

OPEN ACCESS



The Journal of Threatened Taxa (JoTT) is dedicated to building evidence for conservation globally by publishing peer-reviewed articles online every month at a reasonably rapid rate at [www.threatenedtaxa.org](http://www.threatenedtaxa.org). All articles published in JoTT are registered under [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/) unless otherwise mentioned. JoTT allows unrestricted use, reproduction, and distribution of articles in any medium by providing adequate credit to the author(s) and the source of publication.

# Journal of Threatened Taxa

Building evidence for conservation globally

[www.threatenedtaxa.org](http://www.threatenedtaxa.org)

ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)

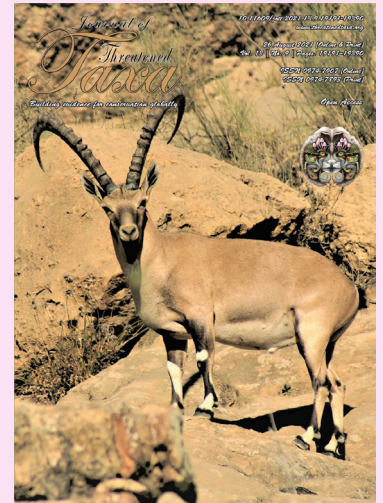
## REVIEW

### WILD UNGULATES IN JORDAN: PAST, PRESENT, AND FORTHCOMING OPPORTUNITIES

Ehab Eid & David Mallon

26 August 2021 | Vol. 13 | No. 9 | Pages: 19338–19351

DOI: [10.11609/jott.6811.13.9.19338-19351](https://doi.org/10.11609/jott.6811.13.9.19338-19351)



For Focus, Scope, Aims, and Policies, visit [https://threatenedtaxa.org/index.php/JoTT/aims\\_scope](https://threatenedtaxa.org/index.php/JoTT/aims_scope)

For Article Submission Guidelines, visit <https://threatenedtaxa.org/index.php/JoTT/about/submissions>

For Policies against Scientific Misconduct, visit [https://threatenedtaxa.org/index.php/JoTT/policies\\_various](https://threatenedtaxa.org/index.php/JoTT/policies_various)

For reprints, contact [<ravi@threatenedtaxa.org>](mailto:ravi@threatenedtaxa.org)

The opinions expressed by the authors do not reflect the views of the Journal of Threatened Taxa, Wildlife Information Liaison Development Society, Zoo Outreach Organization, or any of the partners. The journal, the publisher, the host, and the partners are not responsible for the accuracy of the political boundaries shown in the maps by the authors.

Publisher & Host





## Wild ungulates in Jordan: past, present, and forthcoming opportunities

Ehab Eid<sup>1</sup> & David Mallon<sup>2</sup>

<sup>1</sup> Eco-Values for Sustainable Development, Lutfi Queder Street, Yadodah 11610, Amman, Jordan.

<sup>2</sup> Department of Natural Sciences, Manchester Metropolitan University, Manchester M1 5GD, UK.

<sup>1</sup> eha\_jo@yahoo.com (corresponding author), <sup>2</sup> dmallon7@gmail.com

**Abstract:** Twelve species of ungulates are reported from the wild in Jordan. Three of these, *Addax nasomaculatus* (Addax), *Bos primigenius* (Aurochs), and *Cervus elaphus* (Red Deer) are known only from archaeological excavations. *Dama mesopotamica* (Mesopotamian Fallow Deer), *Oryx leucoryx* (Arabian Oryx) and *Equus hemionus hemippus* (Syrian Wild Ass) have been regionally extirpated in the wild. A semi-captive population of Persian Onager (*E. h. hemionus*) is held in Shumari Wildlife Reserve. The Arabian Oryx is also managed in semi-captive conditions in two reserves. Except the commonly occurring Wild Boar (*Sus scrofa*), other surviving ungulate species continue to be under serious threat. *Gazella gazella* (Palestinian Mountain Gazelle), *Capreolus capreolus* (European Roe Deer), *Gazella marica* (Arabian Sand Gazelle), and *Gazella dorcas* (Dorcas Gazelle) are Critically Endangered, and *Capra nubiana* (Nubian Ibex) is Endangered in the region. This paper provides a review of the historical and current status of wild ungulates in Jordan, listing the threats and conservation measures and provides recommendations for management and conservation in the future.

**Keywords:** Arabian Oryx, Arabian Sand Gazelle, conservation actions, Dorcas Gazelle, Fallow Deer, historical background, Mountain Gazelle, Nubian Ibex, Persian Onager, population, status, Roe Deer, Wild Ass, Wild Boar.

الخلاصة: تم تسجيل 12 نوع من ذوات الحوافر البرية في الأردن تضمنت ثلاثة أنواع وثق تواجدها من خلال الدراسات الأثرية والأحافير التي تم العثور عليها وهي البقر الوحشي (*Addax nasomaculatus*) والأرخص (*Bos primigenius*) والأيل الأحمر (*Cervus elaphus*) بينما انقرضت ثلاثة أنواع أخرى من البرية وهي الأيل الأسمر الفارسي (*Dama mesopotamica*) والمها العربي (*Oryx leucoryx*) والحمار البري السوري (*Equus hemionus hemippus*) ويتواجد حالياً مجموعة من الحمير البري الفارسي في محمية شومري للحياة البرية (*E. h. hemionus*) كما ويتم إدارة قطعان من المها العربي في مسيجات ضمن محميتين طبيعيتين في الأردن. باستثناء الخنزير البري (*Sus scrofa*) الذي يعتبر النوع الوحيد الشائع فإن ما تبقى من الأنواع مهددة بالانقراض كونها تتعرض للعديد من الضغوط وهي غزال الجبل الفلسطيني (*Gazella gazella*) والأيل الأسمر (*Capreolus capreolus*) والغزال العربي (*Gazella marica*) وغزال دوركاس (*Gazella dorcas*) والتي صنفت كأنواع مهددة بشكل حرج والوعل النوبي أو البدن (*Capra nubiana*) المصنف كنوع مهدد بالانقراض. قدمت هذه الورقة العلمية مراجعة تفصيلية للوضع التاريخي والحالي لأنواع ذوات الحوافر البرية في الأردن مع تبيان التهديدات التي تحيط بهم وتدابير الحماية المتوفرة وتم تقديم مجموعة من التوصيات للإدارة والحماية في المستقبل.

**Editor:** L.A.K. Singh, Bhubaneswar, Odisha, India.

**Date of publication:** 26 August 2021 (online & print)

**Citation:** Eid, E. & D. Mallon (2021). Wild ungulates in Jordan: past, present, and forthcoming opportunities. *Journal of Threatened Taxa* 13(9): 19338–19351. <https://doi.org/10.11609/jott.6811.13.9.19338-19351>

**Copyright:** © Eid & Mallon 2021. Creative Commons Attribution 4.0 International License. JoTT allows unrestricted use, reproduction, and distribution of this article in any medium by providing adequate credit to the author(s) and the source of publication.

**Funding:** None.

**Competing interests:** The authors declare no competing interests.

**Author details:** EHAB EID a Steering Committee Member of IUCN SSC, Vice Chair of SSC and EAGL of West Asia. His research focused on species diversity, animal trade, hunting, biodiversity conservation, CITES, and protected areas management. DAVID MALLON is a Visiting Professor in the Department of Natural Sciences at Manchester Metropolitan University, UK, a Special Advisor to the IUCN Species Survival Commission, a member of the IUCN Red List Committee and Co-Chair of the Antelope Specialist Group.

**Author contributions:** EE developed the concept and produced the distribution maps; both authors participated in writing the manuscript.



## INTRODUCTION

Jordan is situated in the junction point of three major biogeographical realms, the Palearctic, Afrotropical, and Oriental (Amr et al. 2004), which support the existence of four distinct biogeographical zones in the country; Mediterranean, Irano-Turanian, Saharo-Arabian, and Afrotropical (Al Eisawi 1996). This results in the presence of a diverse range of habitats, which provide suitable niches for various species of fauna and flora (Image 1). The ungulate diversity includes species of Palearctic origin such as the Roe Deer (*Capreolus capreolus*) in the Mediterranean biome of northern Jordan and Nubian Ibex (*Capra nubiana*) in the western mountains, and widespread Middle Eastern desert species such as the Arabian Oryx (*Oryx leucoryx*) and gazelles (*Gazella* spp.) (Amr et al. 2004).

The presence of ungulates in Jordan is well documented in ancient rock drawings, and mosaics on the walls of desert palaces and churches in Madaba (Hatough-Bouran & Disi 1991). In addition, early travelers to the Levant provided incidental records of many species (e.g., Tristram 1884).

Twelve species of ungulates (defined as the mammalian orders Artiodactyla and Perissodactyla) have been reported to occur in Jordan (Quemsiyeh et al. 1996; Amr 2012) (Table 1). Three species are known only from archaeological excavations: Aurochs (*Bos primigenius*), Addax (*Addax nasomaculatus*), and Red Deer (*Cervus elaphus*), though some doubt exists over two of these. Of the remaining nine species, three have been extirpated from Jordan. The Roe Deer (*Capreolus capreolus*) has been reintroduced. An Arabian Oryx (*Oryx leucoryx*) reintroduction programme has begun, but the released populations in Shumari Wildlife Reserve and Wadi Rum Protected Area are held in semi-captive conditions, and they are not yet considered fully wild. The Syrian Wild Ass (*Equus hemionus hemippus*) formerly occurred across the northern part of the Arabian Peninsula, including Jordan, but became extinct in 1927. A small population of Persian Onager (*E. h. hemionus*) is kept in semi-captive conditions in Shumari Wildlife reserve. There have been no confirmed sightings of Mountain Gazelle (*Gazella gazella*) or the reintroduced population of Roe Deer (*Capreolus capreolus*) since 2015 (Eid et al. 2020). Of the remaining four species, Arabian Sand Gazelle (*Gazella marica*) Dorcas Gazelle (*G. dorcas*) and Nubian Ibex *Capra nubiana* are seriously threatened, while the Wild Boar (*Sus scrofa*) is still common and threats to its population are insignificant (Amr 2012). The aim of this paper is to summarize the history and

status of wild ungulates in Jordan.

Ungulates have always been hunted for meat, hides, and trophies. In ancient times, elaborate stone corrals known as 'desert kites' were constructed to trap gazelles and other species. These are funnel-shaped, stone structures, with walls 25 to 70 m in length, into which animals were driven and killed (Bar-Oz et al. 2011). Desert kites allowed the capture of whole herds and slaughter of hundreds of gazelles. Many desert kites are located in the eastern desert of Jordan, some of them possibly dating from the Neolithic period (Betts & Burke 2015).

Declines in the numbers and diversity of ungulates began in the early 19<sup>th</sup> century (Quemsiyeh et al. 1996; Amr 2012). Meinertzhagen (1954) reported that the enormous decline in wildlife populations in the Arabian Peninsula and Jordan began during the First World War (1914–1918) when modern rifles and motor vehicles first arrived in the country, and these declines have continued since then (Kiwan et al. 2001; Amr 2012; Eid et al. 2020).

Arabian Oryx, Arabian Sand Gazelle, Dorcas Gazelle, and Nubian Ibex are included on Appendix I of the classification system for wild animals which prohibits hunting by virtue of paragraph (e) of Article (57) according to regulation No. 43 for the year 2008 of the Agriculture Law No. (13) for the year 2015. The addition of Mountain Gazelle and Roe Deer to Appendix I is currently under consideration by the government.

## Annotated checklist of the ungulates of Jordan

### (A.) Extinct in the region (Archaeological records)

#### (A1.) *Addax nasomaculatus* (de Blainville, 1816) Addax

[Critically Endangered (IUCN), Extinct in the region, Archaeological records]

The presence of the Addax in Jordan during the Pleistocene has been in report (Tristram 1884; Bates 1937). However, Bodenheimer (1958) suggested that published accounts may be misidentifications or relied on information from Bedouins who used the Arabic common name (bakr al wahsh) for more than one species including the Aurochs. Harrison (1972) reported that the Addax may have formerly existed in the region but that there was no confirmed evidence of its presence in the region in recent times.

#### (A2.) *Bos primigenius* (Bojanus, 1827) Aurochs

[Extinct (IUCN), Extinct in the region, Archaeological records]

Bone remains belonging to this species have been



Image 1. Some ungulate species which still survive in Jordan (top-left—*Gazella marica*; top-right—*Oryx leucoryx*; below—*Capra nubiana*). © Ehab Eid.

excavated from archaeological sites in Jordan dating from different Paleontological eras, such as Ain Ghazal, Azraq, Wadi Hassa, Wadi Jilat, and Tel Hesbon (Boessneck & Van den Driesch 1978; Gerrard et al. 1988). Harrison (1972) reported that the Aurochs may have survived in the region until historical times. The species is Extinct.

**(A3.) *Cervus elaphus* (Linnaeus, 1758) Red Deer**

[Least Concern (IUCN), Extinct in the region]

Qumsiyeh (1996) referred to archaeological remains of this species but added that there was no information

on when it got extirpated. Harrison & Bates (1991) did not include Red Deer in their account of the mammals of the Arabian Peninsula and its presence has never been confirmed in the region in historical times.

**(B.) Extinct in the region (presence in captivity or as different subspecies)**

**(B1.) *Dama mesopotamica* (Brooke, 1875) Mesopotamian or Persian Fallow Deer**

[Critically Endangered (IUCN), Extinct in the region]



Table 1. Ungulate species recorded in Jordan, past and present.

Species name	Common name	IUCN Red List (global) <sup>1</sup>	Jordan National Red List <sup>2</sup>	Notes
<i>Addax nasomaculatus</i>	Addax	Critically Endangered	Regionally Extinct	Archaeological records
<i>Bos primigenius</i>	Aurochs	Extinct	Regionally Extinct	Archaeological records
<i>Cervus elaphus</i>	Red Deer	Least Concern	Regionally Extinct	Archaeological records
<i>Dama mesopotamica</i>	Mesopotamian Fallow Deer	Critically Endangered	Regionally Extinct	More than 250 in enclosures on a private farm
<i>Oryx leucoryx</i>	Arabian Oryx	Vulnerable	Regionally Extinct	230 in total in enclosures within two protected areas
<i>Equus hemionus</i>	Wild Ass	Near Threatened	Regionally Extinct	Syrian Wild Ass ( <i>E. h. hemippus</i> ) is Extinct. 32 <i>E. h. onager</i> in a protected area
<i>Gazella gazella</i>	Palestinian Mountain Gazelle	Endangered	Critically Endangered	Not seen since 2015
<i>Capreolus capreolus</i>	European Roe Deer	Least Concern	Critically Endangered	Not seen since 2015
<i>Gazella marica</i>	Arabian Sand Gazelle	Vulnerable	Critically Endangered	Less than 50 individuals
<i>Gazella dorcas</i>	Dorcas Gazelle	Vulnerable	Critically Endangered	Less than 50 individuals
<i>Capra nubiana</i>	Nubian Ibex	Vulnerable	Endangered	Less than 500 individuals
<i>Sus scrofa</i>	Wild Boar	Least Concern	Least Concern	Numbers unknown but common

<sup>1</sup> www.iucnredlist.org; <sup>2</sup> Eid et al. (2020)

### Distribution and status

Mesopotamian Fallow Deer formerly occurred in forested hills of northern Jordan and the north of the Arabian Peninsula (Harrison & Bates 1991) but it was already rare by late 19<sup>th</sup> century (Tristram 1884). Qumsiyeh (1996) stated that the species disappeared from the eastern Mediterranean region 100 years earlier, although Bodenheimer (1958) reported seeing antlers in a shop in 1923 that reportedly came from Jerash. RSCN obtained four fallow deer in 1983, but it turned out that these were European Fallow Deer (*Dama dama*), a non-native species, so they were given to a private farmer (Harding 2007). Several private owners later obtained European Fallow Deer. More than 250 European Fallow Deer, which were originally introduced from Germany in 2003 were observed in enclosures at Zubia area near Irbid in northern Jordan (E. Eid, pers. obs., 2009). The presence of this non-native species would complicate any future restoration of *Dama mesopotamica* to Jordan.

### (B2.) *Oryx leucoryx* (Pallas, 1777) Arabian Oryx

[Vulnerable (IUCN), Extinct in the region, 230 in total in enclosures within two protected areas]

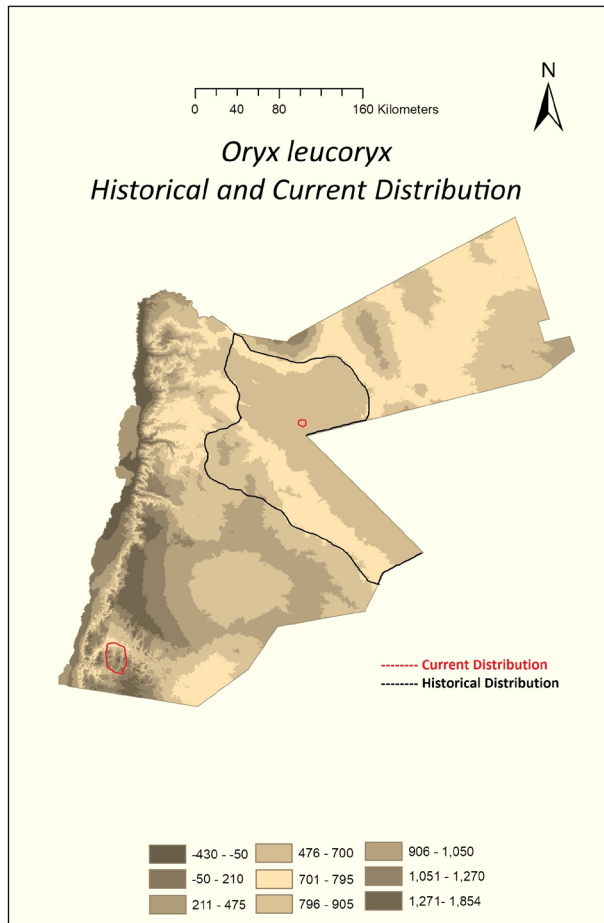
### Distribution and status

Tristram (1884) stated that this species was still

common in northern Arabia and in Balka and Houran in Jordan in the 19<sup>th</sup> century. Schmitz collected it in Jordan in 1910 (Anon 1946) and the specimen is in a museum in Amman. According to Mountfort (1965), a hunter shot three animals at Qatraneh near Karak, southern Jordan in the 1920s. In the 1930s a British army unit kept one in captivity in southern Jordan (Dollman & Burlace 1935). Populations were reported to persist in Saudi Arabia, close to the Jordanian borders, near Jabal et Tubayq (Carruthers 1935) and in Al Busayta and Wadi Sirhan (Raswan 1935).

The exact date of the extinction of the Arabian Oryx in Jordan is unknown but several dates have been proposed. Clarke (1977) stated that the oryx became extinct in Jordan during the 1930s, while Talbot (1960) and Fitter (1967) stated that the last Arabian Oryx was shot in the 1940s. Hatough & Al Eisawi (1987) considered that this species was on the verge of extinction in the 1950s. Mountfort (1965) reported that the last wild oryx in Jordan was shot in the early 1960s near Qatraneh, c. 75 km south of Amman.

Arabian Oryx have been reintroduced to two sites in Jordan, Shumari Wildlife Reserve and Wadi Rum Protected Area (Figure 1). The RSCN initiated the first reintroduction into Shumari Wildlife Reserve in 1978 (Clarke 1979; Nelson 1985; Abu-Jafar & Hays-Shahin



**Figure 1. Former and current range distribution of *Oryx leucoryx* in Jordan.**

1988; Hatough & Al-Eisawi 1988). Eight oryx from the San Diego Wild Animal Park in the United States (four males and four females) and three animals from the Royal herd in Qatar (one male and two females) were donated in 1978 to the RSCN (Hatough & Al-Eisawi 1988). In 1984, Zurich Zoo in Switzerland provided three additional males. The founders were from two separate bloodlines: those from San Diego and Zurich were of Yemeni-Saudi stock, whereas those from Qatar were from a separate line (Harding et al. 2007). This program was considered transitional to a truly wild, free-ranging population, which the RSCN planned to establish eventually (Mountfort 1965; Clarke 1977, 1979).

The Shumari Wildlife Reserve herd grew to 30 in 1983 and about 176 in 1995 (Qumsiyeh et al. 1996). By 2000 the population reached 313 but the lack of available habitat due to overgrazing prevented release of the animals outside the reserve, so as to reduce overcrowding, the RSCN donated some oryx to breeding collections in Qatar, Saudi Arabia, Syria, and the United

Arab Emirates, while others were transferred to Wadi Rum Protected Area in the south of Jordan in 2002 and 2006 (Harding et al. 2007). Currently there are c. 70 individuals in Shumari wildlife reserve (A. Al Halal, pers. comm. 2020. Reserve manager).

In February 2020, the Environment Agency - Abu Dhabi (EAD) and RSCN signed a Memorandum of Understanding on a breeding and reintroduction project for the Arabian Oryx in Shumari Wildlife Reserve. The project aims to release 60 oryx in the reserve over 2021–2022. The Shumari Wildlife Reserve will also be expanded to ensure enough suitable grazing, by rehabilitating land outside the current boundaries (<https://www.rscn.org.jo/abu-dhabis-environment-agency-release-60-arabian-oryx-jordans-shumari-wildlife-reserve>).

Ten oryx were transferred from Shumari Wildlife Reserve to Wadi Rum Protected Area in 2002 and 50 more in 2006 (Harding et al. 2007). A new reintroduction project in Wadi Rum Protected Area was initiated in 2007, funded by H.H Sheikh Mohamed bin Zayed Al Nahyan. Sixty oryx (20 males, 40 females) were transferred from the United Arab Emirates to an enclosure inside the reserve in two batches: 20 in 2009, and 40 in 2012 (N. Zawaydeh. Former reserve manager. pers. Comm. 2019). The current population in Wadi Rum Protected Area numbers around 100 individuals (A. Alhasassein. Oryx reintroduction project manager. pers. comm. 2020.). The oryx are currently held in semi-captive conditions with a plan to release later in the wider area.

**Threats**

The main threat that led to the extinction of the species from Jordan was hunting, but pesticides used to control locusts across the Badia in the 1950s also killed some oryx (Hatough & Al Eisawi 1988; Qumsiyeh et al. 1996). Harding et al. (2007) reported that the main causes of mortality of young oryx in Shumari Wildlife Reserve were predation and flash floods. Illegal live capture of oryx for sale to private collections, and for food has been reported from Wadi Rum Protected Area (E. Eid unpub. data 2020).

**Conservation Actions**

This species is protected at Wadi Rum Protected Area and Shumari Wildlife Reserve. Since the Arabian Oryx populations in Shumari Wildlife Reserve and Wadi Rum Protected Area are still held within enclosures, they are not yet considered fully wild, so this species was assessed as Regionally Extinct in Jordan (Eid et al. 2020). Decisions are needed to be taken in releasing the Arabian Oryx into the wild by working on two levels; the first is regional,

by developing memoranda of understanding with neighboring countries, especially the Kingdom of Saudi Arabia to establish a protocol for conserving the released animals which cross the border. The second is at national level where awareness programs be implemented linked to strong enforcement and partnerships established with the hunters' association and the Royal Department for Environmental Protection.

### (B3.) *Equus hemionus hemippus* (l. Geoffroy, 1855) Syrian Wild Ass

[Near Threatened (IUCN), Extinct in the region (Eid et al. 2020), Syrian Wild Ass (*E. h. hemippus*) is Extinct. But 32 numbers of *E. h. onager* are in a protected area]

#### Distribution and Status

The Syrian Wild Ass was formerly distributed across the whole of the northern part of the Arabian Peninsula (Harrison & Bates 1991), but this subspecies became extinct in 1927 when the last individual was reported shot near Sinjar in northern Iraq (Kaczensky et al. 2015). Musil (1927) reported that in Jordan Wild Ass occurred in the Sirhan depression 100 years earlier and that the last individual had been shot at Al Ghamr wells, south-east of Azraq. Harrison (1972) stated that it was formerly numerous in the Azraq region of Jordan. Qumsiyeh (1996) mentioned a well-preserved image of a wild ass hunt in Qasr Amrah, near Azraq. It is not known precisely when the wild ass disappeared from Jordan (Figure 2).

The Royal Society for the Conservation of Nature (RSCN), selected the Persian Onager (*E. h. onager*) for a reintroduction programme as it is the closest relative of the extinct subspecies, and thus in accordance with the principle of 'the nearest available subspecies' in the IUCN reintroduction guidelines (IUCN/SSC 2013). The main reason for establishing Shumari Wildlife Reserve was for captive breeding and reintroduction of the wild ass and other species (Amr et al. 2004).

Two immature Persian Onagers (male and female) were imported from Montpellier Zoo, France, in 1983 but these animals died, and an additional four individuals (two of each sex) were imported from Koeln, Stuttgart, and Whippsnade zoos in 1988–1989 and an additional male and five females were imported from Basel Zoo in 1997 (Abu Eid 2001; Khoury et al. 2012). Currently, 32 individuals are present in Shumari Wildlife Reserve (A. Elhalah, Reserve manager. pers. comm. 2020.).

#### Threats

There is no specific information on the reasons for extinction of the Syrian Wild Ass in Jordan, although

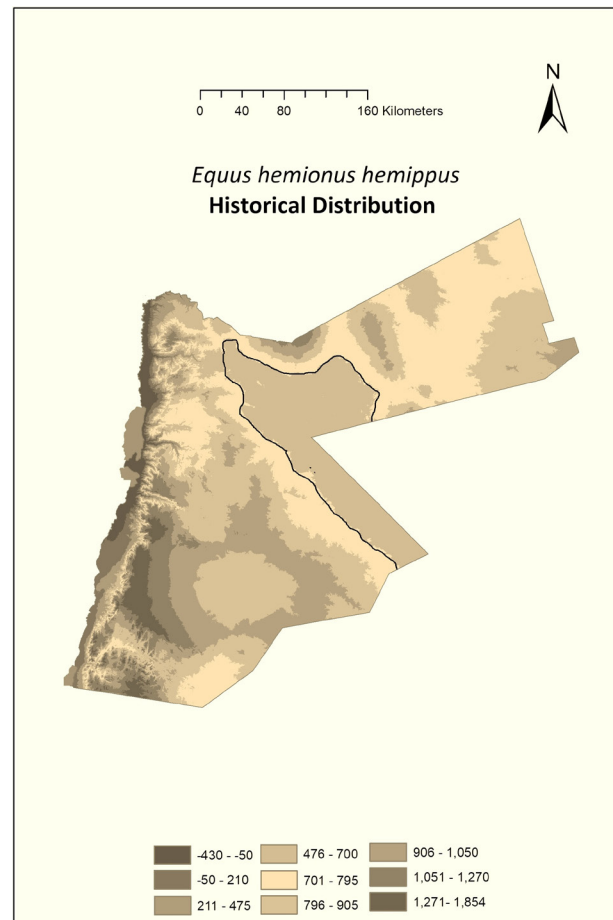


Figure 2. Former range distribution of *Equus hemionus hemippus* in Jordan.

hunting is likely to have been a major factor.

#### Conservation Actions

The species is currently held in semi-captive conditions at Shumari Wildlife Reserve, which is fenced. Release into the wild is not currently considered a priority because of the lack of suitable habitat and the population is used for educational purposes and to raise awareness of the former fauna of Jordan. Wild Ass is considered Regionally Extinct in Jordan (Eid et al. 2020).

#### (C.) Critically Endangered

All three species of gazelles occurring in Jordan are critically endangered. These are, Palestinian or Mountain Gazelle (*G. gazella*), Arabian Sand Gazelle (*Gazella marica*), and Dorcas Gazelle (*G. dorcas*) (Harrison & Bates 1991; Qumsiyeh et al. 1996; Amr 2012). Tristram (1884) stated that gazelles were common and abundant in every part of Jordan. Besides, the European Roe Deer (*Capreolus capreolus*) is also Critically Endangered.

**(C1.) *Gazella gazella* (Pallas, 1766) Palestinian Mountain Gazelle**

[Endangered (IUCN), Critically Endangered in the region, Not seen since 2015]

**Distribution and status**

Archeological evidence suggests Palestinian Mountain Gazelle *Gazella gazella* was a common species throughout the Jordan mountain chain (Tchernov et al. 1986/7; Uerpmann 1987) and Amr & Disi (1988) reported that a specimen killed in the Salt mountains in summer 1986 is now in the Jordan University Museum of Natural History (JUMHN). The distribution extended down the Rift Valley of western Jordan with many records from the Jordan and Yarmouk valleys in the north (Qumsiyeh et al. 1996; Kiwan et al. 2001; Amr 2012; Figure 3). Clarke (1977) reported a population in the Mujib area. Quemsiyeh et al. (1996) described it as rare and reported relict populations in small pockets surrounded by *G. dorcas* in the southern part of Wadi Araba. Amr et al. (2004) stated that the species was declining at an alarming rate. Amr et al. (1987) stated that groups of gazelles could be observed on the Syrian border near the Yarmouk River, and on some occasions on the Jordanian side of the border. According to local people and army personnel, a few individuals still survive near the Yarmouk and Jordan Rivers, on both sides of the international borders. There are no current estimates of population size and there have been no sightings since 2015 (Eid et al. 2020).

**Threats**

Illegal hunting represents the major threat (Quemsiyeh et al. 1996; Eid et al. 2020). Habitat loss and deterioration through agricultural development, fencing pasture for cattle, construction of roads and settlement are further threats. Despite the small numbers, illegal hunting still takes place and a photo of single specimen killed by hunters was posted on Facebook in 2015 (Eid & Handal 2018).

**Conservation Actions**

Mountain Gazelle is protected by law. Eid et al. (2020) listed this species as Critically Endangered (CR) in Jordan. Yarmouk Forest Reserve contains suitable habitat for this species, which provides potential for a reintroduction program, if effective protection can be assured.

**(C2.) *Capreolus capreolus* (Linnaeus, 1758) European Roe Deer**

[Least Concern (IUCN), Critically Endangered

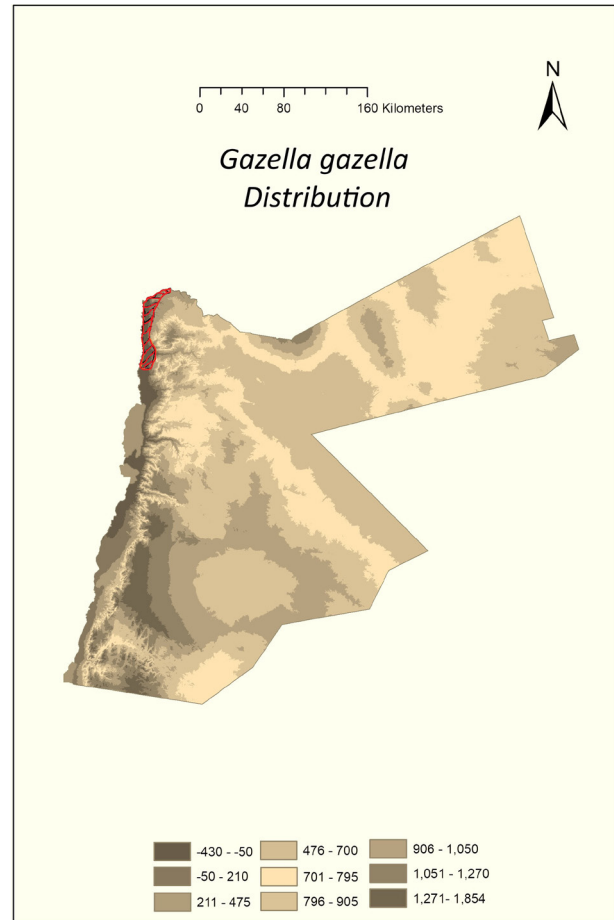


Figure 3. Range distribution of *Gazella gazella* in Jordan.

regionally, Not seen since 2015]

**Distribution and status**

European Roe Deer formerly inhabited forested regions in the northern Jordan valley and the hills of northern Palestine (Harrison & Bates 1991). The species probably disappeared from Jordan at the beginning of the 19<sup>th</sup> century (Amr 2012).

The Royal Society initiated a reintroduction program for the Conservation of Nature (RSCN) in 1996. Four Roe Deer (two males and two females) from the Turkish-Bulgarian border were donated to the RSCN in 1988 and seven more individuals were imported in 1996/1997, believed to be from the same source and including at least five adult females (Amr et al. 2004). The reintroduction program was initiated in Zubiya Nature Reserve in northern Jordan, but later transferred to Ajloun Forest Reserve. In 2006, the 26 animals in the breeding herd (11 males, 15 females) were released into the reserve where they expanded their range into vineyards outside the reserve (Qumsiyeh et al. 1996; Eid



& Ananbeh 2009; Khoury et al. 2012). In 2009, a survey of the reserve observed only four individuals (two males and two females) but mating was recorded (Eid & Ananbeh 2009). Despite annual monitoring, no Roe Deer have been observed since 2015 (Figure 4).

### Threats

Harrison & Bates (1991) reported that the virtual extinction of the roe deer from northern Arabia was due to increased hunting pressure and deforestation. Eid & Ananbeh (2009) reported that habitat degradation, hunting, and urbanization were the major causes of extinction in Jordan. Illegal hunting remains a likely threat.

### Conservation Actions

This species has been reintroduced into Ajloun Forest Reserve, but it is unclear whether the population has become established. Reinforcement or a new reintroduction program will be needed to ensure the survival of Roe Deer in Jordan. To ensure success, it is

critical to strengthen law enforcement in the reserve and monitor the released animals using tracking technologies. It is listed as Critically Endangered in Jordan (Eid et al. 2020). The government is currently planning to add Roe Deer to the list of protected species.

### (C3.) *Gazella marica* (Thomas, 1897) Arabian Sand Gazelle

[Vulnerable (IUCN), Critically Endangered regionally, less than 50 individuals]

### Distribution and status

The Arabian Sand Gazelle was formerly known as *G. subgutturosa marica* but is now considered to be a full species (Wacher et al. 2010). Harrison (1968) reported a specimen from Al Qatraneh in Karak which is now stored at the British Museum. One skull was collected from Safawy (H-5 station) in 1950 and Dr. Muller collected another skull from Qa'a Dhuweila in September 1983 (Amr & Disi 1988). The species was formerly widely distributed in the desert zones of the north-east of the country (Kiwani et al. 2001; Amr 2012; Figure 5). Kiwan et al. (2001) also pointed out that while the Arabian sand gazelle is indigenous to Jordan, other gazelles are occasionally imported illegally from Iraq and, as these females are hornless, they may represent either *G. s. subgutturosa* or intergrades.

Amr (2012) claimed a sharp decline in the population since the 1980s and listed positive records of *Gazella marica* from the Syrian-Jordanian border, specifically at Burqu' near Al Masmah and Hedlat. Kiwan et al. (2001) estimated there were less than 100 individuals in the wild in Jordan, but the population is now estimated at less than 50 (Eid et al. 2020).

A reintroduction program was initiated in 1978, when 10 individuals (nine females and one male) were donated to RSCN and transferred to Shumari Wildlife Reserve. The population increased to 34 in 1990, then declined to 22 individuals in 1990–1991 and 14 in 1994 (Harding 2007). Budieri (1995) stated infectious diseases and poorly designed enclosures contributed to the lack of success. Seven gazelles died during a flood in 1994 (Nelson 1985). Thirty Arabian Sand Gazelles are currently present in Shumari Wildlife Reserve (A. Al-Halah. Reserve manager. pers. comm. 2020).

### Threats

The main threats are illegal hunting (for meat and to a lesser extent for trophies) and habitat loss (due to economic development, conversion to agriculture, and increasing numbers of domestic livestock) while some

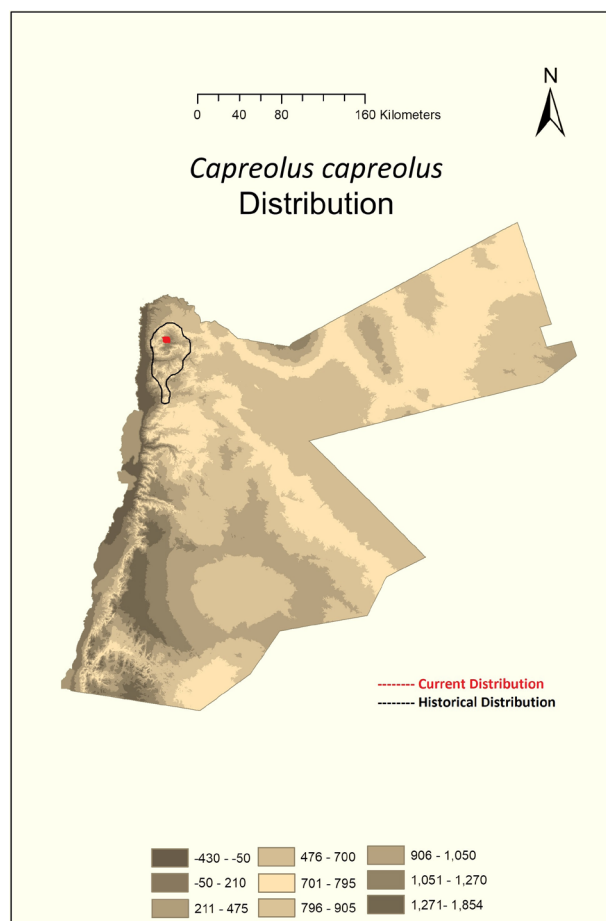


Figure 4. Range distribution of *Capreolus capreolus* in Jordan.

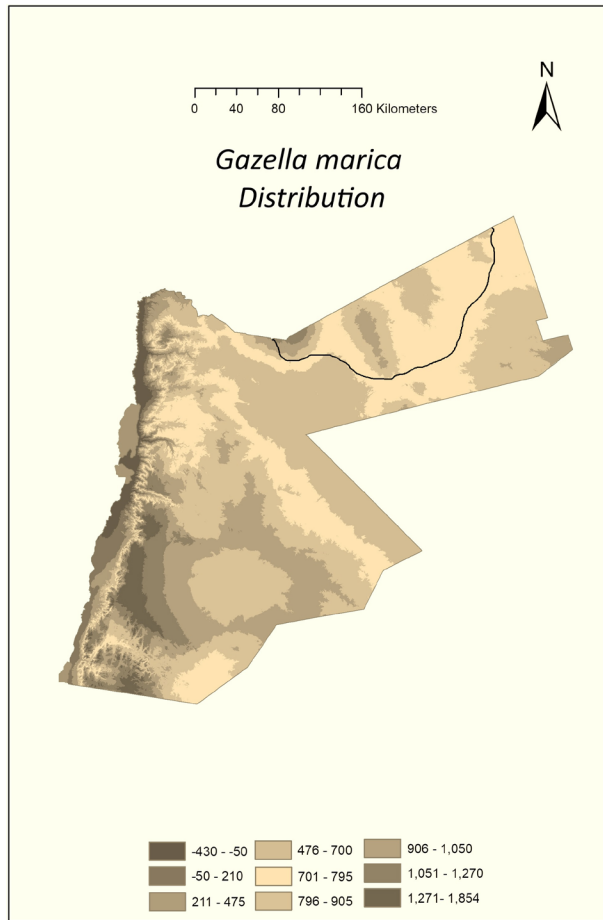


Figure 5. Range distribution of *Gazella marica* in Jordan.

specimens are live caught for private collections (Eid et al. 2020). Eid & Handal (2018) reported images of 23 specimens killed by hunters and posted on Facebook in 2015.

**Conservation Actions**

Arabian Sand gazelle is protected by law, and in-situ at Burqu nature reserve. A small captive-breeding herd is present in the fenced Shumari Wildlife Reserve, but breeding has not been very successful to date. A reintroduction program is needed to reinforce and conserve the remaining wild population, but strict enforcement of the law on hunting is required for any releases to succeed. Eid et al. (2020) listed this species as Critically Endangered in Jordan. Clarke (1976, 1977) proposed wadi Rajil and Burqu as potential reintroduction sites.

**(C4.) *Gazella dorcas* (Linnaeus, 1758) Dorcas Gazelle**

[Vulnerable (IUCN), Critically Endangered regionally, less than 50 individuals]

**Distribution and status**

Bones have been excavated from Neolithic sites in Jordan (Uerpmann 1987). The Schmitz collection has a specimen from Amman (Anon 1946). Recent records are from southern Jordan, from Mujib southwards, mainly in Wadi Araba (Amr & Disi 1988; Amr 2012; Figure 6). The total population in Jordan was estimated at 180–200 (Kiwan et al. 2001) but is now considered to number less than 50 (Eid et al. 2020).

**Threats**

Poaching and land encroachment are the main threats to the remaining populations (Kiwan et al. 2001). Eid & Handal (2018) reported images of two specimens killed by hunters posted on Facebook in 2015.

**Conservation Actions**

Dorcas Gazelle is listed as Critically Endangered in Jordan (Eid et al. 2020) and it is protected by law. Measures are urgently needed to safeguard the remaining small population and to restore the species

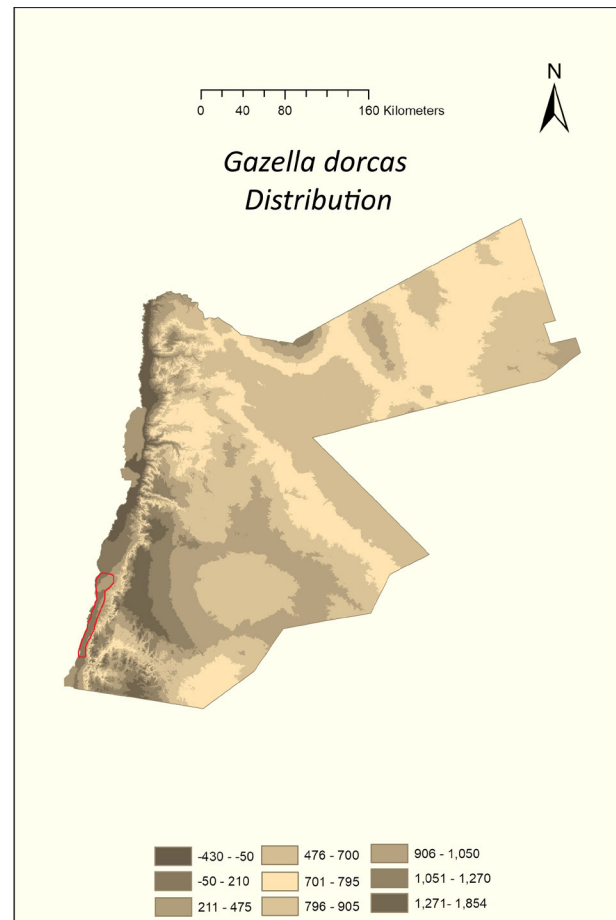


Figure 6. Range distribution of *Gazella dorcas* in Jordan.

through releases and reintroductions into former sites. Potential habitat for this species exists in the western parts of Dana Biosphere Reserves and Rahma Special Conservation Area.

#### (D.) Endangered

##### (D1.) *Capra nubiana* (F. Cuvier, 1825) Nubian Ibex

[Vulnerable (IUCN), Endangered regionally, less than 500 individuals]

#### Distribution and status

The Nubian Ibex is known from archeological sites at several localities across Jordan, in petroglyphs (rock drawings) in the Wadi Rum Protected Area and in mosaics and on the walls of desert palaces and churches in Madaba (Amr et al. 2004). Tristram (1884) reported the species as common from Moab (hills on the eastern side of the Dead Sea), and Jebel Hatrura (near Masada proposed protected area).

The distribution (Figure 7) extends along the western mountains of Jordan from Humrat Ma'ain south to Wadi Rum Protected Area (Amr 2012; Eid et al. 2020). Amr & Disi (1988) recorded ibex in Karak, Wadi Araba, and Ghor Safi. Hatough-Bouran & Disi (1991) stated that the Nubian ibex survived in a few localities along the western mountains of Jordan. Qumsiyeh et al. (1996) and Hays & Bandak (1997) reported ibex presence from Wadi Ibn Hammad Special Conservation Area and Wadi Rum Protected Area. Amr (2012) mentioned that it occurred from the mountains of Aqaba, Al Mazar Al Janobi, Ghawr Al-Mazraa'h, Karak, Al Qadeseyah. Current presence is concentrated in and around Dana and Mujib Biosphere reserves and Wadi Rum Protected Area.

Hatough-Bouran & Disi (1991) warned that ibex was on edge of extinction, but Amr (2012) reported that the ibex managed to persist, despite the rapid decline in its population since the mid-1800s. In 2011, a survey in Dana reserve estimated at least 250 individuals (Eid & Owaji 2011).

A captive-breeding program was initiated in the Raddas area of Mujib Biosphere Reserve in 1989, using 10 captive-bred Nubian Ibex from San Diego Zoo (born spring 1989) along with a locally captured sub-adult male (Khoury et al. 2012). By 1992, the herd had grown to 34 individuals and to 68 adults in 1995. The captive breeding program was terminated in 2006 and RSCN began releasing animals into the wild in 1997 (eight individuals of each sex). In February 1998, six males were released, followed by two main releases in October 1999 (19 individuals) and December 1999 (50 individuals). A survey conducted after the release

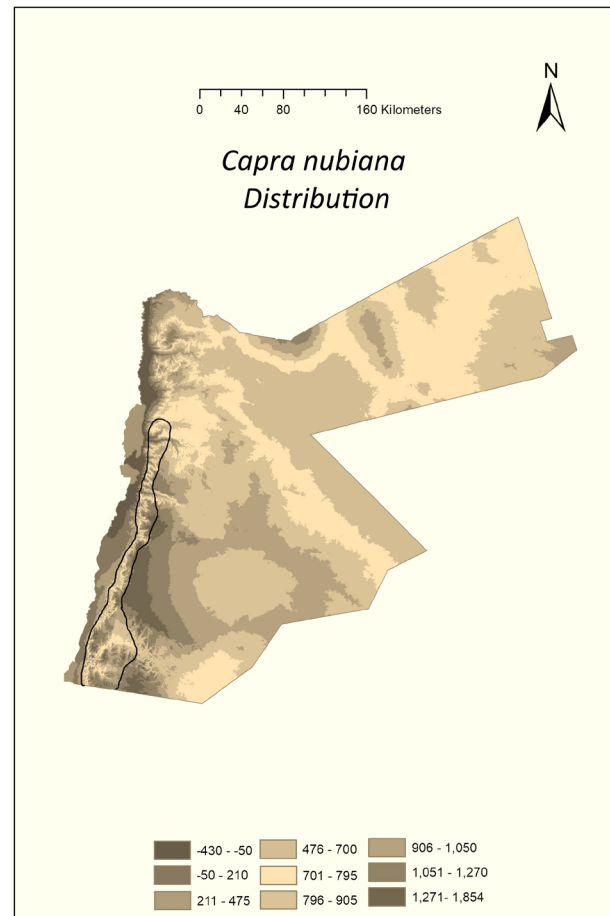


Figure 7. Range distribution of *Capra nubiana* in Jordan.

recorded 150 individuals from various localities within Mujib Biosphere Reserve, 143 of them in the Raddas area (Eid et al. 2020). Small numbers were found in several other parts of the reserve, 103 in total (RSCN, unpub. data).

A second captive breeding program was initiated at Wadi Rum Protected Area in 2014, when 100 Nubian Ibex (30 males and 70 females) were donated by the Environment Agency – Abu Dhabi. In October 2015, following appropriate veterinary and genetic tests, 60 individuals were released into the wild (E. Eid pers. obs. 2015). The population in Wadi Rum Protected Area in 2018 is estimated at 80 individuals. Thus, the current population in Jordan is currently estimated at around 480–500 (Dana Biosphere Reserve – 250, Mujib Biosphere Reserve – 150, Wadi Rum Protected Area – 80) (Eid et al. 2020).

#### Threats

Hunting of ibex was legal until 1978 and is considered the major cause of the sharp decline in Jordan (Eid et

al. 2020) and across its range in the Arabian Peninsula (Habibi 1994). Catullo et al. (1996) stated that competition for forage with domestic livestock and hunting for food and trophies were the major threats in Dana Reserve. Hatough-Bouran & Disi (1991) stated that the pressure on the ibex habitat was also becoming more acute because of decreased mobility of the Bedouin livestock herders. The availability and distribution of waterholes which are a key resource may fluctuate from year to year and thus impact on ibex populations (Amr 2012). Disturbance by high levels of tourists at watering, feeding and birthing sites may also threaten the population. Aloufi & Eid (2014) reported ibex trapped or collected from the mountainous and desert areas of the Tabuk region close to the Jordanian border and sold for USD 734–800. Eid & Handal (2018) reported that images of 115 Nubian Ibex that had been shot by hunters were posted on Facebook in 2015, which is a cause for serious alarm.

**Conservation Actions**

This species occurs in Dana and Mujib Biosphere Reserves, as well as Wadi Rum Protected Area (Eid et al. 2020). It is protected by law, but illegal hunting still poses a threat. Therefore, the Government of Jordan and the RSCN are highly recommended to enforce effective anti-poaching measures in reserves and consider further reintroduction programs following IUCN guidelines to support the wild population. Nubian Ibex is listed as Endangered in Jordan (Eid et al. 2020).

**(E.) Least Concern**

**(E1.) *Sus scrofa* (Linnaeus, 1758) Wild Boar**

[Least Concern (IUCN), Least Concern regionally, numbers unknown but common]

**Distribution and status**

Boessneck & Von den Driesch (1978) and Gerrard et al. (1988) stated that remains were excavated from several archeological sites dating back to the upper Paleolithic period. Tristram (1884), reported that the wild boar “is abundant in every part of Jordan, even in the desert habitats”. *S. scrofa* was introduced to Azraq where it became common but later disappeared according to Meinertzhagen (1924). Wild Boars occur in river valleys, cultivated areas, and forested hills; they may be observed in desert areas but do not move far from water (Harrison & Bates 1991). Amr & Disi (1988) frequently saw this animal around north Shounah and the Yarmouk River. Qumsiyeh et al. (1996) reported a large population in Jordan and confirmed that this

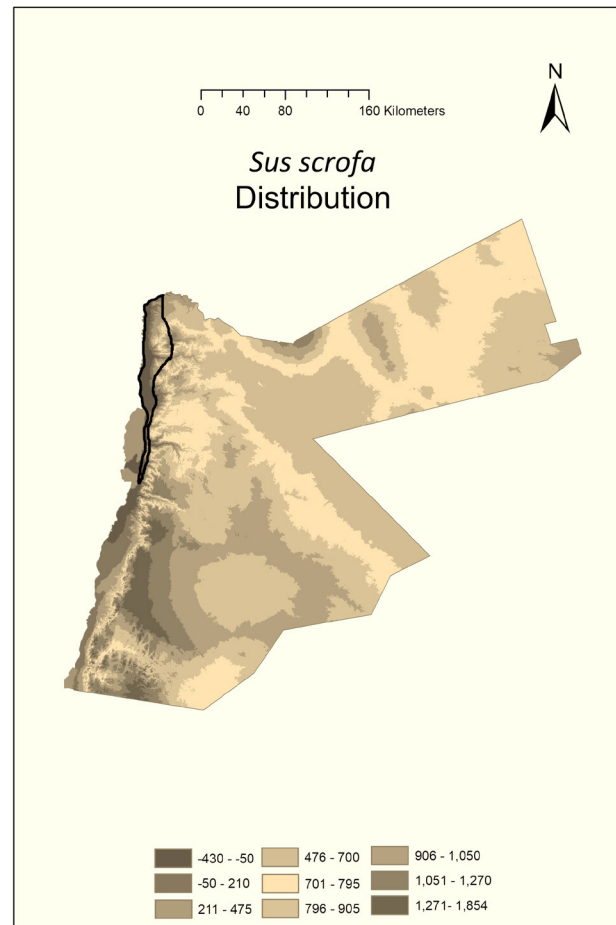


Figure 8. Range distribution of *Sus scrofa* in Jordan.

species is still common in the Jordan valley, south of Ghor Safi. Eid & Ananbeh (2009) reported this species as common in Ajloun Forest Reserve (Figure 8). Wild Boars are agricultural pests and have caused damage to citrus farms along the Jordan Valley (Rahamat 1982).

There is no accurate estimate for the population of the Wild Boar in Jordan, but it is not considered threatened and numbers are increasing (Quemsiyeh et al. 1996; Amr 2012; Eid et al. 2020). The government allowed hunting of Wild Boar in 2010 to control its numbers due to the increasing damage to crops, and as a precautionary step in controlling swine flu (Amr (2012). However, the population is increasing for various reasons, including their presence in border areas which are protected by the army, the fact that this animal is not allowed as a food for Muslims (Quemsiyeh et al. 1996), and the lack of interest by hunters.

**Threats**

There are no significant threats to the Wild Boar in Jordan. Eid & Handal (2018) reported 40 specimens



killed, based on Facebook posts by Jordanian hunters.

### Conservation Actions

Wild Boar was listed as Least Concern in Jordan (Eid et al. 2020). The species occurs in Ajloun Forest Reserve, Dibeen Forest Reserve, and Yarmouk Forest Reserve (Eid et al. 2020). No specific conservation measures are required.

## DISCUSSION AND CONCLUSIONS

The majority of ungulate species in Jordan have been exposed to many pressures and threats that have significantly reduced their numbers and led to the extinction of several of them. The major threat is extensive and uncontrolled hunting, accelerated by the increased power of modern automatic weapons, and the development and use of all-terrain vehicles which enable people to venture into any part of the territory of Jordan. A second important factor is a significant increase in the numbers of domestic livestock, resulting in a serious deterioration in the quality of rangelands through depletion of palatable plants, soil erosion, and desertification. Feral dogs may also predate wild ungulates. These factors are considered the major challenges that need to be overcome to ensure the success of any future re-introduction projects in Jordan.

Mesopotamian Fallow Deer has been extirpated from Jordan and populations elsewhere are so small that establishing a captive breeding program for reintroduction appears unrealistic at present. Arabian Oryx and Wild Ass have also been extirpated, although a small semi-captive population of Wild Ass is maintained in Shumari Wildlife Reserve, and larger populations of Arabian Oryx in Shumari Wildlife Reserve and Wadi Rum Protected Area. There are substantial global and regional ex situ populations of both species, especially Arabian Oryx, that could provide source stock but releases into the wild currently face formidable obstacles, principally the unavailability of an extensive area of good habitat and the difficulty in protecting such wide-ranging species from hunting.

Mountain Gazelle range in Jordan has contracted to the extreme north of the Jordan valley and no confirmed observations have been reported since 2015. Animals may cross into the country from adjoining areas, but a reinforcement and reintroduction programme appear the most reliable way to re-establish their permanent presence. Roe deer have been reintroduced but again no sightings have been confirmed since 2015 and it is

unclear whether the animals have failed to establish or have dispersed.

Arabian Sand Gazelle and Dorcas Gazelle now occur only in very small populations (<50) in the north-eastern desert and southern Rift Valley (Wadi Araba), respectively. Such small populations are highly vulnerable to extinction from ongoing threats, stochastic events, and low genetic diversity. Both species appear close to extirpation in the wild in Jordan. Reinforcement of the surviving populations, and/or reintroductions to other sites within their former range are needed to ensure the persistence of these two species in Jordan.

Nubian Ibex is present in higher numbers (<500) and occurs in Mujib and Dana Biosphere Reserves as well as Wadi Rum Protected Area, and thus receives some protection. However, these sites are isolated from each other by physical barriers (Eid et al. 2020). So, efforts to identify, and then protect, corridors between them may become a priority.

There are breeding herds of some species at Shumari Wildlife Reserve, and animals held at Al Mawa' for Nature and Conservation, belonging to the Princess Alia Foundation, could also be used as a genetic reservoir. However, the current conditions at both these sites are not sustainable, since the breeding groups are increasing, and there is no long-term program for release into the wild due to the existing threats and land use issues, so this will place more financial burdens on the hosting institutions.

The growing interest in business-based conservation that relies on the eco-tourism sector rather than the previous modality of nature-based conservation is another factor that might hinder the establishment of new programs to reintroduce ungulate species. Enforcement has been strengthened following the establishment of the Royal Department for Environmental Protection (RDEP) in 2006, which was merged with the tourism police in 2020 to form the Royal Department for Environmental Protection and Tourism. However, increasing the number of protection staff, stronger logistical and financial support as well as capacity building programs, are required to ensure that enforcement and protection are effective. Financial resources may be allocated by the Government of Jordan represented by the Ministry of Environment to support the work of the RSCN, RDEP and other organizations in strengthening enforcement and conservation efforts as well as conducting research within Jordan's protected areas. Scientific research needs to be designed to support policies, development of legislation, and management of species and habitats. More collaboration

and coordination have to be developed between experts in this field, and the responsible entities in order to exchange information, and research outputs.

However, it would be preferable to begin by regarding these charismatic species as an aspect of natural capital in which to invest for the future. Successful re-introduction programs can be a key driver of nature-based tourism, instead of following a narrower, business-based tourism model. All international standards should be applied, especially the IUCN guidelines on reintroductions and translocations, before considering any species for re-introduction.

The latest red data book of the mammals in Jordan (Eid et al. 2020) highlighted the alarming situation, with four ungulate species assessed as Critically Endangered and three species Regionally Extinct or Extinct in the Wild in Jordan. This highlights the need to ensure effective enforcement and initiate measures to reverse habitat degradation and control of hunting in order to facilitate reintroduction programs and develop more collaboration and partnerships at regional and global levels, increase awareness of the importance of ungulates, and above all to enhance finance allocations for conservation purposes.

## REFERENCES

- Abu-Jafar, M.Z. & C. Hays-Shahin (1988). Re-introduction of the Arabian Oryx into Jordan, pp. 35–40. In: Dixon, A. & D. Jones (eds.). *Conservation and Biology of Desert Antelopes*. Christopher Helm, London, 499pp.
- Abu-Eid, O. (2001). An overview of reintroduction programmes in Jordan. *Al Reem* 70: 10–11.
- Al Eisawi, D. (1996). *Vegetation of Jordan*. UNESCO Cairo Office, Cairo.
- Aloufi, A. & E. Eid (2014). Conservation Perspectives of Illegal Animal Trade at Tabuk Local Market, Kingdom of Saudi Arabia. *Traffic Bulletin* 26: 2.
- Amr, Z. (2012). *Mammals of Jordan*. 2<sup>nd</sup> Edition. Al Rai Press. Amman, 308pp.
- Amr, Z.S. & A.M. Disi (1988). Jordanian Mammals Acquired by the Jordan University Natural History Museum. Publication of the University of Jordan, Amman, 32pp.
- Amr, Z.S., M.A. Baker & L. Rifai (2004). Mammals of Jordan. *Denisia* 14: 437–465.
- Amr, Z.S., S.C. Woodbury & A.M. Disi (1987). On a collection of mammals from Jordan. *Dirasat* 14: 131–136.
- Anon. (1946). The Schmitz collection of Mammals. *Bulletin Jerusalem Nature Club*. 23: 1–2.
- Bar-Oz, G., M. Zeder & F. Hole (2011). Role of mass-kill hunting strategies in the extirpation of Persian Gazelle (*Gazella subgutturosa*) in the Northern Levant. *Proceedings of the National Academy of Sciences* 108: 3745–3750.
- Bates, D.M.A. (1937). New Pleistocene mammals from Palestine. *The Annals and Magazine of Natural History*. 29: 397–400.
- Betts, A. & D. Burke (2015). Desert kites in Jordan – a new appraisal. *Arabian Archaeology and Epigraphy* 26: 74–94.
- Bodenheimer, F.S. (1958). The present taxonomic status of the terrestrial mammals of Palestine. *Bulletin of the Research Council of Israel* 7b: 165–190.
- Boessneck, J. & A. Von Den Driesch (1978). Preliminary analysis of the animal bones from Tel Hesban. *Andrews University Monographs* 10: 259–287.
- Budieri, A. (1995). Captive breeding programme-biodiversity country study. The Hashemite Kingdom of Jordan. Report for United Nations Development Programme & Global Environmental Facility, Amman, Jordan.
- Carruthers, D. (1935). *Arabian Adventure*. H.E and G. Witherby, London, 200 pp.
- Catullo, G., P. Ciucci, A. Disi & L. Boitani (1996). Nubian ibex in southwestern Jordan (Dana Nature Reserve). *Oryx* 30: 222–224.
- Clarke, J.E. (1976). A preliminary Study of Jordan's proposed national parks. Unpublished report. Royal Society for the Conservation of Nature. Amman.
- Clarke, J.E. (1977). Shumari Wildlife Reserve management plan. Royal Society for the Conservation of Nature. Amman.
- Clarke, J.E. (1979). A proposal for wildlife reserves in Jordan (IUCN Project 1591). Royal Society for the Conservation of Nature, Amman.
- Dollman, G. & J.B. Burlace (1935). *Rowland ward's records of big game. African and Asiatic Sections*. 10<sup>th</sup> edition. Rowland Ward, London, 433 pp.
- Eid, E. & Y. Ananbeh (2009). Assessment of the release program of the European Roe Deer *Capreolus capreolus* (Cetartiodactyla: Cervidae) at Ajloun Nature Reserve, Jordan. *Journal of Threatened Taxa* 1(6): 323–326. <https://doi.org/10.11609/JoTT.o2103.323-6>
- Eid, E. & R. Handal (2018). Illegal hunting in Jordan: Using social media to assess impacts on wildlife. *Oryx*. 52: 730-735. <https://doi.org/10.1017/S0030605316001629>
- Eid, E. & M. Owaji (2011). Nubian Ibex Survey at Dana Biosphere Reserve. Unpublished Report. Royal Society for the Conservation of Nature, Amman.
- Eid, E., M.A. Baker & Z. Amr (2020). *National Red Data Book of Mammals in Jordan*. Amman. Jordan: IUCN Regional Office for West Asia. Amman. <https://doi.org/10.2305/IUCN.CH.2020.12.en>
- Fitter, M. (1967). New Hope for Wildlife in Jordan. *Oryx* 9: 35–38. <https://doi.org/10.1017/S0030605300005810>
- Gerrard, A.N., S. College, C. Hunt & R. Montagle (1988). Environment, settlement and subsistence during the late Pleistocene and early Holocene in the Azraq Basin. *Colloque International CNRS. Prehistorik du Levant*. 2.
- Habibi, K. (1994). *The desert ibex: life history, ecology, and behavior of the Nubian ibex in Saudi Arabia*. Immel Publishing, London, 192 pp.
- Harding, L., O. Abu-Eid, N. Hamidan & A. Al Sha'lan (2007). Reintroduction of the Arabian oryx *Oryx leucoryx* in Jordan: War and redemption. *Oryx* 41: 478–487. <https://doi.org/10.1017/S0030605307005029>
- Harrison, D.L. (1968). *The Mammals of Arabia: Carnivora, Hyracoida and Artiodactyla*. Vol. 2. Ernest Benn Ltd., London, 381pp.
- Harrison, D.L. (1972). *The Mammals of Arabia. Volume 3: Lagomorpha, Rodentia*. Ernest Benn, Ltd. London, 670pp.
- Harrison, D.L. & P.J. Bates (1991). *The Mammals of Arabia*. Harrison Zoological Museum, Kent, 354pp.
- Hatough, A.M.A. & D.M. Al-Eisawi (1988). The Arabian Oryx in Jordan. *Journal of Arid Environments* 14: 291–300.
- Hatough-Bouran, A. & A.M. Disi (1991). History, distribution and conservation of large mammals and their habitats in Jordan. *Environmental Conservation* 18: 19–32.
- Hays, C. & N. Bandak (1997). Jordan. In: Shackleton, D.M. (ed.) *Wild sheep and goats and their relatives. Status survey and conservation action plan for Caprinae*. IUCN/SSC Caprinae Specialist Group, pp. 60–63. IUCN/SSC Caprinae Specialist Group, Gland, Switzerland and Cambridge, UK.
- IUCN/SSC (2013). *Guidelines for Reintroductions and Other Conservation Translocations. Version 1.0*. Gland, Switzerland: IUCN Species Survival Commission, viiii + 57 pp.
- Kaczynsky, P., B. Lkhagvasuren, O. Pereladova, M. Hemami, & A. Bouskila (2015). *Equus hemionus*. The IUCN Red List of Threatened



- Species 2015: e.T7951A45171204. <https://doi.org/10.2305/IUCN.UK.2015-4.RLTS.T7951A45171204.en>
- Khoury, F., Z. Amr, N. Hamidan, I. Al Hassani, S. Mir, E. Eid & N. Boulad (2012).** Some Introduced vertebrate species to the Hashemite Kingdom of Jordan. *Vertebrate Zoology* 62: 435–451.
- Kiwan, K., J. Boef & A. Boudari (2001).** Chapter 18. Jordan. In: Mallon, D.P. & S.C. Kingswood (compilers). *Antelopes. Part 4: North Africa, the Middle East, and Asia. Global Survey and Regional Action Plans*. SSC Antelope Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK, viii+260pp.
- Meinertzhagen, R. (1924).** An account of a journey across the southern Syrian desert from Amman in Transjordan to Ramadi on the Euphrates. *Ibis* 11: 87–100.
- Mountfort, G. (1965).** *Portrait of a Desert*. Collins. London, 192pp.
- Musil, A. (1927).** *The Middle Euphrates*. American Geographic Society. New York, 426pp.
- Nelson, B. (1985).** Return to Azraq. *Oryx* 19: 22–26.
- Qumsiyeh, M.B. (1996).** *Mammals of the Holy Land*. Texas Tech University Press, Lubbock, 389pp.
- Qumsiyeh, M.B., Z.S. Amr & A.M. Budairi (1996).** Status and conservation of Artiodactyla (Mammalia) in Jordan. *Mammalia* 60: 417–430.
- Rahamat, O. (1982).** The Wild Boar. *Al-Reem*. 10: 12–13.
- Raswan, C.R. (1935).** *The Black Tents of Arabia*. Hutchinson. London, 280pp.
- Talbot, L.M.A. (1960).** A look at threatened species. A report on some animals of the Middle East and southern Asia, which are threatened with extermination. *Oryx* 5: 153.
- Tchernov, E.T. Dayan & Y. Yom-Tov (1986/7).** The paleogeography of *Gazella gazelle* and *Gazella dorcus* during the Holocene of the southern Levant. *Israel Journal of Zoology* 34: 51–59.
- Tristram, H.B. (1884).** *The Survey of Western Palestine. The Fauna and Flora of Palestine*. Palestine Exploration Fund, London, 455pp.
- Uerpmann, H.P. (1987).** *The ancient distribution of ungulate mammals in the Middle East*. Wiesbaden, Ludwig Reichert Verlag, 173pp.
- Wacher, T., T. Wronski, R.L. Hammond, B. Winney, M.J. Blacket, K.L. Hundertmark, O.B. Mohammed, Sa. Omer, W. Macasero, H. Lerp, M. Plath & C. Bleidorn (2010).** Phylogenetic analysis of mitochondrial DNA sequences reveals polyphyly in the Goitred Gazelle (*Gazella subgutturosa*). *Conservation Genetics* 12: 827–831.







**The challenges of the climate crisis are frustrating.  
Learn to lead to make a positive change.**



**The Ram Hattikudur Advanced Training in Conservation (RHATC)** is a four-month residential course mentored by Indian and international experts. The course will bridge the gap between academics and on-ground conservation realities by equipping you with knowledge, tools, and an understanding of global conservation issues.

### **Challenge yourself**

- Resolve conservation challenges.
- Develop skills in assessments and planning.
- Exposure to real-time conservation needs.
- A window into conservation NGOs.
- Potential opportunities for internship.
- Potential job opportunities with conservation organizations.
- Pursue conservation careers
- Potential to start your own organization.
- Exposure to conservation experts.
- Develop leadership skills.

## **Apply now!**

**Applications open:** 09 August 2021  
**Application last date:** 31 August 2021  
**Course start date:** 12 October 2021

**To know more visit:**  
[www.rhatc.zooreach.org](http://www.rhatc.zooreach.org)





www.threatenedtaxa.org

OPEN ACCESS



The Journal of Threatened Taxa (JoTT) is dedicated to building evidence for conservation globally by publishing peer-reviewed articles online every month at a reasonably rapid rate at [www.threatenedtaxa.org](http://www.threatenedtaxa.org). All articles published in JoTT are registered under [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/) unless otherwise mentioned. JoTT allows unrestricted use, reproduction, and distribution of articles in any medium by providing adequate credit to the author(s) and the source of publication.

ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)

August 2021 | Vol. 13 | No. 9 | Pages: 19191–19390

Date of Publication: 26 August 2021 (Online & Print)

DOI: 10.11609/jott.2021.13.9.19191-19390

#### Articles

**On the impact of earthquake-induced landslides on Red Panda *Ailurus fulgens* (Mammalia: Carnivora: Ailuridae) habitat in Langtang National Park, Nepal**  
– Yogesh Rana Magar, Man Kumar Dhamala, Ajay Mathema, Raju Chauhan & Sijar Bhatta, Pp. 19191–19202

**Rhesus Macaque *Macaca mulatta* (Mammalia: Primates: Cercopithecidae) in a human-modified landscape: population, activity budget, and societal perceptions in Bangladesh**  
– Sufia Akter Neha, Mohammad Ashraf Ul Hasan, Mohammad Abdul Baki & Subrina Sehrin, Pp. 19203–19211

**Factors affecting the species richness and composition of bird species in a community managed forest of Nepal**  
– Bishow Poudel, Bijaya Neupane, Rajeev Joshi, Thakur Silwal, Nirjala Raut & Dol Raj Thanet, Pp. 19212–19222

#### Communications

**A large mammal survey in Koyli Alpha Community Wildlife Reserve and its surroundings in the Great Green Wall extension area in Senegal**  
– Anna Niang & Papa Ilnou Ndiaye, Pp. 19223–19231

**Blackbuck *Antelope cervicapra* (Mammalia: Cetartiodactyla: Bovidae) estimates in human-dominated landscape in Aligarh, Uttar Pradesh, India**  
– Mujahid Ahamad, Jamal A. Khan & Satish Kumar, Pp. 19232–19238

**Diet of Leopards *Panthera pardus fusca* inhabiting protected areas and human-dominated landscapes in Goa, India**  
– Bipin S. Phal Desai, Avelyno D'Costa, M.K. Praveen Kumar & S.K. Shyama, Pp. 19239–19245

**First record of interspecies grooming between Raffles' Banded Langur and Long-tailed Macaque**  
– Zan Hui Lee, Andie Ang & Nadine Ruppert, Pp. 19246–19253

**Photographic evidence of Red Panda *Ailurus fulgens* Cuvier, 1825 from West Kameng and Shi-Yomi districts of Arunachal Pradesh, India**  
– Moktan Megha, Sylvia Christi, Rajesh Gopal, Mohnish Kapoor & Ridhima Solanki, Pp. 19254–19262

**On the reproductive biology of the invasive Armoured Sailfin Catfish *Pterygoplichthys pardalis* (Castelnau, 1855) (Siluriformes: Loricariidae) from the natural drainages in Thiruvananthapuram, India**  
– Smrithy Raj, Suvarna S. Devi, Amrutha Joy & A. Biju Kumar, Pp. 19263–19273

**On the high bird diversity in the non-protected regions of Trashiyangtse District in Bhutan**  
– Lam Norbu, Phuntsho Thinley, Tandin Wangchuck, Ugyen Dechen, Lekey Dorji, Tshering Choephel & Pasang Dorji, Pp. 19274–19292

**Population status and distribution of the Critically Endangered Bengal Florican *Houbaropsis bengalensis* in the grassland of Koshi Tappu Wildlife Reserve, Nepal**  
– Ritika Prasai, Hemanta Kafley, Suraj Upadhaya, Swosthi Thapa, Pratistha Shrestha, Alex Dudley & Yajna Prasad Timilsina, Pp. 19293–19301

**Is habitat heterogeneity effective for conservation of butterflies in urban landscapes of Delhi, India?**  
– Monalisa Paul & Aisha Sultana, Pp. 19302–19309

**A preliminary checklist of moths (Lepidoptera: Heterocera) from Gangajalghati, Bankura, West Bengal, India**  
– Ananya Nayak, Pp. 19310–19323

**First report of three species of the genus *Diaphanosoma* (Crustacea: Cladocera: Sididae) from Jammu waters (J&K), India**  
– Nidhi Sharma & Sarbjeet Kour, Pp. 19324–19337

#### Review

**Wild ungulates in Jordan: past, present, and forthcoming opportunities**  
– Ehab Eid & David Mallon, Pp. 19338–19351

#### Viewpoint

**The captive population of the Lion-tailed Macaque *Macaca silenus* (Linnaeus, 1758). The future of an endangered primate under human care**  
– Nilofer Begum, Werner Kaumanns, Alexander Sliwa & Mewa Singh, Pp. 19352–19357

#### Short Communication

**Jaguar *Panthera onca* (Linnaeus, 1758) (Mammalia: Carnivora: Felidae) presumably feeding on Flathead Catfish *Pylodictis olivaris* (Rafinesque, 1818) (Actinopterygii: Siluriformes: Ictaluridae) at Aros and Yaqui rivers, Sonora, Mexico**  
– Juan Pablo Gallo-Reynoso, Pp. 19358–19362

#### Notes

**Life near a city: activity pattern of Golden Jackal *Canis aureus* Linnaeus, 1758 (Mammalia: Carnivora: Canidae) in a habitat adjoining Bhubaneswar, India**  
– Subrat Debata, Pp. 19363–19366

**Chemical immobilisation of a Eurasian Lynx *Lynx lynx* (Linnaeus, 1758) (Mammalia: Carnivora: Felidae) with ketamine-dexmedetomidine mixture in Ladakh, India**  
– Animesh Talukdar & Pankaj Raina, Pp. 19367–19369

**White-bellied Heron *Ardea insignis* in Hkakabo Razi Landscape, northern Myanmar**  
– Myint Kyaw, Paul J.J. Bates, Marcela Suarez-Rubio, Bran Shaung, Han Nyi Zaw, Thein Aung, Sai Sein Lin Oo & Swen C. Renner, Pp. 19370–19372

**Range extension of the Common Slug Snake *Pareas monticola* (Cantor, 1839) (Reptilia: Squamata: Pareidae): a new family record for Nepal**  
– Dipa Rai, Manoj Pokharel & Tapil P. Rai, Pp. 19373–19375

**First record of *Mantispilla indica* (Westwood, 1852) (Neuroptera: Mantispidae) from the Western Ghats, India**  
– T.B. Suryanarayanan & C. Bijoy, Pp. 19376–19379

**A new distribution record of the Western Ghats endemic damselfly *Melanoneura bilineata* Fraser, 1922 (Insecta: Odonata) from Maharashtra, India**  
– Yogesh Koli & Akshay Dalvi, Pp. 19380–19382

**A new record of the Emerald Striped Spreadwing *Lestes viridulus* Rambur, 1842 (Zygoptera: Lestidae) from Nepal**  
– Manoj Sharma, Pp. 19383–19385

**Rediscovery of the Bhutan Primrose *Primula jigmediana* W.W. Smith (Angiosperms: Primulaceae) after 87 years in Bumdeling Wildlife Sanctuary, Bhutan**  
– Tez B. Ghalley, Tshering Dendup, Karma Sangay & Namgay Shacha, Pp. 19386–19388

**First report of *Golovinomyces* sp. causing powdery mildew infection on *Dyschoriste nagchana* in Western Ghats of India**  
– Sachin Vasantrao Thite, Pp. 19389–19390

Publisher & Host

