Nepalese Journal of Zoology
ISSN: 2705-4403 (Print) & 2705-4411 (Online)
www.cdztu.edu.np/njz
Volume 8 | Issue 2 | December 2024
https://doi.org/10.3126/njz.v8i2.74937

Short communication

Additional knowledge on the Egyptian mongoose *Herpestes ichneumon* (Linnaeus, 1758) from the Jordan River, Jordan

Ehab Eid[1]* | Mohammad Farid Alayyan [2] | Said A. Damhoureyeh [3]

[1] Steering Committee Member at IUCN SSC. Lutfi Queder Street. Al-Yadodah 11610, Amman, Jordan
[2] Blueberrytrading Est. Ghzaleh Street, khelda Um Alsummaq, Amman, Jordan
[3] University of Jordan, Biological Sciences Department, School of Science, Amman, Jordan
*** Correspondence:** eha_jo@yahoo.com

Suggested citation: Eid E., Alayyan M.F. and Damhoureyeh S.A. 2024. Additional knowledge on the Egyptian mongoose *Herpestes ichneumon* (Linnaeus, 1758) from the Jordan River, Jordan. Nepalese Journal of Zoology, 8(2):60–64.
https://doi.org/10.3126/njz.v8i2.74937

Article History:
Received: 05 May 2024
Revised: 19 September 2024
Accepted: 20 September 2024

Abstract

The Egyptian mongoose (*Herpestes ichneumon*) is globally assessed as Least Concern, yet within Jordan, it has been classified as Endangered due to its limited extent of occurrence and rapid habitat degradation. Using camera traps, this study was conducted from 01 June 2020 to 28 February 2022 on a private farm in the Sheikh Hussein area along the lower Jordan River. Despite challenges such as dense reed growth, farm activities, and the presence of workers and roaming dogs, we successfully captured photographic evidence of the Egyptian mongoose displaying various social behaviors, including group and solitary sightings. The species exhibited a diurnal activity pattern and coexisted with other carnivores, such as the golden jackal (*Canis aureus*), jungle cat (*Felis chaus*), and red fox (*Vulpes vulpes*). Our data suggest a small local population, potentially comprising the four individuals observed, vulnerable to localized threats like incidental poisoning and habitat changes due to farming. To mitigate these risks, we recommend implementing Other Effective Area-based Conservation Measures (OECMs) as a tool beyond Jordan's national protected area network to achieve effective and sustained long-term in situ biodiversity conservation outcomes in partnership with the military.

Keywords: Camera trap; *Herpestes ichneumon*; Egyptian mongoose; Jordan; Jordan River; northern Ghor

1 | Introduction

The Egyptian mongoose (*Herpestes ichneumon*) has been classified as a species of Least Concern globally by the IUCN Red List of Threatened Species, indicating a stable population (Do Linh San et al. 2016). This classification has remained consistent in assessments such as the Mediterranean Mammals' Red List (Temple & Cuttelod 2009), as well as the most recent evaluation of mammals in the Arabian Peninsula (Mallon et al. 2023), following a prior classification as Data Deficient in the carnivore assessment for the Arabian Peninsula with an unknown population size (Mallon & Budd 2011). However, Eid et al. (2020) considered the Egyptian mongoose an Endangered species in Jordan.

This species is characterized by its slender body, bushy tail, elongated face, small, rounded ears that remain below head level, and short legs (Kingdon 1977; Hayssen 1993; Osborn 1998). Sexual maturity is reached at approximately two years of age, and typically two to four young are born in July or August, as observed in populations in Spain (Hinton & Dunn 1967). The Egyptian mongoose predominantly inhabits areas with understory vegetation in coastal and riparian environments, such as streams, rivers, marshes, and swamps (Palomares 2013). It avoids humid forests and extreme desert conditions (Delibes 1999; Palomares 2013). In Europe, this species is often found in Mediterranean maquis, with a marked preference for humid and riparian habitats (Delibes 1999). The home range of the Egyptian mongoose spans approximately three-square kilometers, and it is diurnal and omnivorous (Delibes 1999).

The Egyptian mongoose is believed to have been introduced into Europe by humans, supported by zoogeographical analysis (Delibes 1999) and the absence of this species in Europe's fossil records (Do Linh San et al. 2016). Its range includes the north-western part of the Iberian Peninsula, specifically in Spain (Palacios et al. 1992; Delibes 1999; Sobrino et al. 2007), Portugal (Borralho et al. 1995) and is also found in Italy and Yugoslavia (Do Linh San et al. 2016). It spans extensive areas across Africa from Senegal and Gambia to East Africa, further extending southward into Angola, Zambia, Gabon, Malawi, Mozambique, northeastern Namibia, northern Botswana, northern and eastern Zimbabwe, and along the entire South African coastline (Demirsoy 1998; Basuony 2000; Kuru 2001; Ramsay 2002; Berger et al. 2003; Bahaa-el-din et al. 2013; Palomares 2013; Do Linh San et al. 2016). North Africa's range follows a narrow coastal strip from Western Sahara to Tunisia and extends from northern and eastern Egypt southward to Ethiopia (Palomares 2013). Additionally, the species was recorded from various localities in Egypt, including banks of the River Nile, EI-Fayum, Burg El-Arab to the west of Alexandria, and the Sinai Peninsula

(Osborn & Helmy 1980; Kasparek 1992; Delibes 1999) to the southern regions of Turkey (Bosman & Van Den Berg 1988), and has been recorded in Pakistan (Barry 1983).

The origin of the Egyptian mongoose's distribution in the Arabian Peninsula is debated, with suggestions including escape or intentional introduction (Mallon et al. 2023). It has been sighted in Syria (Masseti 2009), the West Bank, and Gaza in Palestine (Qumsiyeh 1996; Albaba 2016; Abd Rabou 2019), as well as Lebanon (Harrison 1991). In Jordan, sightings have been confirmed from various localities, including Irbid governorate and the Jordan Valley, along with reports from Amman, Al Mujib Biosphere Reserve, and Yarmouk Protected Area (Amr et al. 1987; Amr & Disi 1988; Qumsiyeh et al. 1993; Eid et al. 2020). In 2005, five Egyptian mongoose individuals originally from Egypt were introduced to the Birgish area in Irbid Governorate in Jordan for snake control, initially kept captive, and their offspring were released in the forest areas of Birgish (Khoury et al. 2012; Eid et al. 2020).

This study is the initial effort to enhance understanding of the Egyptian mongoose's status, distribution, and coexistence with other species in the lower Jordan River. It also proposes using Other Effective Area-based Conservation Measures (OECMs) to complement existing conservation initiatives in Jordan. As defined by the CBD in Decision 14/8, OECMs are geographically defined areas that are not officially protected but still provide long-term conservation benefits for biodiversity (CBD 2018). These areas include indigenous lands, community-managed ecosystems, or private lands where biodiversity is conserved through traditional practices, sustainable use, or legal frameworks. While OECMs may have other objectives, such as water management, they can still result in effective biodiversity conservation. The OECMs may be governed by various entities, including government agencies, private groups, or indigenous peoples, without altering ownership or governance. Importantly, OECMs do not replace the need for better management of existing protected areas or the creation of new ones. Still, they are a critical tool to meet Target 3 of the Convention on Biological Diversity's goals. Achieving this target requires all available approaches, including equitable governance and effective management of protected areas (WWF & IUCN WCPA 2023).

2 | Materials and methods

2.1 | Study area

The research area covered a 0.099 km² private farm situated in Sheikh Hussein, in the lower lands of the Jordan River in Jordan (Fig. 1) ((UTM): 36 S 742018.23 E; 3597034.04 N). The study area and its surroundings are extensively utilized for agricultural activities, primarily focusing on citrus orchards and vegetable cultivation. The study site is within the Saharo–

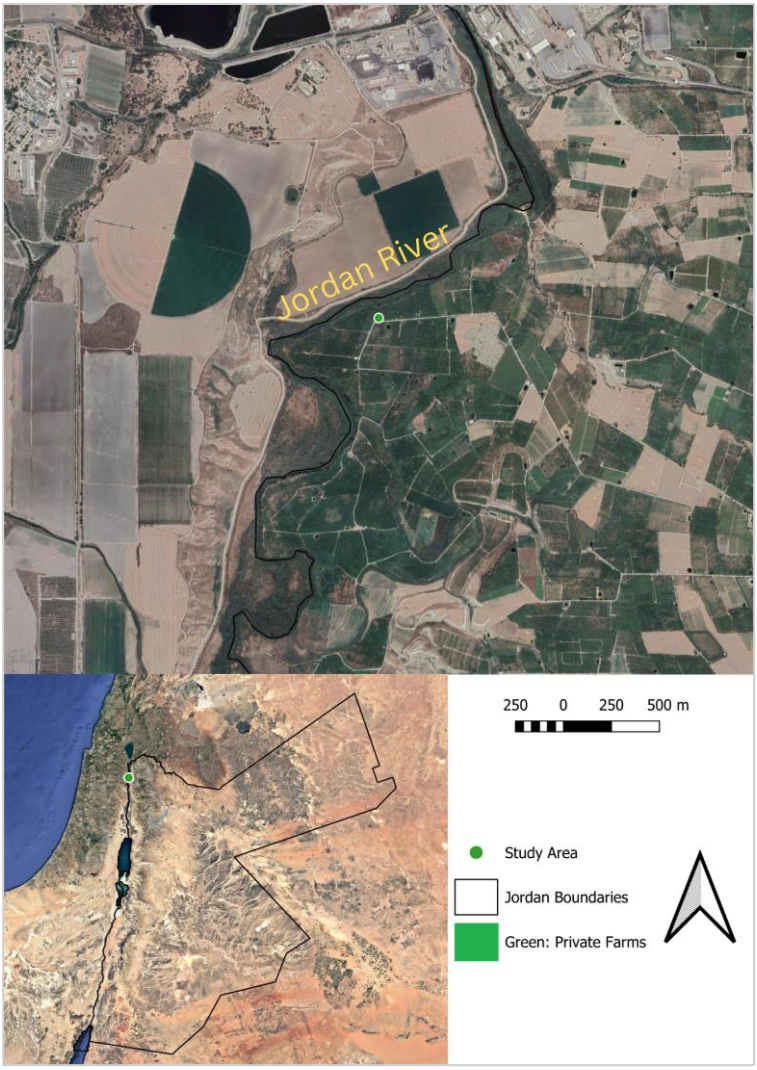

Figure 1. Map of the study area showing land use practices.

Sindian–Nubo–Sindian region, characterized by a semi-arid climate with hot summers and mild winters. The mean annual minimum temperature ranges from 10 to 29 °C, while the mean maximum temperature ranges from 20 to 35 °C. Annual rainfall varies between 50 and 100 mm. The soils in this area are predominantly alluvial, saline, sandy, and granitic (Taifour et al. 2022). The farm's boundaries extend to the Jordan River, with its landscape characterized by riparian vegetation dominated by common reed (*Phragmites communis*), cattail (*Typha domingensis*), and Athel trees (*Tamarix* spp.). Additionally, a variety of shrubs and herbs thrive in this environment, including Sieber's wormwood (*Artemisia sieberi*), Christ's thorn jujube (*Ziziphus spina-christi*), Arabian fagonia (*Fagonia arabica*), and common mallow (*Malva* spp.). This farm also serves as a refuge for migratory bird species such as ducks, herons, egrets, and storks. However, the dense reed growth presents a potential fire risk, leading farmers to actively manage it through removal, controlled burning, or herbicide application to ensure a sustainable agricultural setting.

2.2 | Camera trapping

The survey was conducted from 01 June 2020 to 28 February 2022 over 2,548 trapping days. Four 18MP Browning Dark Ops HD MAX camera traps were employed, each powered by six "AA" alkaline batteries. These cameras were strategically mounted on iron stakes anchored in the riverbed, positioned 40–50 cm above the ground, and oriented in both south and north directions to minimize false captures during sunrise and sunset. The cameras were distributed to cover the riverbank and the entrances to the farm. No bait was used to ensure unbiased data collection, and the cameras were checked on-site monthly.

Figure 2. Photographed mongoose in the study area (A: four individuals; B: Two individuals with a golden jackal Canis aureus and C: one individual)

During the survey, the team faced a significant challenge due to the dense and rapidly growing reed vegetation. This dense growth severely limited visibility, affecting the quality of photographs and resulting in the inadvertent capture of numerous images showing plant movement. Managing this issue necessitated ongoing efforts, including removing reed growth. Active agricultural operations, workers, and roaming feral dogs utilizing these habitats day and night further complicated the recording environment.

3 | Results

The camera traps recorded the presence of the Egyptian mongoose in five separate instances. The largest group, consisting of four individuals, was observed twice: at 15:45 on 25 July 2020, along the riverbed, and at 07:25 on 17 September 2021, foraging at an entrance connecting the riverbed to the farm. Two individuals were captured in the same photo at 11:59 on 28 December 2020 at an entrance connecting the river to the farm. This photo shows the simultaneous presence of two mongooses and a golden jackal (*Canis aureus*). The sequential imagery indicates that the jackal departed the area without conflicting with the mongooses. In addition, one individual was photographed twice: at 15:19 on 21 January 2021 and at 10:41 on 20 July 2020 along the riverbed (Fig. 2).

4 | Discussion

This survey contributed to understanding the Egyptian mongoose in the lower Jordan River regions. All photographs were taken during daylight hours, indicating a primarily diurnal activity pattern, consistent with Basuony (2000) observation of two activity periods for these animals: diurnal and crepuscular. Our findings demonstrate that Egyptian mongooses can exist in groups and as solitary individuals, as evidenced by a photograph showing four individuals together, captured twice (Fig. 2). This observation aligns with Demirsoy (1998) description of their survival ability in solitary or family environments, contrasting with Swanepoel (2018) view that they are predominantly solitary.

Our survey highlights the species' ability to coexist with other species, including the golden jackal *Canis aureus*. This is in line with previous research documenting its harmonious interactions with a range of species, including jackals, foxes, wild and jungle cats, and feral dogs, all of which were observed during our survey (Osborn & Helmy 1980; Ragni et al. 1999; Masseti 1995, 2002). In addition, the survey results align with previous research, confirming the Egyptian mongoose's adaptable habitat preferences, as noted by scholars. This includes its ability to thrive in agricultural and riparian habitats while effectively navigating human-influenced environments to minimize human interactions (Osborn & Helmy 1980; Ragni et al. 1999; Masseti 1995, 2002). As documented in earlier studies, these findings underscore the species' resilience in landscapes influenced by human activities (Tristram 1876; Qumsiyeh et al. 1993; Amr 2000). In addition, Demirsoy (1998) stated that this species adapts to survive within well-developed understory in coastal

and riparian ecosystems, utilizing tunnels and abandoned caves for shelter. Our results highlight the Egyptian mongoose's generalist behavior, showcasing its ability to exploit a wide range of resources and adjust its diet based on local and seasonal food availability, contributing to its ecological adaptability and successful coexistence across various environments.

During an 18-month survey, our camera traps documented a group of four individuals and sightings of two individuals together and several solitary individuals. Given the observed population, we can infer a population density of approximately 0.4 individuals/ha. This relatively low density underscores the limited population size and suggests that the habitat can support only a small number of mongooses, likely due to habitat fragmentation and localized threats. These findings highlight the need for targeted conservation efforts to protect this endangered species in Jordan, ensuring the preservation of its critical habitats along the Jordan River. This population can survive with the diet content supported by the proximity of the Jordan River and surrounding farmland, which includes invertebrates, fish, amphibians, reptiles, birds, small mammals, and various fruits (Atay 2012; Abd Rabou 2019).

In addition, incidental poisoning from substances such as rodenticides is an additional threat. Abd Rabou (2019) and Do Linh San et al. (2016) highlighted this threat in regions like Palestine and the Iberian Peninsula, respectively, stressing that both accidental and intentional poisoning and killings impact the Egyptian mongoose population. In Jordan, the species has been classified as Endangered due to its restricted range and escalating habitat threats (Eid et al. 2020). Additionally, trapping for trade purposes has been confirmed in Jordan (Eid et al. 2020), with stuffed specimens observed in animal markets in Amman (Eid et al. 2010). Eid and Handal (2018) study reported an instance of a mongoose being killed by hunters, with photos shared on Facebook in 2015. There are no records of this species in animal markets in Jordan and Lebanon (Eid et al. 2010; Abi-Said et al. 2018). Aloufi & Eid (2016) conducted thorough research; however, this species was not among the animals hunted for folk medicine in Jordan and Saudi Arabia. Despite the localized threats, this species is particularly valued for its role as a snake predator (Qumsiyeh et al. 1993), while in Palestine, it helps regulate populations of environmental pests such as venomous snakes and commensal rodents (Abd Rabou 2019). This might be a key driver for awareness and education programs that will aid conservation efforts of this species in Jordan.

This study uncovers important information explicitly reported for the Egyptian mongoose in Jordan using photo-trapping cameras, including activity patterns, coexistence with other animals, and social behaviors along the lower Jordan River. Despite the species' protection in the Mujib Biosphere Reserve and Yarmouk Forest Reserve, there is a pressing need to enhance collaborations with the military involved in site conservation to establish Other Effective Area-Based Conservation Measures (OECMs), a strategy proposed by Farhadinia et al. (2022) to meet post-2020 biodiversity targets and contribute further to nature conservation in Jordan. While the species is listed in Appendix II for wildlife protection under Agricultural Law Number 13 of 2015, based on Regulation Number 43 of 2008, implementing this law must be more effective.

Further surveys and monitoring programs are essential for ongoing observation of the studied population. We recommend radio telemetry techniques better to understand the species' home range and movement behaviors.

Acknowledgements

The authors express gratitude to the Sheikh Hussein, Northern Ghor, Jordan community members, who positively received the awareness programs on wildlife conservation that we have conducted.

Authors' contributions

E.E and M.F.A designed research, E.E, M.F.A and S.D collected data, E.E analyzed data and wrote the manuscript. All authors contributed critically to the drafts and gave final approval for publication.

Funding information

This research is self-funded by the authors

Conflicts of interest

The authors declare no conflict of interest.

References

Abd Rabou A.N. 2019. On the occurrence, ecology and risks of the Egyptian mongoose (*Herpestes ichneumon* Linnaeus, 1758) in the Gaza Strip-Palestine. Agricultural Research and Technology, 23(3):267–276.

Abi-Said M., Outa N.T., Makhlouf H., Amr Z. and Eid E. 2018. Illegal trade in wildlife species in Beirut, Lebanon. Vertebrate Zoology, 68:1–4.

Albaba I. 2016. The terrestrial mammals of Palestine: A preliminary checklist. International Journal of Fauna and Biological Studies, 3:28–35.

Aloufi A. and Eid E. 2016. Zootherapy: A study from the Northwestern region of the Kingdom of Saudi Arabia and the Hashemite Kingdom of Jordan. Indian Journal of Traditional Knowledge, 15(4):561–569.

Amr Z. S. 2000. Jordan Country Study on Biological Diversity: Mammals of Jordan. United Nations Environment Programme (UNEP), Amman, 100 pp.

Amr Z.S., and Disi A.M. 1988. Jordanian Mammals Acquired by the Jordan University Natural History Museum. Jordan University Publications, 32 pp.

Amr Z.S., Woodbury S., and Disi A.M. 1987. On a collection of mammals from Jordan. Dirasat, 14:131–136.

Atay E., and Yesiloglu M. 2012. The Egyptian Mongoose, *Herpestes ichneumon* L., 1758 (Mammalia: Carnivora: Herpestidae) in Hatay Province Turkey. The Black Sea Journal of Sciences, 2(7):74–81.

Bahaa-el-din L., Henschel P., Aba'a R., Abernethy K., Bohm T., Bout N., Coad L., Head J., Inoue E., Lahm S., Lee M.E., Maisels F., Rabanal L., Starkey M., Taylor G., Vanthomme A., Nakashima Y. and Hunter L. 2013. Notes on the distribution and status of small carnivores in Gabon. Small Carnivore Conservation, 48:19–29.

Barry J. C. 1983. *Herpestes* (Viverridae, Carnivora) from the miocene of Pakistan. Journal of Paleontology, 57(1):150–156.

Basunony M. İ. 2000. Mammals. Nature Conservation Sector Egyption Environmental 1–36.

Berger L.R., de Ruiter D.J., Steininger C.M. and Hancox J. 2003. Preliminary results of excavations at the newly investigated coopers D deposit, Gauteng, South Africa. South African Journal of Science, 99:276–278.

Borralho R., Rego F., Palomares F. and Hora A. 1995. The distribution of the Egyptian mongoose *Herpestes ichneumon* (L.) in Portugal. Mammal Review, 25:229–236.

Bosman C.A.W. and Van Den Berg A.B. 1988. Egyptian Mongoose, *Herpestes ichneumon,* in southern Turkey. Zoology in the Middle East, 2:5–7.

Convention on Biological Diversity (CBD). 2018. Protected areas and other effective area-based conservation measures (Decision 14/8). https://www.cbd.int/doc/decisions/cop-14/cop-14-dec-08-en.pdf

Delibes M. 1999. *Herpestes ichneumon*. In: A.J. Mitchell-Jones, G., Amori, W., Bogdanowicz, B., Kryštufek, P.J.H., Reijnders, F., Spitzenberger, M., Stubbe, J.B.M., Thissen, V., Vohralik and J. Zima (eds), The Atlas of European Mammals, pp. 356–357. Academic Press, London, UK.

Demirsoy A. 1998. Yaşamın Temel Kuralları, Omurgalılar. Meteksan, 941 pp., Ankara.

Do Linh San E., Maddock A.H., Gaubert P., and Palomares F. 2016. *Herpestes ichneumon*. The IUCN Red List of Threatened Species 2016: e.T41613A45207211. http://dx.doi.org/10.2305/IUCN.UK.2016-1.RLTS.T41613A45207211.en.

Eid E., Abu Baker M., and Amr Z. 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.

Eid E., Al Hasani I., Al Share T., Abed O., and Amr Z. 2010. Animal Trade in Amman Local Market, Jordan. Jordan Journal of Biological Science, 4(2):101–108.

Eid E., and Handal R. 2018. Illegal hunting in Jordan: Using Social Media to Assess Impacts on Wildlife. Oryx, 52(4):730–735. https://doi.org/10.1017/S0030605316001629.

Eid E., Soultan A., and Elalqamy H. 2022. Habitat Suitability Modelling for Feline Species in Jordan: A tool for Climate-Responsive Conservation Planning. Journal of Wildlife and Biodiversity, 6(3):26–53. https://doi.org/10.22120/jwb.2022.290322.1452

Farhadinia M.S., Waldron A., Kaszta Ż. et al. 2022. Current trends suggest most Asian countries are unlikely to meet future biodiversity targets on protected areas. Communication Biology, 5: 1221. https://doi.org/10.1038/s42003-022-04061-w.

Harrison D., and Bates P.J. 1991. The Mammals of Arabia. 2nd Edition. - Sevenoaks, Kent, 354 pp.

Harrison D.L. 1968. The Mammals of Arabia, Vol. II. London. Ernest Benn Ltd., xiv + 193–381 pp.

Hinton H., and Dunn A. 1967. Mongooses: Their Natural History and Behavior. Edinburgh and London: Oliver and Boyd LTD.

Kasparek M. 1993. The Egyptian mongoose, *Herpestes ichneumon*, in western Egypt. Zoology in the Middle East, 9(1):31–32. https://doi.org/10.1080/09397140.1993.1063764.

Khoury F., Amr Z., Hamidan N., Al Hassani I., Mir S., Eid E., and Bolad N. 2012. Some introduced vertebrate species to the Hashemite Kingdom of Jordan. Vertebrate Zoology, 62:435–451.

Kingdon J. 1977. East African Mammals. New York, New York: Academic Press Inc.

Kuru M. 2001. Omurgalı Hayvanlar. Palme Yayıncılık, 841 pp, Ankara.

Mallon D., and Budd K. (eds.) 2011: Regional Red List Status of Carnivores in the Arabian Peninsula. Cambridge, UK and Gland Switzerland: IUCN, and Sharjah, UAE: Environment and Protected Areas. vi + 49pp.

Mallon D.P., Hilton-Taylor C., Amori G., Baldwin R., Bradshaw P.L., and Budd K. 2023. The Conservation Status and Distribution of the Mammals of the Arabian Peninsula. Gland. Switzerland. IUCN and Sharjah, United Arab Emirates. Environment and Protected Areas Authority.

Masseti M. 1995. Quaternary biogeography of the Mustelidae family on the Mediterranean islands. Hystrix, Italian Journal of Mammal, (N.S.) 7:17–34. https://doi.org/10.4404/hystrix-7.1-2-4048

Masseti M. 2002. The non-flying terrestrial mammals of the Mediterranean islands: an example of the role of the biological invasion of alien species in the homogenisation of biodiversity. In: Contributions to the "Workshop on Invasive alien species on European islands and evolutionary isolated ecosystems, "Horta, Azores (Portugal). Council of Europe, Strasbourg. T-PVS/IAS, 2:4–6.

Masseti M. 2009. Carnivores of Syria. ZooKeys 31: 229–252. https://doi.org/10.3897/zookeys.31.170.

Osborn D. 1998. The Mammals of Ancient Egypt. Warminster: Aris and Phillips Ltd.

Osborn D. J., and Helmy I. 1980. The contemporary land mammals of Egypt (including Sinai). Field Museum of Natural History, https://doi.org/10.5962/bhl.title.2801.

Palomares F., and Delibes M. 1993. Social organization in the Egyptian mongoose: group size, spatial behaviour and inter-individual contacts in adults. Animal Behaviour, 45:917–925.

Qumsiyeh M.B. 1996. Mammals of the Holy Land. Lubbock, 389 pp.

Qumsiyeh M.B., Amr Z.S. and D. Shafei D. 1993. The Status and conservation of carnivores in Jordan. Mammalia, 57(1):55–62.

Ragni B., Masseti M., Roussos T., Belardinelli A., and Cicconi P. 1999. The carnivores of the island of Crete, Greece). Contributions to the Zoogeography and Ecology of the Eastern Mediterranean Region, 1:117–123.

Ramsay S.L. 2002. Decapitation of the tortoise *Chersina angulata*: is the large grey mongoose a headhunter? African Zoology 37(1): 114–116. Expanding the geographical distribution of the Egyptian Mongoose, *Herpestes ichneumon* (Linnaeus, 1758), in South Africa. Check List, 14 (4):595–599. https://doi.org/10.15560/14.4.599.

Swanepoel L.H., Loock D., Matthews W.S., Emslie K.W., 2018. Expanding the geographical distribution of the Egyptian Mongoose, *Herpestes ichneumon* (Linnaeus, 1758), in South Africa. Check List, 14(4):595–599. https://doi.org/10.15560/14.4.595.

Taifour H., Dexter K.G., Al-Bakri J., Miller A., and Neale S. 2022. A State-of-the-Art Vegetation Map for Jordan: A New Tool for Conservation in a Biodiverse Country. Conservation, 2:174–194. https://doi.org/10.3390/conservation2010012.

Temple H.J. and Cuttelod A. (Compilers). 2009. The Status and Distribution of Mediterranean Mammals. Gland, Switzerland and Cambridge, UK: IUCN. vii+32pp.

Tristram H.B. 1876. Notes on the discover)' of the roebuck (*Cervus capreolus*) in Palestine. Proceedings of the Zoological Society of London,40–42.

WWF and IUCN WCPA. 2023. A guide to inclusive, equitable and effective implementation of Target 3 of the Kunming-Montreal Global Biodiversity Framework: Version 1. WWF & IUCN WCPA.