International Single Species Action Plan for the Conservation of the Argali

Ovis ammon

This Single Species Action Plan has been prepared to assist the fulfillment of obligations under:

Convention on the Conservation of Migratory Species of Wild Animals (CMS)

International Single Species Action Plan for the Conservation of the Argali

Ovis ammon

CMS Technical Series No. XX
April 2014

Prepared and printed with funding from

Financed by:
The European Union

FLERMONECA
Forest and Biodiversity Governance Including Environmental Monitoring

Implemented by:
giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Support for this action plan:
The development and production of this action plan has been achieved with the financial support of the European Union via the Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ) in the framework of the FLERMONECA Regional Project Forest and Biodiversity Governance Including Environmental Monitoring.

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Milestones in the production of the Plan:

- Proposal for inclusion of *Ovis ammon* in Appendix II of CMS (by Kazakhstan and Tajikistan)
- Workshop "Sustainable Management of Central Asian Game Animals" (22-26 March 2012, International Nature Conservation Academy Vilm, Germany)
- Workshop for the development of an international Action Plan to improve trans-boundary conservation of Argali (2-4 December 2012, Bishkek, Kyrgyzstan)
- Rosen, T. 2012. Analyzing Gaps and Options for Enhancing Argali Conservation in Central Asia within the Context of the Convention on the Conservation of Migratory Species of Wild Animals. Report prepared for The Convention on the Conservation of Migratory Species of Wild Animals (CMS), Bonn, Germany and the GIZ Regional Program on Sustainable Use of Natural Resources in Central Asia.

Geographical scope:
This International Single Species Action Plan requires implementation in the following countries regularly supporting Argali (*Ovis ammon*) populations: Afghanistan, China, India, Kazakhstan, Kyrgyzstan, Mongolia, Nepal, Pakistan, Russian Federation, Tajikistan, and Uzbekistan.

Revision:
This International Single Species Action Plan covers the period 2014 to 2024. A revision should be undertaken in 2019. However, an emergency review can be undertaken prior to 2019 if there are any major changes in terms of population status and/or threats demanding different management interventions to those outlined in this Action Plan.

Recommended citation: Mallon, D., Singh, N., and Röttger, C. (2014) International Single Species Action Plan for the Conservation of the Argali *Ovis ammon*. CMS Technical Series No. XX. Bonn, Germany.

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EXECUTIVE SUMMARY

Argali (*Ovis ammon*) are listed on the current IUCN Red List as Near Threatened, because their numbers are declining due to poaching and competition with livestock. Argali are also listed in Appendix II of the Convention for the Conservation of Migratory Species of Wild Animals (CMS) and in the Appendices of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

Many subspecies and forms have been named, based on various characters, including horn size and shape, body size, coat colour, skull measurements, presence of a ruff, and others. The most widely used arrangement recognizes nine subspecies, but argali taxonomy remains unresolved and genetic research may show that some argali populations are characterized by clinal variation. Argali are distributed widely across eleven countries of Central Asia.

Argali are the largest of the world's wild sheep, with relatively long, slim legs and a compact, lithe body, and are adapted to open terrain and to escape danger through flight. They are usually found on rolling hills and plateaus, mountain slopes and desert hills. Argali are sexually dimorphic and adult males have massive, curled horns. They are polygynous and live in small to large single-sex herds, which come together during the mating season. Females generally give birth to one lamb, during late May to mid-June. Argali have a relatively short lifespan, seldom exceeding 10-12 years. Argali may undertake seasonal movements and some populations occur across international borders.

The primary threats to argali are poaching and loss and degradation of habitat. Some populations are stable while others are decreasing. The horns of the males are highly valued as a trophy and argali are a species with considerable economic potential.

This Single Species Action Plan was developed at a workshop organized by CMS that took place in Bishkek, Kyrgyzstan, in December 2012. The draft plan was subsequently further refined by the world's leading argali experts during an extensive process of review.

Goal of the Action Plan

To maintain and restore argali populations to favourable conservation status throughout their range.

Objectives

Objective 1: To stabilize argali numbers and range and reverse negative trends.
Objective 2: To maintain and restore intact argali habitat and migration routes.
Objective 3: To fill knowledge and information gaps**.**
Objective 4: To ensure effective implementation of the action plan

1 - Biological Assessment

1.1 Taxonomy

Phylum: Chordata
Class: Mammalia
Order: Cetartiodactyla
Family: Bovidae
Genus: *Ovis*
Species: *Ovis ammon* Linnaeus, 1758

Common names: argali (English), arkhar (Russian), argal'(ugalz – ram; *homi* - ewe) (Mongolian), 盘羊 pán yáng (Chinese), *nyan* (Tibetan, Ladakhi), *arkar* (Kazakh), *ak-kiik, kuldja* (Tajik)

Argali taxonomy is complex and many subspecies and forms have been described. Among fundamental arrangements are those by Lydekker (1898) Nasonov (1923) and Tsalkin (1951). Nader *et al.* (1973) listed 16 subspecies, Pfeffer (1967) four, Valdez (1982) and Geist (1991) six, Schaller (1977) seven, and Fedosenko (2000) eight.

Nine subspecies were recognized by the IUCN Caprinae Specialist Group (Shackleton and Lovari (1997):

Ovis ammon ammon	Altai argali
Ovis ammon collium	Kazakhstan argali
Ovis ammon darwini	Gobi argali
Ovis ammon hodgsoni	Tibetan argali
Ovis ammon jubata	North China argali, Shansi argali
Ovis ammon karelini	Tian Shan argali
Ovis ammon nigrimontana	Karatau argali
Ovis ammon polii	Marco Polo sheep, Pamir argali
Ovis ammon severtzovi	Severtzov's argali

The same classification was used by Fedosenko & Blank (2005) and Wilson & Reeder (2005), except that the latter authors preferred the name *O. a. comosa* to *O. a. jubata*. Although this is currently the most widely used arrangement, argali taxonomy remains unresolved and further genetic studies may indicate that some argali populations are in fact characterized by clinal variation (Harris and Reading 2008).

Some authorities formerly considered Severtzov's Sheep of Uzbekistan to be an urial *Ovis orientalis* but it is now considered an argali, based on the evidence of chromosomes (Bunch *et al.* 1998) and mtDNA (Wu *et al.* 2003). Groves and Grubb (2011) speculated that *severtzovi* might be a naturally occurring hybrid between argali and urial *O. orientalis*.

In China, some authors have recognized additional subspecies. Wang (2003) recognized *O. a. littledalei*, *adametzi*, and *sairensis* (all within the range occupied by *karelini* or *collium* above), and *dalailamae* (within a large part of the range occupied by *hodgsoni*). The decision to restrict *hodgsoni* to a small part of the Qinghai-Tibet Plateau may have been influenced by its listing on the US Endangered Species Act which would preclude import of trophies (see Harris 2010 for further discussion of this and other aspects of argali taxonomy in China).

Kapitanova *et al.* (2004) carried out a revision of argali from the former Soviet Union and Mongolia based on craniometry and evolutionary trends and using specimens from key world museums and found three clear types: *ammon/darwini*; *nigrimontana/karelini/polii*; and *severtzovi*.

Based on mtDNA analysis, Tserenbataa *et al.* (2004) questioned the validity of separating *O. a. ammon* and *darwini* within Mongolian populations. Craniometrical analysis of *O. a. polii* showed a hybrid zone with *karelini* (Subbotin *et al.* 2007).

Groves and Grubb (2011) raised the nine forms to species status, in a revision of all ungulates utilizing the Phylogenetic Species Concept, but this arrangement has not been adopted by the IUCN Caprinae Specialist Group.

Subspecies to date have been described on the basis of different characters: the size, shape and direction of twisting of the horns; differences in cranial proportions; colour of the coat; presence of a ruff, and overall body size and dimensions. There are few, if any, clear boundaries between named subspecies and intergrades and transitional forms occur frequently. There has been some further confusion between these taxonomic arrangements and trophy classifications that use the same names.

A phenotype-based trophy hunting classification is proposed by Damm and Franco (in press). It identifies 15 phenotypes and is intended as complementary to formal taxonomic schemes; it is included here in Annex 1.

1.2 Distribution

Argali inhabit a vast geographic range across the highlands of Central Asia: the Kazakh Low Hills (Melkosopochniki) and Nuratau Range, Turkestan and Zeravshan Ranges, Tian Shan, Pamirs, Kun Lun, Altai, western mountains of the Tuva Republic, and from the northern side of the Himalaya across the Qinghai-Tibet Plateau and isolated mountains in the Gobi. Argali also occur outside mountains in areas with hills, canyons, and rocky outcrops.

Argali are found in north-eastern Afghanistan (Wakhan District); China (Gansu, Inner Mongolia, Qinghai, and possibly western Sichuan provinces, and the Tibet and Xinjiang-Uighur Autonomous Republics); northern India (Ladakh district in Jammu & Kashmir; the Spiti area of Himachal Pradesh, and Sikkim); eastern Kazakhstan, southern and eastern Kyrgyzstan, Mongolia, the far north of Nepal, northern Pakistan; the Russian Federation (Altai and Tuva Republics), eastern Uzbekistan, and eastern and southern Tajikistan (Fedosenko and Blank 2005). Argali have not been recorded in Bhutan although apparently suitable habitat exists in the north of the country (Wangchuk 2004).

Overall, the range is highly fragmented and few large, connected populations remain. Several populations occur across international borders and animals may move between countries in the course of seasonal or altitudinal migrations, dispersal, or in response to winter snow.

O. a. ammon: Occurs in the Altai Mountains and adjoining ranges of Mongolia and the Russian Federation extending to the sections of the Altai lying within China and Kazakhstan. The current distribution in Mongolia also includes parts of the Gobi-Altai, Khangai, and Khovsgol ranges, though large areas in western Mongolia now lack the species (Amgalanbaatar *et al.* 2002, Harris and Reading 2008). In the Russian Federation, it is found in the Chikhachev, Tsagan-Shibetu and Mongun-Tayga ranges in the Tuva Republic, Saylyugem Range and Ukok Plateau in Altai Republic (Weinberg *et al.*

1997, Paltsyn 2001, Maroney 2006). In Mongolia, populations also inhabit areas between ranges with hills, rocky outcrops, and steep terrain (Amgalanbaatar *et al.* 2002, Harris and Reading 2008).

O. a. collium: Occurs in central-eastern Kazakhstan from the Kazakh Melkosopochniki, south to the mountains on the northern side of Lake Balkhash and east to the Tarbagatay Range on the border with China (Weinberg *et al.* 1997). *O. a. collium* was not recorded in China by Shackleton (1997) and Wang (1998) listed the argali on the Chinese side of the border adjacent to the range of *O. a collium* in Kazakhstan as *O. a. karelini.*

O. a. darwini: Distributed in mountains, rolling hills, canyons and rocky outcrops of the Transaltai Gobi, Gobi desert and Gobi steppe in Mongolia (Amgalanbaatar and Reading 2000) and Inner Mongolia in China (Harris and Reading 2008). In China, populations have become reduced and fragmented according to Wang and Schaller (1996) and Bu *et al.* (1998). Harris *et al.* (2009) reported that since then, argali have disappeared from at least two more areas (Helan Shan and Lang Shan), and may also have been lost from the Mazong Shan range (although several were observed there in 2000; G. Damm, *in litt,*); small numbers remain in Yabrai (Yubulai) Shan, Hada area and the Erenuo'ersumu region. Very little habitat capable of sustaining argali populations remains within Inner Mongolia and the future of the species there appears tenuous (Harris *et al.* 2009). Details of the distribution of *darwini* and *ammon* in southern Mongolia are unclear and genetic research indicates that all argali in Mongolia represent a single form (Tserenbataa *et al.* 2004).

O. a. hodgsoni: Distributed irregularly across the Qinghai-Tibet Plateau in China, from the northern side of the Himalaya north to the Kunlun and Qilian Shan ranges, and extending into the extreme north of India and Nepal (Schaller 1998, Wang 1998, Harris 2008, Harris and Reading, 2008). In India, argali are restricted to the eastern plateau of Ladakh, the adjacent area of Spiti and separately in northern Sikkim close to the Chinese border (Fox and Johnsingh 1997, Bhatnagar 2003, Ul-Haq 2003, Namgail *et al.* 2009). In Nepal, argali are known from the Damodar Kunda area of Mustang District bordering China (Shrestha *et al.* 2005) and may persist in the Dolpo region, north of the Dhaulagiri Range (Wegge and Oli 1997).

O. a. jubata: This is the least known form of argali. It formerly occurred in the Chinese provinces of Hebei, Shanxi and Shaanxi. However, Harris *et al.* (2009) found no credible reports of argali from south of the Yellow River within recent historical times and concluded that *O. a. jubata* was extinct. Harris *et al.* (2009) also noted that this form was described from sites that differ substantially in topography and vegetation from argali range in the Gobi to the north and high elevation mountains to the west and hypothesize that they may have had unique adaptations to warmer, more mesic conditions than other argali.

O. a. karelini: Quite widely distributed across the Tian Shan Mountains in Kazakhstan, Kyrgyzstan and China (Fedosenko and Blank 2005, Harris and Reading 2008).

O. a. nigrimontana: Restricted to the Karatau Mountains of Kazakhstan. Its habitat has decreased with the expansion of agriculture, encroachment by livestock herders and permanent settlements, especially in the adjacent steppe and piedmont (Delorme 2002). However, it is reported to be increasing in Karatau Strictly Protected Area (O. Pereladova *in litt*.).

O. a. polii: Occur in the eastern Pamirs. Most of the range lies in Tajikistan, extending into adjoining parts of Wakhan (north-eastern Afghanistan), Taxkorgan area of Xinjiang (China), extreme northern Pakistan (around the Khunjerab, Kilik and Mintaka passes) and south-eastern Kyrgyzstan (Fedosenko and Blank 2005, Harris and Reading 2008, Schaller and Kang 2008). The boundary between *polii* and *karelini* in

Kyrgyzstan is unclear and a hybrid zone was noted by Subbotin *et al.* (2007). *O. a. polii* is known to move between the four countries where it occurs (Harris *et al.* 2010).

O. a. severtzovi: Formerly had a wide distribution in Uzbekistan from the north-western Pamiro-Alay Mountains through to the low mountains and hills of the Kyzylkum Desert. Today, almost all remaining animals are restricted to the higher mountains of Nuratau, primarily in the Nuratau Strictly Protected Area, north of Samarkand (Harris and Reading 2008, Aizin 2009). In Kyrgyzstan it occurs in a small part of the Turkestan Range between the Tonuk Suu (Sokh) and Kara Suu (Isfana) rivers, but was formerly more widespread (Vorobeev and van der Ven 2003). It is still present in the area, near Batken, close to the border with Tajikistan (Davletbakov 2012). It is also reported from the Turkestan Range in Tajikistan. *O. a. severtzovi* historically inhabited the Beltau Mountains and eastern portions of the Aktau range in Kazakhstan but is believed to be extirpated from these areas (N. Beshko, pers. comm. in Harris and Reading 2008).

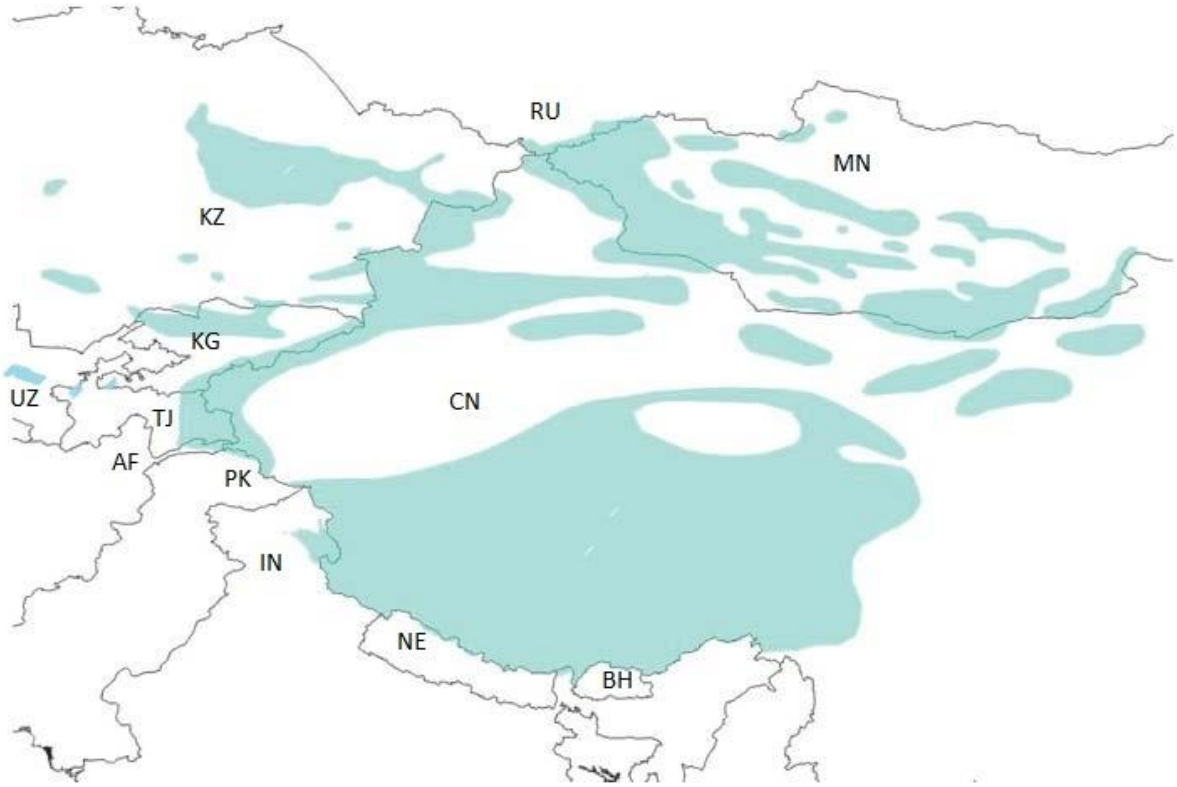

Figure 1. The distribution of argali (adapted from Fedosenko and Blank 2005). AF – Afghanistan; BH – Bhutan; CN – China; IN – India; KG – Kyrgyzstan; KZ – Kazakhstan; MN – Mongolia; NE – Nepal; PK – Pakistan; RU – Russian Federation; TJ – Tajikistan; UZ – Uzbekistan.

1.3. Population

Afghanistan
In Afghanistan, argali only occur in the Wakhan District of Badakhshan Province. *O. a. polii* was historically present in much of the Afghan Pamirs between the Pamir and Wakhan rivers (Petocz *et al.* 1978). Currently it occupies the western part of the Big Pamir, most of the Little Pamir, and the Wakhjir Valley (Harris and Winnie 2008, Schaller and Kang 2008). Petocz *et al.* (1978) counted approximately 1,260 argali in the Afghan Pamirs in the early 1970s and estimated a total population of about 2,500. In autumn 2004, Schaller and Kang (2008) tallied 624 argali primarily in the Little Pamir and estimated a population of 1,000. More recently Harris *et al.* (2010) applied a mark-recapture method using DNA extracted from feces and estimated the female population size in Big Pamir at 172 (95% confidence limits 117-232) individuals. However, the relatively small size of the preferred habitat in Afghanistan and the presence of relatively pristine pastures in the far east of Little Pamir, seem to drive transboundary movements of Marco Polo sheep resulting in marked seasonal fluctuations in estimates of population size, and making it difficult to assess trends. Community rangers in Tegermansu area counted 586 argali individuals during March 2012, and according to Kyrgyz inhabitants of the Little Pamir, argali in this area numbered over 1,000 individuals during late winter 2011-2012, perhaps as a result of an unusually high seasonal immigration from Tajikistan due to the harsh weather conditions that winter (Rosen 2012).
Trend: Unknown

China
The following account is based on Harris and Reading (2008). Wang *et al.* (1997) estimated 29,000-36,000 *O. a. hodgsoni* in Tibet Autonomous Region, Qinghai, and southeastern Xinjiang (but Wang 1998 considered this was probably a "significant overestimate"), with an additional 2,100-2,800 *O. a. darwini* and 600-700 *O. a. jubata* in Inner Mongolia Province, 8,000-11,000 *O. a. karelini* in the Tian Shan, 2,000-3,000 *O. a. polii* in the Pamirs, and some *O. a. ammon* in northern Xinjiang near the border with Mongolia. This would suggest an estimate of 41,700-53,500 argali in China during the early 1990s. In 2004, as part of a nationwide attempt to generate population estimates for wildlife, the total number of argali in China was estimated to be 23,298–31,910 (Yu Yuqun, Northwest Institute of Endangered Species, pers. comm. 2004). Both of these estimates however, are likely to be overestimates according to Harris and Reading (2008).

Argali populations were estimated at 5,000 for the Tibet Autonomous Republic (Liu and Yin 1993) and 3,588 for Qinghai Province (Zheng 2003). Schaller (1998) estimated the total number of Tibetan argali (*O. a. hodgsoni*) on the Qinghai-Tibet Plateau at 7,000.

In Xinjiang Province, no reliable figures are available for *O. a. karelini* in the Tian Shan Mountains and *O. a. ammon* in the Altai Mountains, although estimates are in the "thousands" for the former and in the "hundreds" for the latter. In southern Xinjiang, Schaller and Kang (2008) observed 2,299 *O. a. polii* in the Taxkorgan Nature Reserve and adjoining areas and suggested that numbers were increasing for the last two decades due to confiscation of weapons and provision of game guards.

Most populations of argali in the province of Inner Mongolia appear to be small and isolated (Wang and Schaller 1996, Bu *et al.* 1998, Wang 1998). Survival of argali in Inner Mongolia is likely to depend on the ability of dispersing individuals from Mongolia to supplement existing groups or colonize new areas (Harris *et al.* 2009).

Surveys by WCS in 2008-2009 found argali sparse on the Qinghai-Tibet Plateau, and local reports of a decline in numbers, despite a lack of poaching (A. Kang, *in litt*. 2013).
Trend: Unknown

India
In India, Tibetan argali occur in two small and widely separated populations in the states of Jammu & Kashmir and Sikkim. Argali are rare in northern Sikkim (Sharma and Lachungpa 2003) and occur in two subgroups along the border between Sikkim and China (Tibet Autonomous Region), with an estimated 177 animals (Chanchani *et al*. 2010). Namgail *et al.* (2009) estimated 300–360 *O. a. hodgsoni* in Ladakh. Singh (2008) estimated 480–620 individuals in eight widely spaced locations in Ladakh. Argali only occasionally move into the Spiti area from adjacent Ladakh (Pandey 2003).
Trend: Unknown

Kazakhstan
Population estimates of the recognized subspecies of argali in Kazakhstan based on aerial surveys in spring 2010 were: c.180 *O. a. nigrimontana* (before lambing), approximately 1,360 *O. a. karelini*, and 12,600 *O. a. collium*, and only about 15 argali (*O. a. ammon*. There is an overall growth of the population of *O. a. collium* and its distribution range is expanding (A. Berber, personal comm., 2011); but surveys conducted by Safari Club International/Safari Club International Foundation in 2002 showed significantly different figures; in the majority of the surveyed range (1,544 km^2) only 449 argali were directly counted and the largest group consisted of 17 animals (A. Subbotin, *in litt*.). In the western parts of the Kazakhstan plateau (Ulytau Mountains) the argali population was extirpated in the 1950s-1960s and will most probably not recover without external intervention (Berber 2007). The current distribution area of argali in Kazakhstan's highlands is more than 140,000 km².
Trend: Declining?

Kyrgyzstan
Large-scale surveys in key argali habitats were carried out in December 2010 and May 2011. These tallied a total of 15,311 *O. a. karelini* and *O. a. polii* in the Issykkul, Naryn and Talas regions and 37 *O. a. severtzovi* in Batken (Davletbakov 2012).
Trend: Stable

Mongolia
Argali appear to be expanding their distribution in eastern Mongolia, but contracting and becoming more fragmented in western Mongolia (Mallon *et al.* 1997, Amgalanbaatar and Reading 2000, Amgalanbaatar *et al.* 2002). The most recent nationwide and local data were produced by a survey conducted in autumn 2009. Field teams sampled a total of 134 argali distribution units within Mongolia, which are estimated to occupy approximately 46,603 km² of the total area of 60,237 km² that been previously mapped as occupied by argali. They observed 385 groups of argali, totaling 3,373 individuals and estimated the argali population at 19,701 (95% confidence limits 9,193–43,135). However, post-survey concerns about sampling in some *aimags* (provinces) and estimates derived previously allowed adjustments that resulted in the best single estimate for Mongolia being 17,903 argali. Direct comparisons are difficult because the previous survey report lacked details of the areas visited, field methods, and analysis. Apparent increases or decreases in each *aimag* may be real, or may have been caused by differences in methods (Harris *et al.* 2010).
Trend: Declining in western Mongolia; increasing elsewhere

Nepal
Tibetan argali (*O. a. hodgsoni*) have been reported to occur in the past in several sites of northern Nepal where they are apparently absent today (Schaller 1998). The only extant population in Nepal occurs in the north-east Mustang region, where 77 individuals have been reported from the Damodarkund area (Chetri and Pokharel 2005, Jnawali *et al.* 2011). No overall estimate of argali population size in Nepal exists but numbers are likely to be very small (Shrestha *et al*. 2005).
Trend: Unknown

Pakistan
The number of *O. a. polii* remains unknown, but is possibly less than 100 (Hess *et al.* 1997). Argali once occurred in the hundreds, but declined sharply because of poaching during the construction of the Karakoram Highway in the late 1960s-early 1970s; the current population was estimated at fewer than 150, most or all being seasonal visitors from China (Schaller and Kang 2008).
Trend: Declining

Russian Federation
Surveys of *O. a. ammon* were conducted in the Altai Republic and in the Tuva Republic in 2010. In the Saylyugem Range, 448 argali were counted. The overall population in Altai Republic was estimated at 550–600 animals and in total about 700 argali were recorded in the Russian Federation: Tsagan-Shibetu Range and Mongun-Tayga in Tuva Republic, and Chikhachev Range, Saylyugem Range and Ukok Plateau in Altai Republic (A. Subbotin, *in litt*.). The argali population is at least partly transboundary with Mongolia (WWF 2011).
Trend: Stable, but low numbers

Tajikistan
Sapozhnikov (1976) estimated the total population of *O. a. polii* in the Eastern Pamirs during the 1960s at around 70,000 animals. A population estimate of 10,800–12,000 argali was based on extrapolation from 5,773 animals recorded in a 16,847 km² survey area in May 2002 (Ministry for Nature Protection, Republic of Tajikistan, Tajik National Park 2002, cited in Michel and Muratov 2010). In 2003, in the Eastern Pamirs of Tajikistan, Schaller and Kang (2008) tallied 1,528 argali within selected census blocks totalling 1,977 km² and in winter 2005 counted 2,200 animals within their South Alichur block in the Murgab hunting concession. A survey of accessible sites in 8,170 km² in the Eastern Pamirs was conducted in December 2009. In total 23,711 *Ovis ammon polii* in 510 herds were recorded and maximum herd size was 1,100. Densities varied locally up to 80 per km² but the average density was 2.9 per km². Distribution was very uneven with some large aggregations of argali contrasting with vast empty areas of suitable habitat (Michel and Muratov 2010). In Tajik National Park more than 5,000 argali occur during all seasons (Michel and Muratov 2010). About 1,500 argali were recorded in Zorkul Strictly Protected Area in summer 2011 (Diment *et al.*, 2012). Severtzov's argali numbers around a few dozen animals along the borders with Uzbekistan and Kyrgyzstan (Sharufiddinov, Rahimov, pers. comm. to S. Michel 2008; Rahimov and Amirov 2011). In the eastern Pamirs, a 140-km corridor of unobstructed rangeland extends from the Afghan China border north to the Rangkul Pamir (R. Valdez, *in litt*. 2014).
Trend: Increasing or stable overall, decreasing locally

Uzbekistan
In the second edition of the Uzbek Red Data Book, *O. a. severtzovi* were estimated to number around 2,500 (Azimov 2009), of which 1,800–1,900 were in Nuratau Strictly Protected Area. However assessments conducted in 2005/2006 suggest that argali estimates for the Nuratau Strictly Protected Area were unreliable and presented significant overestimates (CMS Argali Listing Proposal 2011, cited in Rosen 2012). About 1,200–1,300 argali survive in Nuratau Strictly Protected Area and about 250–300 outside, in the Nuratau Mountains, of which ~150–200 occur in western Nuratau and 100 in eastern Nuratau and the Koitash Range; fewer than 100 argali remain in the Tamdytau and Aktau Ranges and a few individuals may persist in the Malguzar Range near the Zaamin SPA. Therefore, fewer than 1,800 Severtzov's argali are believed to persist in Uzbekistan, of which 90% occur in the Nuratau Range (N. Beshko, pers. comm. in Harris and Reading 2008).
Trend: Declining

1.4. Habitat

Argali live in mountains from 300 to 5,750 m above sea level. They inhabit hills, mountains, areas with rocky outcrops, canyons and plateaus, and prefer open or moderately broken terrain, though females use more precipitous areas only during lambing and for 2–3 weeks thereafter. Argali are rarely found on extensive plains and usually avoid forested slopes, except in Nuratau and the Turkestan Range, and in places where poaching and livestock force them to seek refuge in atypical habitat. Argali prefer areas with well-drained soil with little or no snow, or areas with winds that blow snow off the slopes and plateaus; many populations use lower elevations in winter (Heptner *et al.* 1961, Schaller 1977, Fedosenko and Blank 2005).

1.5. Biology and ecology

The diet of argali consists mainly of grasses, sedges, forbs and small shrubs, the proportions of each varying according to elevation, site and season. At lower elevations, such as in Central Kazakhstan, leaves, flowers, and fruit from bushes and trees are significant dietary components. In Mongolia argali favour grasses/shrubs in winter and spring, and forbs/sedges in summer and fall (Wingard *et al.* 2011). Salt licks are particularly attractive to argali (Fedosenko and Blank 2005).

Argali are usually gregarious, living in groups of 2–150 individuals, with much larger aggregations forming at times during the winter rut (Heptner *et al.* 1961, Schaller, 1977, Singh *et al.* 2010a, 2010b). Size and composition of argali herds change with season. Some argali populations segregate by sexes during most of the year, except during the rut. Males tend to use steeper areas at higher elevations than females (Heptner *et al.* 1961, Schaller 1977, Fedosenko and Blank 2005).

Argali are partially sympatric with Siberian ibex *Capra sibirica* and blue sheep *Pseudois nayaur* in places but usually show habitat segregation (Schaller, 1977). On the Qinghai-Tibet Plateau argali diet overlaps significantly with males of chiru *Pantholops hodgsoni*, wild yak *Bos mutus*, blue sheep, and white-lipped deer *Przewalskium albirostris*. Argali may compete with Tibetan gazelle *Procapra picticaudata* and kiang *Equus kiang* for forage resources (Harris and Miller 1995). The grey wolf *Canis lupus* is the main predator of argali; snow leopards *Panthera uncia* also prey on them in some places.

2 - THREATS

Argali are threatened by poaching and overexploitation; habitat loss and degradation due to grazing competition with domestic livestock, fuel wood collection, and mining; disease transmission, predation by domestic dogs and climate change (Amgalanbaatar *et al.* 2002, Fedosenko and Blank 2005, Namgail *et al.* 2007, Harris and Reading 2008, Schaller and Kang 2008, Young *et al.* 2011).

Threats can act directly (causing mortality, stress) or indirectly. This section gives an overview of the main threats. To describe the importance of each threat, the following categories are used:

- **Critical**: a factor causing or likely to cause very rapid declines and/or extinction;
- **High**: a factor causing or likely to cause rapid declines;
- **Medium**: a factor causing or likely to cause moderately rapid declines;
- **Low**: a factor causing or likely to cause low or negligible declines;
- **Local**: a factor causing or likely to cause declines in small parts of the range;
- **Unknown**: a factor that is likely to affect the species to an unknown extent.

2.1. Poaching and Overexploitation

Poaching for meat or horns is the major threat to many argali populations. Although argali receive legal protection in all range states, enforcement is often weak and ineffective. Protected area staff and hunting inspectors are generally under-resourced and under-funded. In many cases they lack the necessary means of transport to conduct patrols as well as basic equipment. In China, poaching had been considered to be a substantial threat (Wang *et al.* 1997 Schaller 1998), but in the mid-1990s a government programme to confiscate guns from pastoralists substantially reduced the weapons available for poaching. This, together with continued efforts to publicize national laws on protected species, appears to have reduced poaching overall in western China during the last decade. Following independence from the Soviet Union and economic hardships, border guards provided with poor rations have sharply reduced argali populations in some of these areas (Rosen 2012) and local militia and customs officials killed dozens of argali (Harris and Reading 2008). In Kazakhstan, there is some information about illegal trophy hunts for argali using permits for hunting for scientific purposes (Vaisman *et al.* in prep.). The actual extent of poaching is difficult to assess, but known cases in Kazakhstan may amount to only 1% of the actual number (M. Levitin, *in litt*. to D. Mallon, 2013). In range states where trophy hunting is allowed, inadequate controls may mean that the number of animals shot does not coincide with the number of hunting licenses issued. Trophies may be exchanged against larger ones or are illegally exported (Vaisman *et al.* in prep.).

When there is insufficient government control, pricing and allocation of permits and concession areas may be influenced by corruption. Unsustainable use tends to occur where incentives for sustainable use and conservation of the resource are absent. Both illegal and legal trophy hunting, if not accompanied by measures ensuring the support of local people, can increase poaching pressure. Selective over-harvesting for horns of the largest, most mature males alters the age and sex structure of populations, disrupts breeding, depresses the age of mean male breeding and so can reduce reproductive fitness.

Importance: Critical

2.2. Overgrazing and competition with livestock

Across argali range, overgrazing is causing degradation and is thus considered the key factor of habitat destruction. Total livestock numbers in most argali range states have increased during recent years to a level causing significant habitat degradation and disturbance. Occupation of pastures by herders forces argali to use sub-optimal habitats, e.g. summer pastures in winter (where forage availability and fleeing from wolves is hindered by snow) and winter pastures in summer (Kashkarov *et al.* 2008). Overgrazing and competition with livestock have been identified as a major threat to wild ungulates in the Indian Transhimalaya, with significant increases in livestock populations apparent in both Ladakh and Sikkim in recent decades (Namgail, 2004, Namgail *et al.* 2007) and in Mongolia (Amgalanbaatar *et al*. 2006). Grazing pressure is high in the argali habitats in the Big and Little Pamirs in Afghanistan, but low or absent in the Wakhjir valley. In China, efforts to settle pastoralists have led to intensified use of productive grasslands preferred by argali, thus displacing them (Harris 2008). Intense summer and year-round grazing in some valleys limits access to high quality pastures in summer, leading to reduced forage and habitat available for argali during winter (Harris 2008). Argali shift to more marginal areas (steeper, less productive sites) when livestock (sheep and goats) move into their habitat. (Harris 2008). In Kyrgyzstan and Tajikistan following independence in the early 1990s, livestock numbers dropped and migration to summer pastures declined, leading to improved habitat conditions for argali. With the recovery of the livestock numbers and reclamation of temporarily abandoned pastures since around 2005, habitat degradation caused by livestock has become more critical. In the eastern Pamirs of Tajikistan, the shrub *Kraschenninnikovia ceratoides* (teresken) is dug out for fuel by local people, causing a shortage of winter forage (Breckle and Wucherer 2006). Livestock herders are often accompanied by guard dogs, which chase argali, further increasing stress and sometimes killing argali lambs and adults (Singh 2008, Young *et al.* 2011). Competition with livestock is caused in part by lack of environmentally-friendly land

use planning and poor or non-existent regulations for the use of argali habitat by livestock and other land use types.

Importance: Critical

2.3. Disturbance

In many areas, argali routinely avoid areas occupied by livestock and people. This may force them to forage in suboptimal areas and increase their energy requirements making them more vulnerable to harsh weather conditions, predators, and diseases, hence decreasing their productivity. In Ladakh, India, Namgail *et al.* (2007) documented a group of argali moving away from preferred foraging areas when livestock were present. In Afghanistan Marco Polo Sheep avoid the vicinity of tended herds of sheep and goats but are more tolerant and even sometimes mix with free-ranging herds of domestic yak (Ostrowski *et al.* 2009). Observations from sites in Kyrgyzstan Mongolia and Tajikistan, however suggest that where poaching is controlled, argali may be more tolerant to livestock. In Ikh Nart Nature Reserve, Mongolia, argali became habituated to people and livestock when they were not harassed (R. Reading in litt.). Mining sites and recreational infrastructure provide further sources of disturbance, though at present these have a relatively limited presence in argali range. Interestingly, local sources report that, due to effective protection from poaching, undestroyed habitats inside the broader mining area at one site in Kyrgyzstan are utilized by argali and the animals no longer react to the noise of heavy machinery (A. Davletbakov, pers. comm. 2010, A.P. Vereshchagin, pers. comm. 2012).

Importance: High

2.4. Mining and infrastructure development

Mining and other forms of resource extraction are increasing within parts of argali range. Large-scale mining developments are under way in Mongolia and gold is mined in the Tian Shan in Kyrgyzstan. There is a uranium mine in the northern part of Karatau in Kazakhstan (Delorme 2002). Hydroelectric installations and tourism development are also increasing, especially in high mountain areas. A second issue is that the road construction associated with large scale infrastructure developments can open up new areas to poachers if adequate controls are not put in place. Habitat destruction can be extremely severe at mine sites themselves, but these sites often occupy a limited area and currently only a very small proportion of the current global range of argali is affected, though this could expand rapidly.

Importance: Local

2.5. Fences and linear barriers

International border fences present a barrier to movement and dispersal of argali, prevent access to optimal grazing sites (especially in winter), and increase fragmentation and genetic isolation. Some fences erected between the former Soviet Union and China have deteriorated and in several places argali can now move across the border. For example, an inner border fence (>2m high) between Tajikistan and China runs for 350 km; however along the southern 50 km, fence posts have been cut for firewood so argali can cross (Schaller and Kang 2008) and it may not form a complete barrier. Border fences also exist along parts of the Afghanistan-Tajikistan border, the Uzbekistan-Tajikistan border; India and China (Singh 2008), Mongolia and Russia (Kashkarov *et al.* 2008) and China and Mongolia, though in the latter case argali were able to cross the fence (Harris *et al.* 2009). The barbed wire border fence between the Russian Federation and Mongolia, built in the year 2000, produces severe negative effects. The fence runs for about 50 km along the Ak-Adyr Ridge and Mongun-Taiga and hinders seasonal migration, effectively excluding argali from critical wintering habitat; deaths from argali becoming entangled in the barbed wire have also been reported (Damm and Franco in press). Roads and railways, particularly when fenced, can also restrict or prevent movement of wild animals, but so far not have not been reported as impacting negatively on argali populations, except for the Karakoram Highway in Pakistan (Schaller and Kang 2008). Secure, well-maintained, high fences can present an impassable barrier to argali with especially serious effects when this disrupts movements to seasonal pastures. Currently, such fences have been

constructed in only a small part of argali range so the threat remains localised, though it could increase in extent and impact in the near to medium future.

Importance: Local

2.6. Disease transmission

Several livestock-introduced diseases, such as pasteurellosis, rinderpest, malignant anthrax, and others, reportedly infect argali (Sapozhnikov 1976, Fedosenko and Blank 2005). However, recent evidence of infectious agents impacting significantly the survival of argali population are lacking, perhaps as a result of decreasing numbers of argali, the difficulty of detection, and low diagnostic capabilities of animal health services across argali range. Nevertheless, in the generalized context of increasing encroachment of livestock into wild habitats, argali as well as other mountain ungulates are at risk of future outbreaks of livestock-borne diseases (Ostrowski *et al.* 2009). Climate change is expected to exert significant modifications on Central Asian ecosystems and may also increase the risk of emergence of vector-disseminated diseases to argali (Harvell *et al.* 2002). All these require continuous and informed disease surveillance in domestic animals that are in contact with argali populations.

Importance: Medium

2.7. Fragmentation

All the preceding threats, acting singly or in combination contribute to fragmentation of argali into smaller and more isolated subpopulations. Small populations are inherently more vulnerable to extinction from stochastic events and generally contain reduced levels of genetic diversity, while greater distances between them reduce inter-connectivity and the exchange of individuals. Isolated protected areas and the absence of migration corridors between them and hunting concessions aggravate this factor. Fragmentation has been reported as a negative factor affecting argali in the Altai in the Russian Federation and Kazakhstan (Kashkarov *et al.* 2008), in Inner Mongolia, China (Harris *et al.* 2009), and in India (Singh 2008). In the Aktau, Tamdytau, and Malguzar Mountains as well as the Turkestan Range (Uzbekistan and border areas of Kyrgyzstan and Tajikistan) very small, isolated populations of Severtzov's argali are threatened by losses due to poaching and predation, inbreeding and harsh climatic conditions (Beshko, pers. comm. 2012). Marco Polo sheep in the Afghan Pamir do not show reduced genetic diversity, due to migration of animals to and from Tajikistan, However, the subpopulation of argali in Taxkorgan, China is potentially becoming genetically isolated (Luikart *et al*. 2011).

Importance: High

2.8. Lack of transboundary cooperation

Given that so many argali populations have a transboundary character, full cooperation between the relevant range states is essential. Without coordinated monitoring of transboundary populations and sharing of relevant information, it is difficult to make accurate assessments of the trends of these populations and implement appropriate management decisions. The successful recovery and/or maintenance of populations will depend on the activities of all those range states which share a population.

Importance: Medium

2.9. Knowledge limitations

The taxonomy, genetics and possible phylogeographic structure of argali are not settled, complicating the identification of important conservation units. Data on distribution, population size and structure, are often outdated or unreliable. Research and population monitoring are expensive and generating robust estimates of population size and monitoring trends are problematic. Singh and Milner-Gulland (2011) reviewed the range of monitoring methodologies for ungulates in Central Asia and suggested a stratified random sampling approach using habitat suitability models to census and monitor argali populations. Such an approach is readily transferrable to different areas where argali occur (Singh *et al.* 2009). Research

information is rarely translated into practical management recommendations and even more rarely are these recommendations applied in practice. Hunting results are rarely documented in detail and data on trophy hunts (success rate, number harvested, age, horn size) are rarely available for scientific monitoring. Decisions on the conservation, management and use of argali are often driven by political and commercial interests rather than based on wildlife management principles. The impacts of disease and climate change are currently unknown. Poor management of hunting operations and detrimental off take quotas may also be the result of poor knowledge of population size and structure.

Importance: Medium

2.10. Climate Change

Changes in global climate patterns include rising in mean temperatures and changes in the level of precipitation (IPCC ARA4 2007) while in mountain regions, the frequency of severe weather events is also predicted to increase (ICIMOD 2009). Potential effects on argali habitat of warmer temperatures and increased precipitation include melting permafrost, longer growing seasons and upward shifts in vegetation zones. Such changes would also affect human land use and patterns of livestock grazing, with potential indirect impacts on argali. The specific effects of climate change on different parts of argali distribution are currently unknown, so including this factor in monitoring programmes and planning for a range of future scenarios are important. Amending protected area boundaries in response to regional climate changes will be problematic, further underlining the importance of large-scale, landscape level approaches to maintain connectivity between subpopulations.

Importance: Unknown

3 –CONSERVATION MEASURES

3.1. International status

Argali receive some legal protection under two Multilateral Environmental Agreements (CITES, CMS) and trade regulations in the EU and USA (summarized in Table 3) and they are included on the IUCN Red List.

- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) – listed in Appendix II except for *O. a. hodgsoni* and *O. a. nigrimontana* which are included in Appendix I (Severtzov's argali is listed in Appendix II as *O. vignei severtzovi*).
- Convention for the Conservation of Migratory Species of Wild Animals (CMS) – listed in Appendix II. (Resolution Conf. 12.11 (Rev. CoP16) on Standard nomenclature provides that for *Ovis ammon*, the taxonomic standard reference is: Wilson & Reeder 2005).
- European Union (EU): Annex B of the EC Wildlife Trade Regulations, except for *O. a. hodgsoni* and *O. a. nigrimontana*, which are included in Annex A (EC Reg. No 709/2010, amending EC Reg. No. 338/97). For the importation of argali or its parts into the EU, an export permit or re-export certificate, issued by country of (re-) export, as well as an import permit issued by the EU Member State of destination are required
- The United States of America Endangered Species Act (ESA): "Endangered", except in Mongolia, Kyrgyzstan and Tajikistan, where the species is listed as "threatened" (a classification that allows for import of trophies from legally taken argali in those countries under limited and specifically authorized permits from the U.S. Fish and Wildlife Service).
- IUCN Red List: Near Threatened (because argali are declining overall and close to qualifying for 'Vulnerable' under criterion A2cd; Harris and Reading 2008).

Table 3. International conservation and legal status of argali *Ovis ammon*

IUCN Global Status	CMS	CITES	EC wildlife trade regulations	The United States Endangered Species Act
Near Threatened	*Appendix II*	*Appendix II* Except: *O. a. hodgsoni* and *O. a. nigrimontana*: *Appendix I*	*Appendix B* Except: *O. a. hodgsoni* and *O. a. nigrimontana*: *Appendix A*	*Endangered* Except: *Threatened* in Mongolia, Kyrgyzstan, Tajikistan:

3.2 National policy and legislation in range states

Afghanistan: Fully protected; hunting and trading are strictly prohibited (Presidential hunting ban since 2006);

China: All argali are classified as a Category II "key species" under the Chinese National Wildlife Protection Law of 1988. Permits to take argali must be obtained from provincial authorities. Only trophy hunting programmes have procured permits to hunt argali under this legislation, but no trophy hunting of argali is currently authorized;

India: Listed as 'endangered' under Schedule I (highest protection) of the Wildlife Protection Act (1972) of the Government of India;

Kazakhstan: Listed in the national Red List as *O. a. ammon* - endangered (Category I); *O. a. collium* - rare (Category III); *O. a. karelini*- vulnerable (Category II); *O. a. nigrimontana* - endangered (Category I); *O. a. severtzovi* - endangered (Category I) and possibly disappeared from the country. Hunting permits are issued only by particular governmental decree following a special procedure, but there have been no legal hunts since 2003;

Kyrgyzstan: Listed in the Red Book as *O. a. polii* – near threatened (Category 3); *O. a. karelini* - vulnerable (Category 2); and *O. a. severtzovi* – endangered (Category 1) (2007); the government issues about 70 permits annually for trophy hunting and scientific purposes;
Mongolia: Listed as "Endangered" after the 2009 nationwide assessment, protected as "Rare" under the 2001 revision (Mongolian Government Act No. 264) of the 2000 Mongolian Law on Animals. General hunting (i.e. by local people) of argali has been prohibited since 1953, although foreign trophy hunters can purchase special licenses under an annual quota;

Nepal: Vulnerable, protected under HMG Nepal's National Parks and Wildlife Conservation Act, 1973;

Pakistan: Critically endangered, protected at provincial level, no hunting permits are issued;

Russian Federation: Listed in the Red Book of the Russian Federation, hunting prohibited;

Tajikistan: Listed in the Red Book, hunting is in theory possible only for scientific purposes but in practice the government annually issues about 80 permits for trophy hunting;

Uzbekistan: Listed in the Red Book, limited trophy hunting irregularly permitted, export permits issued.

3.3. Protected Areas

Protected areas (PAs) have been established within argali range in each of the range States, some of them of substantial size. However, some PAs exist only on paper, and many suffer from lack of funding, staff, training, equipment, and transport. Although each site in theory has a management plan that sets out priority activities, these plans are not always up to date or fully implemented. In many protected areas livestock grazing and harvest of wild plants, as well as poaching take place. The area figures given below refer to the whole PA and not the amount of suitable argali habitat, which may be much smaller.

Afghanistan: Two Wildlife Reserves have been proposed, Big Pamir (576 km^2) and Teggermansu (248 km^2) but in April 2014 the Government of Afghanistan declared the whole of Wakhan as a National Park (>10,000 km^2).

China: A vast reserve complex totalling over 586,500km^2 in area is located on the Qinghai-Tibet Plateau, made up of four contiguous protected areas: Chang Tang Nature Reserve (300,000 km^2), Sanjiangyuan NR (158,000 km^2), Kekexili NR (83,500 km^2) and Arjin Shan NR (45,000 km^2). To these can be added Qilian Shan NR (>20,000 km^2) and Qomolongma NR (33,910 km^2) on the northern and southern edges of the plateau respectively. Argali occur sporadically in all of these sites. In Xinjiang, Taxkorgan NR (14,000 km^2), West Tian Shan National Nature Reserve (280 km^2) and Tomur Feng NR (100 km^2) on the southern side of the Tian Shan also host the species.

India: Occur in a small area within Hemis National Park (3,350 km^2), Ladakh, and Khangchendzonga NP (849 km^2), Sikkim.

Kazakhstan: Argali occur in Karatau State Nature Reserve (343 km^2), Aksu-Zhabagly State Nature Reserve (1320 km^2), Andasay State Nature Sanctuary (10,000 km^2), Zhusandala State Nature Reserved Zone (27,575 km^2), Ile-Alatau State National Nature Park (1,997 km^2), Almaty State Nature Reserve (915 km^2), Almaty State Nature Sanctuary (5,424 km^2), Kolsay Kolderi State National Nature Park (1,610 km^2), Altyn-Emel State National Nature Park (1,611 km^2), Zhongar-Alatau State National Nature Park (3560 km^2), Upper Koksy State Nature Sanctuary (2,400 km^2), Tokhty State Nature Sanctuary (1,870 km^2), Katon-Karagay State National Nature Park (6,434 km^2), Bayan-Aul State National Nature Park (507 km^2), Karkaraly State National Nature Park (903 km^2), Kyzyltau State Nature Sanctuary (600 km^2), Buyratau State National Nature Park (889 km^2), Kyzylaray State Nature Sanctuary (182 km^2), Tarbagatay State Nature Sanctuary (2,400 km^2).

Kyrgyzstan: Argali occur in Karatal-Japyryk State Nature Reserve (364 km^2), Kulun-Ata State Nature Reserve (274 km^2), Naryn State Reserve 370 km^2), and Sarychat-Ertash State Nature Reserve (720 km^2); and Besh-Tash, Chon Kemin, Kara-Bura (114 km^2) State Nature Parks; also formerly in Besh-Aral State Reserve (867 km^2).

Mongolia: At least 14 federally protected areas harbour argali including: Great Gobi Strictly Protected Area (SPA) Unit A (44,190 km^2); Khokh Serkh SPA (723 km^2); Otgontenger SPA (955 km^2); Turgen Uul SPA; Tsagaan Shuvuut unit of Uvs Nuur SPA (7,125 km^2); Gobi Gurvansaikhan National Conservation Park (NCP) (27,000 km^2); Altai Tavaan Bogd NCP (6,362 km^2); Silkhemin Nuruu NCP (140 km^2); Khar Uvs Nuur NCP; Khangain Nuruu NCP (8,978 Tsagaan Shuvuut; Khustain Nuruu NCP (506 km^2); Ikh Nart Nature Reserve (NR) (666 km^2); Burkhan Buudai NR; and Eej Kharkhuun National Monument (225 km^2). About 23% of the argali's range falls within federal protected areas. The species also occurs in dozens of locally protected areas.

Pakistan: Occur in a small area within Khunjerab National Park (2,270 km^2).

Russian Federation: Confirmed in Altaiskiy State NR (864 km^2) and Sailyugemskiy National Park.

Tajikistan: Tajik National Park – declared a World Heritage Site in 2013 (26,000 km^2) and Zorkul Strict Nature Reserve (877 km^2) in the south-east Pamirs.

Uzbekistan: Nuratau State Nature Reserve (170 km^2) within the Nuratau-Kyzylkum Biosphere Reserve, formerly in Chatkal State Biosphere Reserve (573 km^2), and possibly in Zaamin State Nature Reserve (156 km^2).

3.4. Transboundary initiatives

Many argali populations occur across international borders and animals may move between different countries, emphasizing the need for transboundary cooperation in monitoring and management. Transboundary cooperation enables conservation at larger spatial scales, which safeguards dispersal corridors between core populations. Transboundary initiatives can operate at several different levels, including regional and bilateral agreements, ecosystem-level projects, and cooperation and information-sharing among protected area staff, NGOs and field researchers. The following are examples of such initiatives:

Several recent current and proposed transboundary initiatives within the argali range are focused on protected areas.

The UNDP-GEF Project "Biodiversity Conservation in Altai-Sayan Eco-region" ran from 2007 to 2011 in collaboration with WWF, with argali as a flagship species. The governments of the Russian Federation and Mongolia and Russian Federation and Kazakhstan have signed agreements to establish an Altai transboundary Nature Reserve. In 2010, a workshop was held at Ust Koksa in the Altai Republic of the Russian Federation to discuss the establishment of a Mega Connectivity Corridor along the Altai Mountains that would connect several protected areas in China, Kazakhstan, Mongolia (Rosen 2012).

A Pamir International Peace Park has been proposed where the borders of Afghanistan, China, Pakistan and Tajikistan meet in the eastern Pamirs (Schaller 1986, WCS, 2007, 2012), with Marco Polo sheep as a flagship species. The proposed reserve would encompass eight existing protected areas. The most significant of these are Zorkul SNR (870 km^2) in Tajikistan; Pamir-i Buzurg (Big Pamir) NR (679 km^2) in Afghanistan; Taxkorgan NR (15,863 km^2) in China and Khunjerab NR (2,270 km^2) in Pakistan.

The GEF "Trans boundary biodiversity conservation of West Tien Shan Project" aimed to increase cooperation between four PAs: Chatkal State Reserve (Uzbekistan), Sary-Chelek and Besh-Aral State Reserves (Kyrgyzstan) and Aksu-Zhabagly (Kazakhstan). The "Tien Shan Ecosystem Development Project", also funded by GEF, was launched in 2009 to support management of protected areas and sustainable development in Kazakhstan and Kyrgyzstan. The "Pamir-Alai Trans boundary Conservation Area" (PATCA) project, funded by the EU, included consideration of argali conservation needs (Saidov 2007) but the management plan drawn up has not yet been endorsed or implemented (Rosen, 2012).

The "Mountains of Northern Tien Shan" project will run for the period 2013-2016 with the German Society for Nature Conservation (NABU). It is planned to organize a transboundary protected area encompassing three existing PAs: Chon-Kemin National Park (Kyrgyz Republic), Chu-Or NP and Almaty Strict Reserve (Republic of Kazakhstan). UNDP and the Kyrgyz State Agency on Environmental Protection and Forestry have initiated a project to strengthen conservation in the Central and Inner Tian Shan. One of the project aims is to establish the Khan Tengri Natural Park (1870 km^2) in eastern Kyrgyzstan that will border China (documentation on its establishment was prepared in the framework of

WWF project). Once established, this could potentially link Sarychat-Ertash Reserve in the Inner Tian Shan of Kyrgyzstan with Tomur Reserve in Xinjiang, China.

Other transboundary projects operating at a smaller scale within the argali range are summarised in Rosen (2012) and include WCS's Ecosystem Health Initiative between Tajikistan, Pakistan and Afghanistan, aimed at resolving animal health issues at wildlife-livestock interface and an initiative facilitated by ICIMOD on the conservation of wildlife in the Pakistan-China border area that led to an agreement being signed between Xinjiang Uygur Autonomous Regional Forestry Department and the Gilgit-Baltistan Forest, Wildlife Parks and Environment Department, Pakistan.

3.5. Trophy Hunting

The horns of adult male argali are highly valued by trophy hunters and trophy hunting generates significant revenues that could contribute to the conservation of the species and improve local livelihoods. Trophy hunting also provides a viable alternative land-use in areas where agriculture and livestock production are marginal. Furthermore, well-run trophy hunting concessions can provide effective protection to argali populations and other species over extensive areas through effective anti-poaching measures and controls on livestock grazing. Research at one site in Tajikistan has shown that a well-managed hunting concession area had a much higher argali population density and abundance than neighbouring areas (Panthera, unpublished reports 2014, R. Valdez *in litt*. 2014).

Trophy hunting of argali takes place in Kyrgyzstan, Mongolia, and Tajikistan, very irregularly in Uzbekistan, and formerly took place in Afghanistan (during the 1970s), China, and Kazakhstan (until 2003). Quotas are set annually and permits issued by the respective governments. An analysis of CITES trade figures showed that 1,168 argali trophies were exported from Tajikistan and Kyrgyzstan during 2000-2010 (Vaisman *et al.* in prep). It appears that little revenue from trophy hunting operations is currently reinvested in conservation. For example, very little money from trophy hunting has in the past supported conservation activities in Mongolia (Amgalanbaatar *et al.* 2002).

Argali trophy hunting operates principally as commercial operations, though this does not preclude some of them from contributing to biodiversity conservation, and the most effectively managed concessions engage in anti-poaching activities, patrolling and monitoring. Some benefits may reach local communities through payment for goods and services but there are few data available to assess the level of these benefits. Community-based trophy hunting programmes have been developed in two provinces of Mongolia and the NGO Panthera is supporting development of the "Irbis" and "Burgut" conservancies in the Madiyan/Pshart and Alichur valleys in Tajikistan to promote sustainable hunting of argali.

Guidelines and codes of conduct have been produced to guide the sustainability of trophy hunting, to maximise its contribution to biodiversity conservation and to ensure the engagement of local communities. These include the *IUCN SSC Guiding Principles on Trophy Hunting as a Tool for Creating Conservation Incentives* (IUCN 2012) and The International Council for Game and Wildlife Conservation (CIC)'s *Best Practice Guidelines* for trophy hunting (Baldus *et al.* 2008).

Key problems for the sustainability of trophy hunting schemes include legal frameworks that lack clear regulations and often provide contradicting legal and regulatory mechanisms for the allocation of hunting areas, inadequate non-detriment findings to determine sustainable levels of export, as called for by CITES, inappropriate setting and distribution of quotas, and lack of transparent use and allocation of the proceeds from the sale of the hunting permits, particularly towards local communities (Rosen 2012). Lack of political will, legal barriers and lack of organizational capacity of the communities hinder the development of community-based trophy hunting schemes. In other instances, there is a short-term assignment of

hunting areas which does not provide any motivation to invest in the long-term conservation of argali. Quotas and licenses may be exceeded unofficially, especially where regulation is hampered by remote and difficult terrain and under-resourcing of state inspection services. The same factors of under-resourcing, weak law enforcement and corruption, affecting the effectiveness of protected areas also impact trophy hunting through inadequate control of poaching, undermining the quota system and eventually threatening the viability of the resource (Mallon 2013).

3.6. Conservation initiatives

Under successive cooperative agreements with USAID, WCS implemented a Biodiversity Conservation Program between 2006 and 2009 in Wakhan District and a project on Improving Livelihoods and Governance through Natural Resource Management. Activities aimed at improving the conservation of Marco Polo sheep included: estimating population size, evaluating habitat use for future habitat modelling, investigating genetic diversity and occurrence of gene flow within Afghan populations and between Afghan populations and those in neighbouring range states, evaluating the extent of dietary overlap and range-use conflicts with livestock, evaluating the risk of disease transmission between livestock and Marco Polo sheep, implementing livestock vaccination programs to decrease the risk of foot-an-mouth disease transmission to argali, developing extensive public outreach, public awareness and environmental education programs, building the technical and law enforcement capacity of a community based ranger force aimed at monitoring population trends and controlling illegal hunting and violations of wildlife regulations, and promoting the creation of protected areas involving local community management and income generation through sustainable use of natural resources (Rosen, 2012, Ostrowski, pers. comm. 2013). However, local people and hunting concession staff regularly report poaching by Afghans, both in the Afghan sector of the Pamirs and occasionally in Tajikistan. (Bekmurodi pers. comm. 2008 – 2013)

In 2001, Safari Club International Foundation in collaboration with the Russian Academy of Sciences and authorities of range states has launched conservation-hunting programmes in Kyrgyzstan, Mongolia and Tajikistan aimed at the development of sustainably managed trophy hunting programs on argali, including survey design, habitat assessment, GIS databases, public education, development of legislation, etc. These programmes were supported to varying degrees by the CITES Secretariat, EU, USFWS, WWF and others.

In Kyrgyzstan and Tajikistan, the Regional Programme on Sustainable Use of Natural Resources in Central Asia implemented by GIZ on behalf of the German Government since 2009 supports activities on sustainable management of mountain ungulates focusing on development of a legal framework, capacity development for wildlife monitoring and improvement of hunting areas management, and in particular, introduction of community based approaches. All assigned hunting concessions have been mapped in GIS. Substantial support has been provided to the development of draft new hunting laws that provide for clearer regulation and incentives for sustainable hunting and wildlife management. Community based management approaches are demonstrated in pilot areas and capacity building for a country wide allocation of hunting areas to groups of local hunters is underway (Rosen 2012).

In Kyrgyzstan, there is also a state research programme on the status and conservation of argali and Siberian ibex 2010-2014, confirmed by Government decree No/ 238 of 11 October 2010. In Kyrgyzstan and Tajikistan a methodology for monitoring argali and Siberian ibex using standardized field forms has been developed with the help of IUCN Caprinae Specialist Group and GIZ. A Russian-language monitoring handbook and manual on use of GPS have been developed as part of this activity.

In Mongolia, the Argali Wildlife Research Center, the Denver Zoological Foundation (DZF), WWF, Mongolian Conservation Coalition, and the Mongolian Academy of Sciences (MAS) have cooperated on several argali and ibex conservation and research projects since 1997, including an interdisciplinary

research and conservation project in Ikh Nart Nature Reserve. Some of the research has focused on distribution, population dynamics, behavior, social structure, genetics, the level of competition between argali and domestic sheep and goats, and protected area use. They have worked on conservation management measures in cooperation with State officials, local hunting groups and non-profit organizations aimed at specifically addressing trophy hunting issues, to ensure that a substantial portion of future funds obtained from trophy hunting go to help conserve the species and support local people (Rosen 2012). They have also explored options for revenue generation, such as ecotourism, noting, however, that the reclusive nature of argali currently renders them less than ideal candidates for ecotourism (Amgalaanbatar and Reading 2000). However, in Ikh Nart, that is changing (Reading *et al.* 2005, 2011) after over a decade of protection from poaching and habituation to argali researchers.

Activities focused on argali in Kazakhstan include improving survey methods and monitoring techniques; joint monitoring activities with Kyrgyzstan; understanding the genetic diversity; argali restoration in the Ulytau Mountains, and anti-poaching activities along the Kyrgyz border (Rosen 2012).

A WWF/Minstry of Foreign Affairs-Norway project in Kazakhstan supported an increase in the specially protected areas system in the habitats of Karatau argali: Karatau Specially Protected Area (360 km^2) became one component in a system of PAs covering more than 1,500 km^2 in total; established cooperation between regional and district inspectors, the forestry system and reserve rangers; provided technical support and organized special training for rangers. Effective protection of animals in migratory corridors outside the borders of protected areas was also assured. As a result, the number of Karatau argali doubled during the period of project implementation.

Fauna & Flora International is engaged in biodiversity survey, training, monitoring, capacity building and management plan development in Zorkul State Nature Reserve in Tajikistan and Sarychat-Ertash and Naryn State Nature Reserves in Kyrgyzstan.

A WWF project in Kyrgyzstan supports improvement of practical anti-poaching activities of Sarychat-Ertash Strict Nature Reserve (technical support, ranger training) and enlargement of the territory of the reserve.

The US-based NGO Panthera is supporting the development of model community-managed conservancies in the Eastern Pamirs of Tajikistan to ensure the sustainable use of Marco Polo sheep and Siberian ibex for tourism and regulated hunting, thus creating economic and social incentives to protect wildlife for communities involved.

4 - FRAMEWORK FOR ACTION

This section identifies and defines the overall conservation **Goal**, **Objectives**, **Results** and **Actions** of the Plan.

4.1 Goal

To maintain and restore argali populations to favourable conservation status throughout their range.

4.2 Objectives

Objective 1: To stabilize argali numbers and range and reverse negative trends.
Objective 2: To maintain and restore intact argali habitat and migration routes.
Objective 3: To fill knowledge and information gaps**.**
Objective 4: To ensure effective implementation of the action plan

4.3 Results

1.1. Poaching and other human-caused sources of mortality are reduced.
1.2. Argali is used and managed sustainably with support of local communities.

2.1. Pastures are sustainably managed and availability and quality of argali habitat have improved.
2.2. Forage shortages for argali in critical areas and times of the year are reduced.
2.3. Disturbance and displacement by herders and other human activities are minimized.
2.4. Negative impacts of mining and infrastructure development are minimized and mitigated.
2.5. Conservation management and international cooperation are maximized to maintain connectivity of argali populations.

3.1. Sufficient information on argali status, trends, ecology and management is available to all stakeholders.

4.1. An implementation mechanism is established

4.4 Actions

Table 3 presents the Results under each Objective, followed by the Actions grouped by result. Under each Action, the countries are listed (using ISO codes) where its implementation is relevant. Against each Action, the organisations leading and involved in implementation are indicated, based on the best available knowledge.

Actions are prioritized as Essential, High, Medium, and Low.

Time scales used for each Action use the following scale:

- Immediate: completed within the next year
- Short: completed within the next 3 years
- Medium: completed within the next 5 years
- Long: completed within the next 10 years
- Ongoing: currently being implemented and should continue
- Completed: completed during preparation of the SSAP

Table 1. Results and corresponding Actions ranked according to their importance

Objective 1: *To stabilize argali numbers and range and reverse negative trends*				
Result	***Action***	***Priority***	***Time scale***	***Organisations responsible***
1.1. Poaching and other human induced mortality are reduced	1.1.1. Implement effective anti-poaching measures addressing poaching at all levels Applicable to: **All**	**Essential**	**On-going**	Government agencies, Protected area managers, Hunting associations, Hunting area managers
	1.1.2. Strengthen management capacity of trophy hunting concessions and clearly define hunting zones and seasons. Applicable to: **Countries with trophy hunting programmes**[1]	**Essential**	**On-going**	Hunting area managers, Hunting associations, CIC, Government agencies
	1.1.3. Provide relevant training and equipment for law enforcement officers, PA staff, and others. Applicable to: **All**	**High**	**Medium**	Government agencies, International Ranger Federation, TRAFFIC, INTERPOL, NGOs
	1.1.4. Report poaching incidents to mass media and CMS. Applicable to: **All**	**Low**	**Medium**	CMS argali contact points, Argali Working Group (WG), NGOs
	1.1.5. Develop a confiscation policy for argali products and ensure that benefits of retailed or auctioned seized products are reinvested in argali conservation. Applicable to: **All**	**Low**	**Long**	Government agencies
	1.1.6. Address the threat of livestock-wildlife disease transmission through vaccination of livestock in appropriate cases, effective exclusion of livestock from PAs, health monitoring of argali and contiguous livestock populations. Applicable to: **All**	**Medium**	**Long**	Government veterinary agencies, hunting area managers, NGOs

1.2. Argali is used and managed sustainably, with support of local communities	1.2.1. Involve local communities formally in the management and sustainable use of argali and their habitat. Applicable to: **All**	**Essential**	**Medium**	Government agencies, Herder associations, Hunting area managers, NGOs, Development cooperation organizations
	1.2.2. Promote long-term assignment of management rights to communities. Applicable to: **All**	**High**	**Medium**	Government agencies, NGOs, Development cooperation organizations, Community and herder associations
	1.2.3. Ensure that a percentage of hunting revenues is dedicated to argali conservation Applicable to: **Countries with trophy hunting programs**[1]	**High**	**Medium**	Government agencies, Hunting area managers/concessions NGOs
	1.2.4. Ensure the equitable benefit sharing of revenues from trophy hunting to local communities. Applicable to: **Countries with trophy hunting programs**[1]	**Essential**	**Medium**	Government agencies, Hunting agencies, hunting area managers/concessions
	1.2.5. Promote sustainable community-based wildlife management programmes / trophy hunting programmes. Applicable to: **Countries with trophy hunting programs**[1]	**High**	**Medium**	Hunting agencies, hunting concessions, hunting outfitters, NGOs, development cooperation organizations
	1.2.6. Ensure sustainable harvest of argali and compliance with CITES, EU regulation and the US Endangered Species Act. Applicable to: **Countries with trophy hunting programs**[1]	**High**	**Medium**	Law enforcement agencies, Hunting agencies, hunting concessions, scientific monitors, CITES Secretariat and argali contact points, national CITES authorities

	1.2.7. Review and where necessary strengthen legal and institutional measures concerning management of hunting areas, setting of quotas and allocation of licences and ensure their transparency. Applicable to: **Countries with trophy hunting programs**[1]	**Medium**	**Medium**	National parliaments, Hunting agencies, Hunting concessions, CIC NGOs (independent monitoring), Development cooperation organizations
	1.2.8. Coordinate the allocation of quotas in trans-boundary populations among range states. Applicable to: **Countries where trophy hunting occurs across national boundaries**	**Low**	**Long**	Government agencies, Argali WG
	1.2.9. Training law enforcement staff in implementation of CITES regulations, identification of argali products and techniques for countering illegal trade. Applicable to: **All**	**Medium**	**Medium**	CITES Secretariat and argali contact points, Law enforcement agencies, TRAFFIC
	1.2.10 Invest in small grant programmes to generate alternative livelihood options. Applicable to: **All**	**Low**	**Long**	NGOs, Government agencies
	1.2.11 Discuss among all stakeholders the possibility of sustainable use of argali in countries where trophy hunting does not exist at present. Applicable to: **All, except KG, MN, TJ**	**Low**	**Medium**	Government agencies, Protected area managers, Hunting agencies, Hunting associations, CITES etc.
Objective 2: *To maintain and restore intact argali habitat and migration routes*				
Result	***Action***	**Priority**	**Time scale**	*Organisations responsible*
2.1. Pastures are sustainably managed and availability and quality for argali have improved	2.1.1. Develop pasture management plans in key sites to maintain and restore intact rangelands. Applicable to: **All**	**High**	**Medium**	Government agencies, Community and herder associations, hunting area managers, range biologists, NGOs

	2.1.2. Involve local people living on and using argali habitat to improve land management and cohabitation of argali, livestock and people, including through Community Conservation Incentive Agreements. Applicable to: **All**	**Medium**	**Long**	Government agencies, Herder and community associations, hunting area managers, NGOs
	2.1.3. Monitor the effects of climate change on argali habitat and integrate mitigation measures and climate change adaptation scenarios into habitat/site management. Applicable to: **All**	**Medium**	**Long**	Government agencies, Herder associations, Universities, NGOs
	2.1.4. Increase the effectiveness of protected area networks and hunting concessions for argali (including trans boundary), their coverage and interconnectivity. Applicable to: **All**	**High**	**Long**	Government agencies, local communities, hunting area managers, international conservation NGOs
	2.1.5. Provide adequate transport, equipment, and training to protected areas and rangers Applicable to: **All**	**Essential**	**Short**	Government agencies, NGOs
2.2. Forage shortages for argali in critical areas and times of year are reduced	2.2.1. Increase energy efficiency and use of alternative fuel by local households to reduce the collection of fuel wood (e.g. teresken). Applicable to: **All (TJ for teresken)**	**Low**	**Long**	Government agencies, Herder and community associations, development cooperation organizations
	2.2.2 Development of temporal and spatial restrictions on livestock grazing and hay making to ensure adequate forage for argali during critical seasons. Applicable to: **All**	**High**	**Medium**	Government agencies, Herder associations, hunting area managers, NGOs
2.3. Disturbance and displacement of argali are minimized	2.3.1. Work with local herders to reduce the threat of guard and feral dogs preying on argali lambs. Applicable to: **All**	**Medium**	**Medium**	Government agencies, Herder associations

	2.3.2. Reduce or prevent disturbance at key sites from livestock herding, poaching and hunting, mining, and recreational activities through zoning, compensatory payments and other site management measures. Applicable to: **All**	**Medium**	**Medium**	Government agencies, Herder associations
2.4. Negative impacts of mining and infrastructure development are minimized and mitigated	2.4.1. Ensure Environmental Impact Assessments / Strategic Environmental Assessments are conducted rigorously and transparently. Applicable to: **All**	**High**	**Long**	Government agencies, IFC, consultancy companies
	2.4.2. Ensure compliance with International Finance Corporation (IFC) Performance Standard 6 to reduce the negative impact on biodiversity of infrastructure developments and apply appropriate suitable mitigation measures. Applicable to: **All**	**High**	**Long**	Government agencies, IFC, consultancy companies
	2.4.3. Improve connectivity by removing barriers between populations and migration corridors, and if removal is not possible, by adjusting infrastructure (e.g. fences) to make it permeable for argali. Applicable to: **All**	**High**	**Long**	Government agencies; , Border agencies, customs agencies, NGOs
2.5. Conservation management and international cooperation especially for trans-boundary populations is maximized	2.5.1. Increase the capacity of protected area and hunting area managers to monitor and sustainably manage argali populations through training. Applicable to: **All**	**High**	**Medium**	Government agencies, scientific institutions, INGOs
	2.5.2. Engage international agencies that provide common platforms for knowledge sharing and best practices. Applicable to: **All**	**Medium**	**Long**	INGOs, Development cooperation organizations
	2.5.3. Facilitate transboundary activities including information exchange on trade and use, joint law enforcement and anti-poaching activities; penetration of border fences, transboundary monitoring & research, communication and other actions related to wildlife diseases and transboundary protected areas. Applicable to: **All countries with trans boundary populations**	**Medium**	**Medium**	Government agencies, INGOs, CMS

	2.5.4. Establish data sharing protocols and regularly submit information to the Action Plan coordinator. Applicable to: **All**	**Medium**	**Medium**	Argali WG
Objective 3: *To fill knowledge and information gaps*				
Result	***Action***	**Priority**	**Time scale**	*Organisations responsible*
3.1. Sufficient information on argali status, trends, ecology and management is available to all stakeholders	3.1.1. Review different census methods, and methodologies for reliable census and monitoring of argali. Applicable to: **All**	**High**	**Medium**	Argali WG, IUCN Caprinae SG, Universities
	3.1.2. Develop a best-practice manual for argali monitoring using standardised techniques and promote its use in all Range States. Applicable to: **All**	**High**	**Medium**	Argali WG, IUCN Caprinae SG, Universities
	3.1.3. Implement robust monitoring programs for all argali populations. Applicable to: **All**	**High**	**Medium**	Argali WG, IUCN Caprinae SG, Universities
	3.1.4. Monitor and study argali and its habitat to improve management. Applicable to: **All**	**High**	**Long**	Universities, protected areas, research organizations, government agencies
	3.1.5. Assess the root causes and impact of natural and human induced threats to argali populations and the key drivers of population dynamics. Applicable to: **All**	**High**	**Long**	Universities, protected areas, research organizations, government agencies
	3.1.6. Determine national capacity needs, in terms of human resources, knowledge and facilities. Applicable to: **All**	**Medium**	**Long**	Government agencies, INGOs
	3.1.7. Establish a group of management and monitoring experts from different countries and stakeholder groups to inform sound management and steer Action Plan implementation. Applicable to: **All**	**High**	**On-going**	Argali WG, CMS

	3.1.8. Organize training, workshops and joint monitoring missions for management staff and scientists as well as local people. Applicable to: **All**	**Mediu m**	**Medium**	Government agencies, INGOs
	3.1.9. Compile a shared data pool with available information on argali ecology and harvest indicating major knowledge gaps and research needs in different languages. Applicable to: **All**	**Medium**	**Medium**	Argali WG
	3.1.10. Carry out a thorough genetic analysis to clarify the taxonomy of argali. Applicable to: **All**	**Medium**	**Medium**	Universities
Objective 4: *To ensure effective implementation of the action plan*				
Result	***Action***	**Priority**	**Time scale**	*Organisations responsible*
4.1. An implementation mechanism is established	4.1.1. Develop National Action Plans for argali and integrate these into National Biodiversity Strategy and Action Plans. Applicable to: **All**	**High**	**Short**	Government agencies
	4.1.2. Conduct periodic meetings of range states to share experiences, evaluate success and adapt management plans accordingly. Applicable to: **All**	**Low**	**Long**	CMS, Argali WG
	4.1.3. Establish a dedicated argali page using the CMS website and a mailing list to facilitate information sharing and coordination of joint activities. Applicable to: **All**	**High**	**Short**	Argali WG, GIZ CMS
	4.1.4. Designate national lead agency and argali contact points responsible for coordinating argali conservation and management policy and implementation of the action plan in each range state. Applicable to: **All**	**Essential**	**On-going / Completed**	Government agencies, CMS

	4.1.5. Identify a suitable mechanism for the coordination and revision of the Action Plan implementation activities including developing terms of reference for the argali working group. Applicable to: **All**	**Essential**	**On-going**	CMS, Argali WG, Range States, NGOs
	4.1.6. Establish a formal cooperation agreement or Memorandum of Understanding on argali among range states. Applicable to: **All**	**High**	**On-going**	CMS, range states
	4.1.7. Submit range state monitoring data every two years for publication on the CMS argali web page. Applicable to: **All**	**Medium**	**Medium**	Argali WG, CMS
	4.1.8. Secure funding for sustainable financing of Action Plan activities. Applicable to: **All**	**Essential**	**Long**	Government agencies, CMS, NGOs
	4.1.9. Review and adapt or revise the action plan at regular intervals. Applicable to: **All**	**Essential**	**Medium**	Government agencies, CMS, NGOs

[1]As of 2014, range countries with current trophy hunting programmes are Kyrgyzstan, Mongolia, Tajikistan.

Table 2. Results, indicators and means of verification

Result	Indicators	Means of verification
1.1. Poaching and other human induced mortality has significantly been reduced	• Improved protection for argali in all range states • Vaccination programmes in disease hotspots	• Revised legislation where appropriate • Adequate numbers of ranger / inspection staff • Rangers / inspectors adequately resourced • Livestock vaccinated in key sites
1.2. Argali is used and managed sustainably with the support of local communities	• Trophy hunting operations follow international good practice (IUCN 2012) Quotas are scientifically based and sustainable • Process for setting quotas, licences and allocating concessions is transparent • Community involvement in trophy hunting programmes	• Transparent regulations and quota process • Monitoring results • Conservancies established • An adequate proportion of the revenues from trophy hunting reinvested directly in local community development and conservation
2.1. Pastures are sustainably managed and availability and quality for argali has improved	• Pasture management plans developed	• Plans available and implemented
2.2. Forage shortages for argali in critical areas and times of year are reduced	• Measures included in pasture management plans	• Plans available and implemented
2.3. Disturbance and displacement by herders are minimized	• Measures included in pasture management plans • Herders supportive of reducing argali disturbance and displacement	• Plans available and implemented
2.4. Negative impacts of mining and infrastructure are minimized and mitigated	• Argali and their habitat are fully considered in EIAs/SEAs • Fences and other barriers to argali movements removed or adjusted	• Transparent EIAs/SEAs conducted for all major developments • Compliance with IFC 6 • International borders permeable for argali
2.5. Conservation management and international cooperation especially for trans-boundary populations is maximized	• PA networks include all key areas for argali • Transboundary agreements in place for relevant populations	• Expanded PA networks • Transboundary agreements signed • Regular intergovernmental dialogue and information exchange
3.1. Sufficient information	• Standard monitoring	• Best practice monitoring

Result	Indicators	Means of verification
on argali status, trends, ecology and management is available to all stakeholders	methods in use • Monitoring programs for all argali populations in place • Needs and resource assessments undertaken • Genetic analysis completed	manual available • Monitoring results available • Assessments available • Taxonomy of argali clarified
4.1. An implementation mechanism is established	• Argali National Action Plans developed • Argali page on CMS website established • Lead government agencies and argali contact points appointed • Argali Working Group TORs agreed • MOU/other argali agreement established • Funding plan developed	• Action Plans published • Webpage available • Argali Working Group established and functional • TORs published • MOU / agreement published • Funding bids submitted to donors

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ANNEX 1. Argali classification used by CIC (Damm and Franco in press).

The CIC phenotype classification is not proposed as a taxonomic tool, as opposed to molecular or morphometric approaches. It should rather be seen as complimentary to these methods. The CIC Phenotype System categorizes argali 15 geographically and morphologically identifiable phenotypes, sometimes based on admittedly vague points of differentiation in both aspects, but always applying a combination of *genotype + environment + conservation* to describe them along morphological and physiological characters, geographical distribution range and last, but not least, conservation and use systems.

We propose 15 argali phenotypes:

- The wild sheep group occurring in Mongolia with distribution ranges extending into neighboring countries is described as containing four phenotypes - Altai argali (*O. a. ammon*), Khangai argali (*O. a. darwini*) and Gobi argali (*O. a. darwini*) as well as the probably extinct Shansi argali (*O. a. jubata*) from Sino-Mongolian border region in Nei Mongol AR.
- The argali from the Pamirs, the Alai Mountains (Pamir argali, *O. a. polii)* and the southern Tian Shan (Kyrgyz argali – putative *O. a. humei*) are described separately, with average horn length as a major criterion.
- The wild sheep group occurring in the central and northern Tian Shan Mountain system and Kazakhstan is described with 6 phenotypes: Tian Shan argali (*O. a. karelini*), Dzungarian argali (putative *O. a. littledalei*), Sair argali (putative *O. a. sairensis*), Kuruk Tagh argali (putative *O. a. adametzi* - may also be a member of the *hodgsonii* group), Karaganda argali (*O. a. collium*) and Kara Tau argali (O. *a. nigrimontana*). We recognize that the description of morphology and distribution ranges, especially for *karelini* and *littledalei* presents problems as evidenced in often contradictory literature sources, type localities and scant anecdotal descriptions.
- The argali (*O. a. hodgsonii*) from the Tibetan Plateau are separated into a northern and southern phenotype. Argali from the northeastern fork of the Altun Shan and the various Nanshan ranges to the northeast of the Qaidam Pendi and north of the line of lakes and depressions from the Qaidam Pendi to Qinghai Lake are classified as the Northern Tibetan argali phenotype (*O. a. hodgsonii*, with *O. a. dalai-lamae* a secondary synonym). All other argali on the Tibetan Plateau, including the southern fork of the Altun Shan and the mountains south of the Qaidam Basin and Qinghai Lake are recognized as Himalayan or Tibetan Argali Phenotype.
- The Nura Tau argali (*O. a. severtzovi)* for the south western fringes of the argali range.

Putative scientific name(s)	**CIC phenotypes**	**Other common and/or putative scientific names and synonyms**
Taxon		***Notes***
Ovis ammon ammon Linnaeus [1758] 1766	**Altai argali**	Also known as Altay Argali. *Capra ammon,* Linnaeus 1758 & 1766; *Rupicapra cornubus arietinis*, Gmelin 1758; *Musimon asiaticus,* Pallas 1776; *Ovis argali,* Pallas 1777; *O. argali,* Boddaert 1785; *O. argali altaica,* Severtzov 1873; *O. ammon typica,* Lydekker 1898; *O. a. przewalskii* Nasonov 1923
Ovis ammon darwini Przewalski 1883	**Khangai argali**	ka Hangai, Hangay or Mid-Altai Argali (some authors describe Khangai Argali as *O. a. ammon*). *O. a. daurica*, Severtzov 1873 (probably extinct); *O. [darvini] darwini,* Przewalski 1883; *O. a. kozlovi,* Nasonov 1913; *O. a. intermedia,* Gromova 1936
	Gobi argali	
Ovis ammon jubata Peters 1876	**Northern Chinese argali**	*O. a. mongolica,* Severtzov 1873; *O. a. comosa,* Hollister 1919; *O .a. commosa,* Sjölander 1922

Ovis ammon adametzi Kowarzik, 1913	**Kuruk Tagh argali**	Aka Kuruktag Argali. Most authors consider *adametzi* as putative and synonymize Kuruk Tagh Argali either with *O. a. darwini* or *O. a.hodgsonii*
Ovis ammon hodgsonii Blyth 1840	**Northern Tibetan argali**	Aka Altun Shan or Gansu Argali. Some authors describe the Northern Tibetan Argali as [putative] *O. a. dalai-lamae,* Przewalski, 1888
	Tibetan argali	Aka Himalayan Argali. *O. a.*(var.), Hodgson 1833; *O. nayaur***,** Hodgson 1833; *O. hodgsoni,* Blyth 1840; *O. ammonoides,* Hodgson 1841; *Caprovis bambhera,* Gray 1852; *Caprovis argali*, Adams 1858; *O. blythi,* Severtzov 1873; *O. brookei,* Ward 1874; *O. henrii,* Milne-Edwards 1892
Ovis ammon collium Severtzov 1873	**Karaganda argali**	Aka Semipalatinsk or Kazakhstan Argali. *O. collium,* Severtzov 1873; *O. a. collium* var. *albula,* Nasonov 1914; *O. a. collium* var. *obscura,* Nasonov 1923. Some authors classify this phenotype as *O. a. karelini*
Ovis ammon sairensis Lydekker, 1898	**Sair argali**	*O. sairensis,* Lydekker 1898. Most authors consider *sairensis* as putative and classify this phenotype as *O. a. karelini*
Ovis ammon littledalei Lydekker 1902	**Dzungarian argali**	Aka Littledale's Argali. *O. sairensis littledalei,* Lydekker 1902; *O. poli littledalei,* Nasonov 1923. Most authors consider *littledalei* as putative and classify it as *O. a. karelini*
Ovis ammon karelini Severtzov 1873	**Tian Shan Argali**	Aka Karelini Argali. *O. karelini,* Severtzov 1873; *O. heinsii*, Severtzov 1873; *O. poll karelini,* Lydekker 1898; *O. a. heinsii*, Lydekker 1912; *O. polii karelini* var. melanopyga, Nasonov 1914; *O. polii nassonovi* ,Laptev 1929. Some authors include *collium, sairensis* and *littledalei* in *karelini*
Ovis ammon nigrimontana Nasonov 1923	**Kara Tau argali**	Aka Bukharan or Turkestan Argali. *O. nigrimontana,* Severtzov 1873; *O. polii nigrimontana,* Nasonov 1923; *O. a. nigrimontana,* Lydekker 1909
Ovis ammon humei Lydekker 1913	**Kyrgyz argali**	Aka Kashgarian or Hume's Argali. Most authors consider *humei* as putative and include it either in *O. a. polii or karelini.* The US-ESA classified as it *O. a. polii*
Ovis ammon polii Blyth 1841	**Pamir argali**	Aka Marco Polo Argali. *O. poli,* Blyth 1840; *O. sculptorum,* Blyth 1840; *O. poli typica,* Lydekker 1898; *O.poloi*, de Pousargues 1898; *Caprovis polii* Brehm, 1901; *O. a. poli,* Lydekker 1909; *O. poloi poloi,* Nasanov 1914; *O. p. polii,* Nasanov 1923; *O. a. polio,* Pfeffer 1967
Ovis ammon severtzovi Nasonov 1914	**Nura Tau Argali**	Aka Kyzyl Kum or Severtzov's Argali. Previously known as Severtzov's Urial. *O. severtzovi,* Nasonov 1914; *O. a. severtzov,* Nasonov 1923