Caprinae news

Newsletter of the IUCN/SSC Caprinae Specialist Group

IN THIS ISSUE (1/2023)

EDITORIAL

Dear CSG members,
once again we would like to present you our newsletter, which is the main vehicle for internal communication and updates. This year's work related to Caprine was varied. Among others, the re-evaluation of European mammals (northern chamois *Rupicapra rupicapra*, southern chamois *Rupicapra pyrenaica*, Iberian wild goat *Capra pyrenaica*, aoudad *Ammotragus lervia*, mouflon *Ovis gmelini* and musk ox *Ovibos moschatus*) continued; a project for the conservation of the urial *Ovis vignei* and markhor *Capra falconeri* in Pakistan, presented by CSG member Peter Zahler, was approved in June; and in August the British government pledged its support for the inclusion of a conservation amendment in the ban on the import of hunting trophies. And, of course, there is the publication of the Caprinae newsletter.

In this issue, Rehman and coauthors explain how local communities play a key role for markhor Capra falconeri conservation and are the basis of its recovery in Pakistan. Several species are increasing: this is the case of the urial in Golestan National Park whose monitoring revealed an important recovery as Teymoori and coauthors describe from Iran. The importance of the benefits of standardized health surveillance and monitoring strategies in Caprinae is highlighted by Peri Wolff, from USA. Not only vegetation: osteophagy could represent an important nutrient intake in Nubian ibex *Capra nubiana*, Steve Ross and coauthors report from Saudi Arabia. Sun and coauthors provide suggestions to improve the taxonomy of a poorly known genus, the Goral. The increased importance of low altitude chamois is demonstrated by Hussein Ambarli for the Anatolian subspecies *Rupicapra r. asiatica*, in Turkey. Teresa Abaigar, from Spain, informed on the Seminar on the Conservation and Restoration of Sahelo-Saharan Megafauna, held in Morocco, which affected aoudad *Ammotragus lervia*.

Last, but not least, we are looking forward for 9th World Conference on Mountain Ungulates, which will be held in Dushanbe, Tajikistan, between 13-19 October 2024.
Good reading!

Yash Veer Bhatnagar, Luca Corlatti, Gerhard Damm, Juan Herrero & Steve Ross
IUCN SSC Caprinae Specialist Group
Editorial Board

HEADLINE NEWS

First Announcement about the 9th World Conference on Mountain Ungulates: transition to a new integrated and sustainable approach to species conservation

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We are glad to inform you that the 9th World Conference on Mountain Ungulates will be held on October 12-15, 2024 in Dushanbe, Tajikistan. Registrations will be open by March 2024. The deadline for early registration is June 31, 2024, the deadline for abstract submission is 15th May 2024. More info on the conference and registration and abstract submission please contact via email 9wcmutj@gmail.com, the website 9wcmu.com and X twitter.com/9WCMU.

Conference presentation: Scientific research is indispensable for effective management and to foster species and ecosystem conservation. The recent history of some mountain ungulates gives examples on how this can be achieved. In the last decades, however, as research and technology progresses and knowledge accumulates, new questions present exciting and urgent challenges both for researchers and managers. Answering those questions will require an inclusive approach that 3 integrates different perspectives. It is with this aim, that we are delighted to invite you to the 9th Conference on Mountain Ungulates in Tajikistan. As in the spirit of past editions, the goal of the conference is to share the most recent and interesting results of research on mountain ungulates as well as to provide networking opportunities for researchers and wildlife managers. We will cover several topics (see the list below), with the ambitious aim of facilitating the integration of different research fields and connecting them with management and conservation.

Planned sessions

Ecology, Behaviour and Evolution: The interactions between mountain ungulate species, the environment and other species inhabiting it, including humans and livestock, are particularly relevant both for evolutionary biology and for conservation. Rapid changes currently occurring in the mountain environments around the world offer a unique opportunity to investigate the response of wild species to environmental changes, including the return of large predators to many areas of the world, and to shed light on possible changes in selective pressures. Moreover, despite the ecology of some mountain ungulates being relatively well-known, for many others we still lack basic information essential for their conservation. This session aims to share new discoveries on the ecology and behaviour of mountain ungulate species and subspecies. For example, we seek presentations focusing on life history, population dynamics, spatial behaviour, diet, physiology, adaptations to changing environment, within- and between-species interactions, predation and competition.

Genetics: The continuous development of molecular techniques gives new insights on wild species evolution and offers powerful tools to inform conservation. The aim of this section is to present new discoveries on genetics of mountain ungulates. We encourage presentations on the following topics: development of new molecular tools, conservation genetics, hybridisation, immunogenetics and genomics.

Systematics and Palaeontology: Systematics of wild species is constantly revised according to new discoveries on the genetics of mountain ungulates, and we therefore call for talks presenting new knowledge on this subject, obtained through an integration of palaeontological and molecular data. Among others, the intended topics covered by this session are: revised systematics, functional morphology, palaeontological evidence, phylogenetic reconstructions and ancient DNA.

Health and Diseases: Diseases are important drivers of population dynamics and evolution of wild species as they affect the health status of animals and may result in strong selection, drastic reductions of population size, and local extinction. From a conservation perspective, the spread of zoonotic infections may threaten species conservation through indirect effects, such as calls for the extirpation of wild populations to preserve human health or economic activities. This is particularly relevant for mountain ungulates sympatric with livestock and human activities. The aim of this section is to share knowledge on health and disease of mountain ungulate populations with particular focus on conservation-relevant discoveries. Possible topics are health status of populations, effects of diseases on

population dynamics, emergence of new pathogens, immunogenetics, management of zoonotic and major disease outbreaks and macro parasites as markers of climate change.

Conservation and Management: Most mountain ungulate species interact with humans. Those interactions range from simple coexistence to competition for resources (e.g., with livestock), hunting, introduced species and active conservation actions such as translocations or population supplementation. Often, policy makers must make decisions that should be informed by rigorous scientific knowledge. In this section we encourage the presentation of research covering various aspects of mountain ungulate biology and ecology that have potential applications for conservation and management, as well as case studies where management was beneficial or detrimental to populations, as for example in the case of trophy hunting. In addition, we encourage presentations on the role and use of indigenous and local knowledge for the conservation of mountain ungulates.

Monitoring methods: Several methods have been proposed to properly estimate population size of mountain ungulates populations across a variety of habitats. Actually, however, those methods are not yet fully integrated in the monitoring practice. We encourage presentations of methodological studies on mountain ungulates monitoring to promote a thorough discussion between researchers and managers in order to find solutions and trade-offs to incorporate good practices into routine monitoring protocols.

Conservation technologies: Methods in wildlife research have changed dramatically in the last decades due to the advent of new technologies. The spread of tools such as, for example, camera traps, sensors tags, drones, remote sensing, image and video interpretation, acoustic monitoring, coupled with machine learning techniques, allows to collect large amounts of data that can foster conservation. This session aims to share ideas on the applications of technologies to research and conservation of mountain ungulates.

Communication Session: A communication session is planned for the communication of research on all the above-mentioned topics, as well as of research of local interest (e.g., population monitoring), work in-progress, methods, new ideas.

Registration Fee
Early registration, until April 30: 100 €
Late registration: 150 €

Scholarships
Authors of 10 best abstracts submitted for the review will be awarded with the scholarship to participate at 9WCMU including no fee registration, free accommodation and transportation throughout the stay in Tajikistan. The members of the Scientific Committee of the conference will make the decision.

Accommodation
Accommodation options in Dushanbe, the capital city of Tajikistan, vary from budget-friendly guesthouses to luxurious hotels. Dushanbe offers a range of accommodations to suit different preferences and budgets. Many international chain hotels operate in the city, providing modern amenities and services. Additionally, there are boutique hotels and locally-owned guesthouses that offer a more intimate and culturally immersive experience. It's advisable to book accommodations in advance, especially during peak tourist seasons, to ensure availability.

1. Hostel Latifa: Located in the city center, Hostel Latifa offers dormitory-style accommodation with shared bathrooms. Prices start from around $10 to $20 per night.
2. Green House Hostel: This hostel provides dormitory beds and private rooms with shared bathrooms. Prices start from around $10 to $25 per night.
3. Guesthouse Gulmurod: This guesthouse provides basic rooms with shared facilities at reasonable rates. Prices typically range from $15 to $30 per night.
4. Rohat Guest House: Situated in a quiet neighborhood, Rohat Guest House offers clean and comfortable rooms with shared bathrooms. Prices start from around $20 to $40 per night.
5. Tajikistan Hotel: Located in the city center, this hotel offers comfortable rooms and basic amenities. Prices vary, but you can expect to pay around $70 to $150 per night.
6. Sheraton Dushanbe Hotel: Another upscale option with modern amenities, including a fitness center and rooftop pool. Prices typically range from $120 to $250 per night.

Organizing institutions
Special-Protected Natural Areas, State Institution (Tajikistan)
Dashti-Jum National Park (Tajikistan)

Under the Endorsement of
Committee for Environmental Protection under the Government of Tajikistan
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Field trips
There will be a field trip on October 14 for the conference participants to see the wildlife and enjoy the nature in Tajikistan, including markhor Capra falconeri heptneri. All participants will be taken to Shamsiddin Shohin/Darvaz districts to enjoy the markhor habitat and observe this wild species in its natural habitat.

CONSERVATION AND MANAGEMENT

Overview of the recent markhor *Capra falconeri* population in community managed game reserves of Chitral district, Northern Pakistan

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Global conservation goals can be best achieved through the participation of local communities (Berkes 2004). Knowing this, Chitral district in Northern Pakistan engaged local communities in conservation by establishing two community managed game reserves (CMGRs). The CMGRs, named Tooshi Sasha and Gehraite-Golain, were specifically founded to counter markhor poaching, to conserve and safeguard the population, and to promote stewardship of the local land and its wildlife (Ali *et al.* 2015; Rehman and Khattak 2020).

The conservation effort included the inception of markhor trophy hunting in 1998 within CMGRs, leading to markhor becoming a highly coveted trophy for foreigners, and providing a source of economic benefit to impoverished local communities. In addition, regular monitoring was initiated within the CMGRs in the form of an annual markhor census to check population health and management goals and to ensure the markhor harvest remained sustainable. We conducted the census surveys during the rut season, to provide annual population estimates of markhor in Tooshi Sasha and Gehraite-Golain CMGRs (Fig. 1).

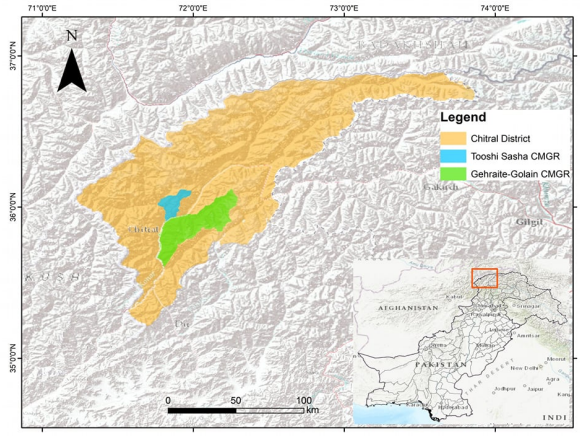

Figure 1: Map depicting survey locations in Chitral district, Northern Pakistan.

Surveys were carried out from 30th December 2020 to 5th January 2022 by employing a vantage point count method. Survey teams conducted counts during peak foraging activity times in the early morning at about 7:00 am, and early evening at around 4:00 pm to confirm the occurrence, number, and demographics of sighted herds. Binoculars (10x42) and a spotting scope were used to make observations. To avoid duplication and potential overestimation, adjacent sightings were critically examined to ensure herd size and composition confirmed the sightings were from separate herds. When found possible duplicate herd counts were deleted to reduce the counting error.

Data was collected from 25 vantage points, 13 vantage points in Tooshi-Shasha CMGR and 12 vantage points in Gehraite-Golain CMGR. The most recent counts in 2022 estimated 2,427 markhor of different age groups distributed within the two CMGRs of Chitral Wildlife Division. This included 1470 markhor recorded in Tooshi Shasha and 957 in Gehraite-Golain CMGR (Fig. 2, 3).

The markhor population has seen a gradual and steady increase in population size since 2020 when 2,349 markhor were counted. Based on estimates in both CMGRs there was an increase to 2,405 markhor in 2021, and a subsequent increase to 2,427 in 2022 (Fig. 4). Results indicate the population is stable with indications of an increasing population trend.

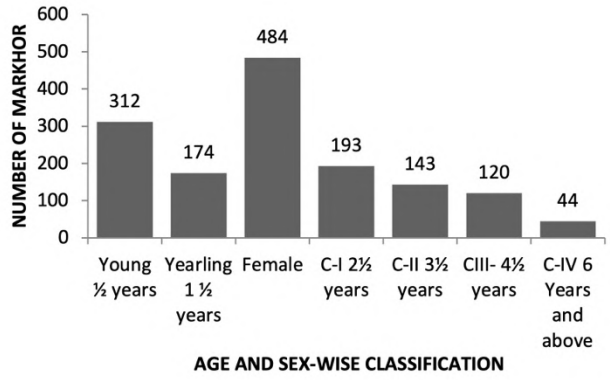

Figure 2: Population estimate of markhor categorized into age groups in Tooshi-Sasha CMGR.

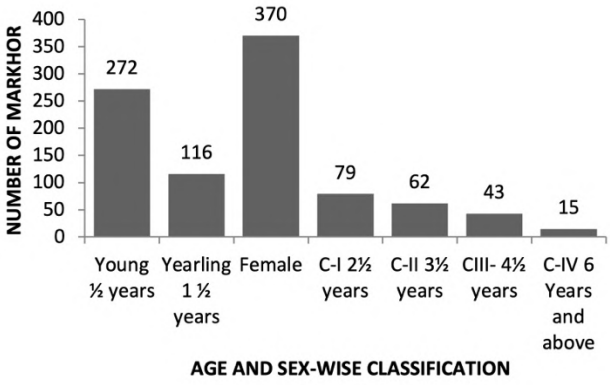

Figure 3: Population estimate of markhor categorized into age groups in Gehraite-Golain CMGR.

We attribute these population increases to enhanced conservation and management due to more effective stewardship and community participation.

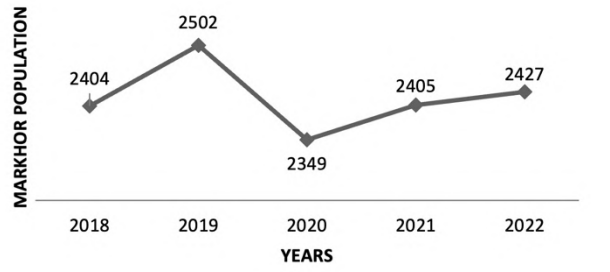

Figure 4: Population trend of markhor in the last five years in Tooshi Sasha and Gehraite-Golain CMGRs, Chitral district.

The community-participatory and their value of the natural resources has also benefitted from trophy hunting. To maintain sustainable hunting tourism established in the CMGR's, we strongly recommend identifying a minimum number of ≥ 8-year-old males in the adult population and for the hunting quota to not exceed 20% of the counted number in this age class. Moreover, we also suggest employing other robust census methods, like double-observer counts to minimize any possible bias in monitoring procedures and investigate natural fluctuations in the existing markhor populations. With these guidelines implemented we see community managed game reserves as a great success that can contribute towards species conservation and the successful restoration of fragile ecosystems in Chitral district.

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Recent monitoring reveals population recovery of urial *Ovis vignei* in Golestan National Park, Iran

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One of the main requirements for effective conservation is robust and repeated monitoring of threatened species (Critchlow *et al.* 2017). Monitoring data can lead to a better understanding of changes in status and threats and enables better decision-making based on reliable knowledge. The urial is one of the most important herbivores occurring in the steppes of eastern and northern Golestan National Park (GNP; Fig. 1) (Ghoddousi *et al.* 2019). GNP is the oldest protected area of Iran and is home to six ungulate species, two of which are Caprinae: wild goat *Capra aegagrus* and urial *Ovis vignei* (Ghoddousi and Van Cayzeele 2022). Due to various threats and a significant decrease in the population over the past decades, urial is listed as Vulnerable by IUCN Red List and included in CITES Appendix I (Michel and Ghoddousi 2020). The present study was conducted to investigate changes in indicator herbivore populations in GNP using data obtained from annual counts.

GNP is situated in northeastern Iran and covers about 87,000 ha. It is located in the eastern part of the Hyrcanian forests and the wide range of elevations found in GNP (450 – 2411 m) result in diverse habitats and ecosystems (Kiabi *et al.* 2004), the

Figure 1: Adult female (left) and adult male (right) urial during mating season, Golestan National Park. Photo: Jafar Panahpour.

park is also strongly influenced by moisture from the nearby Caspian Sea. While there are no villages within the park itself, there are 15 villages with approximately 8,660 inhabitants located within 2 km of the park's borders (Ghoddousi *et al.* 2019). GNP has been protected for 66 years and was the first protected area to be officially designated in Iran. It is home to a variety of large carnivores such as the Persian leopard *Panthera pardus saxicolo*), brown bear *Ursus arctos*, Eurasian wolf *Canis lupus*, striped hyena *Hyaena hyaena* and potential prey species such as red deer *Cervus elaphus*, roe deer *Capreolus capreolus*, wild boar *Sus scrofa*, and goitered gazelle *Gazella subgutturosa* (Soofi *et al.* 2018).During the mating season of herbivorous species in GNP, which typically takes place from early November to late December (Karami *et al.* 2016), large herds form, making it easier to observe and count the total number of individuals. Each year, park rangers, staff, volunteers, and enthusiasts come together to conduct the annual census in GNP. The method used for evaluating the urial is similar to the total count method and has been used for many years. Itineraries are defined along mountainous and steppe paths to cover as much habitat as possible. Each team is equipped with binoculars, notebooks, GPS devices, and data recording forms. The census covers an average of 409 km along 46 routes monitored by 135 people over the past five years. Kernel density estimation is used to measure species density in specific areas, with the Kernel function in ArcMap 10.4 and viewshed area data utilized for each year's assessment.

Table 1: The number of urial counted during the last five years in GNP. Average number of individuals per herd: ANIH. Unidentified: UI. Number of herds: Noh.

Year	Total	Male>5 y	Male 2-5 y	Female	lamb	UI	Noh	ANIH	Distribution (km^2)	Density (In/ km^2)
2018	4367	536	528	2,940	199	163	145	30.7	288.60 (58%)	9.2
2019	4470	477	680	2,877	94	342	179	20.4	337.05 (68%)	10.0
2020	5573	791	494	2,978	187	1123	214	21.2	382.80 (77%)	13.1
2021	8251	862	1,513	4,639	296	941	287	23.1	370 (75%)	17.0
2022	8984	999	641	4,018	348	2,978	298	25.3	405 (82%)	18.3

During the last five years, the urial population has increased from 4,367 to 8,984. Compared to 2018, there has been a growth of 105% in the population. This means a population increase of about 20.9% annually on average (Table 1).

In 2018, urial was observed in 288.6 km^2 (58%) of suitable habitats, with an average herd size of 30.32. By 2022, the average herd size had increased to 30.78 (Fig. 2). Additionally, in 2022, the distribution range of these species had expanded to 405 km^2. As a result, there is now a chance of observing urial in 82% of locations (Fig. 3). The density of individuals per km^2 has also increased from 9.2 to 18.3 (Table 1).

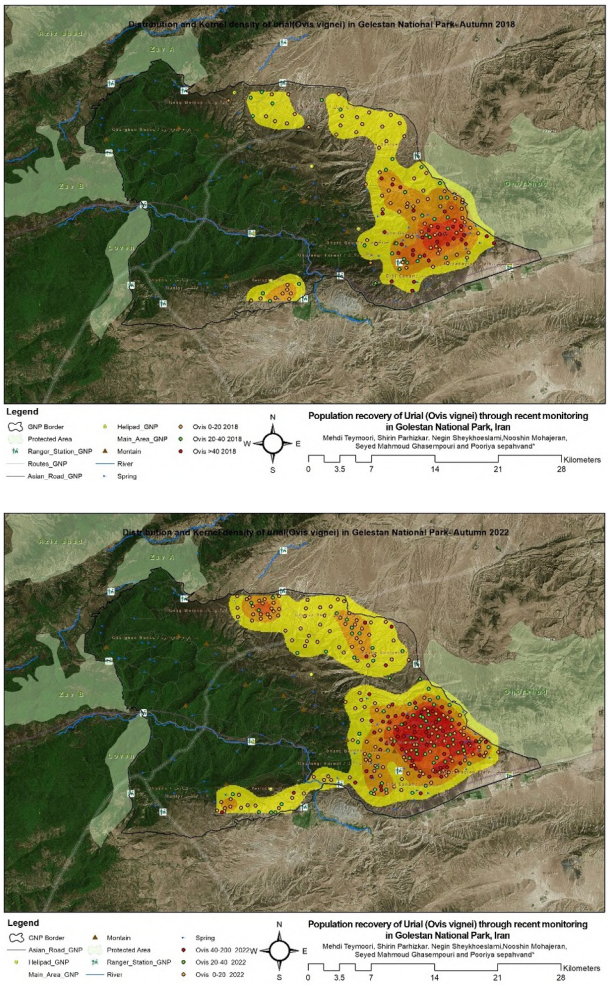

Figure 2: Urial herd hotspots are shown in the 2018 census (top) and the 2022 census (bottom). The higher density and greater number of observed herds are represented by the red areas.

Over the span of five years, the population in GNP has grown to 8,984 individuals, and the density of the urial species has risen by 7 individuals per km^2. However, the population increase is not unprecedented, as previous surveys conducted between 1976 and 1978 estimated the park's urial population to be between 10,000 and 11,000 (Kiabi 1978). The population experienced a significant decline following the Iranian revolution in 1979 due to poaching and human conflicts, leaving less than

5,000 individuals. Reports from the Department of Environment indicate that in 2009 the urial population in GNP was 2,780, which increased to 3,782 in 2017 (Sepahvand *et al.* 2022). A separate study conducted in 2013-2014 estimated the urial population to be 4,257 (Ghoddousi *et al.* 2019). The latest census conducted in 2022 recorded the highest number of urial in a protected area in Iran since 1978.

These successes are due to the implementation of participatory management and conservation approaches and other conservation actions in GNP since 2016, involving local communities and NGOs. Local and provincial officials have been involved in decision-making and supervision as part of the park's steering committee. The park has added more than 30 guards to aid in protection and conservation efforts. Efforts have been made to revive and restore springs and water resources with the help of the local communities. The community also plays a vital role in preventing fires, with six shelters built in high-conflict areas for rangers and local guards to utilize. Six shelters have been constructed in areas of the park with high conflict that are consistently utilized by rangers and native guards. These shelters now cover approximately 170 km^2 of steppe and forest habitats within the national park. Sixty-three % of urial observations were recorded within this area during the 2022 census (Fig. 3). Illegal hunting has decreased due to increased community involvement and cooperation, leading to a decrease in registered offenses from 22 cases in 2017 to 6 cases in 2021. The land affected by fires has also decreased from around 1300 ha in 2017 to less than 100 ha in 2021.

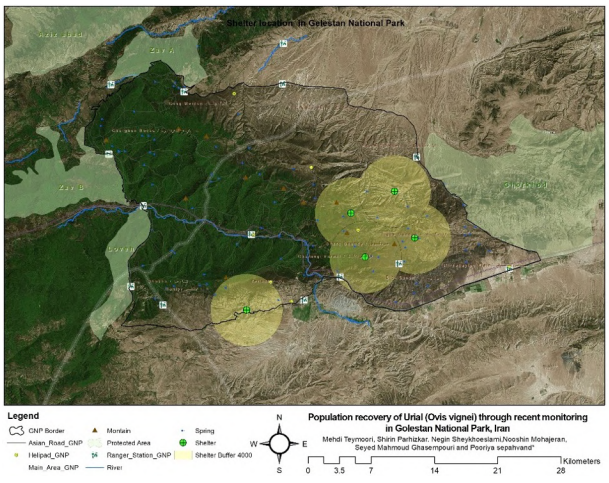

Figure 3: location of the shelters and observation points of the herds in the year 2022.

The management strategy of GNP has undergone a transformation, now engaging local volunteers and non-governmental organizations. This shift has resulted in increased habitat quality and suitability for species like urial, leading to a population increase. According to estimates by IUCN, the population of urial is approximately 30,000 (Michel et al. 2020). Therefore, it can be asserted that the current population of approximately 9,000 urial represents a substantial portion of the global population, and GNP is a globally significant protected area for the species conservation.

The preservation of the large urial population, and maintenance of the growth trend may be possible through continued monitoring, improved security and reduction of human conflicts. GNP's success in conserving urial may be used as a model for other regions hosting urial populations. However, the current population of wild sheep requires better monitoring, and advanced equipment is needed to accurately determine their age and sex composition. In addition, the impact of the high density of urial on its habitat and other coexisting species needs to be investigated, non-governmental organizations, volunteers, and experts are available to aid in these activities.

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The benefits of standardized health surveillance and monitoring strategies in Caprinae: A North American Model

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The development and implementation of standardized disease surveillance programs provides many benefits for the management and conservation of wildlife species. A search on Chat GPT3.5 provided 10 key benefits to the question: Benefits of Standardized Disease Sampling Strategies in Ungulates. To save space and redundancy the listed benefits have been grouped and the subtext condensed below.

Early detection of Disease, Risk Assessment and Management and Capacity Building

A standardized protocol for surveillance increases the opportunity for early disease detection and should be developed in conjunction with an assessment of the risk the identified disease poses to the population. Regular monitoring programs can detect changes in prevalence, enabling management actions to be deployed. This strategy can be further enhanced by building capacity amongst wildlife professionals, researchers, and stakeholders. Establishing a common framework for collaboration and training can foster a more cohesive and effective approach to wildlife management.

Data Quality and Reliability, Uniformity of Data Collection, Comparative Analysis, Research Consistency and Allocation, and Policy Development

Consistent sampling, handling, and testing techniques enhances the accuracy and quality of results. Standardized protocols facilitate comparative analysis between different herds, populations, regions, or time periods, aiding in the understanding of the causes, transmission, and impact of disease in a population and assists researchers, wildlife managers and policy makers to make management decisions based on risk assessment and resource availability.

Public Health, and Conservation Efforts

Diseases in wild ungulates occasionally pose health risks to humans. Common zoonotic disease should be included in sampling protocols where risk of spillover exists from domestic species. Monitoring and managing diseases assist conservationists in maintaining healthy populations, contributing to the long-term survival of the species.

In North America, the value and impact of using standardized health surveillance protocols has increased when adopted at regional levels where political boundaries may cut across species home ranges or migration corridors. This is of relevance to wild sheep due to foray behaviors, home range expansion and / or seasonal movements between summer and winter habitats (Carpenter *et al.* 2014). In addition, throughout most of their range wild caprinae species are spatio-temporally exposed to domestic ungulates (Western Association of Fish and Wildlife Agencies 2012) with the risk of pathogen transmission at the livestock-wildlife interface and potentially resulting in catastrophic disease events or die-offs (Besser *et al.* 2012; O'Brien *et al.* 2014).

In the United States (US) and Canada, epizootic pneumonia has been a barrier to wild sheep conservation and recovery efforts across much of their historic range (Cassirer *et al.* 2018). Although there had been jurisdiction specific passive and active surveillance for respiratory and other diseases in wild sheep for decades, these have been primarily associated with local events and translocation or reintroduction projects and there has not been a concerted range wide effort to develop standardized health surveillance and monitoring protocols.

From 2008-2010, Five western US states experienced epizootic pneumonia outbreaks resulting in all-age or lamb only die-off events with confirmed losses between 33-90% of the involved herds (Besser *et al.* 2012). These outbreaks were part of the impetus that led to the gathering in September 2013, of wildlife health professionals from nine western states and two Canadian provinces for a bighorn sheep disease sampling / health assessment workshop, conducted at the request of the Western Association of Fish and Wildlife Agencies, Wildlife Health Committee (WAFWA, WHC).

The goals of the workshop were to:

- develop standardized testing methods and protocols for respiratory pathogens of bighorn sheep based on the best available science;
- provide standard definitions for the evaluation of wild sheep population characteristics as pertains to the assessment of herd production, performance, and health;
- provide recommendations for herd health sampling protocols to be implemented prior to planned management actions. Such recommendations would be based on herd health performance and supported by disease sampling results derived from opportunistic and targeted sampling, disease investigation or monitoring;
- Update the 2009 WAFWA, WHC Sheep Sampling Guidelines.

The group produced the following documents that have been incorporated into the new version of the sampling guidelines.

Standardized definitions: To avoid confusing jargon, such as a "dirty" or a "clean" herd when discussing health status of different populations, it was crucial that wild sheep managers across the west adopt consistent terminology to allow for comparable discussions of data. This also provided specific defined parameters around classifications of herd performance with agreements on expected lamb recruitment rates for the different subspecies and a trigger level that was consistent with low lamb recruitment rates across all subspecies.

Sampling recommendations based on herd management plans and herd health status: Reintroduction and augmentation programs have been used extensively across the US and Canada to restore wild sheep to historic ranges or to expand existing herds (Western Association of Fish and Wildlife, Wild Sheep Working Group 2015). To evaluate the risk of such programs to the source and recipient populations, surveillance protocols were developed for specific management treatments assigned to the herd (Table 1).

A. **Recommendations for sample collection, processing, and diagnostic techniques for *Pasteurellaceae* spp.:** wild sheep habitat is usually difficult to access, and targeted sampling programs often occur during extremes in weather and temperatures. It was important that culture-based protocols included options that accounted for time delays in samples reaching a laboratory while still preserving the viability of the sample.
B. **Recommendations for sample collection processing and diagnostic techniques for *Mycoplasma* spp.:** *Mycoplasma ovipneumoniae* (Movi) is a primary bacteria associated with epizootic respiratory disease in bighorn sheep (Besser *et al.* 2008).
C. ***Necropsy protocol*:** Provides a process for field necropsy with a focus on a standardized evaluation of the upper and lower respiratory tract as well as sample collection for evaluation and storage. Technological advances have and will continue to inform longitudinal studies by confirming the presence or absence of pathogens in archived biological samples.
D. ***Other Documents:*** Provides links to lists of available documents including additional field necropsy protocols and data sheets for capture and handling operations that have been developed by agency wildlife professionals.

These documents were all developed as appendices so they could be edited as the new science became available (Western Association of Fish and Wildlife Agencies, Wildlife health Committee 2014).

Table 1: Suggested sampling plans for herds in various status states and management plans.

WAFWA Wildlife Health Committee 2014 BIGHORN SHEEP HERD HEALTH MONITORING RECOMMENDATIONS

APPENDIX B: SAMPLING RECOMMENDATIONS BASED ON HERD MANAGEMENT PLAN

DIAGNOSTIC METHOD / ASSAY	HERD MANAGEMENT PLAN						Test Commercially available at lab
	Healthy Herd Assessment Baseline (>20 lambs:100 ewes)	**Unhealthy Herd (<20 lambs:100 ewes)**	**Recipient Herd**	**Source Herd- Highest health**	**Disease Investigation**	**Disease Follow Up or Targeted Surveillance**	
	Minimum samples size for surveillance should be 10% of herd or sub-herd/ Combine with herd performance data						
Necropsy & histopathology	Opportunistic- even if it looks healthy	Recommended if feasible (consider collecting sick adults or lambs)	Opportunistic- even if it looks healthy	Opportunistic- even if it looks healthy	Recommended (collect carcasses or sick adults & lambs)	Recommended if feasible (consider collecting sick adults or lambs)	**See necropsy protocol. Be sure tissues and blocks are accessible for retrospective work**
Tissue Banking	Yes	Yes	Yes	Yes	Yes	Yes	
Nutrition & trace mineral assessment	Yes	Yes	Yes	Yes	Yes	Yes	Liver preferred, bank opportunistically
Serum banking	recommended	recommended	recommended	recommended	recommended	recommended	In ultralow in cryovials
Parasitology (internal & external parasites)	Recommended	Recommended	Recommended	Recommended	Recommended	Recommended	minimum 10% of herd
***Pasteurellaceae* detection**	Recommended	Live & dead	Recommended	Recommended	Recommended	Recommended	***See Appendix B Supplement below for details***
See Appendix B Supplement below for details	Refer to Appendix C: Recommendations For Sample Collection, Processing And Diagnostic Techniques For *Pasteurellaceae*						
***Mycoplasma ovipneumoniae* detection**	recommended	recommended	recommended	recommended	recommended	recommended	***See Appendix B Supplement below for details***
See Appendix B Supplement below for details	Refer to APPENDIX D: Recommendations for Sample Collection Processing And Diagnostic Techniques For *Mycoplasma* spp.						
Virus exposure (serology recommended)	recommended	recommended	recommended	recommended	recommended	recommended	
Parainfluenza 3 (PI3)	as indicated	as indicated	as indicated	as indicated	as indicated	as indicated	consult your state diagnostic lab for testing availability
Respiratory syncytial virus (RSV)	as indicated	as indicated	as indicated	as indicated	as indicated	as indicated	
Others (as indicated)							
Virus detection (by isolation, PCR, or IHC)	as indicated	as indicated	as indicated	as indicated	as indicated	as indicated	Consult your state diagnostic lab for protocol

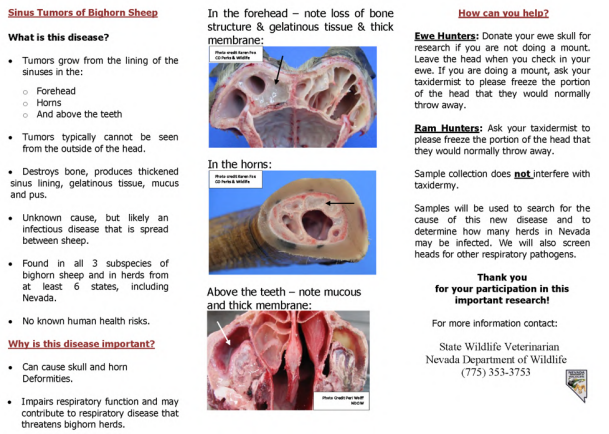
In addition to these documents a training event was held for agency-based wildlife managers (2 per jurisdiction) who received training in all aspects of the protocols including sample collection from live and dead, diseased bighorn sheep. The intent was that these individuals would then train other biologists within their own agencies. This training was well received, and although often labor intensive and costly, ongoing training, is recognized as a key component of an effective, long-term, and comprehensive plan (Kutz *et al.* 2013).

An additional key point emphasized during this process was that collected samples must be of diagnostic quality when they reach the testing facility. Repeating sample collection in free-ranging wildlife is logistically impractical to impossible. Developing and maintaining a collaborative relationship with diagnostic laboratories, including cultivating pathologists that have an interest in wild ungulates, and following recommended protocols for collection, handling and storing of samples is strongly encouraged to increase the diagnostic value and reliability of results over time. This is of particular importance in areas where access to lab equipment and or maintaining a cold chain is a challenge and alternative sample collection and storage techniques are required. In these recommendations we chose to list laboratories that provided commercial testing as well as research laboratories. In 2016, Walsh *et al.* completed a series of ring tests involving 9 laboratories that were involved in the routine diagnosis of

respiratory pathogens involved in epizootic bighorn sheep pneumonia. This information has been valuable in increasing confidence in data quality and strengthening comparative analysis.

One area that the workshop did not extensively cover was developing collection protocols geared toward various stakeholders. *Ovis canadensis* is a species that is sought after by subsistence and trophy hunters as well as non-consumptive wildlife enthusiasts. Home ranges of these species occupy private, state, provincial, federal, and tribal lands. Recognizing and including the various stakeholders in the process of the implementation of surveillance programs can build capacity and promote communication and collaboration. Government based management agencies may have resource constraints which limit their ability to conduct regular surveillance and monitoring efforts, whereas hunters, rangers, recreationists, landowners, and livestock managers may regularly engage these species. Capturing their observations through standardized protocols can greatly increases the potential for early detection of disease in species whose habitat is often difficult to access. Incorporating stakeholder groups into the process can build trust and a foster a more informed, inclusive, and equitable approach to the surveillance effort, which may be particularly beneficial if targeted lethal removal of animals is required for disease investigation or control efforts (Western Association of Fish and Wildlife Agencies, Wildlife Health Committee 2023).

In the US and Canada, wild sheep hunters, and taxidermists provide an ongoing, reliable, and affordable disease detection system. Procuring a sheep tag is often a once in a lifetime experience and many hunters and hunting guides spend months scouting for the "perfect" ram. Hunters may be the first to observe clinical signs of disease in adults and lambs or spot mortalities. In addition, successful tag holders may be required to attend an indoctrination class where they will receive information about symptoms of disease and often a sampling kit from the tag issuing agency. Requested samples can range from nasal swabs to blood samples to collection of the entire lower respiratory tract of the harvested sheep. These samples are screened for evidence of respiratory pathogens including Movi. Taxidermists will see most wild sheep rams come through their facilities for processing. Once the skull cap with horns has been removed the remaining portion of the head is usually discarded. Many jurisdictions have requested that this portion of the head, that contains the frontal and maxillary sinuses, be saved to be used for screening for Movi as well as paranasal sinus tumor, an emerging infectious disease in bighorn sheep (Fox *et al.* 2011) (Fig. 1).


Sinus Tumors of Bighorn Sheep

What is this disease?

- Tumors grow from the lining of the sinuses in the:
  - Forehead
  - Horns
  - And above the teeth
- Tumors typically cannot be seen from the outside of the head.
- Destroys bone, produces thickened sinus lining, gelatinous tissue, mucus and pus.
- Unknown cause, but likely an infectious disease that is spread between sheep.
- Found in all 3 subspecies of bighorn sheep and in herds from at least 6 states, including Nevada.
- No known human health risks.

Why is this disease important?

- Can cause skull and horn Deformities.
- Impairs respiratory function and may contribute to respiratory disease that threatens bighorn herds.

In the forehead – note loss of bone structure & gelatinous tissue & thick membrane:

In the horns:

Above the teeth – note mucous and thick membrane:

How can you help?

Ewe Hunters: Donate your ewe skull for research if you are not doing a mount. Leave the head when you check in your ewe. If you are doing a mount, ask your taxidermist to please freeze the portion of the head that they would normally throw away.

Ram Hunters: Ask your taxidermist to please freeze the portion of the head that they would normally throw away.

Sample collection does **not** interfere with taxidermy.

Samples will be used to search for the cause of this new disease and to determine how many herds in Nevada may be infected. We will also screen heads for other respiratory pathogens.

Thank you for your participation in this important research!

For more information contact:

State Wildlife Veterinarian
Nevada Department of Wildlife
(775) 353-3753

Figure 1: Brochure distributed to sheep hunters and taxidermists to provide education on paranasal sinus tumors of bighorn sheep and request that sheep heads be saved for sampling.

ChatGPT3.5 summarized that: standardized disease sampling strategies in ungulates provide a foundation for effective disease monitoring, research, and management, ultimately contributing to the conservation of wildlife populations and mitigating potential risks to both animal and human health.

Recognizing the importance of ongoing health surveillance in wildlife is increasing. However, long term funding of such programs is often caught between the ongoing cost vs. the perceived value of the population. Wild caprinae are often considered of high value as a trophy hunt and maintaining viable populations can be a priority management goal. Across their native ranges wild sheep and goats are at risk of or have suffered from disease spillover events at the wildlife-livestock interface, often with devastating outcomes (Cassier *et al* 2018) and all populations would benefit from some level of long-term health assessment program.

The complexity of a surveillance program can be scalable to fit the resources of the management authorities and level of expertise of the samplers. Programs can be designed to take full advantage of all ongoing sampling opportunities, such as mortalities, hunted specimens, capture operations, etc. In addition, engaging and educating available samplers, the stakeholders, hunters, rangers, researchers, recreationists. Sample handling and storage is often complex, however basic information as well as many samples can be collected and stored without the need for special, equipment, or storage facilities. However, the most important component for a successful and long term, standardized health surveillance program is for regional wildlife managers and stakeholders to commit to building the partnerships and collaborations necessary to develop and implement such an effort across existing political boundaries. Only this level of commitment to collaboration will truly contribute to the conservation of these majestic species.

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RESEARCH

First record of bone eating (osteophagia) in the Nubian ibex found in the Sultanate of Oman

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Free-ranging ungulates acquire most of their essential minerals through forage consumption, though occasionally seek other sources to account for periodic deficiencies due to seasonal changes in mineral concentrations of plants (Mori *et al.* 2023) and changing physiological demands due to lactation, growth, or weight regain (Ayotte *et al.* 2006). Approximately 4% of mammalian body weight is made up of macronutrient minerals, including calcium, phosphorus, potassium, sulfur, sodium, chlorine, and magnesium, in that order (Schmidt-Nielsen 1997). Deficiencies and imbalances of these minerals are recognized as important determinants of animal condition, fertility, productivity, and mortality (Underwood and Suttle 1999). Consequently, when mineral concentrations in plants are low, or insufficient for their needs, ungulates address mineral deficiencies by consuming non-food sources. Most commonly this includes consuming soil at mineral-rich licks (geophagy; Mori *et al.* 2018), consumption of brackish water sources or occasionally seawater (Al Said *et al.* in press), or less commonly, the consumption of bone, antler or horns (osteophagia; Ayotte *et al.* 2006). A wide range of animals have been observed eating bones as a dietary supplement, including a range of herbivorous mammals and rodents (Bredin *et al.* 2008; Gambin *et al.* 2017; Mori *et al.* 2018). Bone eating in ungulates is believed to occur due to phosphorus and calcium deficiencies.

This study reports the first observation of bone consumption by the Nubian ibex *Capra nubiana*. The Nubian ibex is a Vulnerable Caprinae species, found in rocky, desert mountains with steep slopes and associated hills and plateaus, from North-east Africa, across Arabia to the Levant (Ross *et al.* 2020). They are grazer-browsers and consume a wide array of herbaceous and woody plants (Campbell 1997; Ross *et al.* 2020). This study took place in the central desert of Oman within and surrounding the Arabian Oryx Sanctuary (Fig. 1). The area experiences mean annual precipitation of 39 mm, falling mainly in spring, and average monthly temperatures of 23º C in January and 45º C in June. The area also receives an average of 54 fog days per year (Fisher and Membury 1998).

Figure 1: A male Nubian ibex on the Huqf escarpment of the Arabian Oryx Sanctuary of central Oman.

Methods and Results

From 2016 to 2020 a camera trapping survey was conducted in and around the Arabian Oryx Sanctuary and Huqf Escarpment of central Oman to understand wildlife distribution in the area. A number of carcasses were deployed in front of cameras as bait for carnivores such as the striped hyena *Hyaena hyaena* and Arabian wolf *Canis lupus arabs*. As the carcasses were eaten, bones and bone fragments remained in front of camera traps. Only one of the baited camera trap areas was occupied by Nubian ibex, which had access to the bones of an Arabian sand gazelle *Gazella marica*) that had died approximately 1.5 years before. The camera trap was active for 1 year in front of the carcass, inactive for 4 months, and then reset for a further 272 days in front of the bones from April 9th 2019 to January 6th 2020.

Only two days after resetting the camera the first photographs of Nubian ibex eating bones were captured, suggesting that if set earlier additional bone eating would have been captured. Over the 272 days of operation 12 female Nubian ibex photos were captured, one male was also captured in the area but in the previous year. Red fox *Vulpes vulpes* and Rüppell's fox *Vulpes rueppellii*, were the only other animals photographed in the area. Six of the female Nubian ibex photo captures (4 individuals in total) ate bones and a further two smelled the bones without consuming them. Bone eating was seen in the months of April, May, June, July and September, and was completed over the course of 2 to 3 minutes each time. Small bone fragments were preferred to larger bones and several fragments were eaten during each observation. On two occasions large intact bones were also chewed (Fig. 2), likely resulting in the swallowing of bone fragments following chewing.

Discussion

Female Nubian ibex were observed eating bones, with a preference for bone fragments, between the months of April and September. Calcium and phosphorus are the two most abundant mineral elements within bones (Underwood & Suttle 1999) and Nubian ibex most likely ate the bones to obtain a supplemental source of these minerals. Experiments on bone eating have shown that blood phosphate concentration in cattle regulates appetite for bones. When cattle' blood phosphate concentration is artificially increased to normal levels, cattle reduce consumption or stop eating bones entirely (Denton *et al.* 1986), suggesting bone eating in animals is driven by mineral deficiencies.

Figure 2: A female Nubian ibex chewing a Reem Gazelle bone at Raki, Oman.

Nubian ibex showed a preference for eating small, scattered fragments and chewing bones to reduce bone size. Reducing the size of bones before ingestion is important to promote digestibility by increasing particle surface area for digestion so increasing mineral availability. This is particularly important in ruminants which are not adapted to digest bones (Robbins 2012).

Bone eating observations overlapped both the post-birth and lactation period of female ibex and the non-growing season for herbaceous plants. Our observations suggest ibex are unable to obtain sufficient phosphorus and/or calcium from regular plant food sources, which could have negative effects on health. Calcium deficiencies can result in retarded growth, high basal metabolic rate, reduced activity, osteoporosis and rickets, among other conditions, whereas phosphorus deficiencies can cause rickets, reduced body growth, weakness and death (Robbins 2012).

In conclusion, bone eating or osteophagia might have an important role as a natural supplement of calcium and phosphorus for Nubian ibex during periods when mineral requirements are increased, or availability is low. It is possible that in the Huqf, phosphorus is less available to Nubian ibex than is calcium. Potential calcium sources in the Huqf include numerous fossilized coral reefs and a limestone dominated geology; in contrast, other than plants, few other phosphorus sources are apparent in the area. Therefore, calcium may be less limiting than phosphorus, depending on the ability of ibex to access digestible forms.

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SPOTLIGHTS

Confusing genetic samples and suggestions for IUCN goral taxonomy

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The Goral *Naemorhedus* is a genus of "goat-antelope" (Bovidae: Caprinae: Rupicaprini) endemic to the montane forests of the South and Eastern part of the Asian continent. There is considerable debate about the number of species within this genus (Groves and Grubb 1985; Grubb 2005; Li *et al.* 2020; Mori *et al.* 2019; Valdez 2011). Four species used to be recognized by the IUCN Red List: red goral *Naemorhedus baileyi* from Eastern Himalayas, Himalayan goral (also called brown goral) *Naemorhedus goral* along the south slope of central and western Himalayan range, long-tailed goral *Naemorhedus caudatus* from Northeast Asia, and Chinese goral *Naemorhedus griseus* from North China south to Thailand. However, only three goral species are listed in IUCN Red List currently: red goral *Naemorhedus baileyi* (Nijhawan 2020), long-tailed goral *Naemorhedus caudatus* (Bragina *et al.* 2020) and Himalayan goral *Naemorhedus goral* (Duckworth 2008). Based on their distribution map and description, none of the three species includes the goral populations in East-Central China, which causes great confusion for goral management and conservation in this area, thus we recommend updating this discrepancy.

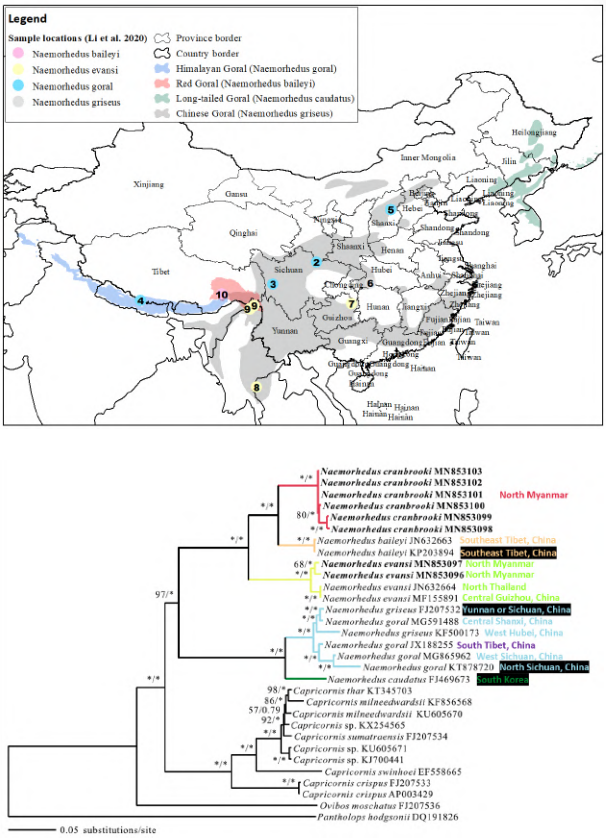

Figure 1. Top: The distribution range of three goral species (pink, blue and green) listed in the current IUCN system, together with the distribution range of Chinese goral (grey) downloaded from IUCN before the 2020 re-assessment. Samples with coordinates used in Li *et al.* (2020) and Mori *et al.* (2019) were shown on the map with colors indicating which species they represent in GenBank and numbers indicating locality codes corresponding to those in Appendix S2 (Li *et al.* 2020). Bottom: Adapted from Fig. 1 in Li *et al.* (2020), with sample locations added after each sample. The samples with a black background were also used in Mori *et al.* (2019). Original figure title in Li *et al.* (2020): "a maximum-likelihood inference tree (GTR+G+I model) for *Naemorhedus*, based on mitogenome data. Numbers on branches indicate bootstrap support values for maximum likelihood, followed by posterior probability in Bayesian inference analyses, for the node. Stars indicate values of 100 (maximum likelihood) and 1.00 (Bayesian inference)."

The IUCN revised *Naemorhedus* taxonomy is based on the phylogenetic research of Mori *et al.*

(2019). The Mori *et al.* (2019) paper used the total mitochondrial genomes of one individual from each of the four IUCN previously recognized goral species. However, the only "*Naemorhedus goral* sample" (GenBank No. KT878720) was collected in Tangjiahe Reserve, Sichuan, China (Liu and Jiang 2017). Liu and Jiang (2017) misidentified this sample as Naemorhedus goral although the sampling location is far away from its range (Sample 2 in Fig. 1). In fact, the text in their paper itself is contradictory: the first sentence claimed that "The Himalayan goral (*Naemorhedus goral*) is a bovid species found across the Himalayas including Bhutan, northern India, Nepal, southern Tibet (Grubb 2005), and possibly western Myanmar", while the third sentence said "the individual sampled in Tangjiahe Natural Reserve, Sichuan Province, China in August 2014", a place far from southern Tibet and based on the location should be deemed as a sample representing Chinese goral *Naemorhedus griseus*. The other sample (GenBank No. FJ207532.1) representing Chinese goral *Naemorhedus griseus* uploaded by Hassanin et al. (2009) came from the French National Natural History Museum where all *Naemorhedus griseus* samples except the oldest ones were collected from Yunnan or Sichuan province of China. Therefore, due to the misidentification of Liu and Jiang (2017), the Mori *et al.* (2019) paper compared two Chinese goral samples from similar locations and concluded that the two species should be lumped together.

Similarly, the same sample identification mistake happened in Li *et al.* (2020) paper. Among the four "*Naemorhedus goral* samples", only JX188255 (from the Qomolangma National Nature Reserve at the border of China and Nepal) was in the range of Himalayan goral *Naemorhedus goral* (Sample 4 in Fig. 1). All other three samples (Sample 2, 3 and 5 in Fig. 1), including KT878720 already used in Mori *et al.* (2019), were collected in the range of Chinese goral *Naemorhedus griseus*. After the verification of misidentified sample species, the overall conclusion by Li *et al.* (2020) that *Naemorhedus goral* and *Naemorhedus griseus* should be lumped together did not change, based on one *Naemorhedus goral* sample and five *Naemorhedus griseus* samples. However, since only one valid *Naemorhedus goral* sample was used in existing studies, more genetic samples should be collected in the future to further verify this conclusion. Meanwhile, as all the previous genetic studies regarding Genus *Naemorhedus* were based on mitochondrial genomes, a nuclear DNA comparison should be made between *Naemorhedus goral* and *Naemorhedus griseus*, to solve the dispute on whether these two morphologically distinct taxa should indeed be lumped together.

Regarding the Burmese goral *Naemorhedus evansi*, no sample was used by Mori *et al.* (2019) to represent this species according to Table 1 of their paper. Therefore, based on Mori *et al.* (2019) it is impossible to claim there is, "no justification for the existence of *Naemorhedus griseus* (Chinese goral), *Naemorhedus bedfordi* (Himalayan goral) and *Naemorhedus evansi* (Burmese goral), which should be pooled together within *Naemorhedus goral* (brown goral)", as this was only based on samples representing the Chinese goral. Li *et al.* (2020) suggested that *Naemorhedus evansi*, *Naemorhedus baileyi* and *Naemorhedus cranbrooki* should be deemed as three distinct species. In the IUCN system, the long-tailed goral *Naemorhedus caudatus* is classified as a distinct species from brown goral *Naemorhedus goral*, but the genetic distance between *Naemorhedus cranbrooki* and *Naemorhedus baileyi* is actually greater, as is the genetic distance between *Naemorhedus evansi* and *Naemorhedus baileyi* (Fig. 1). It seems reasonable to acknowledge the existence of Burmese goral *Naemorhedus evansi* on the IUCN website and organize the evaluation for their red list status. The problem is that the exact distribution range of this goral is lacking, especially in its northern and eastern range in China. The *Naemorhedus evansi* sample in Fanjing Mountain, Guizhou province (Sample 7 in Fig. 1) is puzzling, since it is deep in the range of *Naemorhedus griseus*. To extend our understanding more genetic samples should be collected to verify goral species identity.

To conclude, genetic studies to merge two species into one need to make sure that the genetic samples indeed represent the pre-defined species. A few existing samples in GenBank labeled as *Naemorhedus goral* were actually *Naemorhedus griseus* samples and should be taken with caution. More genetic samples to correctly represent each pre-defined species should be collected and nuclear DNA comparisons made with the *Naemorhedus* Genus is needed to solve the phylogeography disputes about these species and sub-species. Before a solid conclusion could be made, we suggest the IUCN assessment of goral species should re-describe the distribution range of *Naemorhedus goral* to include the original range of Chinese goral *Naemorhedus griseus*, while change the English name into brown goral instead of Himalayan goral to avoid confusion for goral management and conservation in East-Central China.

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Unusual low altitude sightings of the endangered Anatolian chamois in Turkey

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The Anatolian chamois *Rupicapra rupicapra asiatica* is one of the least known Caprine species. It mainly inhabits the alpine grasslands in the Lesser Caucasus of Turkey and western Georgia. In the past the Anatolian chamois was more widespread, not only in the eastern Black Sea region but also in eastern Anatolia, including the two highest mountains, Mount Agri (5165 m) and Suphan (4058 m). However, its range has steadily decreased over the past 30 years, and it is now difficult to observe in the wild even in protected areas (Ambarlı 2014). There is a limited amount of Turkish literature on the Anatolian chamois because of the small number of ungulate researchers and limited resources in Turkey. In addition, those who study ungulates mostly work on the wild goat *Capra aegagrus* which occupy less remote habitats than the Anatolian chamois and are easier to observe. The wild goat *Capra aegagrus* is classified as Near Threatened by the IUCN (Weinberg and Ambarli 2020) yet It also has a high trophy value in local and international markets, and is heavily hunted and poached in the eastern Anatolian mountain ranges, the Mediterranean Toros Mountains and neighboring countries (Parker *et al.* 2022).

This preference over the wild goat can also be seen in the completed dissertation studies in Turkey, for example, there are 12 completed dissertations on the wild goat, while there is only one dissertation on the Anatolian chamois that was done more than 20 years ago (YOK Thesis Center 2022). The relative number of sightings of wild goats and Anatolian chamois is apparent on citizen science websites (e.g. www.tramem.org). While there are more than 260 wild goat photos from montane areas of Turkey, as of October 2022, there are only 15 photos of Anatolian chamois, mostly from rocky alpine areas above 2000 meters (with only one photo outside of the alpine zone). The limited number of photos of Anatolian chamois suggests their scarcity. Indeed, the Anatolian chamois population size has decreased sharply in the last three decades (by ca. 60-70%); there are now only between 500 and 750 in the wild. Much of the species sub-alpine habitat has been lost due to new road construction projects and tourism. Despite the Anatolian chamois being classified as endangered, poaching and trophy hunting of the species continues (Anderwald *et al.* 2021).

In the last decade, the species has mainly been observed in cliffs and rugged montane areas (Ambarlı 2014). Observations, photographs, and studies also indicate the Anatolian chamois mostly inhabit alpine grasslands near rugged areas and cliffs in summer and winter. They prefer to graze near rugged rocky areas or cliffs to facilitate escape from threats. There are few photographs of Anatolian chamois below the alpine zone. The first camera trap photo below this elevation was taken in Artvin province in 2014 at about 1350 m asl (Fig. 1). This individual was probably a young female looking for a safe place.

Figure 1: The camera trap photo of a female Anatolian chamois near the Yusufeli district, Artvin in 2014

Some recent citizen observations of the Anatolian chamois in northeastern Turkey, where the largest populations occur, have shown that chamois have begun to occupy some previously abandoned habitats, especially at the western edge of its occurrence range near Ordu and Giresun provinces. In 2017, after many years without any signs of its presence, the villagers near Kürtün district, Giresun province, recorded Anatolian chamois with a camera at about 900 m. asl (Fig. 2). This is the lowest altitude record for the subspecies, and the deciduous forest dominated area with steep slopes is an unusual habitat to find Anatolian chamois in Turkey.

Figure 2: The Anatolian chamois near the Kürtün district, Giresun in 2017.

In a similar case in Southcentral Pyrenees, Spain, a population of Pyrenean chamois *Rupicapra p. pyrenaica* were also recorded at 600 m all year round in a forested area, mainly dominated by Alepo pine *Pinus halepensis* (Herrero *et al.* 2023). The reason for the recent low altitude observation in deciduous forest in Turkey is unclear, but it could be due to decreased interspecific competition with wild goats or increased human disturbance at higher elevations due to road construction, hunting or tourism activity (Ambarlı 2014). In addition, the rural human population has been steadily decreasing since the 1990s, human populations are now 20% rural in contrast to 40% rural in 1991. As a result, the Anatolian chamois may be inhabiting former or previously unoccupied habitats, such as the deciduous forests near the Kürtün district, Giresun. More research and international support are needed to better understand the species ecology of the species instead of considering it as a only game species at the international level.

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The third International Seminar on the Conservation and Restoration of Sahelo-Saharan Megafauna

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The Third International Seminar on The Conservation and Restoration of Sahelo-Saharan Megafauna (SSMF) was held in the city of Agadir (Morocco), from March 14th to 16th, 2023. This meeting was convened and organized by secretariat of the Convention for Migratory Species (CMS) and hosted by the government of Morocco through their Agence National des Eaux et Forêts (ANEF). This meeting is part of the activities of the Concerted Actions for the SSMF adopted by the Conference of the Parties (COP) at its 13 meeting in Gandhinagar (India). The meeting brought together representatives from 11 range states parties, two range states non-parties, four parties and eight other institutions including research centers, IUCN specialist, zoos and zoological associations, international NGOs.

Part of the agenda was dedicated to update the Draft Action Plan for the following species: addax *Addax nasomaculatus*, scimitar-horned oryx *Oryx dammah*, dorcas gazelle *Gazella dorcas*, red-fronted gazelle *Eudorcas rufifrons*, aoudad *Ammotragus lervia*, dama gazelle *Nanger dama*, slender-horned gazelle *Gazella leptoceros* and Cuvier´s gazelle *Gazella cuvieri*) For the aoudad, Dr Philippe Chardonnet (IUCN/SSC Specialist) noted that outside of its native range the species is abundant and in certain localities considered a pest or invasive species that outcompetes native fauna. The Meeting agreed on structuring the activities along the following topics: Status of the Species in the Wild; Conservation of Known Wild Populations; Reintroductions; and Genetics (with distinction between *in-situ* and *ex-situ*).

The Meeting was unanimously in agreement on the benefits of the establishment of the Sahelo Saharan Megafauna Initiative (SMFI) that will be proposed by the Moroccan government as a resolution to be adopted in the next COP 14, in October Samarkand (Uzbekistan).

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