REPTILES & AMPHIBIANS

Notes on Natural History and Conservation of the Indian Spiny-tailed Lizard (*Saara hardwickii*)

Raju V. Vyas[1], Mital R. Patel[2], and Kartik Upadhyay[3]

[1]1–Sashwat Apartment, BPC-Haveli Road, Nr. Splatter Studio, Alakapuri, Vadodara, Gujarat 390007, India (razoovyas@hotmail.com [corresponding author]; ORCID ID 0000-0003-2467-549)
[2]D-199 Girdhar Park Society, B/h Makarpura Bus Depot, Makarpura, Vadodara, Gujarat, India (mital.jsp@gmail.com)
[3]1/101 Avni Residence, Near Bansal Super Market, Gotri Vasna Road, Vadodara, Gujarat, India (Kartik_upadhyay35@yahoo.com; ORCID ID: 0000-0001-9659-7208)

The Indian Spiny-tailed Lizard (hereafter ISL), *Saara hardwickii* (Agamidae: Uromastycinae), is widely distributed in India, Pakistan, and Afghanistan (Wilms et al. 2009). In India, the species, locally known as "Sandha" or "Sandho," occurs throughout the arid zones of western and northwestern states. This species is protected in Schedule I of the Indian Wildlife (Protection) Act 1972 (now the Wild Life (Protection) Amendment Act, 2022; Ministry of Law and Justice 2022) and is listed as Vulnerable (VU) on the IUCN Red List of Threatened Species (Vyas et al. 2022).

This ground-dwelling herbivorous, diurnally active lizard is associated with dry landscapes in hotter parts of its range (Wagner et al. 2016; Tatu et al. 2024). The Indian Spiny-tailed Lizard inhabits sandy and gravel plains, dry, arid, and semi-arid grasslands, scrub forests, and the periphery of dry deciduous forests. This species faces various threats, including poaching, national and international trade, and collection for medicines and food. Many populations are depleted due to these threats, from minor to major; the most significant is loss of habitat and habitat alteration (Vyas et al. 2022; Bhardwaj 2023). Kaur et al. (2020) stated that this species was once very widely distributed in many parts of western and northwestern India, including Delhi, Haryana, Uttar Pradesh, Madhya Pradesh, and Gujarat (Smith 1935; Husain 1997; Chandra and Gajbe 2005; Dutta and Jhala 2007; Das et al. 2015; Srivastava et al. 2018), but now is limited to small, fragmented populations in the Thar Desert of Rajasthan and the dry arid parts of Gujarat, especially Kutch and the surroundings of Little Rann of Kutch (LRK).

The semi-arid LRK landscape, including the saline mud plain and surrounding fringe villages, covers an area of about 5,000 km^2 near the southern coast of the Gulf of Kutch (23.16, 70.75; 23.75, 71.75). A total of 4,953.71 km^2 of the LRK landscape was designated as a Wildlife Sanctuary for the Indian Wild Ass (*Equus hemionus khur*). The vegetation of this region is dominated by the invasive mesquite, *Neltuma* (formerly *Prosopis*) *juliflora*, known as "Vilayati Babul." Native trees, including *Acacia nilotica*, *A. senegal*, *Salvadora*

Figure 1. Typical habitat of the Indian Spiny-tailed Lizard (*Saara hardwickii*) in the Little Rann of Kutch: An elevated land with sparse xerophytic vegetation and invasive *Neltuma juliflora.* Photograph by Kartik Upadhayay.

Figure 2. An Indian Spiny-tailed Lizard (*Saara hardwickii*) accompanied by 8–10-day-old hatchings. Photograph by Kartik Upadhayay.

Reptiles & Amphibians ISSN 2332-4961
https://doi.org/10.17161/randa.v32i1.22562

persica, and *S. oleoides*, are present in sporadic patches. The LRK comprises three distinct surface features: Rann (the exposed saline mud flats where almost nothing grows); the higher islands of sandy soils, nearly free of salt with grass cover and sparse scrubs islands, locally called "beyts"; and the shore or fringes of the mainland border of the Rann that support scattered vegetation. About 75 beyts bear xerophytic vegetation and are some of the best habitats for the ISL and other desert species. It is a vast, desiccated, unbroken, bare surface of dark silt encrusted with salts that transforms into a spectacular coastal wetland after the rains. The Rann can be considered a large ecotone, a transitional area between marine and terrestrial ecosystems. During the monsoon season, the Rann is inundated and totally inaccessible for about two months, and remains wet until the beginning of summer. We herein present some noteworthy observations and new information on the natural history of the ISL that we encountered during a census of the Indian Wild Ass in the Sanctuary.

On 22 May 2024, we were in the southeastern portion of the sanctuary collecting data on the target species. This part of the sanctuary is in Dasada Tehsil, Surendranagar District, Gujarat. On our way through the Rann to Vachchhraj Beyt, we encountered slightly elevated areas covered with sparse xerophytic vegetation, including thickets of *Neltuma juliflora* (Fig. 1). All six of these elevated pockets (2–6 km^2 area) are ideal natural habitat for wildlife. While exploring one of these elevated areas on foot, we noticed a small colony of ISL, some of them hatchlings and juveniles (Fig. 2). Based on size (~7–9 cm total length), we estimated that the hatchlings were at most 8–10 days old. They were foraging with their parents (Fig. 3) and all had dark black-brown vermiculations on bright brown bodies that contrasted with their parents' paler colors. This specific colony (23.35, 71.56) of ISL is 10 km from Zinzuwada Village, which is located on the fringe of the sanctuary. We spent two hours at this location, where the parents were active and alert, whereas the hatchlings were considerably less so. When we approached them, adults immediately ran toward burrows, but we were able to approach the hatchlings more closely (Fig. 4).

In the morning of the next day, we revisited the area and counted eight colonies, each with 10–18 active burrows, in a 3-km^2 area. Five to eight hatchlings were clustered with

Figure 3. Hatchling Indian Spiny-tailed Lizards (*Saara hardwickii*) are foraging with their parents. Photograph by Kartik Upadhayay.

Figure 4. When disturbed, adult Indian Spiny-tailed Lizards (*Saara hardwickii*) immediately retreat to a burrow, whereas hatchlings remain on the surface. Photograph by Kartik Upadhayay.

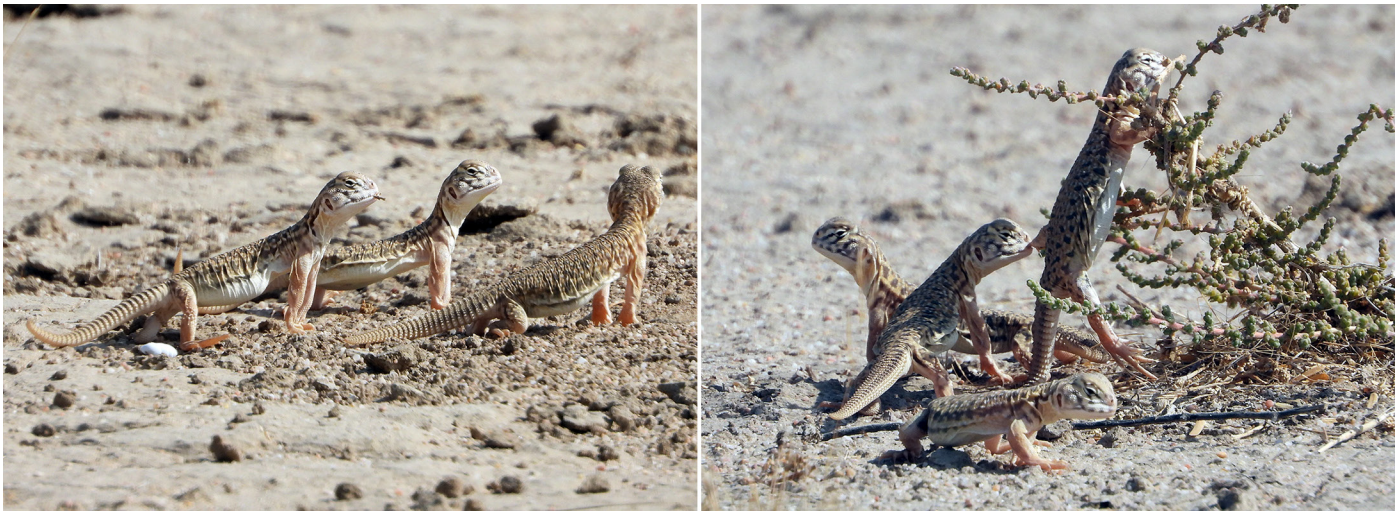

Figure 5. Hatchling Indian Spiny-tailed Lizards (*Saara hardwickii*) feeding on leaves of seepweeds (*Suaeda* sp.). Photograph by Kartik Upadhayay.

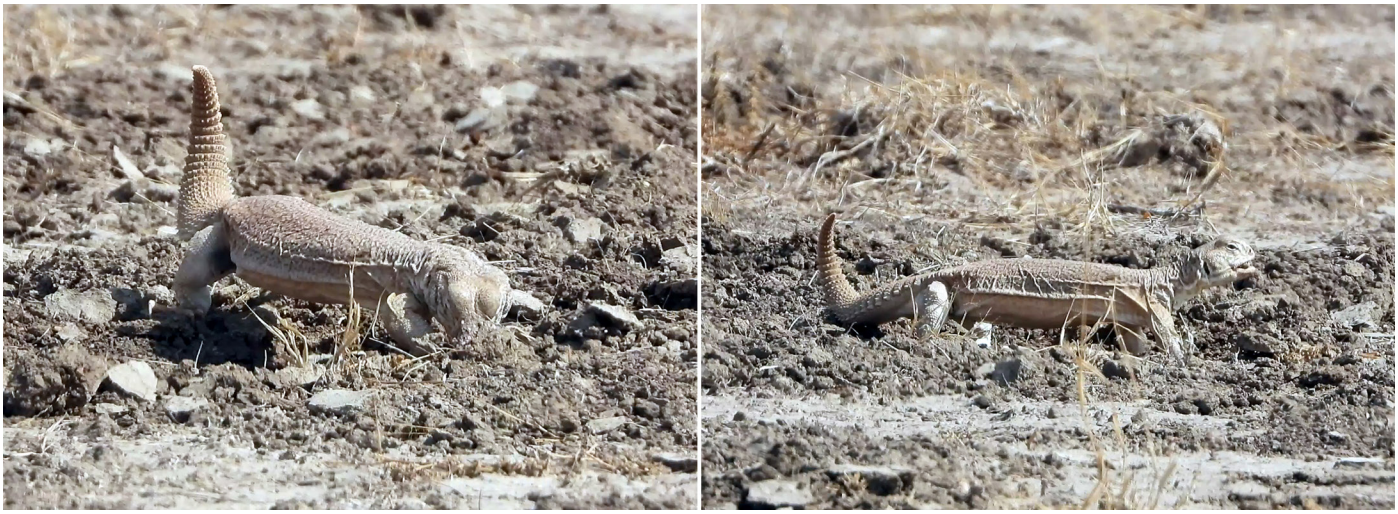

Figure 6. Adult Indian Spiny-tailed Lizards (*Saara hardwickii*) foraging for tuber roots of cane grasses (*Erogrostis* sp.) by rooting in ground disturbed by Wild Boars (*Sus scrofa*) (left) and with a bulb root in its mouth (right). Photographs by Mital R. Patel.

each parent. Some of the hatchlings were feeding on the leaves of seepweeds (*Suaeda* sp.) (Family: Amaranthaceae) (Fig. 5), which is locally known as "Lunhi Bhaji" or "Morad Bhaji." Adults were foraging by rooting in the ground with their forelimbs (Fig. 6), apparently in search of tuber roots of cane-grasses *Erogrostis* sp. (Family: Poaceae) (locally known as "Theg" or "Chaki Mako"). Based on the presence of hoof-prints, we determined that the hard soils in the area had been excavated by Wild Boars (*Sus scrofa*) during the previous night, facilitating the efforts of the adult lizards.

On the third day, we visited the sanctuary's northern and southern fringes to assess the sanctuary for habitat and threats. The northern and southern sanctuary boundaries were not clearly demarcated and these areas were affected by various anthropogenic activities, including temple developments and religious tourists, saltpans, and wood collection for charcoal production. Also, a large amount of water had been released from Narmada Irrigation Canals into the Rupen River near Kodda Village. All these activities have direct or indirect negative impacts on the fragile ecosystems of the Rann by shrinking or altering the habitat.

Scant information is available on the ecology and breeding biology of the ISL. We observed adults with hatchlings in the third week of May, indicating that they hatch during the hot season. ISL hatchlings have been recorded emerging before the rainy season in June and July in Pakistan and India (Minton 1966; Daniel 2002; Khan 2006; Maurya et al. 2009; Masroor 2012; Ramesh and Sankaran 2013), and Khalil et al. (2020) reported a hatchling ISL in May in the Cholistan Desert, Bahawalpur, Pakistan.

Studies of food and feeding habits of the ISL in India (Bhanotar et al. 1972; Pradhan et al. 1973; Sharma and Vazirani 1977; Das and Pandey 2005; Dutta and Jhala 2007; Ramesh and Sankaran 2013) and Pakistan (Minton 1966; Qasim et al. 2018; Khalil et al. 2020) indicated that these lizards are primarily herbivorous, feed on a variety of xerophytic plants, and only occasionally take a few arthropods. Qasim et al. (2018) suggested that plants in the diet of the ISL generally reflected the vegetation in the area, which corresponds to our observation of ISLs in the sanctuary feeding on leaves of seepweeds (*Suaeda* sp.) and tuber roots of cane-grasses (*Erogrostis* sp.).

Threats to these populations include the hatching period in the hot months of May to July, the only time when most of the Rann was dry and remote areas of the sanctuary were accessible, coinciding with peak human activity, including saltpan expansion and salt production, pilgrimages, and tourism (Joshi et al. 2018). More than two dozen small to large Hindu temples are on the large beyts in the sanctuary. We estimated that about 2,000 visitors per day visited the Vachchhraj Dada Temple Complex (a 2-km^2 area with 5,000 domestic animals) while we were in the area, and that number can double on weekends. Effects of this human activity on the fragile ecosystems of the LRK and its wildlife include disturbance, pollution, and collisions with animals and vehicular traffic.

We were unable to quantify the spread of the invasive mesquite (*M. juliflora*) during our short visit, but interviews with local residents indicated that it is spreading rapidly on the beyts and along the northern to southern borders of the sanctuary, triggered largely by increases in irrigation for farming and cattle grazing. Such growth in the sanctuary puts native vegetation at risk (e.g., Thomas et al. 2016), with the resultant shift in community structure posing serious risks to humans, livestock, and wildlife (Patnaik et al. 2017), especially endangered species (Kumar and Mathur 2014).

Large quantities of water released from the Narmada Irrigation Canals into the Rupen River at Kodda Village drastically changed local patterns of land use, converting non-

irrigated croplands and natural dry habitats into irrigated farmland (Singh 2001; Berman et al. 2021), with the entire southern fringe of the sanctuary becoming a permanent wetland. Those changes have destroyed the natural ecosystems of the Rann, on which the Wild Ass and other species, including the ISL, depend (Berman et al. 2021; Rao 2017).

Suitable ISL habitat has declined drastically throughout the species' entire range. Many local populations have been extirpated due to exploitation for the pet trade, meat, and oil for use in aphrodisiacs, along with habitat alteration and destruction due to the spread of invasive plants, irrigation of agricultural lands, and development of road networks linked to urbanization and industrialization (Vyas 1990; Dutta and Jhala 2007; Ramesh and Ishwar 2008; Patel 2011; Das et al. 2013). Despite conservation efforts, the ISL is increasingly threatened (Kaur et al. 2020; Vyas 2021), as even in protected areas like the LRK, habitat is lost or modified; one can only imagine how the species is faring elsewhere.

Acknowledgements

We thank the Principal Chief Conservators of Forest (PCCF-Wildlife), Gujarat State Forest Department, Gandhinagar, Gujarat; Dr. Dhaval Gadhvi, Deputy Conservator of Forests, Wild Ass Sanctuary; and the Range Forest Officer for their support and motivation. Special thanks to Devvratsinh Mori for help with data collection in the field and Anil Parmar and Rahul Bhatt for sharing information on the Spiny-tailed Lizard.

Literature Cited

Berman, B.B., N. Shah, A. Prasad, A. Sanyal, V. Chavda, and Q. Qureshi. 2021. Monitoring spatial and seasonal abundance of Indian Wild Ass (*Equus hemionus khur*) in Little Rann of Kutch Landscape, Western India. *Journal of Ecophysiology and Occupational Health* 21: 168–174. http://dx.doi.org.10.18311/jeoh/2021/29033.

Bhanotar, R.K., R.K. Bhatnagar, and Y.N. Srivastava. 1972. Further observations on the dietary habits of spiny-tailed lizard *Uromastix hardwickii* Gray. *Entomologists News Letter* 2(5): 34.

Bhardwaj, D.K. 2023. Predators and threats of the Indian Spiny-tailed Lizard *Saara hardwickii* (Gray, 1827) (Reptilia: Squamata: Agamidae). *IOSR Journal of Environmental Science, Toxicology and Food Technology* 17: 1–7.

Chandra, K. and P.U. Gajbe. 2005. An inventory of herpetofauna of Madhya Pradesh and Chhattisgarh. *Zoos' Print Journal* 20: 1812–1819.

Daniel, J.C. 2002. *The Book of Indian Reptiles and Amphibians*. Bombay Natural History Society, Oxford University Press, New Delhi, India.

Das, S.K. and V.K. Pandey. 2005. Food, feeding, behavior and habitat preferences of Spiny-tailed Lizard (*Uromastix hardwicki* Gray, 1827) in the Thar Desert of Rajasthan, India. *Tigerpaper* 32: 30–32.

Das, S.K., S. Dookia, K. Das, and S.K. Dutta. 2013. Ecological observations on the Indian Spiny-tailed Lizard *Saara hardwickii* (Gray, 1827) (Reptilia: Squamata: Agamidae) in Tal Chhapar Wildlife Sanctuary, Rajasthan, India. *Journal of Threatened Taxa* 5: 3516–3526. https://doi.org/10.11609/JoTT.o2806.484.

Das, S.K., M. Joshi, and S. Sahoo. 2015. On the population status of Indian spiny-tailed lizard *Saara hardwickii* outside the Thar Desert of Rajasthan, with a preliminary report on the herpetofauna of Sariska National Park. *Herpetology Notes* 8: 51–54.

Dutta, S. and Y.V. Jhala. 2007. Ecological aspects of Indian spiny-tailed lizard *Uromastyx hardwickii* in Kutch. *Journal of Bombay Natural History Society* 104: 255–265.

Husain, A. 1997. Reptilia, pp. 665–698. In: ZSI Director (ed.), *State Fauna Series 6, Fauna of Delhi*. Zoological Survey of India, Kolkata, India.

Joshi, J.D., K. Tatu, D. Joshi, and R.D. Kamboj. 2018. Comparative account of faunal diversity of four major Islands (Bets) in the Little Rann of Kachchh (LRK), Gujarat, India. *International Research Journal of Biological Sciences* 7: 9–19.

Kaur, M., M. Joshi, K. Sarma, A. Syed, and S.K. Das. 2020. Population status, habitat suitability and threat assessment of Indian spiny-tailed lizard *Saara hardwickii* (Gray, 1827) in the Thar desert of Rajasthan. *Journal of Wildlife and Biodiversity* 4: 80–90. https://doi.org/10.22120/jwb.2020.122080.1120.

Khalil, S., A. Nisar, T. Hussain, and A. Hassan. 2020. Population ecology of spiny tailed lizard (*Saara hardwickii*) from lesser Cholistan desert, Bahawalpur, Punjab. *Pure and Applied Biology* 9: 1436–1441. https://doi.org/10.19045/bspab.2020.90149.

Khan, M.S. 2006. *Amphibians and Reptiles of Pakistan*. Krieger Publishing Company, Malabar, Florida, USA.

Kumar, S. and M. Mathur. 2014. Impact of invasion by *Prosopis juliflora* on plant communities in arid grazing lands. *Tropical Ecology* 55: 33–46.

Masroor, R. 2012. *A Contribution to the Herpetology of Northern Pakistan: The Amphibians and Reptiles of Margalla Hills National Park and Surrounding Regions*. Society for the Study of Amphibians and Reptiles in cooperation with Chimaira Buchhandelsgesellschaft mbH, Ithaca, New York, USA.

Maurya, K.K., I.P. Bopanna, and S. Dutta. 2009. Cattle egret *Bubulcus ibis* preying on Indian spiny-tailed lizard *Uromastyx hardwickii* in Kachchh. *Indian Birds* 5: 48–49.

Ministry of Law and Justice. 2022. The Wild Life (Protection) Amendment Act, 2022. *The Gazette of India* CG-DL-E-20122022-241252. <https://prsindia.org/files/bills_acts/acts_parliament/2022/The%20Wild%20Life%20(Protection)%20Amendment%20Act,%202022.pdf>.

Minton, J.R. 1966. Indian spiny tailed lizard (*Uromastix hardwickii*, Gray) Minton. Herpetology of West Pakistan. *Bulletin of the American Museum of Natural History* 134: 27–127.

Patel, P. 2011. Will development spare the Spiny-tailed Lizards in Kachchh? *Current Science* 101: 1519–1520.

Patnaik, P., T. Abbasi, and S.A. Abbasi. 2017. Prosopis *(Prosopis juliflora)*: blessing and bane. *Tropical Ecology* 58: 455–483.

Pradhan, S., K.M. Singh, H.S. Sangwan, R.N. Singh, and R.P. Singh. 1973. Exploration of vertebrate predators for crop pests–I: Food and feeding habits of spiny-tailed lizard, *Uromastix* sp. *Indian Journal Entomology* 35: 148–149.

Qasim, S., M. Rais, F. Akrim, and T. Mahmood. 2018. A study on diet and relationship of Indus valley spiny-tailed lizard (*Saara hardwickii*) with vegetation. *The Journal of Animal and Plant Sciences* 28: 702–707.

Ramesh, M. and N.M. Ishwar. 2008. Status and distribution of Indian Spiny-tailed Lizard (*Uromastyx hardwickii*) in the Thar Desert, Western Rajasthan. GNAPE Technical Report No. T 02. Group for Nature Preservation and Education, Chennai, India.

Ramesh, M. and R. Sankaran. 2013. Natural history observation on the Indian Spiny-tailed Lizard *Uromastyx hardwickii* in Thar Desert, pp. 295–310. In: B.K. Sharma, S. Kulshreshtha, and A.R. Rahmani (eds.), *Faunal Heritage of Rajasthan, India*. Springer, New York, New York, USA.

Rao, K. 2017. The Sardar Sarovar Project–A failure of two bottom lines, uncertainty looms over the third. Unpublished manuscript, Stanford University, Stanford, California, USA. <https://www.researchgate.net/publication/320556888_The_Sardar_Sarovar_Project-A_failure_of_two_bottom_lines_uncertainty_looms_over_the_third>.

Sharma, R.C. and T.G. Vazirani. 1977. Food and feeding habits of some reptiles of Rajasthan. *Records of the Zoological Survey of India* 73: 77–93.

Singh, H.S. 2001. Indian wild ass (*Equus hemionus khur*) in the little Rann of Kutch, Gujarat, India. *Journal of the Bombay Natural History Society* 98: 327–334.

Smith, M.A. 1935. *The Fauna of British India, Including Ceylon and Burma. Reptilia and Amphibia. Vol. II.–Sauria.* Taylor and Francis, London, UK.

Srivastava, D.P., A.S. Chauhan, and R. Ahlawat. 2018. Indian Spiny-tailed Lizard. First record of *Saara Hardwickii* (Gray, 1827) in south-western Hisar District of Haryana, India. *Reptile Rap* #187 in *Zoos' Print Journal* 33: 9–14.

Tatu, A., S. Dutta, and M. Thaker. 2024. Hotter deserts and the impending challenges for the Spiny-tailed Lizard in India. *Biology Open* 13: bio060150. https://doi.org/10.1242/bio.060150.

Thomas, J., M.A. El-Sheikh, A.H. Alfarhan, A.A. Alatar, M. Sivadasan, M. Basahi, S. Al-Obaid, and R. Rajakrishnan. 2016. Impact of alien invasive species on

habitats and species richness in Saudi Arabia. *Journal of Arid Environments* 127: 53–65. https://doi.org/10.1016/j.jaridenv.2015.10.009.

Vyas, R. 1990. Notes on capture of the Spiny-tailed Lizard (*Uromastyx hardwickii*) in Gujarat. *Hamadryad* 15: 28.

Vyas, R., P. Mohapatra, and T. Papenfuss. 2022. *Saara hardwickii* (amended version of 2021 assessment). *The IUCN Red List of Threatened Species* 2022: e.T199817A216173870. <https://dx.doi.org/10.2305/IUCN.UK.2022-1.RLTS.T199817A216173870.en>.

Wagner, P., A.M. Bauer, A. Leviton, T.M. Wilms, and W. Bohme. 2016. A checklist of the amphibians and reptiles of Afghanistan. Exploring herpetodiversity using biodiversity archives. *Proceedings of the California Academy of Sciences, Series 4* 63: 457–565.

Wilms, T.M., W. Bhome, P. Wagner, N. Lutzmann, and A. Schmitz. 2009. On the phylogeny and taxonomy of the genus *Uromastyx* Merrem, 1820 (Reptilia: Squamata: Agamidae: Uromastycinae): Resurrection of the genus *Saara* Gray, 1845. Bonner *Zoologische Beiträge* 56: 55–99.