# Caprinae

Newsletter of the IUCN/SSC Caprinae Specialist Group

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## In this issue



## Editorial

This might be considered an "Argali Issue", with 4 reports on these wild sheep; one on capturing and collaring argali in Mongolia, two on the status of various subspecies in some of the Central Asian states, and a Ph.D. abstract on argali genetics and conservation.

The second notice for the 3rd World Conference on Mountain Ungulates to be held in June 2002, in Spain, is attached, and includes an application form. Details about the conference can also be found on the CSG website

**Notice:** This will be the last newsletter of 2001. I have only 1 new article for next year (on Simen National park - home of Walie ibex), so this will be the last for some time. If you wish to keep the newsletter please 1) send articles for consideration and 2) send citation details on recent publications on Caprinae. This way, we keep the newsletter alive, and help members without ready access to library facilities with international journals.

**David Shackleton**
**Editor**

## The feasibility of immobilizing & radio-collaring free-ranging Argali Sheep (*Ovis ammon*) in Mongolia

### Introduction

Argali (*Ovis ammon*) inhabit the mountains, inter-mountain valleys, rolling hills, and rocky outcrops of Mongolia (Amgalanbaatar and Reading 2000). Little is known about any of the aspects of the life of this giant sheep, as few studies have been conducted (Sukhbat 1978, Amgalanbaatar 1993, Luschekina 1994, Mallon *et al.* 1997, Reading *et al.* 1997). There are mounting pressures on wildlife in Mongolia from natural resources extraction, unmanaged hunting, poaching, and incursions into habitat from rapidly increasing livestock herds (Mallon *et al.* 1997, Reading *et al.* 1998, 1999). As a result, argali populations are declining throughout Mongolia, but especially in the western Altai Mountains (Shiirevdamba *et al.* 1997). Currently, argali are listed as a threatened species by the Mongolian and U.S. governments, as well as by the World Conservation Union (IUCN) (Nowak 1993, Baillie and Groombridge 1996, Shiirevdamba *et al.* 1997).

Studies of argali life history, habitat utilization, movement patterns, population ecology, and feeding are required for Mongolia to develop sound conservation management programs for argali. However, argali are a shy, elusive, and cursorial sheep that have never been successfully immobilized in the wild for radio-collaring. We undertook this project in an attempt to address this problem by evaluating the feasibility of safely capturing argali sheep with a remote delivery system for subsequent radio collaring. Radio telemetry is arguably the best method for collecting the kinds of detailed ecological data on argali that we require.

### Study Site

Our work was conducted in Ikh Nartiin Chuluun Nature Reserve (Ikh Nart) in November of 2000. Ikh Nart was established in 1996 to protect 43,740 ha of open valleys and large maze-like rocky outcroppings in northwestern Dornogobi Aimag (Myagmarsuren 2000). The region is a high upland (~1,200 m) covered by semi-arid steppe vegetation. Permanent cold-water springs are available in some of the several shallow valleys draining the reserve. Climate is strongly continental and arid, characterised by cold winters (to -40 °C), dry, windy springs, and relatively wet, hot summers (to 35 °C). Precipitation is low and seasonal, with most falling in the summer. The flora and fauna are representative of the semi-arid regions of Central Asia, with a mix of desert and steppe species referred to as the Mandal Gobi by Gunin *et al.* (1999).

### Methods

Our field project group consisted of two Americans (biologist and veterinarian) from the Denver Zoological Foundation and six Mongolian scientists (biologists, botanists, and driver) from the Argali Wildlife Research Center, the Mongolian Academy of Sciences, and the Mongolian National University. We lacked access to helicopters or net guns, and baiting had not been successful with this species, so we elected to use dart guns and stalking by foot. We selected a remote delivery system developed by Pneu-Dart® Inc. for the project. We used a model 193SS rifle and a 2 ml .50 calibre type C dart with a 1½ inch gelatine collared needle. The rifle

uses a .22 calibre brass power load to fire the dart from the rifle. The power loads come in different strengths. The dart contains a charge in the tailpiece that explodes upon impact, driving the plunger forward and discharging the drug into muscle.

Anaesthetic darts and reversals were prepared in advance for an average sized female sheep. For anaesthesia we used a mixture of 4 mg of the opioid carfentanil citrate (Wildnil™, Wildlife Pharmaceuticals Inc.), 50 mg of the α-2 adrenergic agonist xylazine (Cervizine™, Wildlife Pharmaceuticals Inc.), and 100 mg of the dissociative anaesthetic ketamine (lyophilized by a compounding pharmacist and reconstituted at 200 mg/ml).

The darted argali was repositioned from lateral recumbency to sternal recumbency as soon as possible to avoid bloating and respiratory compromise. We also applied a hood to cover the eyes. We administered 100 mg doxapram hydrochloride (Dopram®V) intravenously (i.v.) to stimulate cardiovascular and respiratory systems. The carfentanil was reversed approximately 30 minutes following immobilization with 100 mg of naltrexone hydrochloride administered i.v. and 400 mg administered intramuscularly (Trexonil™, Wildlife Pharmaceuticals Inc.), and the xylazine was reversed with 15 mg of yohimbine hydrochloride administered i.v. (Antagonil™, Wildlife Pharmaceuticals Inc.). The recommended dose of naltrexone is 100 mg per 1 mg of carfentanil. We opted to give an additional 100 mg naltrexone to minimize the possibility of re-narcotization later. It is recommended to give yohimbine at a rate of 0.1 mg/kg body weight. Since we did not know in advance the size of the sheep we would immobilize, we prepared for an animal that might weigh as much as 136 kg.

The feasibility study was conducted in the early part of November, 2000. It was unseasonably cold (morning temperatures down to about -25º to -30º C, with a wind chill factor as low as approximately -85º C) and unusually snowy. The cold made it difficult to keep the darts from freezing, so we kept them in a cooler with a hot water bottle. One dart actually froze in the rifle barrel. The snow made it difficult for us to make a soundless approach. November also coincided with the rutting period for argali, so rams had herded ewes into large groups.

We spotted potential targets from a distance with binoculars and spotting scopes. We used a range finder to determine our distance from potential targets to facilitate estimating the required delivery strength. Two team members would stalk the animals, while others functioned as observers from good vantage points. The second stalker helped carry equipment and could get to an immobilized animal quickly to facilitate rapid processing. The observers watched the stalk, communicating by radio, to provide directions and were in vantage points to better follow darted animals. This was important, as we were concerned that a successfully darted ewe could disappear into the rocks and valleys, preventing us from locating her; which could be fatal.

## Results

We stalked several argali and fired 4 shots before hitting an animal. Initially we used a scope on the rifle sighted in at 50 meters, but after the 4 missed shots we determined that targeting with the scope was too difficult to adjust for distances varying from 20 to 75 meters. After removing the scope we were immediately successful using an open sight. We darted an approximately 45 kg female yearling (~ 18-month-old) argali from a distance of 28 meters. The dart struck the animal in the muscles of the caudal-lateral right thigh. The sheep travelled approximately 250 meters in about 5 minutes, stopping often to look back, before she was fully immobilized. We radio collared the sheep with a traditional transmitter. Simultaneously, we collected biological samples (blood, hair, and faeces) and a number of body measurements. The entire process took approximately 30 minutes. The sheep was successfully reversed within about 1-2 minutes. The argali showed no ill effects from the procedure.

We radio tracked the yearling ewe over the next three days, visually sighting her on each occasion. On the third day post capture, she was located within 100 m of the darting site, and appeared to be in good condition. We continued to monitor her monthly until her death in February 2001. Each month we radio tracked her location several times each day for several days. Cause of death was starvation, as determined by the jell-like state of her bone marrow and lack of body fat. Dozens of other argali (N=25), primarily older rams (N=17) and young animals (N=6) were also found dead of starvation on the study site during the next few months, as were several ibex (N=6; *Capra sibirica*), Mongolian gazelle (N=9; *Procapra gutturosa*), goitered gazelle (N=1; *Gazella subgutturosa*), and livestock (N=74) . Mongolia experienced the worst winter in decades, with extremely cold temperatures (to –50º C) and relatively heavy snow. In addition, "*dzud*" conditions prevailed over much of the country, including the study site. A *dzud* occurs when autumn snow partially melts and then freezes, forming a thick ice coating over the vegetation of an area, preventing foraging by ungulates.

## Discussion

This project demonstrated that it is possible to safely dart and immobilize a free-ranging argali sheep with the equipment we employed. A better time to dart argali may be late summer through early fall; after the heat of mid-summer, but before the rut while the sheep are still dispersed into smaller groups of two to three animals and are still in prime condition. In November, group sizes were as large as 72 sheep, increasing the difficulty of stalking. In addition, warmer temperatures would allow darts to be stored in the rifle, reducing the time it takes to prepare for shooting. On at least 3 occasions we lost possible darting opportunities when sheep moved slowly out of range as we removed darts from the cooler and loaded them into the gun. In addition, we often "jumped" animals at close range that we had not observed earlier. On 2 or 3 instances these animals stopped for a few seconds after running only 30± meters. A loaded rifle may have permitted us to get a shot off.

Despite our difficulties, we were able to approach to within about 25 meters of argali at this study site. The maximum range for darting argali using our equipment under field conditions, even in better weather, is probably about 50 meters. However, because of the large number of rocky outcrops at Ikh Nart, stalking to within 50 is possible.

For this project the major advantages of the Pneu-Dart system were (1) the ability to be fire darts at varying distances, (2) the ease of loading darts,(3) use of pre-

charged darts, (4) an ammunition clip that will hold 5 power loads, and (5) a rifle that could be loaded in advance, rendering it ready for immediate use. The major disadvantages of the system were (1) that darts could strike a target at a terminal impact velocity that is too high, causing injury or death and (2) an apparent variability in power load strength. Weighing the charges on an analytical scale and discarding outliers to obtain greater uniformity might improve the accuracy of our equipment.

We hope to immobilize and radio collar several animals in the future to enable us to conduct studies on argali ecology, population dynamics, movement patterns, and habitat requirements. Adequate conservation management and, ultimately, continued existence of this species may well depend on such research.

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## Research Reports

### Nubian ibex response to human presence in 'Eretz Ha'Machteshim region in the Israeli Negev desert

The behavioural responses of wild animals to human presence are dependent, in part, on the extent and type of interaction. In recent years, the continued expansion of human activity has caused a significant increase in the level of contact between man and wildlife. The world-wide increase in conservation awareness and law enforcement have reduced the levels of direct threats to some wild populations, but brought about an unprecedented increase in eco-tourism. Although eco-tourism is often driven by good intentions, it may have negative effects by altering the animal's behavior and modifying natural selection pressures a population is subjected to (e.g., learning to rely on human handouts).

Our research focuses on the impact of eco-tourism on Nubian ibex (*Capra ibex nubiana*). The Nubian ibex is one of the main tourist attractions in the Eretz Ha'Machteshim region in the Israeli Negev desert. Specifically, we are looking at changes in time budgets (mostly vigilance behavior) and habitat preference of Nubian ibex in response to tourist pressure. We selected 6 populations residing in 6 different areas, which differ in the amount and types of eco-tourism, and are comparing between the behavioural patterns of the ibex between these sites. Three sites offer good accessibility to tourists and are heavily visited by organised tours (buses). These sites include the Mitzpe Ramon visitors centre - located on the outskirts of the town of Mitzpe Ramon along the Makhtesh Ramon cliffs, En-Avdat canyon nature reserve, and Sde-Boqer campus located along the Zin cliffs. Two sites are more remote springs (En Aqev and En Saharonim) which are less pressured by tourists and are usually toured by hikers that can park in the near vicinity. The last site is the Lotz dry riverbed which is visited only occasionally by four-wheel travellers passing through on the dirt road.

Behavior observations are taken every 2 minutes during a 40-minute period by binoculars or telescope. Observers are on

foot or in a 4-wheel drive car, and each observation is taken only after a sighted group has been characterised according to its composition (sex and age) and after the ibex appeared to be habituated to the presence of the observer. In addition, we have radio collared animals in 4 of the 6 areas, and we are studying their spatial movement patterns. Eating, walking, resting, and vigilance are the 4 main factors in the ibex's time-budget. Since we expect vigilance to be the strongest indicator of human disturbance we use it as the dependent factor.

In many species, group size is a major factor affecting vigilance. Thus, in each area we regressed vigilance on group size and studied how the slope and intercept of these regressions change with the level of disturbance (number of visitors). Vigilance is an essential behavior in the life of an ibex (more than 10% of the total time budget is invested in this activity). In all sites, the time investment in vigilance was negatively correlated with group size, such that as group size increased the investment in vigilance per individual decreased. We found that the higher the average disturbance in a specific site, the less steep the slope of the regression of vigilance on group size. The flattening of the regression with increased disturbance can be caused either by a surge in vigilance in the large groups or a reduction in vigilance in the smaller groups. Since the Y-intercept from these regressions declined with disturbance, we conclude that the flattening of the regression of vigilance of group size with increased disturbance is caused by a reduction in vigilance in the smaller groups. This implies a habituation process in the disturbed areas. The low CV values of disturbance in those areas reflect this process.

We conclude that in areas with relatively high numbers of visitors (Ein-Avdat, Mitzpe-Ramon and Sde-Boqer) ibex habituate to human presence and no longer view humans as a threat. The fact that ibex get used to human presence in areas with many visitors is not so new. However, this is the first time the exact pattern of this behavioural change is elucidated. Specifically, the time devoted to vigilance is minimal and almost unaffected by group size. As a result, a key behavioural adaptation of wild animals, namely devoting time to vigilance as a function of group size, may be selected against over time and may impact the species future viability.

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## Argali Sheep Survey in the Eastern Pamir, Tadjikistan

In October and November 1999, we surveyed almost the whole territory of the eastern Pamir. Our research was financed by the U.S. Fish and Wildlife Service. The area lying to the south of the Murgab-Khorog highway differs significantly from the north-eastern Pamir. It is an upland with valley bottoms lying at an elevation of 3600-4200 m. The low ranges, sometimes looking more like hills, are separated by wide and open valleys. This area had been surveyed previously by the first author of this report, A.K. Fedosenko, in November 1995. North-eastern Pamir is different: here valley bottoms are not significantly lower but the ranges are much higher, and the topography is noticeably more broken and complex. All the surveyed areas are semi-desert or montane steppe, at best. The climate is sharply continental with annual precipitation between 63 and 133 mm.

Thanks to the topography, the south-eastern Pamir could be surveyed exclusively from a motor vehicle, while in the north-eastern part, argali had to be counted mainly on foot otherwise animals occupying the headwaters of the valleys would have been missed. We also managed to carry out several surveys behind the borderline barbed-wire fence.

The south-eastern Pamir is, at least potentially, continuous Pamir argali (*Ovis ammon polii*) habitat, except for the widest river valleys, and Siberian ibex (*Capra sibirica*) occur in the more precipitous locations. In the north, argali distribution is patchy and often altitudinally separated. The first habitat type is the valley bottoms of major rivers surrounded by low hills, while the second is open areas near the headwaters of the tributaries and rolling parts of the ridges. The areas between these two habitats are usually more precipitous and are favoured by ibex. Westward, argali habitat becomes increasingly disrupted and gives way to that of the ibex. Argali distribution and numbers evidently depend upon water resources as well. Few or no animals were found in places with no springs and snow, as for example on the arid southern slopes of the South-Alitchur Range near Zorkul Lake, while the northern slope of this range harboured significant argali numbers.

During our surveys, we counted a total of 5,700 argali. Of these, 5,100 occurred on a area of about 5000 $km^2$ in the southern part of the survey area, mostly in the foothills of the Wakhan Range and between the Saluistyk and Aksai rivers in the extreme south-eastern corner of the Pamir. Thus, the overall mean population density was about 1 animal/$km^2$ (including the wide valley habitat). Low estimates in the north could be due, at least partly, to disturbance created by the trophy hunting which began shortly before our arrival, and/or to the lack of proper assistance from hunting companies operating in this area. Nevertheless, it was quite clear to us that overall argali population density in the north was several times lower than in the south. In 1995, only 1,137 animals were counted in an area of 2,000 $km^2$ and the population density in the south-east was only about 0.6 animal/km2 (Fedosenko and Weinberg

1999). These data suggest a noticeable increase of argali population in the south-eastern Pamir; probably the first increase after continuous decline that began in World War II.

Of all the counted animals, we were able to classify only 614. We counted 27 class IV males, 27 class III males, 42 class II males, 6 class I males, 313 females, 37 yearling males, 33 yearling females, and 129 lambs. All the class IV rams were seen only in the south, but since these data were collected outside the rutting period they cannot represent the sexual structure of the population. Lamb:female and yearling:female ratios (0.41 and 0.22 respectively) were almost identical in the south and north, despite differences in wintering conditions in these areas. According to local information, the winter of 1998/99 was had abnormal heavy snows in the south while the weather in the north was quite mild and dry. Nevertheless, no increased argali mortality was reported in the south-eastern Pamir, though local herdsmen reportedly lost many domestic sheep. The lamb and yearling ratios are close to those found in 1995 (Fedosenko and Weinberg 1999). In the inner Tien Shan, the corresponding data are similar in poor years (Fedosenko *et al.* 1995), but are twice as high in favourable years after mild winters (Fedosenko and Weinberg 1999).

During the period of our survey, adult males and females were in sexually segregated groups. Of all the males counted, only 2 (class I and II) were associated with females. The average female group size was 23.2 (n=18) in the north and 36.0 (n=16) in the south, although herds of 300-500 individuals were seen in the south. For the male groups the figures were 10.2 (n=16) and 11.4 (n=5) respectively.

The apparent increase in the argali population in the south-eastern Pamir, as evidenced by this survey, may be caused by several circumstances (e.g. drastic decline in livestock numbers). According to our estimates which were based on information acquired from locals, current livestock numbers (sheep and yak ) in the eastern Pamir are only 20-30% of what were previously present. Isolated farmhouses, shepherds huts and enclosures are no longer used and are in a state of collapse. The remaining livestock occur mostly near major settlements, such as Murgab, Rangkul and Karakul in the northern and central part of the study area. Therefore, there are no traces of argali population increase in these latter areas; on the contrary, the subspecies is probably declining.

The human population of the eastern Pamir is decreasing slowly following a period of sharp growth in the early 1990's during the civil war. Refugees from the lowlands, who had plenty of firearms, traded them to local people for livestock, and resulted in increased poaching. After the civil war came to an end between 1996 and 1998, refugees began returning home. However, locals are also leaving. While the smaller settlements are being abandoned, people are also leaving even larger towns such as Murgab or Karakul, because of difficult living conditions. This is especially true in winter, which is long and extremely severe in the eastern Pamir.

Poaching is now mainly confined to the immediate vicinity of human settlements because of high price of gasoline. Locals report that that it is cheaper to buy a domestic sheep for meat than to pay for gasoline for an argali hunt that might turn out to be unsuccessful. Therefore the main poachers are probably local officials and various enforcement officers (police, border-guards etc.) who do not have to pay for fuel, even though they have little of it for their official duties.

In the Soviet period, the strip of land between the barbed-wire fence that stretches along the border-line, and the borderline itself (up to 30 km wide) was a natural sanctuary for argali because of access was strictly controlled. Today this area has no protection advantages compared to the rest of the territory. As a result, argali population densities within this border-zone did not differ noticeably from areas outside it, contrary to the situation in the 1970's and 80s. As for the impacts of trophy hunting, we still have no direct evidence of its negative impact upon argali. Under the given circumstances we might expect a further increase of argali population in the eastern Pamir.

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## Population status and taxonomic problems for Caprinae in Western Tien Shan and Kizil-Kum Desert

Three subspecies of wild sheep occur in the mountains of Kyzylkum desert and Western Tien Shan: Severtsov's or Kizil-Kum argali (*Ovis ammon severtzovi*), Tien-Shan argali (*O. a. karelini*) and Karatau argali (*O. a. nigrimontana*). During recent years due to unfavourable ecological conditions, a worsening of socio-economical conditions of people and unsustainable use of nature resources in this region there was observed the sharp declining of number for two last subspecies.

**Tien-Shan argali** inhabits the area of the Aksu-Jabagly Nature Reserve, and travels in the Syrdarya Karatau ranges during its seasonal migrations. In the summer season, the subspecies is under the protection in the nature reserve, but during migration and wintering on Karatau range, Tien-Shan argali are face pressure from poaching. Its number has decreased by an order of magnitude from the 1950s and 1960s to the present. Whereas in the 1950s there were about 670 sheep in the nature reserve, by the 1990's only 50-90 of these argali were estimated. The structure of the argali population in the nature reserve in the period of decrease was 15% males, 62.2% females, and 8.9% lambs (12.9% - sex was not determined). It should be noted that here and later, young males (1-2 years

old) were miscounted as females owing to difficulties to differentiate them. Fertility rate was estimated to be 107 lambs:100 females. During periods of stability, the population composition was 48.8% males, and 51.2% females, with 112 lambs:100 females.

**Karatau argali** is an endemic species of Syrdarya Karatau range. Its number declined catastrophically. The last surveys within the Karatau made in 1992-1999 estimated only about 100 animals. But, on the Karatau range, there appears to be a zone of hybridisation. In this region there are either hybrids between Tien-Shan and Karatau argali, or only Tien-Shan argali, or some unknown subspecies of argali. The number of argali in this zone is relatively high despite factors such as intensive hunting, livestock grazing and other human disturbances. Adequate surveys have not been made in this area in recent years, but based on data from local hunting inspections there may be about 2,000 individuals. This population has an increasing trend. Population parameters are: 23.8% adult males, 56.5% females, 19.7% lambs, and a fertility rate of 145 lambs:100 females.

**Severtsov's or Kizil-Kum argali** was studied in Nuratau nature reserve. During the last 20 years the trend was that of an increasing of population number in spite of live-stock grazing, agricultural developments in argali habitat, and poaching. The number of this subspecies was estimated to be between 800-1200 specimens in the 1980's, and 2000 individuals in the 1990's. Population parameters are as follows: 29.4% adult males, 49.6% females, 21% lambs, with 113.3 lambs:100 females. In the Kazakhstan part of the reserve, within the low mountains of north-eastern Kizil-Kum, the Kizil-Kum argali has completely disappeared.

### Taxonomic problems

It is known that Tien Shan mountain sheep based on its kariotype (2n = 56)belongs to the argali group. We found that Kizil-Kum argali has the same chromosome number (2n = 56) (Shakula *et al.*, 1994). However, the taxonomic status of all argali in the Tien Shan and Karatau range needs to be re-examined and in some case to be explored for the first time.

There are many other interesting questions awaiting answers, including possible areas of hybridisation or even new subspecies. *Ovis polii nassonovi* Laptev, 1929 was described in the Talas Alatau, but was not recognised by scientists owing to the type specimen being lost. Questions still remain about the status of Kizil-Kum argali, for although most reviews show it occurring in the Nuratau range and small mountains in Kizil-Kum desert, some references suggest its presence in Turkestan, Zeravshan and the Alay ranges of Pamiro-Alay mountain system (Sapozhnikov 1976). Previously in this area there only Bukhara mountain sheep - *Ovis orientalis bocharensis* Nasonov, 1914 were considered. But, if Sapozhnikov (1976) is correct and Kyzylkum argali are found there, this will change our views not about not about the distribution, but about populations estimates and also even about the approaches to conservation of these sheep.

Besides the genus *Ovis*, our researches were directed to members of the genus *Capra*, found in the Western Tien Shan and represented in the Aksu-Jabagly Nature Reserve by local subspecies *Capra (ibex) sibirica formosovi* Zalkin, 1949 (Zalkin 1950). Opinions differ as to the taxonomic status of this subspecies of ibex. In the past, several researchers did not recognise this subspecies and contended that all mountain ibexes can be divided on 2 groups: *Capra sibirica sibirica* - distributed within the Southern Siberia, Northern Mongolia and Altai; and *Capra sibirica sakeen* - distributed within all other area of the specie's range (Flerov 1935).Perhaps, the biometric methods at past were inadequate to clarify this question and further work is needed to determine the taxonomic status of the ibex of the Western Tien Shan using by modern techniques using genetic and kariological approaches.

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## Abstracts

Feng, J. 2000. Molecular Approaches for Conservation of Endangered Giant Argali Sheep (*Ovis ammon*) and Dwarf Blue Sheep (*Pseudois nayaur schaeferi*) in Asia. Ph.D. Dissertation, State University of New York at Buffalo. 112 pp.


Conservation of an endangered species requires knowledge of its evolutionary history, as well as the amount and distribution of genetic diversity existing in extant populations. Here, I used molecular genetic approaches to address conservation genetic issues for endangered argali sheep (*Ovis ammon*) and dwarf blue sheep (*Pseudois nayaur schaeferi*) in Asia. First, I examined the phylogeography of 24 geographic populations of argali sheep throughout most of its distribution range using mtDNA control region sequences. Five major evolutionarily distinct lineages were revealed. Traditional morphology-based argali subspecific taxonomy received little support from these molecular analyses. I identified nine conservation units and propose that each unit be recognized as a genetically distinct subspecies. Results also suggest that argali originated in the Pamir region, and then spread to other regions through two paths of radiation. Second, I used both mtDNA control region sequence and nuclear microsatellites to study the population genetic structure of three argali populations in Mongolia. The mtDNA results revealed two evolutionarily distinct lineages, i.e., Altay population and Hangay/east Gobi populations. Microsatellite results indicated that the three populations are genetically distinct from each other, with approximately equal genetic differentiation and gene flow among them. I recommended two conservation units (Altay, and Hangay/east Gobi), and

three management units (Altay, Hangay, and east Gobi) for conservation management. The effective population sizes estimated from genetic data were similar to the results of field censuses, and suggest that these argali populations in Mongolia are relatively healthy. Third, I examined the genetic distinctiveness of highly endangered dwarf blue sheep by studying its phylogenetic relationship with blue sheep (*Pseudois nayaur*) using mtDNA control region and Y-linked ZFY intron sequences. The mtDNA results revealed that dwarf blue sheep is a strongly supported monophyletic group with an average of 12.21% sequence divergence from blue sheep. ZFY intron results revealed an average of 0.51% sequence divergence between the dwarf blue sheep and blue sheep, and one haplotype was shared. These results suggest that dwarf blue sheep are genetically distinct from blue sheep, and should receive conservation protection as a unique subspecies.

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Maudet,. C., Luikart, G., & P. Taberlet. 2001. Development of microsatellite DNA multiplexes for wild goats using primers designed from domestic Bovidae. *Genetics, Selection & Evolution.* in press.

Many wild goat taxa (Capra spp.) are endangered and would benefit from the availability of molecular tools that are useful for population management and conservation. We developed microsatellite DNA markers useful in all wild goat species, by using a cross-species amplification approach. Seventy-five microsatellites primer pairs designed from domestic cattle (*Bos taurus*), sheep (*Ovis aries*) and goat (*Capra hircus*) were tested on three distantly related Capra species: *C. ibex ibex*, *C.* [*i.*] *sibirica*, and *C. pyrenaica*. On average, 90% of the domestic ungulate primers amplified a microsatellite PCR product in all the wild goat species. Forty percent of the total were polymorphic in *C. i. ibex*, which is expected to have the lowest genetic diversity among all Capra species. We developed multiplexes of 24 polymorphic fluorescent microsatellite loci that can be amplified in 13 PCR reactions and loaded into two gel-lanes. These microsatellites will allow studies of conservation, ecology and forensics in all Capra species, and the multiplexes will reduce the time and cost of the genetic analyses.

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Luikart, G., Gielly, L., Excoffier, L., Vigne, J-D., Bouvet. J. & P. Taberlet. 2001. Multiple maternal origins and weak phylogeographic structure in domestic goats. Proceedings of the National Academy of Sciences, USA. in press

Domestic animals have played a key role in human history. Despite their importance, the origins of most domestic species remain poorly understood. We assessed the phylogenetic history and population structure of domestic goats by sequencing a hypervariable segment (481 bp) of the mitochondrial (mt) DNA control region from 406 goats representing 88 breeds distributed across the Old World. Phylogeographic analysis revealed three highly divergent goat lineages (estimated divergence >200,000 years ago), with one lineage occurring only in eastern and southern Asia. A remarkably similar pattern exists in cattle, sheep and pigs. These results, combined with recent archaeological findings, suggest that goats and other farm animals have multiple maternal origins with a possible centre of origin in Asia, as well as in the Fertile Crescent. The pattern of goat mtDNA diversity suggests that all three lineages have undergone population expansions, but that the expansion was relatively recent for two of the lineages (including the Asian lineage). Goat populations are surprisingly less genetically structured than cattle populations. In goats only ~10% of the mtDNA variation is partitioned among continents. In cattle the amount is >50%. This weak structuring suggests extensive intercontinental transportation of goats and has intriguing implications about the importance of goats in historical human migrations and commerce.

# Conservation News

## Pet trade threatens endangered urial

The Punjab urial (*Ovis vignei punjabiensis*) is endemic to the Salt and Kala Chitta Mountain Ranges of northern Punjab Province in Pakistan. It occurs at elevations from 250 - 1,500 m in dry sub-tropical and semi-evergreen scrub forest. Currently classified as Endangered by the IUCN, the mature males of this subspecies are a sought-after hunting trophy while the lambs are traditionally prized as pets. These two factors, illegal hunting, and the capture and removal of newborn lambs from the wild, combined with habitat fragmentation and competition from domestic livestock, have been identified as the principal reasons for the decline in urial numbers in recent decades.

The possession of a pet urial is a status symbol, and in the small towns scattered around the Kala Chitta and Salt Ranges, more than 50 people were reported to be keeping wild urial in captivity. Some of these some farmers have experimented by cross-breeding urial with domestic sheep. The F1 hybrids resulting from these crosses are reported to be viable, consequently this creates yet another significant threat, that of genetic adulteration.

From my field observations over 3 years, the lambing season begins at the end of March and lasts until early May. I found that about 1 week before lambing, pregnant ewes moved to the upper reaches of ravines, eroded gullies or rough and steep cliff and other broken terrain. Most of the ewes I observed were accompanied by only 1 lamb, suggesting that single births are the rule in the study area and that twins are rare. On 2 occasions I saw ewes with 2 young at heel but I could not be certain that they were twins. In April 2001, I found hidden newborns 4 times - all were singletons.

The principal natural mammalian predators in the area are the leopard (*Panthera pardus*) and wolf (*Canis lupus*), but their populations have been reduced in recent years by the anti-predator measures of livestock farmers. Jackals (*Canis aureus*) and Indian foxes (*Vulpes bengalensis*) are potential predators, but are likely able only to kill

very young lambs, especially those not defended by their mothers.

Lambs can only be hand-captured within a few hours of birth and 3 techniques are used to do this. The most common technique is for the lamb poachers - usually local shepherds or grass cutters - to constantly watch pregnant ewes in the vicinity of known traditional lambing sites. Lambs are then hand-captured immediately after birth. A different technique is employed if the lamb is not captured immediately after birth. Here the poachers discharge firearms or loud flares near a female with a newborn lamb. The loud noises appear to cause a "freezing" response by the lamb, which enables its capture. When a lamb cannot be captured with either of these techniques, its mother may, in some cases, be shot, then the orphaned lambs can usually be captured when it begins to suffer from dehydration and becomes progressively less mobile. As far as I can ascertain, many of these captured lambs die soon after capture while a significant proportion of those that survive appear to develop poorly.

The illegal trade in lambs is fuelled by relatively high market prices of 6,000 to 12,000 rupees, or about US $100 to $200. To place these prices in a local perspective, a common labourer may earn as little as 80 rupees a day while low-ranking government conservation officers are often paid less than Rs. 6,000 a month.

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## Recent Publications

Shackleton, D.M. 2001. A review of community-based trophy hunting in Pakistan. IUCN-Pakistan, Islamabad. 59 pp.

For those wishing to search for (& order) Indian wildlife publications, try the following web:
http://www.dkagencies.com/booksearch

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## Notice to Contributors

Submissions of articles, including **research reports, conservation news, recent publications, etc., on wild or feral Caprinae**, are always welcome from any professional biologist. A potential author does not have to be a member of the Caprinae Specialist Group. Please send submissions to the Editor, either by post or by e-mail attachment.

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- Faculty of Agricultural Sciences, UBC.

## CSG Web Site

http://callisto.si.usherb.ca:8080/caprinae/iucnwork.htm

## Editorial Note

Views expressed in the articles in this newsletter, do not necessarily reflect those of the Caprinae Specialist Group

## Third World Conference on Mountain Ungulates

**Saragossa (Aragon, Spain), 10-15 June, 2002**

### Registration Form

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**Abstracts and communications:** Please send your abstract as a MS Word e-mail attachment to Juan Herrero (egasl@arrakis.es) before the 1st of March 2002. Abstracts should not exceed a total of 350 words, including the title, authors and addresses, and text. The text of the Abstract must include the aim of the research, the methodology, main results and conclusions. The name of the author who will present the communication should be underlined. Style has to be concise and simple, using short phrases, with not more than one main idea per sentence. A maximum of eight key words must be included at the end of the text. If time available for oral presentations will be insufficient, the Scientific Committee will decide which proposed oral presentations should be changed to posters. Posters must fit on a surface of 1.1 m high by 70 cm wide. Oral communications will last 15 minutes with 5 minutes for questions.

**Grants:** We are currently soliciting fund to assist researcher from developing countries that will present communications to the conference and cannot afford the registration, travel and hotel expenses. While at this point we cannot guarantee that any support will be available, interested candidates should send to the Conference organizer an application including an expected travel and accommodation budget and a *curriculum vitae* together with their registration. The Scientific and Organizing Committees will decide on the grants before the 31st of December 2001.

**Registration and conference fees:** Those who are interested in participating and wish to be included in the Conference mailing list are kindly requested to complete the enclosed registration form and send it by e-mail to Juan Herrero (egasl@arrakis.es) EGA, Wildlife Consultants. Sierra de Vicort, 31, 1ºA. E-50.003 Zaragoza, Spain. Phone & fax: + 34 976 280698. Registration, including reception, abstract booklet, meals and coffees during the conference, excursion and banquet is 150 Euro per person, 100 Euro for students without institutional support. A photocopy of student ID card must be submitted with the registration. Registration does not include accommodation. Deadline for registrations is the 1st of March 2002. After that date late registration will be 200 Euro. The conference fee should be sent by bank transfer to the Banco Bilbao Vizcaya Argentaria, in Jaca (Huesca, Spain), account number: 0182 0737 85 0201522759. Please indicate "registration" in the subject. Please fax a copy of the money transfer receipt to the conference secretariat.

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