

Caprinae

news

Newsletter of the IUCN/SSC Caprinae Specialist Group



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EDITORIAL

Dear CSG members,

The eventful 2020 is coming to an end and we hope that in spite of all the challenges, all of you, your dear ones and of course, conservation of species so dear to us, are safe and sound! Best wishes for a splendid 2021!

In the new quadrennium, Dr Juan Herrero continues as co-chair of the CSG while Dr Sandro Lovari has decided to step down. He is replaced by Dr Yash Veer Bhatnagar who has been engaged with mountain ungulate conservation in India and Central Asia over about three decades. Dr Lovari has continued to provide support to the co-chairs and we are glad that he will be happy to share his

vast experience with us and the members, even though he has decided to step down from IUCN officially.

We are delighted that 22 caprine species were reassessed for their IUCN Redlist category by the unflinching support of 62 CSG members and other experts, and reviewed by 17 peers during 2019-20. As you all know, species assessments involve careful synthesis of the often scattered knowledge on the species' morphology, taxonomy, distribution, status, ecology, threats and conservation action. While reviewing various reassessments, we appreciated the effort but also realized that much of this information on species remains incomplete. While numerous detailed studies are available for North American and European species, even basic information is often lacking for many species in Asia and Africa. We thus wish to prioritize and focus on some selected aspects in the coming quadrennium (2021-2024) so that the future assessments will be more meaningful. This reassessment process was skillfully led by Stefan Michel, our Redlist Authority Co-ordinator, who also took on the arduous task to review and upload this information into the IUCN's Species Information Service (SIS), which allows us to access the information on the Redlist Website. The co-chairs, Drs Sandro Lovari and Juan Herrero provided constant support to the process.

We have initiated the process of renewing membership and enrolling new ones. Veterans in the group have provided tremendous service to the field and continue to do so. In particular we wish to acknowledge the contributions of Drs Marco Festa-Bianchet and Sandro Lovari in running and supporting the group for many years. They have, however, decided to step down from the membership due to various reasons, and we wish them all the best in their future endeavors. We do note that there are steadily increasing cohorts of researchers globally, especially in many range-countries of Central and South Asia. In the new call for membership, we have striven to scout for such researchers that has helped us to widen the reach of both, experience, geographic spread and also bring in wider expertise from a larger proportion of Caprinae species. We initiated this process in October 2020 and hope to complete it by 31 January, 2021. We thus regret that as per the norm, we are not listing the member list at the end of this issue but will certainly share it on email in early February 2021.

Going ahead in the new quadrennium, we have set some targets and are glad that all feedback from the members has been positive. The targets include the following, but are not limited to:

1. Consolidate what we know about the status of caprines (Caprinae) in formal, ideally peer-reviewed publications so that the next re-assessment will be more objective.
2. Commission a paper on robust ungulate monitoring methods that can apply to the cross-section of Caprinae species and a variety of habitats. This can be the outcome of facilitated collaborations among specialises and/or a workshop (can be an online workshop or one as a part of the 8th World Congress on Mountain Ungulates).
3. Advise, collaborate and endorse global or regional initiatives related to Caprinae conservation. This can include harnessing other global flagship species programs for enhancing caprine conservation. An example for this includes the Global Snow Leopard Ecosystem Protection programme (GSLEP; <https://globalsnowleopard.org/>) that brings in high level government and stakeholder conservation commitments and cover the ranges of most of the Central Asian – Himalayan caprine species. Sandro Lovari has taken up the responsibility as the Chairperson of the Snow Leopard Network, and this should help facilitate these collaborations.
4. Endorse and participate in the 8th World Conference on Mountain Ungulates, which will be held in Cogne, Parco Nazionale Gran Paradiso, Italy in 2022. This is among the best opportunities for us to learn from each other and possibly forge collaborations.
5. Continue editing one issue of Caprinae News per year. A task being ably led by Drs. Luca Corlatti, Steve Ross and Gerhard Damm.

Yash Veer Bhatnagar & Juan Herrero
IUCN SSC Caprinae Specialist Group Co-chairs

HEADLINE NEWS

My reasons for leaving IUCN

Sandro Lovari

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What follows is the contents of my letter of resignation which I sent to the Chairman of the IUCN

Species Survival Commission, on the 16th of March 2020. After mulling long over it, I have decided not to offer my availability as Chairman of the Caprinae SG for the quadrennium 2021-2024 and leave all other IUCN groups in which I was a member. I was invited to join IUCN SGs on 1984 and I have chaired the Caprinae SG for some 19 years, in total. During this period of 36 years, especially from the early '90s on, I have seen IUCN changing slowly, but steadily, into something different from the initial IUCN and from the way I see conservation science. The ways of "old" IUCN were perhaps less flashy, but - I believe - with a somewhat... more earnest approach. Just to provide a couple of examples, let's take the criteria to assess risk categories and the Species Information System (SIS).

Risk categories

These criteria were established to overcome the limitations of the previous subjective "expert-based" information by providing "objective" assessments instead. Very detailed, impressive protocols have been developed, based on quantitative measures. A very good approach, of course. Yet, for anyone who has spent decades in the field, working on wild animals, these criteria appear wildly theoretic, with a quite limited applicability - but for those species occurring in parts of the world where the local wildlife has been observed, recorded and studied for decades (e.g. Europe and North America) and these extant species are mostly well off, not really at risk. Even our recent re-assessment of wild sheep, wild goats and goat-antelopes has shown it most clearly: the large majority of the assessments of species occurring in Asia and Africa is based largely on "guesses" (there may be very good local information, but to expand it to cover the whole range will lead inevitably to biased assessments). Besides, nearly all information comes from local informants, thus turning again to be "expert-based" - not to mention that sometimes the experts are missing. What is the difference in terms of reliability from the "old" expert-based approach, then? There is a difference, indeed: now elegantly coloured, detailed maps and figures are generated (out of approximate, expert-based information), providing the misleading impression that we have got a wealth of reliable data, which is - I believe - dangerous to conservation.

As an example, just have a look at the IUCN criteria to define "*the number of mature individuals*" in a species. You will find unrealistic statements such as "*The number of mature individuals is the number of individuals known, estimated or inferred to be capable of reproduction* [how to tell it? From their age, a parameter often difficult to estimate under field conditions? How will you know how many of these could reproduce, actually?]", "*Mature individuals that will* [one should rather ask a soothsayer to know it] *never* [again, who can tell what they will do in the future?] *produce new recruits should not be counted*" and "*Re-introduced individuals must have*

produced viable offspring [the same comment applies here, unless they come from captive conditions] *before they are counted as mature individuals*". It is true that the guidelines suggest to choose the most conservative options, but, clearly, this piece of information is going to be quite flawed - not to say imaginative - for most species, even for a few occurring in Europe and North America, let alone those inhabiting e.g. the dense forests or vast high-altitude steppe of remote areas. Yet, the number of mature individuals in a species is one of the cardinal issues in the new "objective" way to assess risk category. If flawed information is available for a taxon, one should rather accept it and invest in data collection, e.g. on its distribution (sometimes even that piece of information is missing!) and numbers. This approach seems more responsible than making do with the little one has got and providing a beautiful picture of apparent knowledge, which will militate against the organisation of further surveys or the usage of robust sampling methods to better estimate numbers. Actually, most species - at least among mammals - are data deficient (DD) and, while waiting for sound information to flow in, one should rather play it safe and place the DD category in the "Threatened" group.

SIS

The development of SIS has been an attractive idea of the mid-'90s, but, by emphasising the species level, has militated actually against the protection of subspecies (i.e. local populations with their own genetic identity, potentially inter-fertile, often with zones of fertile hybrids in between) which are now rarely mentioned in species accounts. To preserve subspecies, there has been the tendency to turn them into full species, thus generating a real chaos in taxonomy. Besides, the procedure to insert the account information into the SIS is far from being user-friendly.

In sum, I am sad to say that my understanding of conservation science does not quite overlap any longer with that of IUCN. Although cooperation with the Caprinae Specialist Group will still be possible from outside, I have thought it honest to leave, then. Maybe I am wrong: the future will show.

8th World Conference on Mountain Ungulates: towards an integrated approach to species conservation

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After the 7th edition was held in Bozeman, Montana (USA) in 2019, the next World Conference on Mountain Ungulates will return to Europe to the

beautiful landscape of the Italian Alps. The next conference has been planned for September 2022 and will take place in Cogne (Aosta, Italy) at the border of Gran Paradiso National Park.

Gran Paradiso National Park is one of the oldest protected areas in Europe and has had a primary role in the recovery and conservation of the Alpine ibex. In the XIX century, the Alpine ibex was on the brink of extinction due to over-hunting. The only remnant population at the time consisted of less than one hundred individuals and was found on the massif of Gran Paradiso. The area was declared a Royal Hunting Reserve in 1856 by Vittorio Emanuele II and hunting was forbidden. Thanks to protection laws and active surveillance the Alpine ibex was saved from extinction. The hunting reserve of Gran Paradiso was finally donated to the Italian state and declared as a National Park in 1922. In the following years, a huge conservation effort with several reintroduction programs brought back the Alpine ibex to its original range encompassing an alpine arc with a count of more than 50,000 individuals distributed in c. 180 populations. Although a long time has passed since the initiation of the Alpine ibex recovery, it is still one of the most successful conservation stories worldwide.

Since the beginning, the conservation and management of the Alpine ibex have been accompanied by a deep interest of the scientific community to employ the species as a model for the investigation of a broad range of questions, both theoretical and applied to conservation and management. This has allowed the establishment of a virtuous circle that integrates scientific research into conservation and management and, in our opinion, acts as a model for other species.

Over time, it has become clear that as research and technology move on and knowledge accumulates, new questions arise while researchers and managers face exciting and urgent challenges. To answer these questions a narrow research perspective is no longer sufficient, rather a multidisciplinary approach is required. We believe that this is valid not only for the Alpine ibex but also for other ungulate species, spread all over the mountain ranges in the world, and it is with this aim that we are pleased to organize this conference.

The Gran Paradiso National Park will host the Conference as part of the celebrations for its 100th anniversary of the foundation and we will be pleased to welcome researchers, students, wildlife managers, government agencies, NGOs, hunting associations and anyone else interested in mountain ungulates from all over the world.

As in the spirit of past editions, the aim of the 8th Conference on Mountain Ungulates, will be to share the most recent and interesting results of mountain ungulate research and provide opportunities to network with researchers and wildlife managers from the mountain ungulate community. Several topics will be covered, including ecology, behavior,

genetics, systematics, palaeontology, pathology, conservation and management, with the ambitious aim of enhancing the integration of different research fields and connecting them with management and conservation.

More details on the conference will be spread via the newsletter of the IUCN/SSC Caprinae Specialist Group as well as through other media. The provisional schedule includes the following timeline:

First call: September 2021

Registration date/Abstract submission: October 2021-March 2022

Final conference programme: June 2022

Conference date: September 2022

3rd International *Rupicapra* Symposium

Luca Corlatti*, Nikica Šprem

(on behalf of the organizing committee)

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June 16-18, 2021
Makarska, Croatia

After the 2nd edition held in Bellver de Cerdanya, Catalonia, Spain in 2013, the International *Rupicapra* Symposium will move to the east coast of the Mediterranean. The symposium is scheduled 16-18 June 2021 in Makarska (Croatia) in collaboration with the Biokovo Nature Park.

The Biokovo mountain range, which protects the city of Makarska from the harsh continental climate, was declared a protected Nature Park in 1981. The Biokovo Nature Park is a unique entity in that various karstic forms are present, such as phenomena in stone (valleys, sink-holes, caves, etc.), prehistoric tumuli, precipices, numerous endemic plants (Biokovo grassy bells – *Edraianthus pumilio*) and rare animal species (e.g., Balkan chamois, grey eagles, Balkan snow vole).

Although the presence of chamois is often associated with high-elevation mountain environments, the Biokovo Nature Park constitutes a little deviation from the "traditional" view of chamois habitat. Here, the Balkan chamois inhabits limestones peaks, with vegetation and climatic conditions typical of the Mediterranean region. Nonetheless, paleontological findings in the Baba cave have shown that the species inhabited the Biokovo area in geological times. After a drastic reduction in the past, reintroductions were carried out from 1964 to 1969 with 48

individuals coming from Čvrsnica and Prenj Mountains, in Bosnia and Herzegovina. Today, 350 to 400 individuals of the Balkan chamois dwell on Mt. Biokovo.

In the recent years, the collaboration between the Park, the Croatian Forestry Ltd, the Croatian hunting association and the University of Zagreb has led to increased knowledge on this subspecies and, while acknowledging many questions still remain unanswered, all groups started working together to protect the Balkan chamois.

The organizing committee and the Biokovo Nature Park are happy to welcome researchers, students, wildlife managers, government agencies, NGOs, hunting associations and anyone else interested in *Rupicapra* from all over the world. The Symposium aims at promoting the exchange of ideas among chamois experts, favoring the sharing of state-of-the-art knowledge on different chamois species and subspecies while promoting the research, conservation and sustainable management of chamois. We aim to set the ground to bridge the gap between science and practitioners, as well as provide networking opportunities for researchers and wildlife managers. For this reason, we will try to keep the event in-person. However, the organizing committee will continue to monitor the COVID situation and the final decision about whether the in-person meeting can take place will be made at the end of April 2021. If the epidemiological situation will still be concerning, the Symposium will be converted to a fully online or hybrid event.

Different topics will be covered: genetics and systematics, physiology and disease, behavior and ecology as well as management and conservation, with contributions and presence of renowned chamois experts from all over the world, introduced by a plenary lecture by Sandro Lovari on the first day.

More details on the conference can be found on the website (<http://rupicapra-symposium.agr.hr/>) and on the symposium social media (Facebook: <https://www.facebook.com/RupicapraSymp/>; Twitter: <https://twitter.com/RupicapraSymp>).

Registration and Abstract submission are currently open on the website and the deadline is **31st January 2021**.

Early bird registration fee: 17th May 2021

Final conference program: 30th May 2021

Conference date: 16th - 17th June 2021

Field trip to Biokovo Nature Park (included): 18th June 2021

CONSERVATION AND MANAGEMENT

Update on the reassessment of Caprinae in the IUCN Red List

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Background

As explained in the Caprinae News 2019, the IUCN Red List of Threatened Species is a globally recognized source of information about the extinction risk of biological taxa. As official Red List Authority and Co-chairmen of the Caprinae SG of the IUCN Species Survival Commission, we undertook the responsibility of facilitating the reassessment of the status of most Caprinae species. This tremendous job is near-finished with only few species still in progress or in need of a reassessment. In the so far submitted reassessments 62 assessors participated; several of them assessed more than one species. 26 experts as contributors provided additional information on reassessments. Thus, the still ongoing reassessment has been a joint effort of the entire CSG and beyond it.

Current status

The current status of the reassessment is quite satisfying: The IUCN Red List currently lists 33 species of Caprinae; additionally, one taxon was earlier assessed at subspecies level as *Pseudois nayaur schaeferi*. Four species had been reassessed already during the last decade: Arabian tahr *Arabitragus jayakari* in 2019, chiru *Pantholops hodgsonii* in 2016 (a Caprinae species covered by the Antelope SG), markhor *Capra falconeri* in 2015 and bharal *Pseudois nayaur* (inclusive of *P. n. schaeferi*) in 2014. This left us with the task of reassessing 29 species. These species have a number of subspecies and local populations, the assessments of which IUCN encourages to include in the respective species accounts instead of doing full separate assessments as done in the past. Out of these 29 species we managed to get 21 reassessments submitted and published by March 2020. Another species was submitted and considered as published in July 2020, but the account is not online yet due to the long intervals between updates of the IUCN Red List website (www.iucnredlist.org).

Currently we have four more species in the process of review and revision. Two species are still in the drafting process – Himalayan goral *Naemorhedus goral* (see below) and snow sheep *Ovis nivicola*. Unfortunately for two species so far no assessor has been identified – for the takin *Budorcas taxicolor* and for the Formosan serow *Capricornis swinhoei*. Anyone who can suggest the name and email address of somebody potentially willing to cover these species will be most welcomed.

The taxonomy of a few species has changed. The mouflon and urial, formerly *Ovis orientalis*, were split into *O. gmelini* and *O. vignei*, following the findings of the CSG Workshop on Caprinae Taxonomy in 2000 (IUCN/SSC Caprinae Specialist Group 2000). The reassessment of the serows and gorals followed the taxonomy of Mori *et al.* (2019) for these species. Therefore, the assessment of the mainland serow *Capricornis sumatraensis* now includes the two former separate species Chinese serow *C. milneedwardsi* and Himalayan serow *C. thar*. Himalayan goral now includes the formerly considered full species *Naemorhedus griseus*. For further details, see Mori *et al.* (2019). These taxonomic changes caused additional challenges for the assessment, as data had to be attributed to the “new” taxa as accurate as possible for determining range areas and population sizes and identify trends.

Results

Most (n = 19) of the species, for which the reassessments are completed (n = 25), remained in the same risk category, including the earlier reassessed Arabian tahr *Arabitragus jayakari* and bharal *Pseudois nayaur*. The reassessments showed that the status of five species has improved since the last assessment, among them wild goat *Capra aegagrus* (from VU to NT), walia ibex *Capra walie* (from EN to VU) and mouflon *Ovis gmelini* (from VU to NT). The mouflon had previously been assessed together with now separate urial *O. vignei* as one species, *O. orientalis*, and thus the status change is rather a consequence of the change in terms of populations considered than caused by a genuine improvement. Furthermore, chiru *Pantholops hodgsonii* and markhor *Capra falconeri* had earlier been assessed as improved (both now NT). The assessors found that the status of one species has worsened, the Asiatic ibex *Capra sibirica* is no longer LC, but now NT (Table 1).

Thus, the Caprinae may be one of few taxonomic groups, whose red list categories remained overall stable or improved. However, this on the first glance favorable picture should be taken with care. Many local or regional populations of generally still numerous species are at higher risk than the respective species as such. For instance, many local populations and entire subspecies of the probably most numerous Caprinae species, the Northern chamois *Rupicapra rupicapra*, are threatened at various levels. In other cases, e.g., for markhor or urial, local populations, which are stable or increasing thanks to intensive conservation management, influence the positive impression, hiding the decline and local extinctions in larger areas.

The reassessment brought up opportunities as well as issues and concerns related to the Red List approach and process. The reassessment has brought together many Caprinae experts and facilitated an exchange and joint review process of the status of species and populations. The updating and

correcting of the range maps make these maps even more valuable. Overall, the Red List accounts are a major source of concise background information referenced in many papers. Therefore, they are worth the investment of time and energy put in by the assessors, contributors and reviewers.

The IUCN Red List is based on a standardized approach, assessing extinction risk in a semi-quantitative way and using the same sets of categories and criteria across all groups of organisms. This causes sometimes dissatisfaction when experts feel that the category to be assigned does not fully reflect the actual status of the species. Another issue felt among many experts was that the IUCN guidelines seem to call for calculations based on very accurate data on populations, threats and biology of the species. In the practice, for many species data are lacking or they are of uneven quality for different areas and time periods, making robust calculations of population numbers and trends challenging (to phrase it mildly). Dealing with lack of data and uncertainty thus remains an issue. Keeping in mind the inherent uncertainty in most species assessments will be particularly important for IUCN as well as authors using the Red List assessments as reference points.

The IUCN Red List assessments include a number of categorization schemes, e.g., on threats or on habitats, which are used in meta-analyses. Assessors often felt uncomfortable assigning the discrete categories available in these schemes, not allowing for enough differentiation to represent the perceived situation. One such example is the threat category “harvest”, which does not allow for a distinction between regulated legal use, i.e., hunting, and illegal use, i.e., poaching, although both types of threats would call for very different actions. This is particularly relevant to many Caprinae for which legal regulated hunting can be a conservation tool, while poaching may be a threat; in other cases legal hunting might be inadequately regulated, controlled and/or carried out and thus it threatens populations. Some assessors and contributors expressed concerns that lower risk categories in the Red List cause actually a weakened protection status, or vice versa that a high extinction risk category means a stricter protection. However, the IUCN Red List categories, in contrast to some national legislation with similar terminology, like the US Endangered Species Act or the Red Books in many post-Soviet countries, are not thought to provide any direct guidance on legal protection. The Red List assessments only provide an estimate – or guess – about the risk of extinction and provide additional information on overall threats and conservation needs. The IUCN Red List assessments can thus be used as one input for decision making about national and international legal protection, but especially the Caprinae show that higher extinction risk does not necessarily need to exclude a regulated sustainable use and that such hunting systems can trigger conservation

Table 1: Caprinae species and their category in the previous (2008) and most recent assessment (2020 or earlier). (Bold: changed to higher risk category; Underlined: changed to lower risk category).

Common English name	Scientific name	Prev. cat.	Year	Curr. cat.	Year	Comment
Aoudad	<i>Ammotragus lervia</i>	VU	2008			In progress
Arabian tahr	<i>Arabitragus jayakari</i>	EN	2008	EN	2019	
Takin	<i>Budorcas taxicolor</i>	VU	2008			No assessor yet
<u>Wild goat</u>	<u><i>Capra aegagrus</i></u>	VU	2008	<u>NT</u>	<u>2020</u>	
Western tur	<i>Capra caucasica</i>	EN	2008	EN	2020	
Eastern tur	<i>Capra cylindricornis</i>	NT	2008	NT	2020	
<u>Markhor</u>	<u><i>Capra falconeri</i></u>	EN	2008	<u>NT</u>	<u>2014</u>	
Alpine ibex	<i>Capra ibex</i>	LC	2008	LC	2020	
Nubian ibex	<i>Capra nubiana</i>	VU	2008	VU	2020	
Iberian wild goat	<i>Capra pyrenaica</i>	LC	2008	LC	2020	
Asiatic ibex	<i>Capra sibirica</i>	LC	2008	NT	2020	
<u>Walia ibex</u>	<u><i>Capra waliae</i></u>	EN	2008	<u>VU</u>	<u>2020</u>	
Japanese serow	<i>Capricornis crispus</i>	LC	2008	LC	2020	
Chinese serow	<i>Capricornis milneedwardsii</i>	NT	2008			<i>C. sumatraensis</i>
Red serow	<i>Capricornis rubidus</i>	NT	2008			In progress
Mainland serow	<i>Capricornis sumatraensis</i>	VU	2008	VU	2020	Now includes <i>C. milneedwardsi</i> and <i>C. thar</i>
Formosan serow	<i>Capricornis swinhoei</i>	LC	2008			No assessor yet
Himalayan serow	<i>Capricornis thar</i>	NT	2008			Now included in <i>C. sumatraensis</i>
Himalayan thar	<i>Hemitragus jemlahicus</i>	NT	2008	NT	2020	
Red goral	<i>Naemorhedus baileyi</i>	VU	2008	VU	2020	
Long tailed goral	<i>Naemorhedus caudatus</i>	VU	2008	VU	2020	
Himalayan goral	<i>Naemorhedus goral</i>	NT	2008			In progress
Chinese goral	<i>Naemorhedus griseus</i>	VU	2008			Included in <i>N. goral</i>
Nilgiri thar	<i>Nilgintragus hylocoius</i>	EN	2008			In progress
Mountain goat	<i>Oreamnos americanus</i>	LC	2008	LC	2020	
Muskoxen	<i>Ovibos moschatus</i>	LC	2008			In progress
Argali	<i>Ovis ammon</i>	NT	2008	NT	2020	
Bighorn sheep	<i>Ovis canadensis</i>	LC	2008	LC	2020	
Thinhorn sheep	<i>Ovis dalli</i>	LC	2008	LC	2020	
<u>Asiatic mouflon</u>	<u><i>Ovis gmelini</i></u>	VU	2008	<u>NT</u>	<u>2020</u>	2008 as <i>O. orientalis</i>
Snow sheep	<i>Ovis nivicola</i>	LC	2008			In progress
Urial	<i>Ovis vignei</i>	VU	2008	VU	2020	2008 as <i>O. orientalis</i>
Chiru	<u><i>Pantholops hodgsonii</i></u>	EN	2008	<u>NT</u>	<u>2016</u>	Covered by the IUCN SSC Antelope Specialist Group
Bharal	<i>Pseudois nayaur</i>	LC	2008?	LC	2014	
Dwarf bharal	<i>Pseudois nayaur schaeferi</i>	EN	2008?	EN	2014	Subspecies, no longer online
Southern chamois	<i>Rupicapra pyrenaica</i>	LC	2008	LC	2020	
Northern chamois	<i>Rupicapra rupicapra</i>	LC	2008	LC	2020	Not yet online

actions leading to an improvement of the status of the respective species.

The Caprinae Specialist Group needs **further expert support** to finalize the reassessment of all species and for the future updates of the species accounts. We therefore call Caprinae experts, involved in conservation and management of populations, to support this work with updated field data.

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Conservation status of Nubian ibex *Capra nubiana* in Jordan

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The distribution of the Nubian ibex *Capra nubiana* in Jordan is confined to remote areas of rugged, mountainous terrain. The species is distributed from the north eastern escarpment of the Dead Sea, south along the rift valley to Wadi Araba and the southern mountains to Wadi Rum and the Aqaba mountains (Fig. 1). Published information on the historical distribution of ibex in Jordan is scarce (Harrison & Bates 1991), but prehistoric rock carvings suggest it was well known to the ancient inhabitants of the Wadi Rum area and in the eastern Badiyah (Rollefson *et al.* 2008).

Historical conservation background

In 1985, The Royal Society for the Conservation of Nature (RSCN) realized Nubian ibex populations in Jordan were under threat and sought to take action. Following the RSCN designating the Mujib Biosphere Reserve at the edge of the Dead Sea, the society established a long-term captive breeding program for ibex in the reserve. A total of 20 individual ibex (10 male:10 female) of local origin were imported from San Diego Zoo, and an additional male ibex (named “Fareed” in Arabic = unique) was added after being confiscated from a hunter who illegally captured the ibex. The breeding program continued until 1998 and between 1998 to 2000 RSCN released 110 ibex (90 adults, 20 juveniles) in five stages. RSCN monitored ear tagged individuals released back to the wild, and recorded interactions between the wild and the released population, however there was a general scarcity of data collected in Mujib Biosphere Reserve (RSCN 1999).

After the establishment of Mujib Biosphere Reserve, Dana Biosphere Reserve was established in 1989. As part of the reserve’s management RSCN

moved towards *in-situ* conservation of ibex by initiating ranger patrols, and starting an important local community awareness and development program. Wadi Rum Protected Area (word heritage site) was subsequently established in 1998 to conserve the exceptional cultural and natural values of Wadi Rum, and Jordan. RSCN applied an integrated approach of conservation at Wadi Rum, and ibex protection was targeted in the management plan supported by a range of awareness, socioeconomic development, and ecotourism initiatives.

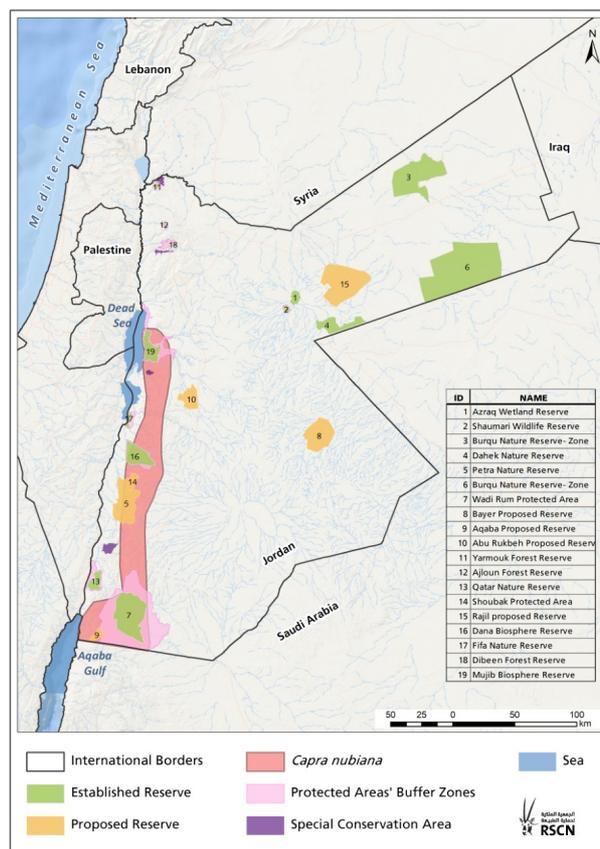


Figure 1. Distribution of Nubian ibex *Capra nubiana* in Jordan.

Research on ibex conducted by the RSCN team were focused only in these three protected areas. At the country scale, RSCN ranger observations were collected, and poaching incidents recorded; poaching was also monitored through social media posts, posted by the poachers themselves. Baseline surveys started in Dana and Mujib Biosphere Reserves in 1995 and 1996 respectively, where ibex population size, group size, sex ratio and age structure were documented. In 1999 and 2000 Wadi Rum also received baseline surveys by RSCN, before management was handed to the Aqaba Economic Special Zone Authority who established a reintroduction program in 2014, releasing 100 ibex (30 male: 70 female) following 2-years in-situ captivity. More advanced research was made by Hamidan and Ma’aqbeh (2016) in Mujib Biosphere Reserve where species distribution modelling (SDM) and

camera trapping were applied. Camera traps (37 units) were distributed across the Mujib area based on ibex probability of occurrence and kept in-situ for 10 months. A total of 2,947 photographs of ibex helped identify preferred habitats per season, activity, movement, breeding of ibex and demographic data. The data were used for management purposes and to understand current threats in the area. Evidence suggested poaching was affecting ibex behavior. Mujib ibex appeared to move more frequently at the hottest time of day which is generally a resting time (e.g., Habibi 1994), and females were seen moving goatlings at night, both potentially allowing ibex to avoid peak poaching times (Fig. 2).



Figure 2. Female ibex moving goatlings at night, which minimizes the impact of poachers and predators.

Threats

Poaching has the most obvious impact on the ibex populations across Jordan. Despite protection by patrolling rangers, poachers are still reaching areas inside the reserves to hunt and/or collect ibex goatlings. Based on camera trapping Hamidan and Ma'aqbeh (2016) found an average incidence of poaching in Mujib Biosphere Reserve was 3 cases per week in spring, with an average number of poacher individuals reaching 8.28 per month.

While it is difficult to know exactly the target of poachers, if we assume that half of them killed ibex with a 50-50 proportion between sexes, approximately 37 females and 25 males might be lost every year. The situation may be similar in Dana and Wadi Rum but worse in places such as Petra. Assessments of the Petra area suggested that the ibex was extremely rare, with cameras deployed for 3-months failing to capture ibex. This may possibly be due to poaching, as posts on social media suggest the Petra and its surrounding mountainous ridges are targeted by poachers (Fig. 3).

In addition to poaching, livestock grazing in ibex habitat is also an increasing problem across Jordan, which reduces ibex occupancy and increases competition for limited resources (Boef *et al.* 1996). Camera traps have also identified feral dogs *Canis lupus familiaris* occupying ibex habitats, and may be a potential threat especially following the breeding season when more vulnerable young may be predated. Although no evidence of predation has been



Figure 3. Ibex is over-hunted in the Petra area and its surroundings, images are occasionally posted on social media by poachers.

documented, locals and reserve rangers have observed feral dogs chasing ibex.

Ongoing conservation actions

Eid *et al.* (2020) concluded that the Nubian ibex is endangered at the local scale, that the Jordanian population could count less than 1000 individuals, and the population might have declined by some 50% over the past 20 years. In response to threats, laws have been reviewed and updated by the government. Actions taken include: 1) species appendices have been developed and the ibex has been prioritized for protection and poaching fines increased. A capacity development program has been delivered to judges to increase understanding of the importance of conserving biodiversity and to enable prosecution of wildlife crimes. The same programme was delivered to the royal rangers (environmental police) who are following up on poaching, including poaching evidence posted on social media. 2) Ranger patrolling has been revised to focus on prevention of poaching and monitoring inside reserves, outside of reserves royal rangers undertake a national patrolling plan. 3) Biological monitoring is continuing with a focus on key indicators of ibex population health such as population size, structure, age class and distribution in Mujib and Dana Biosphere Reserves. Monitoring feeds directly into protected area management and local and national patrolling plans. 4) RSCN is working on public awareness towards the conservation of ibex. This includes school curricula updates, a young ranger program, exchange visits, and social media. With these measures RSCN believes that conserving the species in its natural habitat is more effective and efficient than further reintroduction programs. As seen elsewhere we have found in-situ conservation to be

more effective than high-cost captive breeding and reintroductions.

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Reintroduction of the Nubian ibex to Lebanon

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After more than a century of absence, the Nubian ibex *Capra nubiana* is making its comeback to Lebanon through a reintroduction project promoted by Shouf Biosphere Reserve (SBR). The initiative is in-line with the Lebanon's commitments and goals under the UN Convention on Biological Diversity, with an aim to restore the biodiversity of the Shouf Mountains and the natural biota of Lebanon.



Figure 1: An example of habitat found in the study area in Shouf Biosphere Reserve, Lebanon.

Previous research has proven that the Nubian ibex was a native species of Lebanon, but was extirpated in the middle of the 19th century due to large scale habitat destruction and over-hunting. The return of this iconic species must therefore be considered of great value in restoring the original

ecosystem of Shouf Biosphere Reserve (Fig. 1). It is also a unique opportunity to raise awareness of local people on the importance and value of biodiversity.

Following the directions of the IUCN, in 2016 a captive breeding plan was conceived in preparation for a subsequent re-introduction program. The program was developed by experts and paved the way for the transfer of the first herd of twelve ibex from Jordan in October 2017 to a fenced area located on the eastern side of the Shouf mountain range. In the following months, the animals were monitored using camera traps to verify their adaptation to their new surroundings and to ensure their health. The camera trapping program has continued monitoring births and the status of the core herd. Three reproductive seasons have passed since the herd arrived in Shouf, with the herd growing to nineteen ibex and appearing completely adapted to the habitat in the Lebanese mountains.

A five-year management and monitoring plan for the Nubian ibex has been realized, including guidelines for the management of silvo-pastoral habitats, and a feasibility study and proposal outlining preliminary steps towards the reintroduction of the animals into the wild. The ultimate goal of the initiative is the reconstruction, in approx. 100 years, of a wild minimum viable population (MVP) of Nubian ibex integrated into the Shouf ecosystem and surroundings, and in coexistence with resident human populations. A reliable estimate of the MVP is not currently possible but, based on the information available on the mean home range of the species, the reintroduction study area appears large enough to meet our objectives. Surveys conducted in the last 4 years and a habitat suitability model have indicated that large parts of the study area are suitable for ibex, in particular higher elevation and western orientated habitats with a total area of 170 km². Research has also identified core areas for the release of the founding herd, that include predator escape terrain, that are difficult to access by humans, have few livestock, and have water sources. The minimum number of founders to set free into the wild is considered to be 45 ibex. This will be achieved by transferring 36 to 42 Nubian ibex into captive fences on site and letting them breed freely until numbers increase to 45 individuals. Based on the stock already living in the existing Lebanese enclosure and the ongoing negotiations for the transfer of more ibex from other Middle Eastern countries to Lebanon, the process of release into the wild should start in 2021, and be concluded within 36 months. To monitor the reintroduction process, released ibex will be individually marked with ear tags, microchipped, and equipped with a radiocollar for monitoring by telemetry. Direct observations will also be sought on a regular basis following a standardized protocol.

Our research suggests that local threats that contributed to the original extirpation of the Nubian ibex are no longer a major issue and can be

addressed though proper management and a firm commitment. We feel the reintroduction has a high probability of success if all potential risks to the survival of Nubian ibex in the new area are addressed, and if measures are taken to prevent conflicts between Nubian ibex and existing human activities. Special attention will also be paid to the interactions between Nubian ibex and goats so as to avoid territory overlap, in addition we aim to remove or eradicate stray dogs from the reintroduction sites. A key factor in the program's success is the involvement of local people; this will be addressed through local involvement, adequate communication and full cooperation with all institutions and organizations involved.

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RESEARCH

Credible and affordable population estimation for Caprinae

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Populations of Caprinae typically inhabit mountainous, remote and occasionally highly vegetated terrain, often making population estimation costly or impractical to pursue. Therefore, many Caprinae populations lack abundance data (Shackleton 1997). This problem motivated us to design and test a simple and inexpensive solution for producing credible abundance and distribution data for Caprinae (Harris *et al.* 2020).

Our approach uses trail camera photos, analyzed with distance sampling approaches (program R). We tested our method by estimating the abundance of a captive desert bighorn sheep *Ovis canadensis* population within the southwestern United States. These sheep remain wild, and are used to augment populations elsewhere. Population abundance of the sheep is known through an annual census. By comparing our abundance estimate to the census, we show that the approach produces unbiased results.

We encourage use of this technique to quantify abundance of other Caprinae populations. An important step is identifying sample size (number of trail cameras) needed to meet the precision desired. For example, biologists often want abundance estimates with a coefficient of variation (CV [standard error of density / mean density]) < 20% (Williams *et al.* 2002). By conducting a "pilot" study, one can acquire sufficient data to determine the sample sizes necessary for a target CV. Data from previous trail camera work can also be used to inform the sample size requirements. With adequate sample sizes, this technique can produce accurate results (CV < 20%).

Although populations of Caprinae often span >100 km² (Shackleton 1997), the size of the study area does not affect the sample size requirements. Sample size is determined by the target precision and “encounter rate”, namely the number of individual animal detections per trail camera. Animal density and behavior influence this rate. Generally, sample size requirements increase with variability in Caprinae counts across cameras. Understandably, the more sampling sites used equates to more time involved in data assembly and organization.

It is extremely important to have a solid understanding of the target species behavior and habitat preferences, to understand when, where and if sampling coverage is incomplete in the study area. Researchers must be cognizant of potential biases resulting from their study designs regardless of the technique used. For example, some Caprinae species frequent inaccessible terrain (e.g., cliffs, pinnacles) within the areas they inhabit, precluding human access and the establishment of the trail cameras required for sampling. Awareness of sampling deficiencies and potential biases enable researchers to make better decisions about which techniques to use and the bounds of their inferences.

Given the importance of pilot work for estimating Caprinae abundances, we provide guidance describing “how to” implement the technique (<https://ecos.fws.gov/ServCat/Reference/Profile/127281>). Following our guidelines enables pursuing the abundance estimation procedure with confidence.

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Assessment of disease prevalence in ungulates in protected areas of Mizoram, India

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Mizoram State (21,081 km²) is located in the North Eastern Region of India and falls within the Indo-Burma biodiversity hotspot. It is bordered by Myanmar to the east and south, Bangladesh to the south and west, the state of Tripura to the northwest

and the states of Assam and Manipur to the north. This hilly state has 89% forest cover and the forests are classified into seven types including, subtropical evergreen, tropical evergreen, tropical moist deciduous, bamboo forest, *Quercus* forest and *jhum* (slash & burn) lands. Mizoram State has 10 wildlife protected areas covering 6% of its area.

Mizoram has a rich and diverse assemblage of mammals ranging from large mammals such as the Asian Elephant and Gaur, to small mammals such as rodents. Ungulates of Mizoram include the long-tailed goral *Naemorhedus griseus*, red serow *Capricornis rubidus*, sambar *Rusa unicorn*, hog deer *Axis procinus*, muntjak *Muntiacus muntjak*, wild pig *Sus scrofa* and gaur *Bos gaurus*. Information on the mountain ungulates of Mizoram is limited. Choudhury (2013) and Lalthanazara (2017) have reported on the status and distribution of ungulates in Mizoram based on field surveys, historical records as well as secondary data from interviewing hunters.

Wildlife populations in North East India are severely threatened due to habitat destruction, poaching and hunting (Chatterjee 2008; Roy *et al.* 2015). In addition to these threats, there have been recent mass mortalities of wild ungulates caused by Goat Pox virus in Mizoram from 2015 to 2017 (Dutta *et al.* 2018), and in domestic goats in 2018 (Bora *et al.* 2018) and in gorals in the state of Arunachal Pradesh north of Mizoram in 2018 (WWF. 2018). Mass mortalities and local population declines of wildlife from disease have been linked to spillover of pathogens from livestock (Jones *et al.* 2008; Kock 2005), caused by an increase in the wildlife - livestock direct and indirect interactions. The close relationships between wild ungulates and livestock also gives them enormous potential for transmission of diseases that are shared between the two (Bengis & Kock 2002). Reservoirs of pathogens in wildlife also play a significant role in public health since spillover of pathogens to livestock have been reported to be precursor for emerging zoonotic diseases in humans (Wolfe *et al.* 2012). A lot of research has focused on wildlife diseases due to their zoonotic potential; however relatively little attention has been given to the effects of diseases on the health of wildlife populations.

Considering the recent episodes of mass mortalities in wild ungulates in the region and the threat of disease on wild populations, the Wildlife Institute of India has initiated a research project titled “Assessment of Disease Prevalence in Ungulates in Protected Areas of Mizoram”. Though the study will cover only the state of Mizoram in the first phase, we are hopeful that the geographical scope of research will extend to other affected states as well. The objectives of the project are to: (i) assess the prevalence of infectious diseases in protected areas of Mizoram with special reference to pathogens that caused mortality of wild ungulates in the recent past; and (ii) assess the prevalence of transmissible

diseases in domestic counterparts in and around the protected areas. The baseline data generated from this study will help us understand the distribution and dynamics of diseases both in domestic and wild animals which is crucial for the prevention and management of future disease outbreaks and spillovers. We also aim to gain a better understanding of diseases shared between domestic and wild ungulates and the transmission pathways between hosts. The research is expected to provide baseline information for the development of a health management plan related to disease and surveillance and monitoring strategies of wildlife diseases in the protected areas.

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SPOTLIGHTS

A rare observation of a wild goat *Capra aegagrus* with unusual coat-colour in northern Iraq (Kurdistan)

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The wild goat *Capra aegagrus* is a Near Threatened caprinae distributed throughout central Afghanistan, southern Pakistan, the Caucasus region,

western Turkmenistan, southwestern Turkey, west through Iran, and northern Iraq (Weinberg & Ambarli 2020). It may also have occurred in Arabia but is now extinct (Grubb 2005). Within Iraq isolated populations inhabit the Zagros Mountains in the north (Kurdistan) and eastern Iraq, but populations are in decline due to poaching, disturbance, and habitat destruction (Al-Sheikhly *et al.* 2020). Coat-colour of ungulates is generally adaptative in order to provide camouflage against detection/recognition by predators (e.g., Pembury Smith and Ruxton 2020); however, colour aberrations have been reported in caprinae and antelope species (McCardle 2012). On 25th of February 2019, a leucistic young female wild goat was sighted in Khoshk Mountain (34°59'44.43"N 45°46'28.03"E), in Sulaymaniyah Province of northern Iraq. It was distinguished from a normal coat-colour herd (7–8 individuals) by its distinctive pale-grey outer coat, paler horns and hoofs than conspecifics, and light face and body markings (Fig. 1a–c).



Figure 1: a–c. Leucistic young female wild goat *Capra aegagrus* contrasting with normally coloured young male in Khoshk Mountain in northern Iraq (Kurdistan) in 2019, and d. with two kids in 2020. Photos © Jawhar Faiq Hakim

Based on subsequent field observations in 2020, this leucistic female became much lighter in colour, and despite her more conspicuous appearance, survived potential poaching and predation (Persian leopard *Panthera pardus saxicolor* and grey wolf *Canis lupus*). It is also showed normal territorial and social behavior towards adult males and succeeded in mating and rearing two normal coat-colour kids (Fig. 1d). Interviews with locals indicated that two “white” individuals were frequently seen at two different localities within Khoshk Mountain which thus, may indicate sibling leucistic individuals or offspring. This is the first report of leucism in wild goat population in northern Iraq, and possibly the Middle East. The causes of its leucistic colour were not determined but could have occurred randomly, be due to inbreeding within a small, isolated population, or due to crossbreeding with domestic goats (e.g., Naderi *et al.* 2008); further genetic investigation would be required to elucidate the reason.

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“Red-light” chamois: First record of nocturnal mating behavior

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The nocturnal behavior of Caprinae (e.g., their rutting activities) remains largely unknown, but it is worth being investigated. Chamois *Rupicapra* spp. exhibits a rich behavioral repertoire during the rutting period, including 31 social behavior patterns for the Northern chamois *R. rupicapra* (Krämer 1969, Corlatti *et al.* 2013) and 31 for the Southern chamois *R. pyrenaica* (Lovari *et al.* 2020, for a comparative synthesis). So far, all observations of rutting behavior have been conducted in daylight.

Chamois has long been considered as a mainly diurnal species (Pepin *et al.* 1989, Aldezabal *et al.* 1999) with scarce nocturnal activity (Pachlatko & Nievergelt 1985, Pepin *et al.* 1989, Willis & Ingold 2007), but recently nocturnal movements have been documented, showing some variation in relation to environmental features (Carnevali *et al.* 2016; Grignolio *et al.* 2018).

During the night of the 8th of November 2020, from 12:14 am to 12:15 am, some mating behavior of Balkan chamois *R. rupicapra balcanica* has been recorded in the Rodopi mountain range, NE Greece. A one-horned adult male performed an intentional mount to a female, lasting 6 seconds (12:14:09 am to 12:14:14 am) (Fig. 1a). After 53 seconds he mounted her a second time (Fig. 1b). Several pelvic thrusts occurred during the second mount, lasting

no less than 5 seconds (12:15:07 am to 12:15:12 am) suggesting ejaculation. The two events were recorded in a series of 2 videos and 3 pictures from a camera trap (Bushnell 24MP Trophy cam HD), during the night (moon phase: Last Quarter), in a forested area.



Figure 1: nocturnal mating events (a-b) of Balkan chamois recorded in the Rodopi mountain range, NE Greece.

The Balkan chamois is a protected species in Greece and its hunting has been prohibited since 1969, with an estimated national population of 1330–1765 individuals, according to the National Action Plan for the Balkan chamois recently implemented by the Hellenic Ministry of Environment and Energy (Papaioannou 2019). Our observations took place within a protected area of the Natura 2000 network (GR1140001) that is included in the Rodopi Mountain Range National Park and it is also a wildlife reserve where hunting is prohibited. However, poaching/predation risk is considered high in the area, since poaching activities are quite frequent and large predators such as the brown bear and the wolf are present.

Our observations and information from recent literature indicate that chamois may be more active at night than assumed so far, showing even complex behavior such as courtship. Our records provide evidence that Caprinae can mate at night. Further research is needed on nocturnal behavior, particularly in relation to the intensity of poaching/hunting in daylight.

Our data were collected within the monitoring project for the Balkan chamois population in the Rodopi Mountain Range National Park (RMNP), which has been conducted since 2015 by the Management Body of RMNP in collaboration with

experts and volunteers of the Balkan Chamois Society (BCS).

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Watch the video: <https://www.facebook.com/BalkanChamoisSociety/videos/1291465287889620>

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