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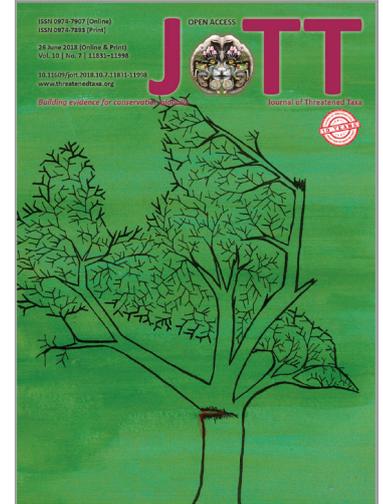
SHORT COMMUNICATION

A FIRST CONFIRMED RECORD OF THE INDIAN CRESTED PORCUPINE *HYSTRIX INDICA* (MAMMALIA: RODENTIA: HYSTRICIDAE) IN THE UNITED ARAB EMIRATES

Maral K. Chreiki, Mark D. Steer, Sami Ullah Majeed, Swamiti Kakembo & Steve Ross

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A FIRST CONFIRMED RECORD OF THE INDIAN CRESTED PORCUPINE *HYSTRIX INDICA* (MAMMALIA: RODENTIA: HYSTRICIDAE) IN THE UNITED ARAB EMIRATES

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Abstract: We report the first records of the Indian Crested Porcupine (*Hystrix indica*; Kerr, 1792) in the United Arab Emirates (UAE), approximately 600km beyond its known range in Arabia. Images of *H. indica* were taken by camera traps at two locations in Wadi Wurayah National Park (WWNP), Fujairah, in three separate events in 2015 and 2016. Long-term occupancy of porcupines was confirmed via social surveys conducted in four villages bordering WWNP. These findings represent a previously unrecorded and most likely isolated subpopulation of *H. indica*. Further study is warranted to assess the genetic and demographic resilience of the population.

Keywords: Camera trapping, conservation, Indian Crested Porcupine, Rodentia, United Arab Emirates.

في هذه الورقة نقدم لكم أول تسجيل مؤكد للنفذ الهندي المتوج (الشبيهم أو النيص) *Hystrix indica* في دولة الإمارات العربية المتحدة، والذي يبعد حوالي 600 كم عن أقرب موقع سجل فيه في شبه الجزيرة العربية سابقاً. سجلت الكاميرات الفخية في محمية وادي الوريعة الوطنية، الشبيهم في موقعين مختلفين وفي ثلاثة مواقع منفصلة في العامين 2015 و2016 على التوالي. لاحقاً قمنا بالتحقق من تاريخ تواجد الشبيهم في المنطقة عن طريق مسوحات إجتماعية أجريناها في أربع قرى محيطة بالمحمية. هذا الإكتشاف الغير متوقع والمعزول جغرافياً على ما يبدو، يكشف الستار عن مجموعة قد تكون مهددة بالإنقراض من الشبيهم *H. indica* ويستحق التمعن والدراسة لتقييم الأصول الوراثية والديمومة الديموغرافية لهذه المجموعة.

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Hystrix indica (Family Hystricidae) is the largest rodent occurring in the Arabian Peninsula (Harrison & Bates 1991). Although it is widely distributed throughout southwestern Asia, parts of central Asia, and the Middle East (Kadhim 1997; Kryštufek & Vohralík 2009; Spalton & Al-Hikmani 2014; Amori et al. 2016; Fig. 1), there have been no confirmed records of the species in northern Oman or the United Arab Emirates (UAE), except for one anecdotal reference from Abu Dhabi Emirate (Gasperetti 1967). Even though the habitats available in these areas appear suitable, as there was no reliable evidence of their existence in the UAE (Cunningham 2004), *Hystrix indica* was not included in the mammalian Red Data List of Abu Dhabi (Tourenq & Drew 2005).

H. indica is nocturnal and generally lives in small family groups, spending the day resting in burrows, caves or crevices (Qumsiyeh 1996). It feeds on roots, bulbs, bark and other plant parts (Aulagnier et al. 2009) and is known to forage in cultivated habitats.

Conservation threats to *H. indica* in the Middle East include habitat destruction and disturbance, hunting, persecution, and pesticides (Aspinall & Hellyer 2005; Doç & Yürümez 2016). Despite being globally listed as Least Concern by the IUCN Red List of Threatened Species (Amori et al. 2016), within many individual countries *H. indica* is considered threatened due to consumptive hunting, including in Turkey, Palestine, Jordan and India (Qumsiyeh 1996; Amr et al. 2004; Doç & Yürümez 2016). In addition, in Iran and Pakistan it is persecuted as an agricultural pest (Hafeez et al. 2011; Khan et al. 2014). Anecdotal reports suggest that hunting also occurs in Yemen, Saudi Arabia and Syria, although *H. indica* is not considered threatened in these countries. In western Arabia, it is considered too scarce to pose an economic threat to agriculture (Kingdon 1991).

Here we describe the first confirmed records of *H. indica* in the UAE and subsequent interviews carried out to confirm the period of persistence of the species in the area.

METHODS

Study Area

Wadi Wurayah National Park (WWNP) was designated by the Ruler of Fujairah in 2009 and managed by Fujairah Municipality, Environment Department. WWNP is a mountainous protected area, located in Fujairah Emirate, UAE (25.396770°N & 56.269608°E) and within the Hajar Mountain Range (Tourenq et al. 2009). The total area of WWNP is 222km², divided into three administrative zones: the buffer zone 96km², the core zone 117km² and the eco-tourism zone 9km² (Appendix 1). The area is

considered typical of the Arabian Highland Woodlands and Scrublands Eco-region (Olson & Dinerstein 2002). The dominant vegetation is mostly low-growing woody perennials, well adapted to high temperatures and long periods of drought (Feulner 2016).

Camera trapping

Since 2006 Fujairah Municipality has used camera traps to monitor wildlife, poachers and intruders within WWNP. Since initiation, the camera trap distribution has developed into a systematic monitoring network of the core zone of the park. The primary objective of the monitoring network is to ascertain and monitor the status of species, and to inform the management on how the ecosystem is responding to management actions. The camera-trapping network has expanded over the last 11 years, and now 89 camera traps monitor the core zone of WWNP, using a stratified random distribution facilitated by 2x2 km grid squares covering WWNP.

The main species targeted for camera trapping are Arabian Tahr *Arabitragus jayakari*, Caracal *Caracal caracal schmitzi*, Red Fox *Vulpes vulpes arabica*, Blanford's Fox *Vulpes cana*, Gordon's Wildcat *Felis silvestris gordonii* and feral and domestic goats *Capra hircus*.

The camera traps used for wildlife monitoring included Bushnell-Trophy cam HD 119476, 119676 and No-Glow 119776, and Reconyx Hyperfire-PC800. Camera traps were equipped with PIR sensors triggered by a combination of temperature and motion. The camera traps were set-up 50–150 cm above the ground, targeting wildlife routes to enhance detection probability. Cameras were set to record three photographs per event with a five-second interval between events, using



Figure 1. Distribution of *Hystrix indica* (dark grey) and *H. cristata* (hatched), and location of new records (triangle). Distribution data reproduced from the IUCN Red List of Threatened Species. Version 2017-1, supplemented by Oman records mentioned in the text.

medium LED control, normal sensor level and no bait. The camera traps were maintained every 6-8 months.

Social Surveys

Following confirmation of the presence of *H. indica* by camera traps, we conducted unstructured interviews to ascertain local knowledge about the species and its occurrence and distribution in the area. Interviewees were shown photographs of both *H. indica* and Brandt's Hedgehog *Hemiechinus hypomelas* to avoid any confusion between the two species, which are mistakenly called by the same name in Arabic sometimes (Qunfoth or Qunfodh). We asked whether they had seen *H. indica* in the past, the nature of any sightings and whether they or others considered the species to have any economic value or impact.

RESULTS

The first visual observation of *H. indica* in WWNP was reported verbally by park staff (A. Cloke) in April 2014, however, the sighting was not followed-up, and no action was taken. Later in 2015 a photograph of the species was captured (Image 1) at a permeant camera trap monitoring location (Camera Trap_1) on 30 October 2015, 1.7km from the first visual observation (Appendix.1). In the first sequence of captures, the porcupine was being followed by a Red Fox (Image 1). Additional images were captured at the same site on 5 November 2015, followed by another photograph on 15 November 2016 at a second site (Camera Trap_2), 3.8km north of the first location (Image 2). A second visual sighting was made near the original observation location, almost three years following the first sighting (28 March 2017) by a park ranger (S. Kakembo). All sightings and photographs were made between 21:00 and 23:00 (Appendix 1).

Camera Trap_1 was located within the core zone of WWNP on a mountain ridge facing a disused graded road built in 2012 to maintain electrical pylons. The camera was 1.2km from farms in the east and 150m from the wadi bed to the west. The camera was at an altitude of 200m. Vegetation cover was very low in the surrounding area, consisting of some dispersed trees and woody perennials. Camera Trap_2 was located on a wadi terrace inside the buffer zone of WWNP, at an altitude of 163m. Monitoring at Camera Trap_1 was carried out from Jan 2015 until September 2016, for a total effort of 594 trap-nights, over which time two separate *H. indica* events were recorded and 1,883 other capture events. Camera Trap_2 was set from June 2016 until March 2017, with a total effort of 295 trap-nights, one *H. indica* event

was recorded, and 1,062 other capture events. Other species recorded at both sites included feral dogs, feral goats, red foxes and domestic sheep, as well as humans engaged in collecting honey and poaching.

Social Survey

Interviews were conducted during February 2017, and included 26 farmers and farm owners from four villages to the east (Bidiya), north (Zikt) and west (Al Hala and Al Abadilah) of WWNP. Fifteen of the interviewees were local farm owners (UAE nationality), and the rest were expatriate labourers on the farms. The interviews elicited eight visual records of porcupine sightings, all occurring on the eastern side of WWNP between Bidiya (East) and Wadi Zikt (north-east). All observations were either near farms or near the roads leading to farms (Appendix 1).

Six respondents reported seeing porcupines within the last 10 years and two of them suggested that populations were larger 20–30 years ago, suggesting a long-term presence of a porcupine population in the area. None of the respondents reported the porcupines as being a pest species, but one respondent reported that their body parts were traditionally used for medicine. One local man who was born within WWNP mentioned that porcupines were common near water pools decades ago, and added that he had heard many stories about porcupines from his father while growing up. Interestingly, there was two sightings of a porcupine carcass near to farm areas to the east of WWNP (Appendix 1).

DISCUSSION

Reviews of UAE mammals in the modern era have recognized 10 species of native and naturalized Rodentia belonging to two families, Muridae (9 species), and Dipodidae (1 species) (Wilson & Reeder 1993). Two of these rodent species, Lesser Jerboa *Jaculus jaculus* and Egyptian Spiny Mouse *Acomys dimidiatus*, are considered Near Threatened at the national level (Hornby 1996). Our discovery of *Hystrix indica* brings the total number of Rodentia in UAE to 11, and brings the list of mammal's residents in WWNP to 13 species.

Although it is very difficult to distinguish African Crested Porcupine *H. cristata* from Indian Crested Porcupine *H. indica* based solely on our camera trap photographs, biogeographic considerations make *H. indica* overwhelmingly the most likely candidate for our sighting. The closest record of *H. cristata* is approximately 2,100 km away, in Eritrea, whereas the closest previous record of *H. indica* was approximately 600km south of

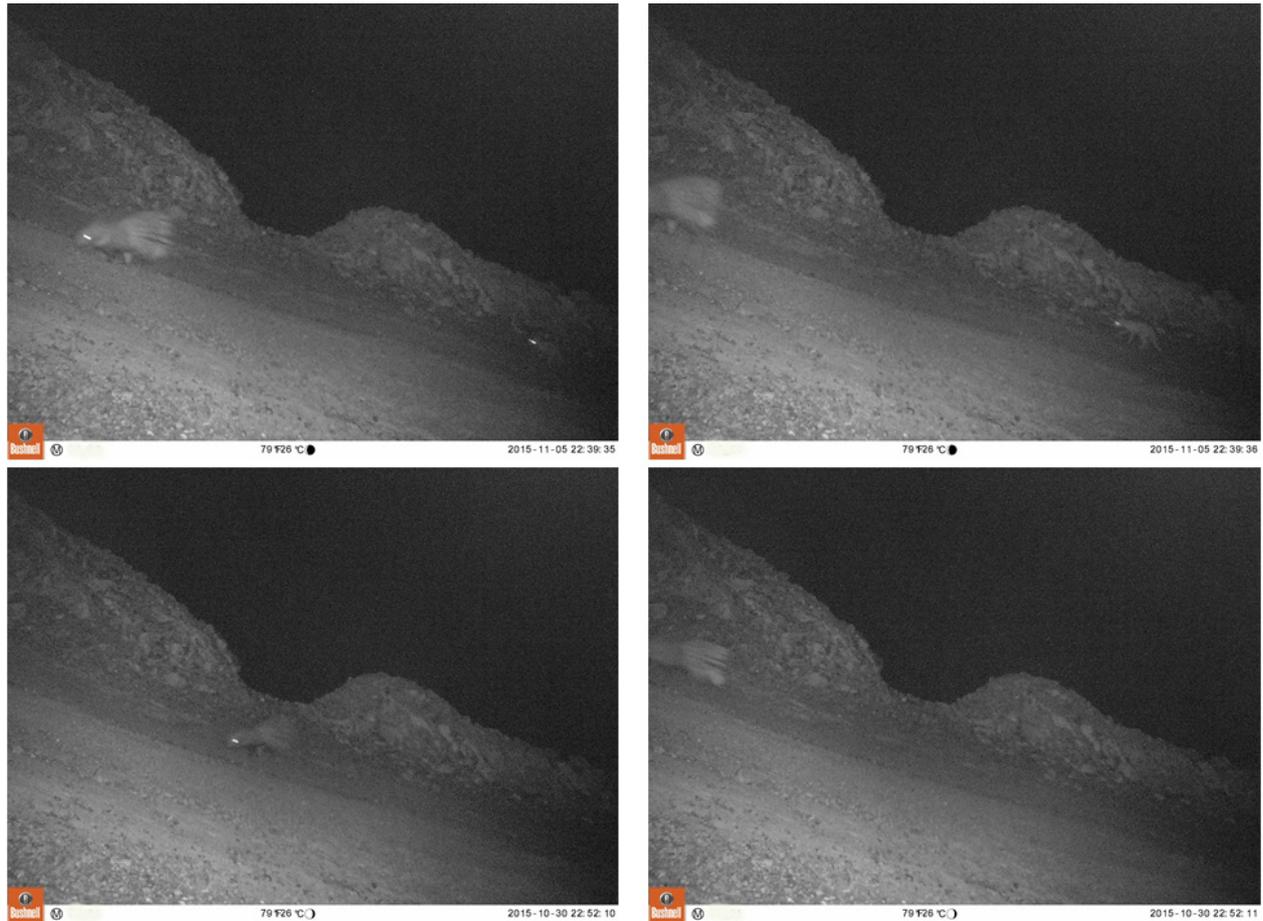


Image 1. Images of Indian Crested Porcupine taken over two capture events, the first in October (top) and the second in November 2015 (bottom) at camera trap location_1.

our sighting, in the central desert of Oman (Harrison & Bates 1991). In addition, the contiguous *H. indica* population extends to the Arabian Gulf coast of Saudi Arabia (900km to the north-west), and Iranian populations are even closer, only 120km away to the north-east. The Iranian populations are separated today from the UAE by the Strait of Hormuz, but the Strait and the Arabian Gulf were dry lands as little as 18,000 years ago (Hellyer & Aspinall 2005). Only a limited amount of camera trapping and nocturnal exploration has yet been conducted elsewhere in the foothills of the Hajar Mountains, making it possible, perhaps even likely, that other areas of the Hajar Mountains, especially in the relatively “mesic” wadis of northernmost Oman, are also occupied by *H. indica*. Local knowledge should not be underestimated or ignored, social surveys and questioners could contribute, lead research effort and identify hot spots for other wildlife discoveries.

The use of camera traps for research and conservation in the UAE have increased gradually since

the early 2000s, yielding interesting records of species such as the rediscovery of the Arabian Sand Cat *Felis margarita harrisoni* in Abu Dhabi, UAE (Ahmed et al. 2016). The current camera trap monitoring network in WWNP has reduced human biases by using a systematic random survey design, which is likely to have increased the probability of discovering new species occupying the park, and we recommend this approach for further biodiversity surveys in UAE and elsewhere.

Our discovery and investigation emphasize the importance of preserving and protecting marginal habitats associated with “core” protected areas. This ensures the preservation of environments and resources that are complementary to those of the principal protected environment. In the case of WWNP, the buffer zone within the protected area comprises rugged foothill environments that are transitional to extensive flat and agricultural lands outside the park., both of which contribute towards diversifying food and habitat resources for wildlife. Both *H. indica* and *Vulpes*

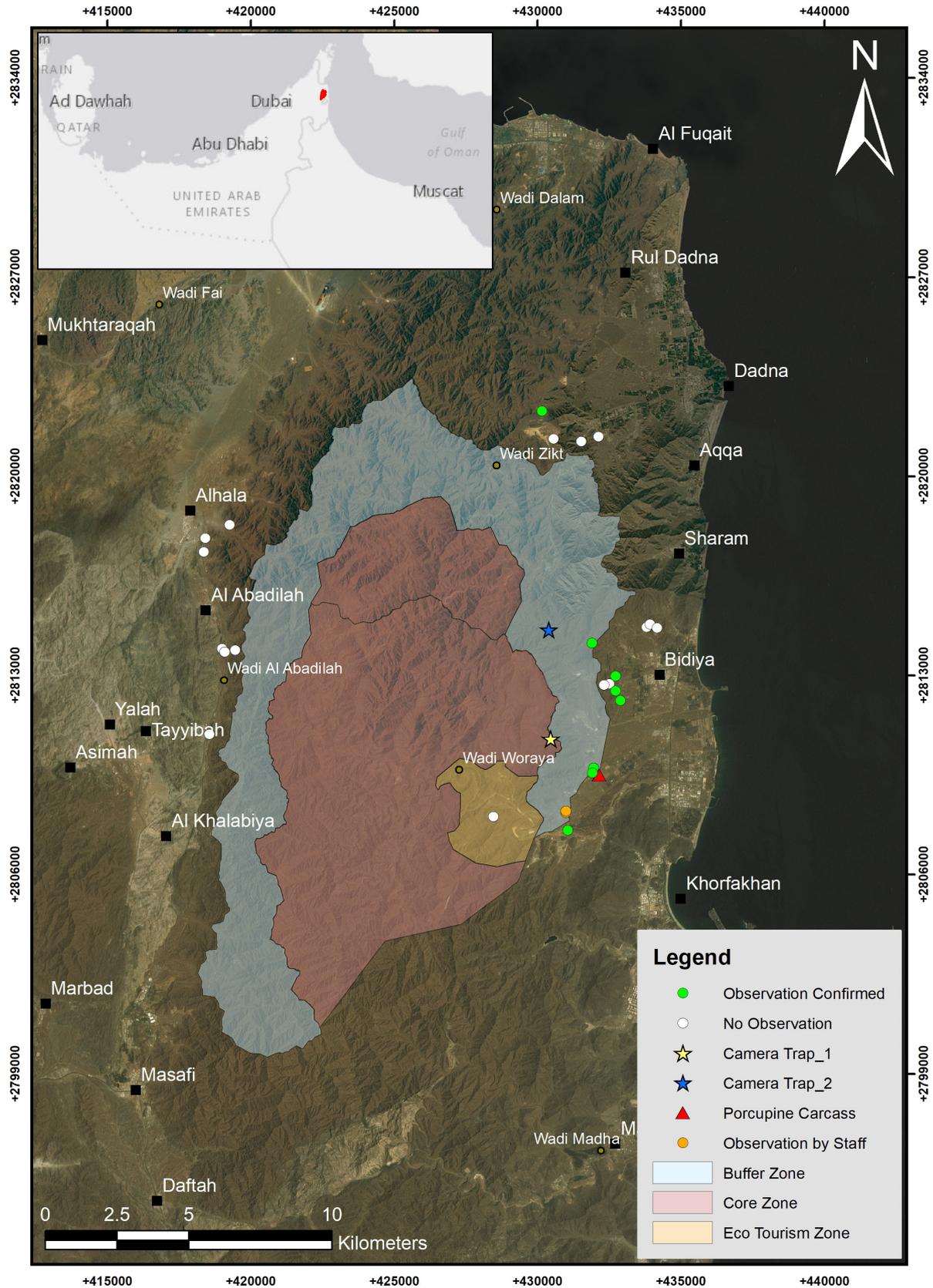


Image 2. Images of Indian Crested Porcupine taken in November 2016 at camera trap location_2.

vulpes arabica are particularly suited to these peripheral environments, as their association with anthropic habitats is well known (Hafeez et al. 2011; Kauhala et al. 2016). Wildlife using buffer areas used by humans are, however, at more risk from human persecution. To help prevent loss of rare wildlife residents in the WWNP buffer zone, we suggest actions including education and additional protective legislation. Although *H. indica* is classified globally as Least Concern by the IUCN, within the UAE, the population is likely to be extremely small and could meet the criteria for Critically Endangered classification at country level. Genetic study would be required to assess the population size and resilience. Social surveys in the villages surrounding WWNP have shown their worth in gaining and preserving traditional knowledge. They may also help in supporting education and awareness about wildlife in protected areas. The interactions between rangers and local people promote the exchange of traditional knowledge of biodiversity and may also increase understanding of protected area goals and help prevent wildlife conflicts.

REFERENCES

- Ahmed, S., R. Al Zaabi, P. Soorae, J.N. Shah, E. Al Hammadi, R. Pusey & S. Al Dhaheeri (2016). Rediscovering the Arabian Sand Cat (*Felis margarita harrisoni*) after a gap of 10 years using camera traps in the western region of Abu Dhabi, United Arab Emirates. *European Journal of Wildlife Research* 62(5): 627–631.
- Amori, G., R. Hutterer, B. Kryštufek, N. Yigit, G. Mitsain & L.J. Palomo (2016). *Hystrix indica* (errata version published in 2017). The IUCN Red List of Threatened Species 2016: e.T10751A115099509. <http://doi.org/10.2305/IUCN.UK.2016-3.RLTS.T10751A22231834.en>. Downloaded on 16 June 2018.
- Amr, Z.S., M.A. Baker & L. Rifai (2004). Mammals of Jordan, pp. 437–465. In: Waitzbauer, W., R. Albert, B. Petutschnig & G. Aubrecht (eds.). *Denisia 14. Reise Durch Die Natur Jordaniens*. Linz: Biologiezentrum/Oberösterreichische Landesmuseen, 404pp.
- Aspinall, S. & P. Hellyer (2005). Environmental Development and Protection in the UAE, pp. 277–304. In: Hellyer, P. & S. Aspinall (eds.). *The Emirates: A Natural History*. Trident Press, UK.
- Aulagnier, S., A.J. Mitchell-Jones, F. Moutou, J. Zima & P. Haffner (2009). Mammals of Europe, North Africa and the Middle East. A & C Black Publishers Ltd, USA, 272pp.
- Cunningham, P.L. (2004). Checklist and status of the terrestrial mammals from the United Arab Emirates. *Zoology in the Middle East* 33(1): 7–20.
- Doç, Y. & G. Yürümez (2016). Distribution of Indian Crested Porcupine *Hystrix indica* (Kerr, 1792) (Mammalia: Rodentia) in Batman Province. *Journal of Life Science* 6(1): 181–186.
- Feulner, G.R. (2016). The Flora of Wadi Wurayah National Park, Fujairah. *Tribulus* 24: 4–84.
- Feulner, G.R. (2005). The quaternary period. In: Hellyer, P. & Aspinall S. (eds.). *The Emirates - A Natural History*. Trident Press, London, 59pp.
- Gasperetti, J. (1967). Survey of the Reptiles of the Sheikhdome of Abu Dhabi, Arabian Peninsula. Part I. A Geographical Sketch of the Sheikhdome of Abu Dhabi. *Proceedings of the California Academy of Science* 35: 141–156.
- Hafeez, S., M. Ashfaq, G.S. Khan & Z.H. Khan (2011). Damage Inflicted by the Indian Crested Porcupine, *Hystrix indica*, on Forestry and Agricultural systems in Punjab, Pakistan. *Journal of Asian and African Studies* 47(2): 168–175.
- Harrison, D.L. & P.J.J. Bates (1991). *The Mammals of Arabia* (Vol. 357). Harrison Zoological Museum, Sevenoaks.
- Hornby, R. (1996). A Red List of Mammals for the United Arab Emirates. *Tribulus* 6.1: 13–14.
- Kadhim, A.-H.H. (1997). Distribution and reproduction of the Indian crested porcupine *Hystrix indica* (Hystricidae: Rodentia) in Iraq. *Zoology in the Middle East* 15 (October 2014): 9–12.
- Kauhala, K., K. Talvitie & T. Vuorisalo (2016). Encounters between medium-sized carnivores and humans in the city of Turku, SW Finland, with special reference to the Red Fox. *Mammal Research* 61(1): 25–33.
- Khan, A.A., A. Mian & R. Hussain (2014). Deterioration impact of Indian crested porcupine, *Hystrix indica*, on irrigated forest plantations in Punjab, Pakistan. *Pakistan Journal of Zoology* 46(6): 1691–1696.
- Kingdon, J. (1991). *Arabian Mammals: A Natural History*. Academic Press, London, 72–73pp.
- Kryštufek, B. & V. Vohralík (2009). *Mammals of Turkey and Cyprus, Rodentia II: Cricetinae, Muridae, Spalacidae, Calomyscidae, Capromyidae, Hystricidae, Castoridae*. NHBS, UK.
- Olson, D.M. & E. Dinerstein (2002). The Global 200: Priority ecoregions for global conservation. *Annals of the Missouri Botanical Garden* 89(2): 199–224.
- Qumsiyeh, M.B. (1996). *Mammals of the Holy Land*. Texas Tech University Press, Lubbock.
- Spalton, A., & H. Al-Hikmani (2014). *The Arabian leopards of Oman*. Stacey International, London, 118pp.
- Tourenq, C. & C.R. Drew (2005). The Red List of terrestrial mammalian species of the Abu Dhabi Emirate. Terrestrial Environment Research Center, Environmental Research and Wildlife Development.
- Tourenq, C., A. Khassim, M. Sawaf, M.K. Shuriqi, E. Smart, M. Ziolkowski, M. Brook, R. Selwan & L. Perry (2009). Characterisation of the Wadi Wurayah catchment basin, the first mountain protected area in the United Arab Emirates. *International Journal of Ecology and Environmental Sciences* 35(4): 289–311.
- Wilson, D.E. & D.M. Reeder (1993). *Mammal Species of the world: A Taxonomic and Geographic Reference*. Smithsonian Institution Press, xviii+1206pp.



Appendix 1. Wadi Wuraya National Park and its designated zoning system. Also showing reported sightings of the Indian Crested Porcupine at the interview and camera traps locations.



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