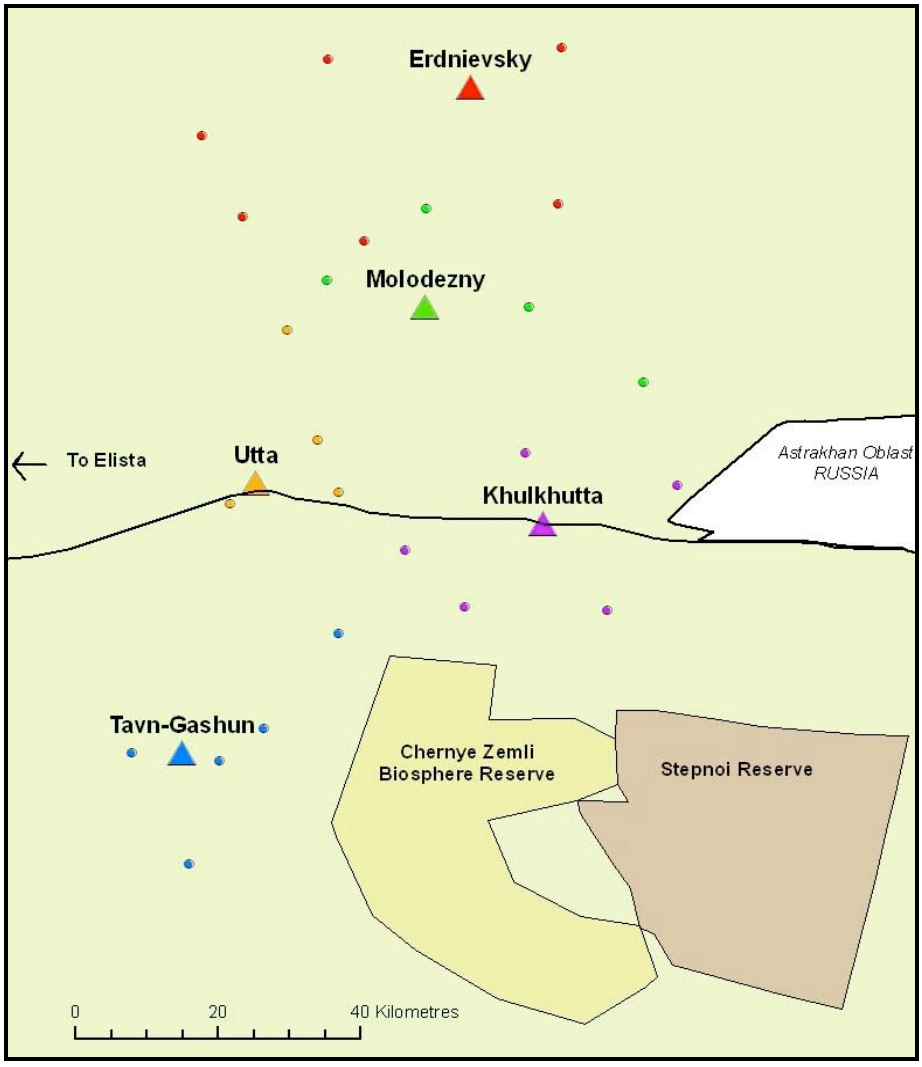

Figure 12: Map to show the location of village monitors, colour-coded by the village to which each monitor belongs. The fifth monitor in Molodezny is not marked as he is a driver and therefore visits numerous locations daily. His location is assumed to be Molodezny itself. The village each monitor belongs to is denoted by the differing colour of the dots, as follows:

Erdnievsky Khulkutta Molodezny Tavn-Gashun Utta

4.1.2 Data booklets

This pilot scheme has already highlighted improvements that could be made to the data booklets in order to make them easier for the monitors to understand and therefore produce more useful data (see Appendix 1 for a sample page of the booklet).

The inclusion of blank spaces at the top of each form to fill in details about the weather was not only unnecessary but illogical; monitors have space to make up to 13 observations per page, and it is likely that these will be spread out over the course of days, if not weeks. Therefore a single space for weather conditions to encompass each date recorded is not feasible.

The main criticism that monitors had of the data sheets was that there was no specific place to record observations of saiga young, but this was dealt with by asking them to record any saiga young in the “Notes” section.

There were several instances where a monitor had recorded an observation but had given insufficient information to accurately indicate where and when it had taken place. Many monitors omitted dates, their location or the saigas’ location, or clearly referred to one when they meant the other. Even on our return visit when the different headings were explained for a second time some people seemed unsure. Similarly, “Angle from path” caused problems. Quite soon it was apparent that it would be easier for monitors to give a direction, such as North, South West etc rather than an exact angle but, even so, many monitors had left this blank or indicated what direction the saigas were moving in, but not their original starting point. Given that there were so many occasions on which it was obvious that something had been mis-recorded, it is likely that I have interpreted some observations differently to how they were intended.

Other misunderstandings regarding how to record sightings data were: entering a record into the booklet every day, even when saigas had not been seen; giving a location that could not be understood by non-locals (e.g., “between my farm and Bochorev’s farm”); failing to record saigas that had been seen; and adding up totals of males, females and juvenile saigas incorrectly.

4.1.3 The village monitors

Village monitors were engaged by the village administration, and each village may have conducted the process differently. Monitors in Tavn-Gashun, for example, knew barely anything about the project until I visited them for the first time, whereas those in other villages had either been briefed before I arrived or were invited to a meeting on the eve of my arrival to the village.

Finding willing participants for this locally-based monitoring project was not difficult. In all but one village, Utta, the village administration was able to find at least five people willing to act as saiga monitors. Utta is not the smallest of the villages, so it is difficult to suppose why they may have had difficulty. But there was clearly no shortage of keen monitors in Erdnievsky, as they were able to find another monitor there with only a few days' notice.

4.1.4 Saiga sightings data

Hereafter, the term "saiga sighting" will be used to refer to any occasion on which one or more saigas were observed. During the data collection period (11th June to 6th July 2008), village monitors made a total of 40 observations during which a total of 230 saigas were observed, with the mean number of saigas seen per observation being 16.4. The mean number of saiga sightings per monitor was 1.6. However, 11 of the 25 village monitors (44%) recorded no saiga sightings at all in that period, and a further 24% had only made one saiga observation. These observations were made over an average period of 13 days during the data collection period.

Linear regressions found that the greater the length of the data collection period (in days) the higher their number of saiga sightings was likely to be ($F_{3,21}$=11.2, R_2=0.61, $p<0.01$, see Figure 13). Distance from the reserve by itself was not quite significant at the $p<0.05$ level ($F_{3,21}$=11.2, R_2=0.61, $p=0.059$), as the influence of length of data collection period was too strong. However, when plotted against the average number of saiga sightings per day there was a significant effect of distance ($F_{3,21}$=7.3, R_2=0.51, $p<0.01$). There was no correlation between the number of hours each monitor worked and the number of saiga sightings (correlation coefficient -0.19).

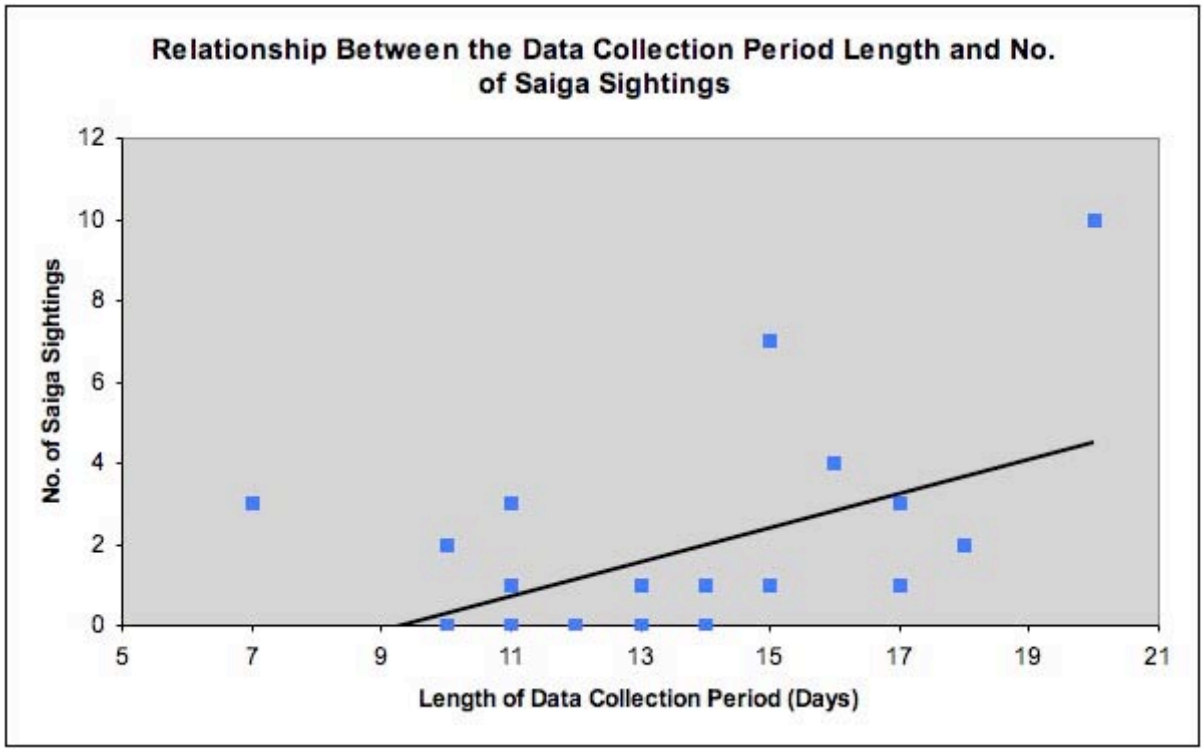

Figure 13: Graph to show the relationship between the length of the data collection period (in days) that each monitor had and the number of saiga sightings they recorded.

Village monitors recorded six saiga sightings on 1st July, one of the designated "control days" (during which they were instructed to spend a few hours specifically looking for saigas). This was as opposed to a mean of only 1.2 (±0.49) on non-control days (see Figure 14) that formed part of each monitor's data collection period (this period covered a slightly different set of dates for each monitor). Pearson's Chi-square test showed that there was a significant difference between the number of saiga sightings made across these six dates ($X^2_{5,6}$=13, d.f.=5, $p < 0.05$). There were no sightings recorded on 15th June, the other "control date". However, only four monitors were in their data collection period at that stage, so owing to the small sample size this date has been omitted from analysis.

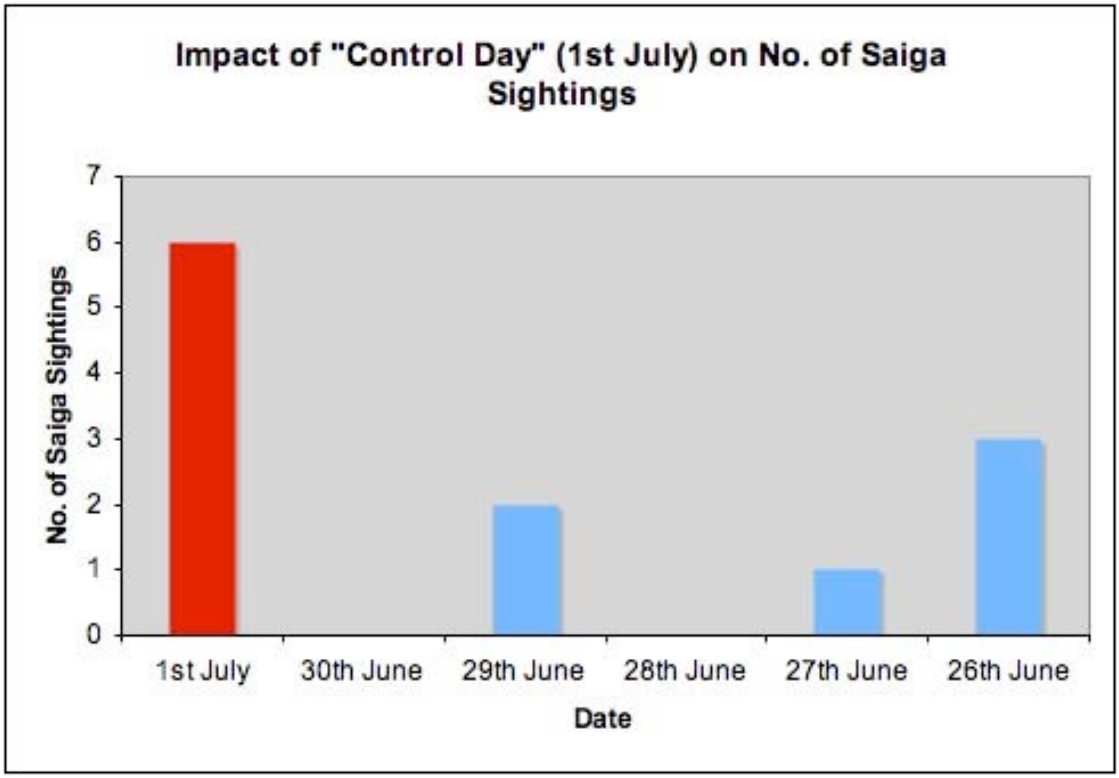

Figure 14: Graph to show the impact of the "Control Day", 1st July on the number of saiga sightings recorded. Dates shown are those on which every village monitor was in their data collection period.

4.2 Local attitudes

4.2.1 Demographics

Respondents were aged between 20 and 78, with a mean age of 41.5, and with 54% being female (see Figure 15).

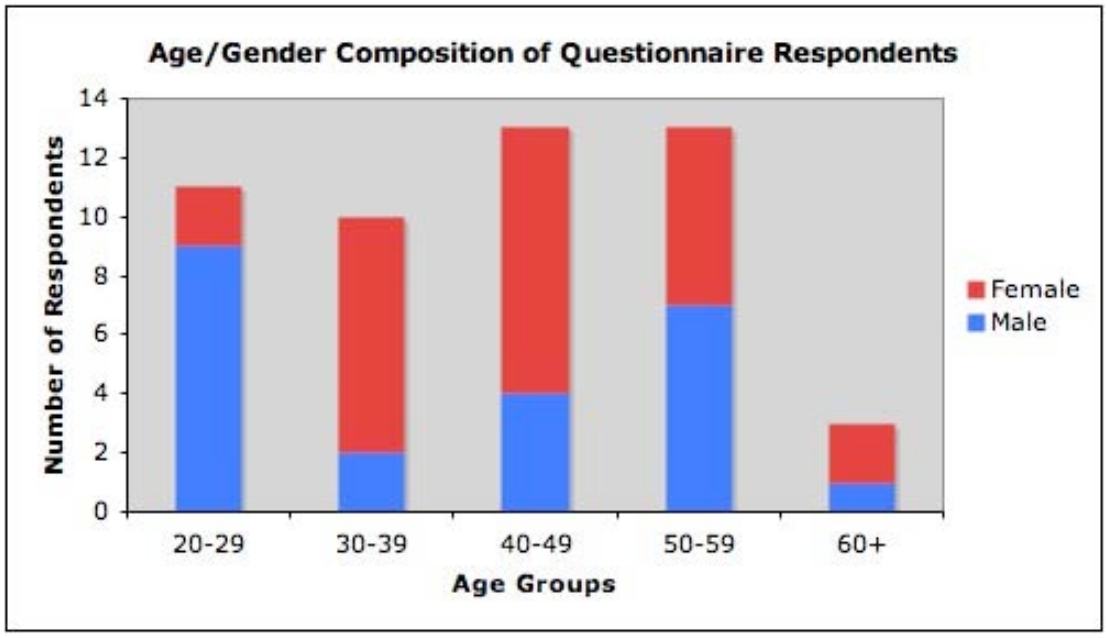

Figure 15: Age and Gender composition of questionnaire respondents.

The most common occupation amongst respondents was housewife, of which 100% were female. This accounted for 41% of female respondents' jobs. 100% of those who identified themselves as unemployed were male, representing 22% of the male occupations. In total, 23 livelihood activities were mentioned (see Figure 16).

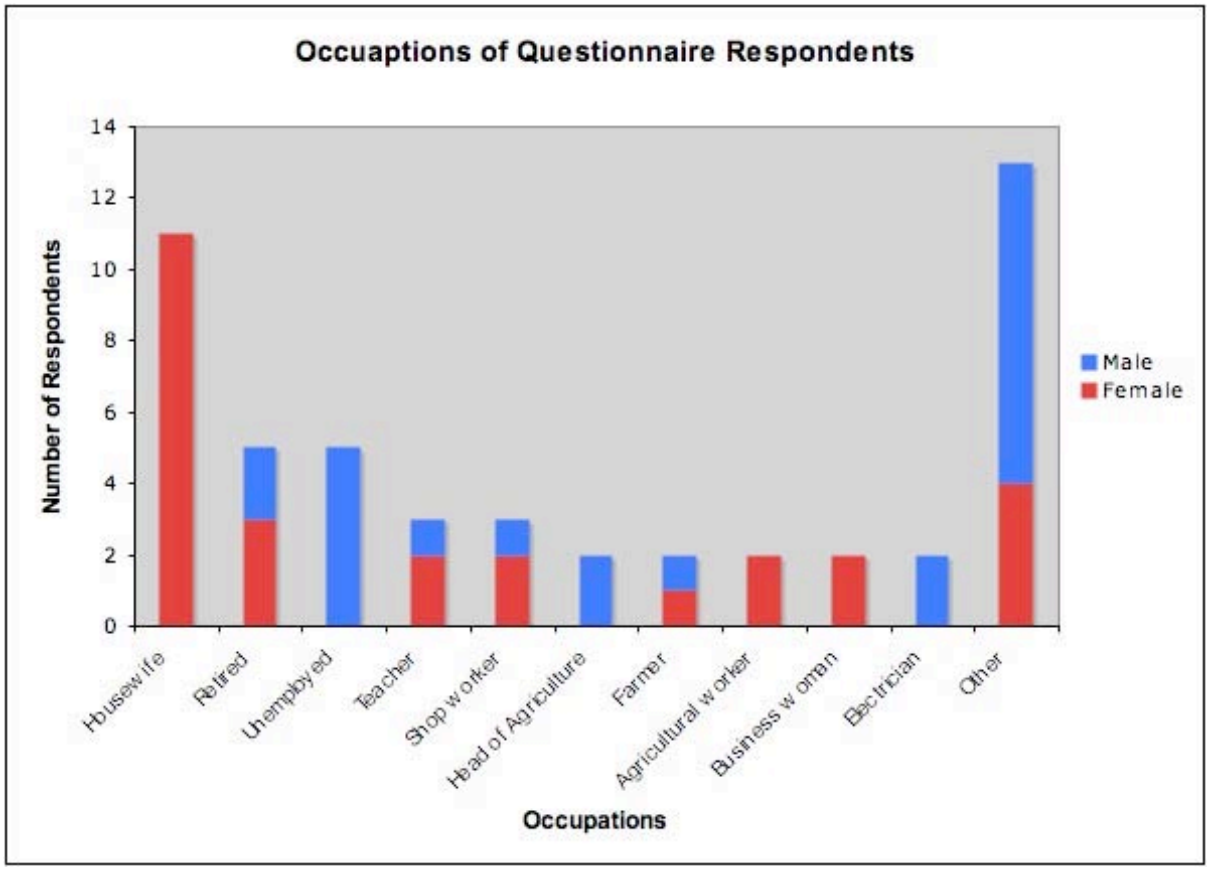

Figure 16: Primary occupations of questionnaire respondents. The category "Other" comprises one each of: accountant, administrator, driver, head of agriculture, head of village, manual labourer, mechanic, nurse, postwoman, security guard, social worker, student and zoologist.

4.2.2 Saiga conservation awareness

Whilst 94% of those questioned had seen saigas in the past, only 54% were aware of any saiga conservation activities within Kalmykia, despite each of the villages having been exposed to some form of conservation initiative over the past two years (see section 2.3.3). Still fewer were aware of any monitoring currently taking place (42%). However, there was a significant effect of age on saiga knowledge (see Figure 17). One-way ANOVAs found that respondents' age explained a significant amount of variation in awareness of saiga monitoring ($F_{1,50}$=17.2, d.f.=1, $p<0.001$) and saiga conservation within Kalmykia ($F_{1,50}$=4.6, d.f.=1, $p<0.05$), but was not significantly related to having seen a saiga (F=1.4, d.f.=1, p=0.2).

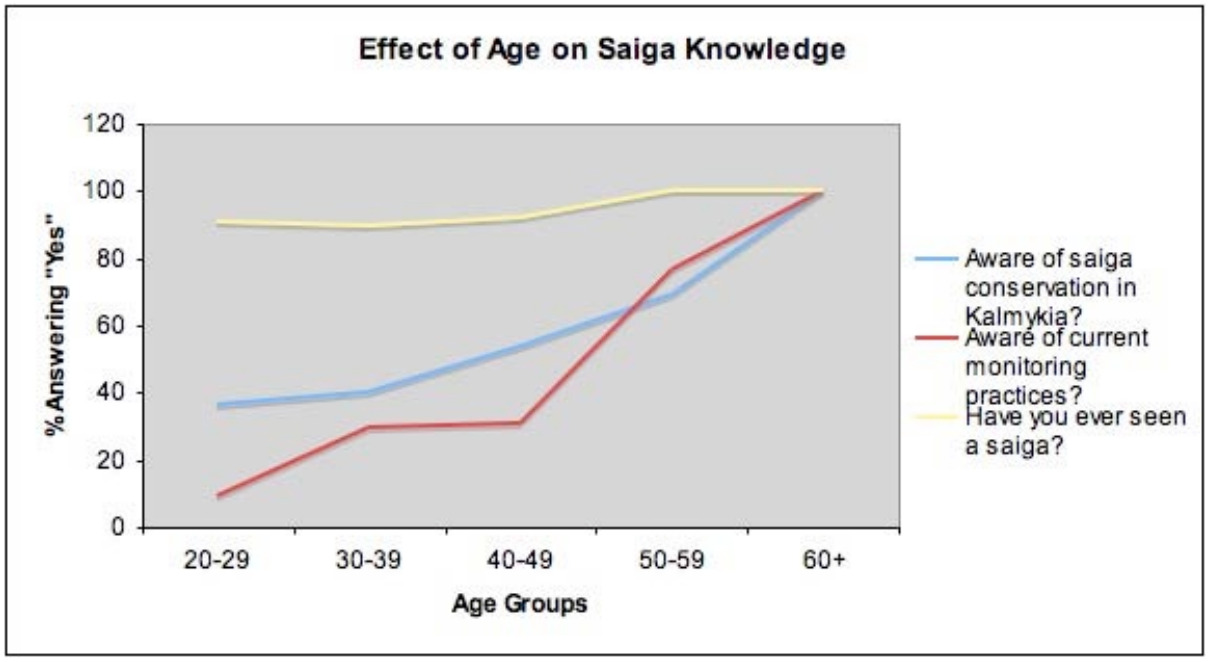

Figure 17: Effect of age on knowledge of saiga conservation activities and monitoring.

4.2.3 Opinions of the village monitor scheme

When asked whether or not they would support the village monitor scheme to collect saiga observations, 96% answered in the affirmative, with the remaining 4% giving the response “Not sure”. Figure 18 shows respondents’ opinion of the current and village monitoring schemes as rated on a five point Likert scale.

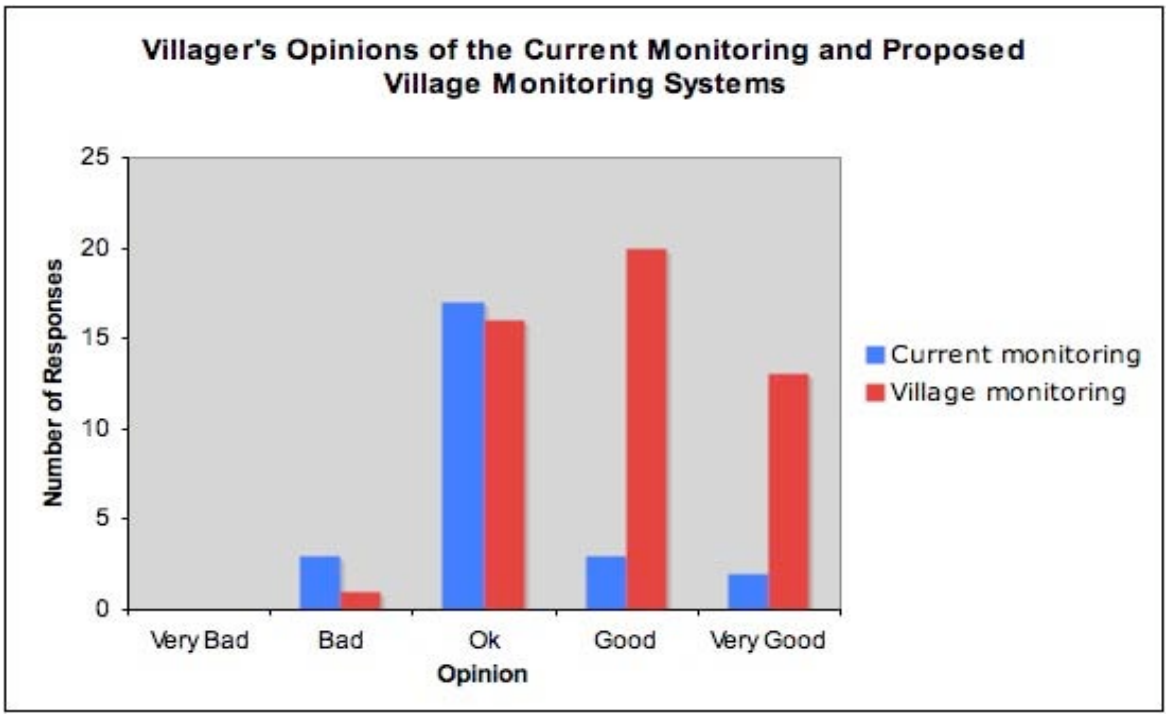

Figure 18: Villagers’ opinions of the village monitoring scheme and current monitoring practices, as rated on a five-point Likert scale. Only 50% of respondents rated the current monitoring, as half were unaware of it and so had no opinion (n=25).

66% of local people (n=33) rated the village monitoring scheme as either “Good” or “Very Good”, with a Pearson’s Chi-squared test showing a significant deviation from an equal distribution of ratings ($\chi^2_{2,50}$=21.76, d.f.=2, p<0.001), and therefore indicating that the village monitoring scheme is viewed as significantly better than would have been expected by chance. Additionally, 84% of people questioned said that they thought other villagers would support the scheme.

The current monitoring practices were not rated as highly as the village monitoring scheme, with only 10% of people placing it within the two positive categories (n=5). However neither monitoring system was thought to be particularly bad: no-one rated either scheme as “Very Bad” and only 12% and 2% rated the current and village monitoring respectively as “Bad”.

Respondents’ views of the village monitoring scheme could not be predicted by their assessment of the current scheme: a Fisher’s Exact test revealed no relationship between people’s opinion of current monitoring and the new village monitoring pilot (p=0.976).

4.2.4 Comparison with previous attitudinal studies

The gender composition of questionnaire respondents was almost exactly the same when comparing this study (n=50, male=46%) to the 2006 Darwin study (n=135, males=47%). A Pearson’s chi-squared test revealed there was no significant difference between this study and the 2006 Darwin study in terms of the percentage age composition of respondents (χ^2= 7.72, d.f.=5, p= 0.171).

However, when looking at the breakdown of both gender and age combined (e.g., how many males were aged 30-39 in each study) a Pearson’s chi-squared test revealed there was very nearly a significant difference between the two at the p<0.05 level (χ^2= 18.98, d.f.=11, p= 0.061). See Figure 19 for a graphical representation of this gender/age composition.

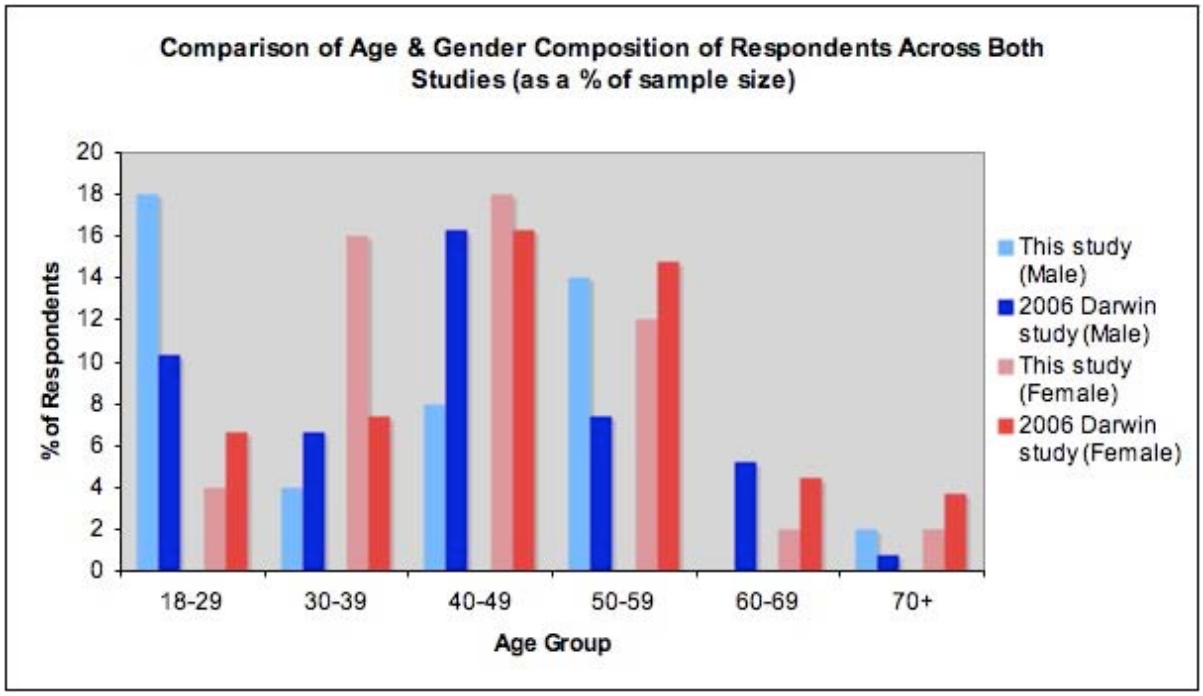

Figure 19: Comparison of age and gender composition of questionnaire respondents in the current study and the 2006 Darwin study as a percentage of sample size. 2006 Darwin data courtesy of Caroline Howe.

The 2003 Darwin study, which recorded the occupations of survey respondents, showed some similar patterns to the current study (see Figure 20). For example, unemployment was high in each, with 44% and 35% of males being unemployed in this study and the 2003 study respectively. In this study all those unemployed were men of 25 years old or younger. Indeed it often seemed that it was difficult to find a young man who was not unemployed. This male bias can possibly be explained by the fact that women are likely to be housewives if they do not have a paid job. It is also possible that women are more likely to pursue higher education; although this study only had one respondent who was a student (who was female), Kuhl (2003) found that of the 9 students living in Tavn-Gashun at that time 100% were female.

However, when analysed using Pearson's chi-squared test there were found to be highly significant differences between the occupation compositions of the two studies (χ^2= 52.02, d.f. = 15, p<0.001). This can perhaps be accounted for by the large number of occupations in both cases that had only a single respondent attached to them, as these did not often overlap.

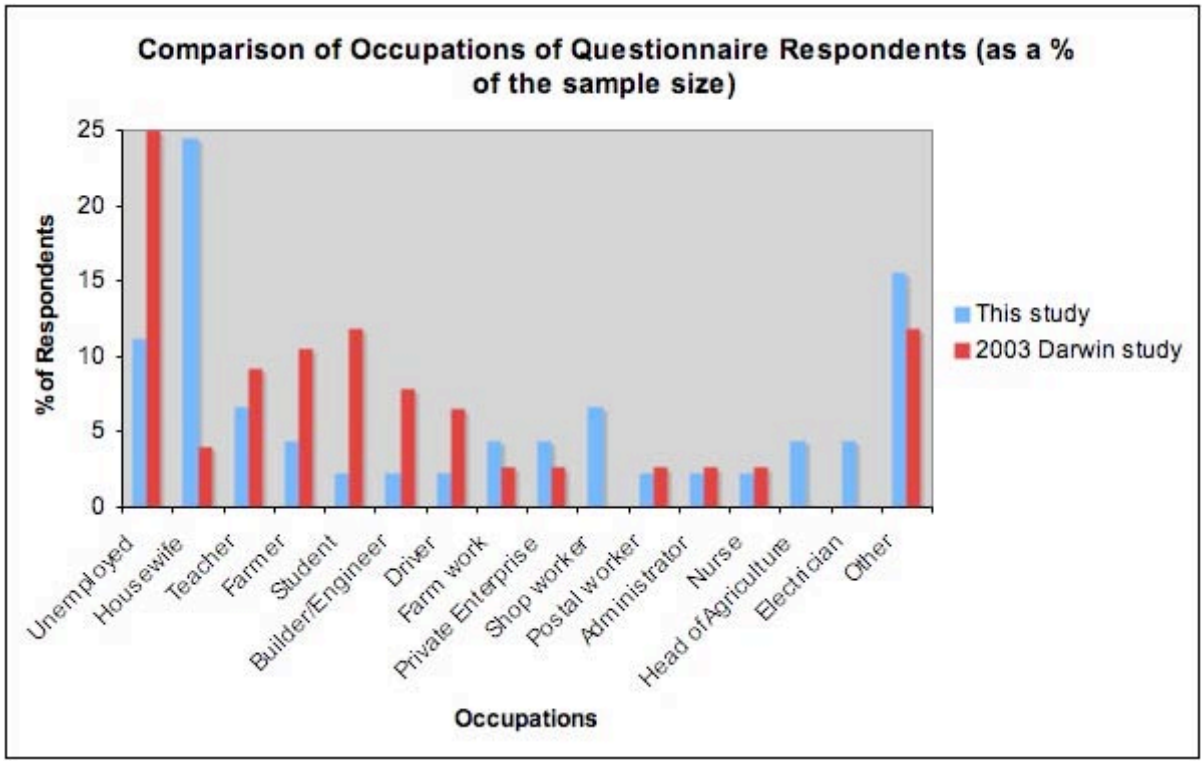

Figure 20: Occupations of questionnaire respondents for both this study and the 2003 Darwin study as a percentage of sample size. "Other" includes: accountant, head of village, librarian, manual worker, mechanic, ranger, school/hospital worker, seasonal worker, security guard, social worker, tailor/hairdresser, veterinarian, and a zoologist. The occupation "Business woman" was combined with "Private enterprise". 2003 Darwin data from Kuhl (2003).

The vast majority of those who knew about conservation activities in this study were aware of CZBR (63%), with one third of those aware mentioning rangers and only one person mentioning CWA. This was in contrast to an array of responses from the 2006 Darwin study, including knowledge of public education (2.8% of those aware), the Rotating cow project (12% of those aware) and the 2003 Darwin attitudinal study (6.5% of those aware). The number of respondents who stated awareness of CZBR was similar to the current study (66.7%), but the number of those aware who mentioned rangers and the CWA (55.6% and 28.9% respectively) was much larger.

The most striking difference between the two studies however, was the difference between the percentage of respondents who claimed they were unaware of any conservation activities in Kalmykia in both studies (see Figure 21). A Pearson's chi-squared test revealed that there were significant differences in the number of people who stated that they were not aware of saiga conservation activities in this study compared to the 2006 Darwin study (χ^2= 73.98, d.f. = 4, $p<0.001$).

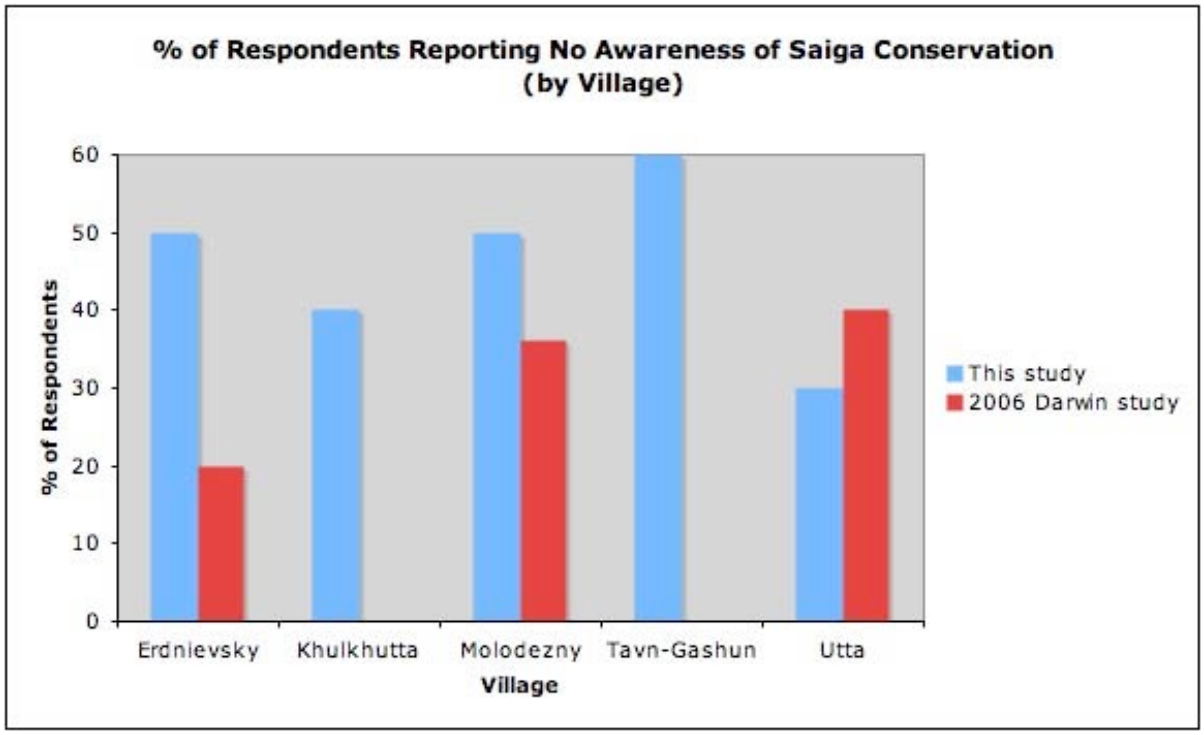

Figure 21: Percentage of respondents who stated that they were not aware of any saiga conservation activities happening in Kalmykia across the five study sites. 2006 Darwin study data courtesy of Caroline Howe.

4.3 Assessment of count accuracy

24 village monitors and 9 rangers took part in the count accuracy experiment using saiga photos (see Table 3). The percentage difference between the mean estimate and actual number of saigas in each photo was 33.9% for the village monitors and 32.7% for the rangers. ANOVAs (Student's t-Test could not be used as samples were different sizes) found no significant difference between estimates given by rangers and monitors for any of the photos used (A: $F_{1,33}$=0.4, d.f.=1, p=0.541; B: $F_{1,33}$=0.1, d.f.=1, p=0.787; C: $F_{1,33}$=0, d.f.=1, p=0.879; D: $F_{1,33}$=1.6, d.f.=1, p=0.2; E: $F_{1,33}$=0.9, d.f.=1, p=0.363).

Statistical analysis using a two-way ANOVA found that the time taken to estimate the number of saiga was significantly related to accuracy ($F_{1,159}$=4.8, p<0.050), with longer time periods leading to a more accurate estimation. Photo (i.e., the actual number of saigas), was highly significantly related to accuracy ($F_{4,159}$=16.9, p<0.001), with smaller saiga groups resulting in more accurate estimations. Linear modelling found that both groups showed a highly significant tendency to exaggerate the number of saigas as the number in the photos increased ($F_{3,161}$ = 74.2, R^2: 0.573, p<0.001). Although this effect appeared more pronounced for the

rangers than the village monitors (see Figure 22) there was no significant effect of group ($F_{1,163}$<0.001, R_2<0.001, p=0.990).

Variation also increased with number of saigas. Linear modelling found that there is a significant effect of the number of saigas in the photo on the variation of participants' estimates – as the number of saigas increased, so did the variation ($F_{3,5}$=20.27, R_2=0.828, p<0.050).

	A	B	C	D	E
Actual no. of saiga	13	85	5	17	72
Monitors' mean estimate	10.5	148.3	5.3	20.2	83.4
Rangers' mean estimate	11	158.3	5.3	18.8	98.7
Combined mean	10.7	153.3	5.3	19.5	91
% Difference between combined mean & actual	17.5	80.4	6.2	14.6	26.5

Table 3: Comparison of village monitors and rangers mean estimates of saigas featured in photos A-E with the actual number of saigas in each photo.

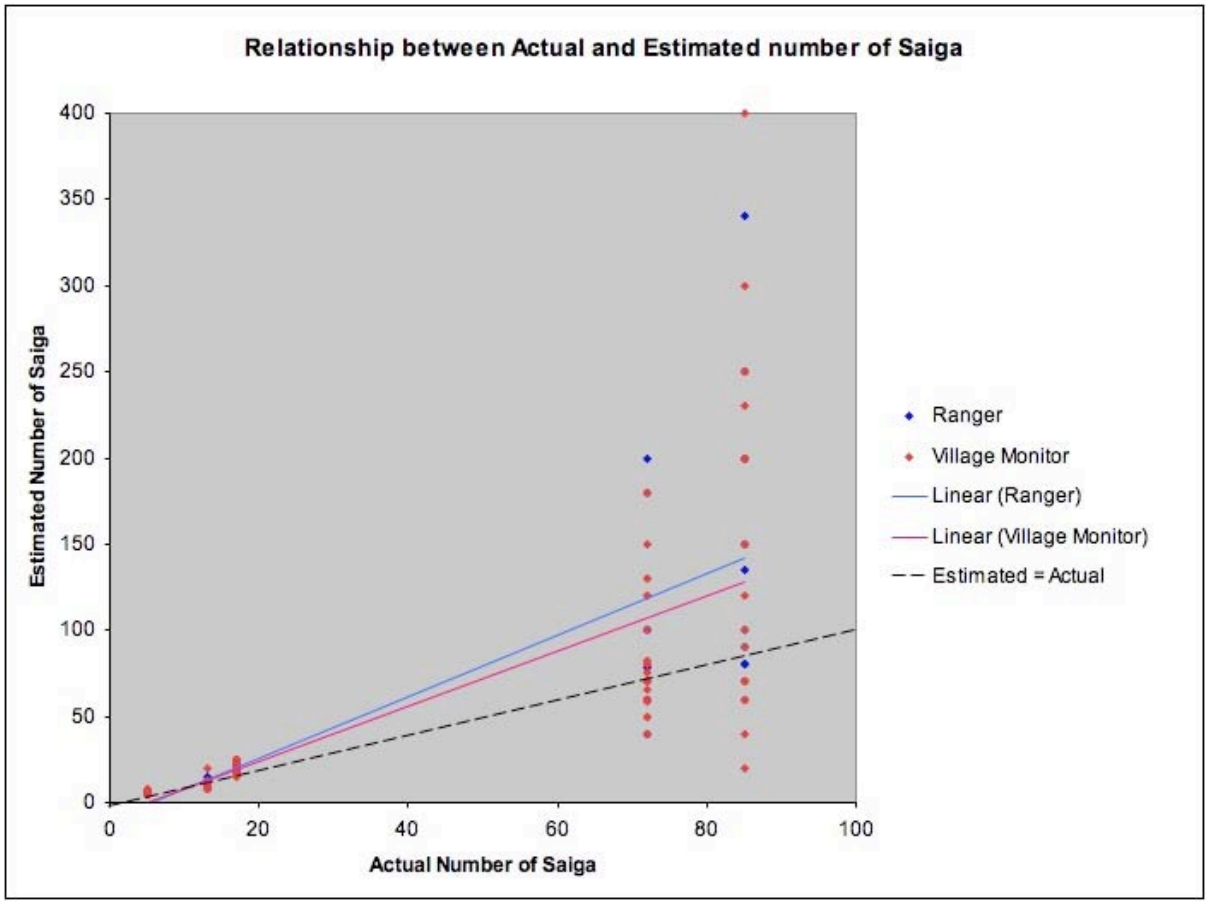

Figure 22: Graph to show the relationship between the actual number of saiga and the estimated number of saiga for both groups.

4.4 Cost effectiveness comparison

Given the small sample size and approximate nature of many of the variables involved, this comparison can only give a guide to possible trends and should not be treated as a definitive account of costs and benefits of the participatory monitoring scheme as opposed to the monitoring currently in place.

Keeping in mind these constraints, the village monitors seem to work more cost-effectively with regards to costs per hour than the rangers at CZBR and SR, but less effectively with regard to cost per saiga sighting (see Table 4). Village monitors cost less (77.5-82% less, n=25) than the rangers and reported working a considerably greater number of hours per month (between 166% and 247%, n=25), although their patrol area is reportedly smaller than that of the rangers (13,410-30,410 ha fewer, or 18-33%). See Figure 23 for a map of the additional land covered by the village monitors.

Monitor	No. of rangers/ monitors	Salary per month, per person (RUB)	Area covered (ha)	Hours worked per month	Mean no. of saiga sightings per month	Mean cost per sighting (RUB)
CZBR Ranger	12	5,000	75,000	285	35.95 (±4.46)	139.07
SR Ranger	8	4,000	92,000	191		111.26
Village Monitor	25	900	61,590	472	3.70 (±0.38)	243.30

Table 4: Cost-effectiveness assessment of CZBR and SR rangers and village monitors. Saiga sightings data for CZBR and SR were not available separately (data courtesy of H. O'Neill, 2008).

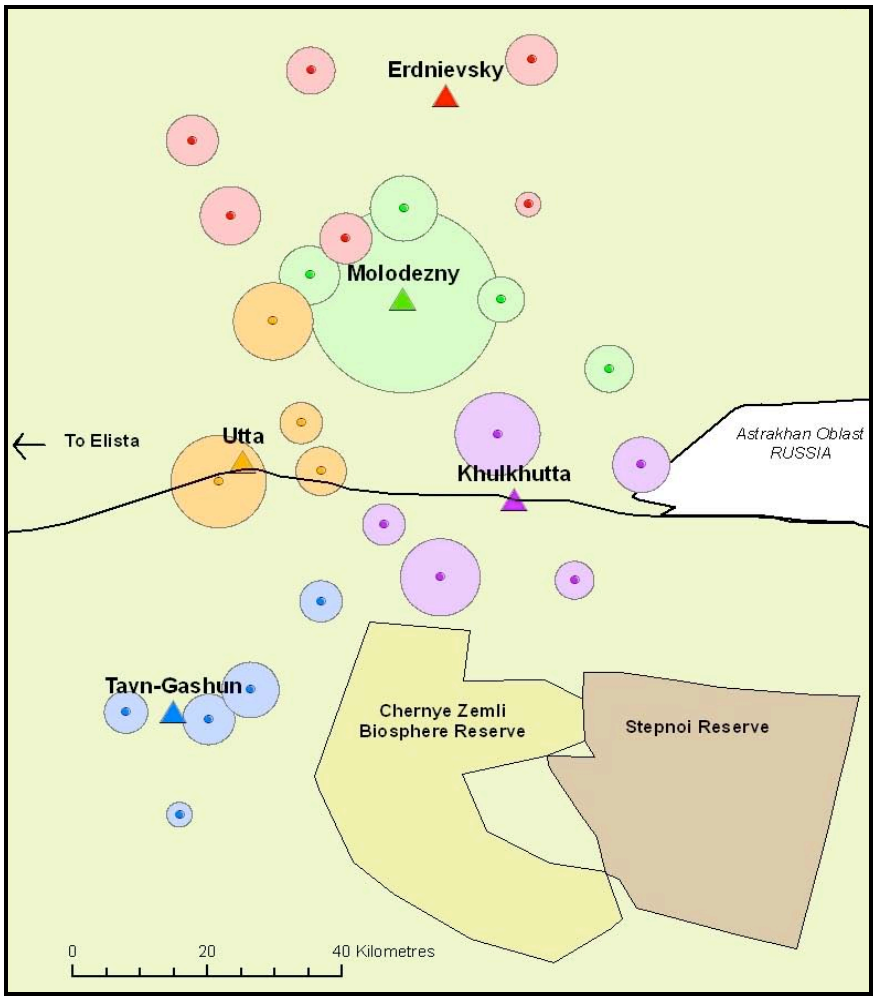

Figure 23: Map to show to approximate observation area of each village monitor. For simplicity, all observation areas are assumed to be circular, but in reality this may not be the case. The village each monitor belongs to is denoted by different colours, as follows:

Erdnievsky Khulkutta Molodezny Tavn-Gashun Utta

Rangers also saw more saiga per day than the monitors (see Figure 24). It is unclear however, why the rangers have recorded sightings over such a varying number of days, as they are usually working every day. See section 5.4.2 for a discussion of possible problems with these data.

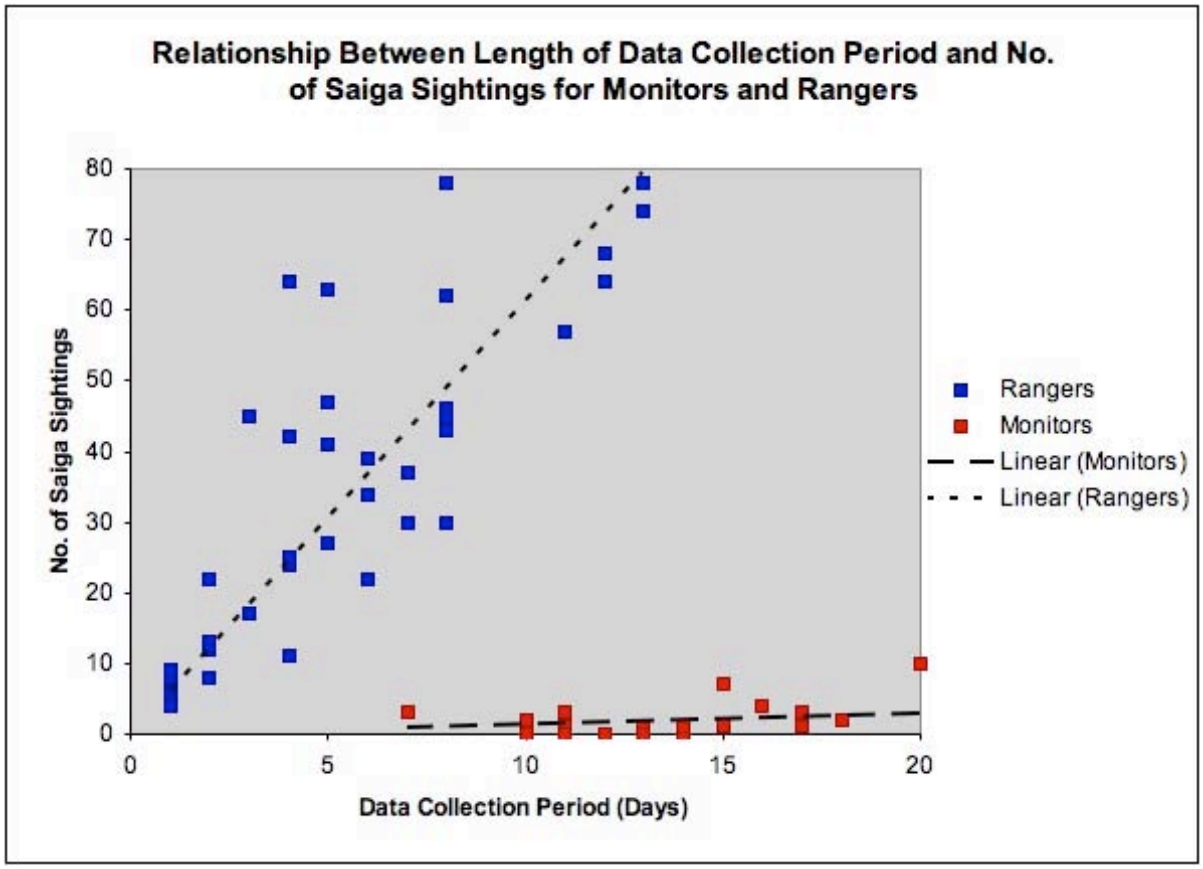

Figure 24: Graph to show the relationship between the length of the data collection period and the number of saiga sightings recorded for both rangers and monitors. One outlier from the ranger data has been omitted (no. of days = 22, no. of sightings = 150). Ranger data courtesy of H. O'Neill (2008).

4.5 Validating observations

In order to validate the monitors' saiga sightings their data was compared with the observations of rangers from SR during periods when they were collecting data outside the reserve (it should be noted that this is not normal practice, but rather was performed by the rangers specifically for this project). For a summary of the dates covered and saiga sightings recorded by each group see Table 5.

It was not possible to perform statistical analysis on the data to ascertain whether the sightings made by the village monitors were significantly similar to those made by rangers over the time period, as there were not enough data points from the village monitors (30 were needed and there were only 7). As Table 5 indicates, sightings by village monitors were far fewer and the number of saigas encountered tended to be smaller compared with the monitoring by the rangers.

Date	Rangers		Village Monitors	
	No. of sightings	*No. of saigas*	*No. of sightings*	*No. of saigas*
21/06/08	12	1,256	1	1
26/06/08	14	281	1	3
27/06/08	3	36	0	0
03/07/08	28	416	1	11
04/07/08	23	190	3	23
05/07/08	31	172	1	3

Table 5: Summary of observations made by both rangers and village monitors across six dates, during which time rangers travelled outside of their reserves to observe saigas in areas close to village monitors (see Figure 21). It should be noted however that the village monitors collected data from 11/06/08-06/07/08 and not just on the dates shown.

However, Figure 25 shows that whilst the village monitors collected a small amount of data compared with that of the rangers, they did make a substantial amount of saiga observations in the areas they monitored. Whilst these areas did not usually exactly overlap those covered by the rangers, this was because rangers mainly observed saigas near to the edges of the reserves, whereas village monitors tended to observe saigas in the vicinity of their farms, or range area. The pattern of observations is therefore unsurprising.

4.6 Summary of key findings

- Village monitors recorded 40 saiga sightings, which accounted for 230 individual saigas. However 44% of monitors recorded no sightings at all. Saiga sightings occurred more frequently the closer each monitor lived to the reserves, and the longer the recording period.
- The village questionnaire indicated that local people are in favour of the participatory monitoring scheme and would support it. It also showed an increase in saiga conservation awareness with age.
- Estimates by village monitors of the number of saigas in photos did not differ significantly from rangers' estimates, and both groups showed a significant tendency to overestimate saiga numbers the greater the number there were in the photo.
- Village monitors did make saiga observations on the same days as rangers, and in roughly similar areas, but there were not enough saiga sightings data from this time period to draw statistically supported conclusions.

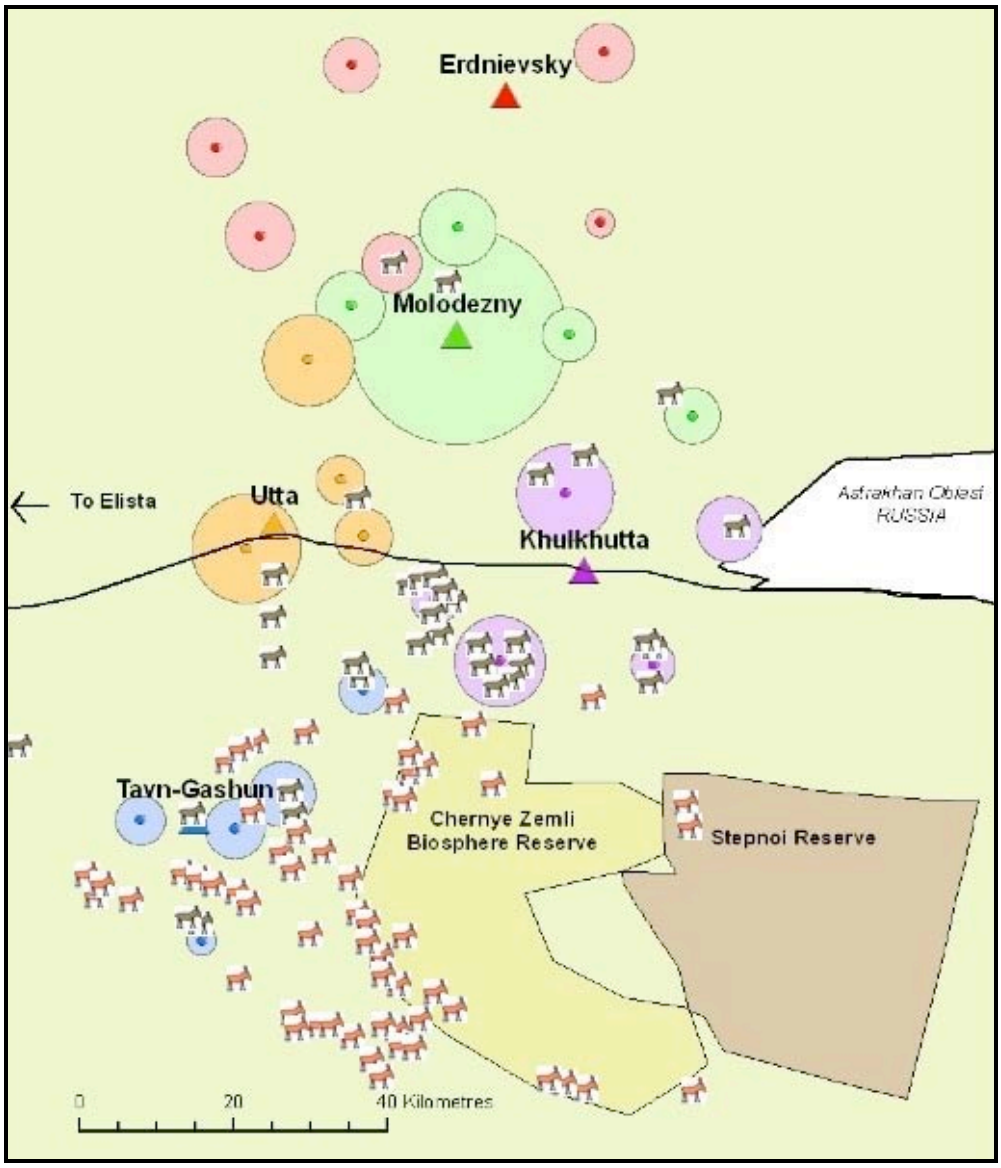

Figure 25: Map to show locations of saigas observed by village monitors and rangers from CZBR and SR. Village monitor sightings were collected between 11/06/08 and 06/07/08 (although many monitors had a much shorter data collection period than this due to disparities between start and revisit dates) and ranger sightings on 21/06, 26&27/06 and 03-05/07/08.

Village Monitor observations Ranger observations

5. DISCUSSION

5.1 Establishment of the pilot participatory monitoring programme

5.1.1 Problems with the data booklets

The data booklets need amending slightly for future use, as several monitors found them difficult to understand. The main criticism that monitors had of the data sheets was that there was no specific place to record observations of saiga young. This was dealt with by asking them to record any saiga young in the "Notes" section, but in future this should have a dedicated column (see Figure 26).

Date	Time	Where are you?	Where are the saigas?	Number of saigas				Notes
				M	F	Young	?	

Figure 26: Example of how the data tables could be changed to make them easier to use and therefore aid the gathering of more accurate data.

The heading "Location" needs to be altered for future use, as most monitors seemed confused about whether this applied to themselves or to the saigas. I suggest the use of an unambiguous heading such as "Where are you?" Monitors also need to be briefed more clearly about the information needed, because, during this pilot, many wrote locations that were illegible or required local knowledge to make sense of. Similarly, "Direction" and "Angle" should be merged into one column to write where the saigas are, since this should lessen confusion.

5.1.2 Village monitors

Ideally the process of engaging monitors could be standardised, and it would be nice to have a meeting (or one meeting per village) with all those involved to welcome them to their role before visiting them individually to explain the exact requirements of the task and answer their questions. However, in some instances this will not be possible: in Tavn-Gashun, for example, there is no mobile phone coverage and the village can only be reached by a 40km dirt road from Utta, and hence it was difficult

to arrange anything prior to our arrival.

It seemed relatively easy to find people to participate in this scheme. It is of course possible that it was easier to find people to volunteer for this role in the villages selected because they were villages that had been involved in saiga conservation activities before, and hence my local collaborators were familiar both to the administration and to many of the villagers. If this participatory monitoring scheme were to be extended to more villages then a greater preparation period may be required for the villagers to get to know my collaborators and to encourage people to apply for the village monitor positions.

5.1.3 Saiga sightings

It is surprising that there were no saiga sightings in the more northerly villages of Erdnievsky and Molodhezny, as saiga were previously thought to migrate north of the Nature Reserves during late June and early July (Zhirnov, 1985). It is possible that the lack of sightings was merely a consequence of the short period of time between the observation start dates and the collection of preliminary data (as my data indicate a strong relationship between the number of collection days and the number of saiga sightings), or that previous assumptions regarding saiga movements were incorrect. It is also possible, however, that this lack of observations is due to the presence of fewer saigas in the Kalmykian population than has been recently estimated. This possibility highlights the urgent need for reliable, accurate and ongoing population status assessments throughout the saiga range.

5.2 Local attitudes

5.2.1 Local people are in favour of participatory monitoring

Perhaps unsurprisingly for a scheme that offers to pay people (albeit a small amount) for recording observations of a species they care about deeply (Kuhl, 2007), the vast majority of people interviewed approved of the participatory monitoring project. This is an important result, because without the support of the local community any participatory monitoring programme would be unsustainable.

5.2.2 Older people showed a greater awareness of saiga conservation

It is interesting to note that older people showed a greater level of conservation awareness than younger generations. Whilst my sample size was small, from personal observations I am confident that it is an accurate one, since by far and away the people who had most to say about each question were elderly. While most people were content simply to fill in the questionnaire and give the minimum information required, older people seemed much more keen to have a discussion about the issues raised, demonstrating their higher level of interest and knowledge of the subject. This is possibly just a result of having had a longer amount of time to accrue information, but may also reflect changing attitudes from the Soviet period to today's more West-facing Russia.

5.2.3 There were differences between my results and those of previous studies

Although demographic differences between the questionnaire respondents in this study and in the 2006 Darwin study were not statistically significant, there were significant differences in awareness of conservation activities. It is possible that this can be explained by the slight trend towards difference shown in the demographic compositions of each set of respondents, but I feel it is more likely that it was caused by different approaches to the questionnaire process. The questionnaires used in the 2006 Darwin study were much longer than those used in this study, and participants were asked several times about conservation activities. In contrast, the questionnaires in the current study were often completed quite quickly, and initially at least there was no emphasis on the desirability of writing comments, so that when someone was asked whether they knew of any conservation activities within Kalmykia they simply wrote "Yes" without elaborating. As such, the results of this survey should probably be taken as the minimum awareness that exists within the study villages. This should not affect the validity of the questions regarding the respondents' support for the participatory monitoring scheme, as they did not require elaboration and could be answered quickly.

This study supports the findings of the 2003 Darwin study, as unemployment continues to be a problem in the region, particularly among young men. The fact that my occupation data was significantly different from the 2003 study is, I believe, an artifact of the large numbers of occupations listed in both studies that had only one

person attached to them. However, it is interesting to note the large difference in the number of people listing themselves as housewives. It is possible that many women are housewives as well as having another job, and that to save time when completing the current questionnaire they listed only the former. Indeed, from personal observations there was at least one “housewife” who in fact ran the local shop!

5.2.4 Limitations

The village questionnaire revealed that the overwhelming majority of people are in favour of a participatory monitoring scheme, and most people also thought that other village members would approve. This result should be treated with caution, however, as the sample size was small (n=50), and it is possible that people gave positive answers as they thought this was what I wanted to hear. I tried to present the locally-based monitoring as an idea rather than something that was actually being put into practise, as I thought that if people already knew it was going ahead they would be less likely to give their true opinions, either through being annoyed that they had not been consulted in the first place, or through wanting to appear positive about a scheme with which I was involved.

5.3 Assessment of count accuracy

5.3.1 Monitors are as accurate as rangers

Perhaps because the majority of the village monitors employed in this scheme are farmers, and thus used to counting large numbers of animals, there was no significant difference between their ability to count saiga herds accurately and the rangers’ ability. Although both groups showed a worrying tendency to overestimate saiga numbers as the actual number increased, this is perhaps less worrying for the village monitors, as they are more likely to see saiga in smaller groups as that is usually how they travel when they venture outside of the reserves to migrate north over the summer (Kuhl, 2007).

Although monitors were as accurate as rangers, it is difficult to know whether this is adequate. With both groups overestimating large herd sizes it is possible that estimates of the size of the Kalmykian saiga population could be greatly

exaggerated. This is probably more of a problem for rangers than monitors, as they are likely to make not only a greater number of saiga observations but also to see larger herds, as calving aggregations and ruts both take place within the reserves. O'Neill (2008) makes suggestions for improvements to count accuracy, and it is possible that these methods could also be used to train monitors to be more accurate. The method for doing this would have to be tactful, however, as the rangers would no doubt be insulted if "trained" at the same time and at the same level as the village monitors.

5.3.2 Limitations

Initially I had intended to compare ranger and village monitor accuracy when counting saiga by using a real-world experiment. The idea for this experiment was to visit various farms within the same locality and (after first establishing the correct answer with the farm owner) ask both groups of respondents to estimate the number of sheep, goats or cows visible in the field ahead of them. I had hoped to use several different scenarios (i.e., different numbers of animals at different distances) and that at least ten farmers and ten rangers would be present for the experiment in order to have large enough group sizes to find any potential effect of group. For logistical reasons this was not feasible, but it is possible that had such real-world count scenarios been used then the results gathered would have been quite different.

The real-world experiment would not have solved the major limitation of the photo method for assessing count accuracy, however. In neither scenario was it possible to re-create the movement that takes place when a saiga is seen (as photos are static and sheep, for the most part, stand still) – usually running away fast from the observer. It is this element of saiga behaviour, combined with the great distance at which they are normally seen, that makes counting them so difficult.

5.4 Cost effectiveness

5.4.1 Village monitors cost very little, but were not as cost-effective as rangers

Purely in terms of cost and hours worked, village monitors were more cost-effective than either group of rangers. However, rangers at CZBR and SR have other

responsibilities to fulfil and their higher level of pay reflects not only this but also recognises the qualifications they possess (e.g., gun licence, driving licence). Therefore this result should not be used as an excuse to criticise the work of the rangers within the reserves, but rather to show that participatory monitoring by local people would be a cheap and efficient means of complementing their work.

In terms of overall cost-effectiveness (i.e., cost per saiga sighting), rangers were more cost-effective than monitors. This is perhaps unsurprising, as rangers spend all their time looking for saiga, whereas monitors only devote a few hours every month to this specific activity (on control days). It is possible that in the future the number of sightings per monitor will increase as they get used to the scheme, leading to a more cost-effective result. On the other hand, it is also possible that, once the initial enthusiasm has died down, monitors will report fewer saiga sightings as they become bored with the scheme. It is important that monitors are visited often and frequently afforded the opportunity to give feedback to prevent this from happening.

It is also important to stress the fallibility of these data. Given that there were few saiga sightings and that estimates of hours worked was approximate for both groups, it is important not to take this result as absolute. Rather, it should be looked upon as a guide to the relative costs of participatory versus traditional monitoring in this specific context.

If, in the long-term, it emerges that monitors are less cost-effective than the rangers, this result should not necessarily be seen as a reason to cease involvement of local people. In comparison to the absolute costs of ranger-based monitoring, this participatory monitoring scheme is so cheap that it may make economic sense to continue even if, per saiga sighting, it is less cost-effective. It is also worth remembering that increasing saiga sightings is not the only aim of this project: community involvement will always be increased by participatory monitoring. By increasing feelings of local ownership over the monitoring of the saiga, people should become less likely to poach and more likely to comply with regulations.

5.4.2 Limitations

The saiga sightings data for the rangers cover the period September 2003 - February 2007 but, strangely, do not include data for two of the months within that

period, and for many months record very few instances of saiga sightings. From personal observations, whilst in the reserves it was very unusual to go a day without observing saiga - and although I was there between May to July (just after saigas have given birth and so were more likely to be within the reserves) - saiga should be present in the reserves all year round. It is not clear whether the number of days listed for each month is the number of days on which saiga were seen, or rather the number of days on which rangers were active. Rangers in CZBR work every day, but rangers at SR sometimes take time off when there are few saigas in the reserve.

This problem with the ranger data represents one of the reasons why current knowledge of saiga numbers and distribution is so poor, as current monitoring strategies are not adequate to produce good quality data (O'Neill, 2008).

5.5 Validity of observations

It is perhaps unsurprising that there were not enough sightings by village monitors to compare them statistically with the rangers' sightings on certain days. The area covered by the rangers was small and so not all of our farmers were proximal enough for any of their sightings to be considered. Additionally, monitors will never amass as much saiga sightings data as rangers, as they are performing monitoring in addition to other responsibilities, whereas the rangers' main responsibility is to search for saiga and record observations. Rangers travel a long way every day by car in order to collect as many saiga sightings as possible, whereas village monitors will, for the most part, stay at home, and it is likely that they will make fewer observations as saiga do not often approach human dwellings.

5.6 Future recommendations

Given the limited data available at this stage through the pilot programme, it would be unwise to draw definite conclusions about the benefits of participatory monitoring other than to say that the idea does have potential. Provided that nothing important goes wrong over the final few months of the scheme and the village monitors continue amassing saiga sighting data there is no reason why, at the end of six months, the pilot should not be deemed successful. If this scenario proves to be a reality, what are the next steps?

5.6.1 The need for post-project evaluation

Each village monitor was informed upon initiation to the scheme that at the end of the six-month pilot there would be an opportunity for them to express their views on the project and any recommendations for improvements. It is important that this meeting takes place if the monitors are to feel truly involved with the project (if they have no control over adjustments to the scheme then the extent to which it can be called “participatory” becomes rather limited). Additionally, I would recommend asking each monitor (as well as any family members who assisted them) to complete a short questionnaire outlining their attitude towards the pilot project, whether it met their expectations, and any improvements that could be made. It might also be helpful to design a questionnaire for each village administration to ascertain how easy they found it to recruit monitors, and any ideas they have for recruiting other villages to the scheme.

5.6.2 Extensions of the scheme

In the future, it would be exciting to reach a point at which the rangers from CZBR and SR are complemented by many villages of monitors flanking the entire perimeter of the reserves. Four of the five pilot villages are located north of the reserves, with Tavn-Gashun being located to the west. Ideally the next villages to be recruited should cover the south and east (although villages to the east may be harder to engage with as they will be within Russia rather than Kalmykia, and there are currently many political issues making work between the two more difficult [A. Khludnev, pers.comm.]).

From a community engagement point of view, it would be interesting to try to introduce the village monitor scheme to Adyk, a small town west of CZBR and Tavn-Gashun, which has experience of conservation in the village but which is also known to be a hub for the sale of saiga meat. Although there is some mileage in arguments against attempting social engagement strategies in areas with a known history of involvement in poaching (as the risks are higher that the illegal activities will continue but be effectively subsidised by the project) it also seems contrary to the purposes of conservation to avoid such problem areas. If people in Adyk can take part in the participatory monitoring scheme and through doing so earn not only a small additional income but also pride from being associated with an international

scientific project, then this may go some way to addressing the problems that lead to involvement in poaching (or activities arising from poaching such as selling saiga meat).

Additionally, there is no reason why more monitors should not be employed from the villages currently engaged in the scheme, especially since their homes tend to be widely dispersed around the village area. This would ensure more even coverage of whole areas of the saiga range that currently are not monitored. Initially at least, it may be easier to employ more monitors from the current villages, as the infrastructure is already established.

It is possible in future that this scheme could be extended to other saiga range states, although there are good reasons to suppose it would not be as easy to implement as in Kalmykia. The Betpak-dala population has such an enormous range, that to see one of these saigas is very unusual. The Ural population is incredibly remote, and any scheme involving the Ustyurt population would have to be very well organised between range states as the population is trans-boundary. Participatory monitoring of saigas has already begun in Mongolia, and it will be interesting to see if this yields positive results.

5.6.3 Who should the village monitors be?

From the initial findings of this research it seems that farmers will make good monitors.

However, if by initiating this participatory monitoring programme we hope to engage members of the community who are likely to be poachers, and in so doing hope to alter their behaviour, then farmers are possibly not the right people for the job. This study supported previous research that found an abundance of unemployed young men in villages surrounding the reserves. As poverty and a lack of livelihood options is strongly correlated with the decision to poach (Kuhl, 2007) then it is these unemployed young men that we should be engaging.

On the other hand, although this scheme will hopefully have a positive effect on community attitudes towards saiga conservation, it may be unrealistic to hope that the small amount of remuneration offered could lead to a drop in saiga poaching,

whoever the monitors are. Instead, real alternative livelihood opportunities are urgently needed, both in order to reduce poaching and to boost the economy of the region.

5.6.4 Payment options

Ticheler et al (1998) used a bonus scheme alongside monthly salary payments for fishermen who made records of their catches in Lake Bangweulu, Zambia. If funds allow, it might be beneficial to offer a bonus, either at the end of each year, half-year, or month, to the monitor who has made the best records of their observations. This should be in terms of the quality of the data recorded, not in terms of the number of saiga sightings they have seen as this is biased by location. Hopefully, such an incentive would improve the quality of the data recorded (which in the period of this project was rather patchy) and also keep monitors interested in the scheme. Another idea would be to give a larger bonus to the village where the monitors have performed the best overall, on the proviso that this should be invested in something for the benefit of the whole community. For example, villages could buy books for the school, improve their roads or hold a party, and Tavn-Gashun may be able to raise enough money to build a mobile phone mast.

Rather than focusing on payment however, it would be good to think about reasons why monitors have chosen to be involved in the scheme, as due to the small salary money will probably not be the motivating factor. Indeed, Sommerville (pers.comm) found that monitors in Madagascar rated financial benefits as only the fifth most important factor in their decision to monitor, and Danielsen (pers.comm) believes that many incentives can be non-tangible, e.g., access to decision-making bodies, pride in being part of an international conservation programme etc.

5.7 Future research

As well as the need for further research to assess the progress of this particular study, there is also a need for more research into monitoring of migratory species in general. As a group they are difficult to monitor, having no fixed location where they can be found. It is possible that participatory monitoring may have an advantage over traditional monitoring, as local people’s TEK (Traditional Ecological Knowledge)

of migratory species may enable them to predict more accurately when and where a species should be expected to be within their locality.

There is also a good opportunity for future research combining ecological and psychological disciplines in terms of the effects of payment on behaviour. The aim of participatory monitoring schemes is to conserve the species being monitored, and this usually involves attempting to lessen the impact of local people on that species to the extent where it is either sustainable or in fact no longer used. Human behaviour is a complex issue, and one not sufficiently correlated to attitudes to be easily predictable (Holmes, 2003). In order to ascertain whether use of community engagement techniques such as participatory monitoring will have the desired behavioural change, and whether this impact will be enhanced or diminished through various payment structures, ecologists and psychologists should work together.

5.8 Conclusions

After only two months of this six-month pilot participatory monitoring project it is difficult to draw any firm conclusions. However, it has been easy to find willing monitors, and they have recorded a reasonable number of sightings, which have been where we would expect saiga to be seen. The monitors all seemed pleased to be involved in the scheme, and there is every indication that they will continue to get better at recording observations until the end of this pilot. Therefore, in conclusion, there is great potential for the continuation of this participatory monitoring scheme, which will hopefully serve not only to generate additional data on saigas and positively engage local people, but also fill a hole in the participatory monitoring literature by addressing non-resource users and migratory species.

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Appendix 1: Data sheet from village monitors' booklets

English version

Weather: Temperature: Max: Min:

Date	Time	Location	Distance from observer	Angle from path	Number of saiga			Sex structure		Notes
					Exact	Min	Max	Male	Female	

Russian version

Погода: Температура: Максимальная: Минимальная:

Дата	Время	Место	Дистанция от наблюдателя	Угол от пути	Количество Сайгака			Пол		Записи
					Точное	Мин.	Макс.	Мужской	Женский	

Appendix 2: Village Questionnaire

English Version

Village Questionnaire

Hello, I'm an MSc student from the UK and I'm here to learn about local people's attitudes to the saiga antelope and its conservation. Would you mind answering a couple of questions for my student project? There are no right or wrong answers, and this isn't a test! I'm just interested in your opinions. And of course, all answers will remain anonymous.

Village: Date: Person Number:

Gender:

Age:

Main Occupation:

How long lived in the village:

1. Have you ever seen a saiga? Circle one.

Yes No Can't remember

2. What saiga conservation activities are going on in Kalmykia?

3a. Have you heard anything about how the people who protect saigas find out where they are, and how many there are? How certain do you think they can be about saiga numbers and distributions, and why?

3b. If yes, how good do you think the current system is? Circle one.

Very good Good Ok Bad Very Bad

4a. Currently rangers are employed full-time within Chernye Zemli and the Stepnoi reserves and part of their job is to monitor saiga numbers and distribution within the area of the reserves. However, when saiga leave the reserve areas, there is little information about where they go.
It has been suggested that some local shepherds from *(insert name of village here)* could be paid a small amount to record observations of saiga in addition to the continued monitoring by rangers within Chernye Zemli and Stepnoi. What do you think about this plan? Circle one.

Very good Good Ok Bad Very Bad

Comments:

4b. Would you support this scheme?

Yes No Not sure

Comments:

5. If this scheme existed do you think that people round here would be more likely to support saiga conservation?

Yes No Not sure

Comments:

Many thanks for your time. If you would like to know more about my work, the results of the survey, or other Saiga Conservation Alliance activities you can visit www.saiga-conservation.com.

Russian version

Привет, меня зовут Элизабет, я аспирантка Королевского Колледжа в Великобритании. Я получила степень магистра. Моя цель пребывания в Калмыкии – узнать отношение местных людей к сайгакам и проблеме их сохранения. Не возражаете ли вы ответить на несколько моих вопросов, которые помогут мне для написания моей работы? Здесь нет правильных или не верных ответов. Мне нужно только ваше мнение. Все ответы останутся анонимными.

Населенный пункт Дата № опрашиваемого

Пол:

Возраст:

Занимаемая должность:

Как долго вы проживаете на данной территории?:

1. Видели вы сайгаков? Обведите ваш ответ

Да. Нет. Не помню

2. Знаете ли вы, какие мероприятия проходят в Калмыки по сохранению численности сайгаков?

3a. Слышали ли вы о том, как инспектора узнают о численности и местах нахождения сайгаков? На сколько они могут быть точны в своих сведениях?

3b. Если да, то, как эта система работает?

Очень хорошо Хорошо Нормально Плохо. Очень плохо

4.a. Работа защитников диких животных, в Заповеднике «Черные земли» и в Заказнике «Степной» Астраханской области заключается в охране сайгаков, в подсчете их популяции и их распространении. Однако, когда сайгаки покидают их территории, остается мало информации о том где они потом обитают. Предлагается разработать план, который заключается в том, что некоторым жителям вашего поселка будут платить небольшую сумму денег за то, чтобы они записывали свои наблюдения. Как вы относитесь к этой идее?

Очень хорошо Хорошо Нормально Плохо. Очень плохо

Комментарии:

4b. Поддерживаете ли вы этот план?

Да Нет Не уверен

5. Если эта система будет существовать, думаете ли вы, что люди будут более заинтересованы в защите сайгаков?

Да Нет Не уверен

Комментарии:

Спасибо за то, что вы уделили нам время.Если вы хотите узнать больше о моей работе, и результатах,о организации по защитете сайгаков, вы можете посетить страничку в Интернете www.saiga-conservation.com.

Appendix 3: Count Accuracy Test Photos

All photos taken by Helen O'Neill at CZBR, 21-25 June 2008.

Photo A (13 saigas)

Photo B (100 saigas)

Photo C (5 saigas)

Photo D (17 saigas)

Photo E (72 saigas)

Appendix 4: Information collected from village monitors

Village Monitor	Date initiated	Village	Gender	Age	Occupation	Livestock experience (years)
1	12/6/08	Khulkhutta	Male	49	Farmer	15
2	13/6/08	Khulkhutta	Male (+wife)	57	Farmer	13
3	14/6/08	Khulkhutta	Male	50	Farmer	3
4	15/6/08	Khulkhutta	Female	42	Farmer	5
5	16/6/08	Khulkhutta	Male	43	Farmer	0
6	17/6/08	Utta	Male	48	Farmer	6
7	18/6/08	Utta	Male	43	Farmer	6
8	18/6/08	Utta	Male	42	Farmer	14
9	19/6/08	Utta	Male	61	Farmer	35
10	19/6/08	Molodezhny	Male	40	Driver	0*
11	20/6/08	Molodezhny	Male	48	Farmer	12
12	20/6/08	Molodezhny	Male	30	Farmer	14**
13	21/6/08	Molodezhny	Male	45	Farmer	20
14	21/6/08	Molodezhny	Male	47	Farmer	25
15	22/6/08	Erdniyevskiy	Male	40	Farmer	15
16	22/6/08	Erdniyevskiy	Male	51	Farmer	35**
17	23/6/08	Erdniyevskiy	Male	31	Farmer	15
18	23/6/08	Erdniyevskiy	Male	46	Farmer	21
19	24/6/08	Erdniyevskiy	Male	38	Farmer	18
20	25/6/08	Erdniyevskiy	Male	48	Farmer	16
21	25/6/08	Tavn Gashun	Male	28	Farmer	12
22	29/6/08	Tavn Gashun	Male (+niece)	30	Farmer	0***
23	25/6/08	Tavn Gashun	Male	46	Farmer	10
24	26/6/08	Tavn Gashun	Male	49	Farmer	8
25	26/6/08	Tavn Gashun	Male	47	Farmer	15

* Worked with animals 7 years ago; ** Has been farming his entire life, but have assumed meaningful involvement did not commence until he was 16; *** Has been living on a farm for 1.5 years.