QSCIENCE connect
A Qatar Foundation Academic Journal

OPEN ACCESS

Research paper

# First record of a gecko species to the fauna of Qatar: *Hemidactylus persicus* Anderson, 1872 (Gekkonidae)

Aurora M Castilla[1,2,3,*], Aitor Valdeón[4,5], Dan Cogălniceanu[6], Alberto Gosá[4], Ali Alkuwary[7], Essam O.H. Saifelnasr[8,9], Sara Al Naimi[10,1], Ahmad Amer Mohd Al-Hemaidi[11]

[1]Department of Biodiversity, Qatar Environment and Energy Research Institute (QEERI), Qatar Foundation, Education City, P.O. Box 5825, Doha, Qatar
[2]Forest Sciences Centre of Catalonia (CTFC), Solsona, Lleida, Spain
[3]Spanish National Research Council (CSIC). Madrid, Spain
[4]Department of Herpetology, Aranzadi Society of Sciences, Zorroagagaina, 11. San Sebastián, Spain
[5]Department of Geography and Regional Planning, University of Zaragoza. Pedro Cerbuna, 12. Zaragoza, Spain
[6]University Ovidius Constanţa, Faculty of Natural Sciences and Agricultural Sciences, Al. Universitatii 1, corp B, 900740 Constanţa, Romania
[7]Wildlife Research Section, Ministry of Environment, Qatar, P.O. Box 7635, Doha, Qatar
[8]Genetic Resources Department, Biotechnology Centre, Ministry of Environment, Qatar, P.O. Box 200022, Doha, Qatar
[9]Agricultural Research Center (ARC), Ministry of Agriculture, Egypt
[10]Qatar University, College of Arts and Sciences, P.O. Box 2713, Doha, Qatar
[11]Qatar Petroleum. Halul Terminal and Export, P.O.Box 47, Doha, Qatar

*Email: acastilla@qf.org.qa; castilla.aurora@gmail.com

http://dx.doi.org/10.5339/connect.2013.28

Submitted: 30 June 2013
Accepted: 6 August 2013



## ABSTRACT

We report the discovery of a gecko species, the Persian leaf-toed gecko *Hemidactylus persicus* Anderson, 1872 (Gekkonidae) in Qatar, found on Halul Island. According to the Qatar National Biodiversity Surveys and the available international literature *H. persicus* was not previously recorded in Qatar. Its known range covers the north east of the Arabian Peninsula, Bahrain, the United Arab Emirates, and south western Asia. Our findings bridge the current geographic gap in the known distribution of the species from Saudi Arabia to Asia. We believe that the species could also be present in the Qatar peninsula. A thorough field survey is needed in order to map the range of this species in the State of Qatar.

*Keywords:* Halul Island, lizard, mapping, biodiversity, wildlife conservation, Arabian Gulf

Cite this article as: Castilla AM, Valdeón A, Cogălniceanu D, Gosá A, Alkuwary A, Saifelnasr EOH, Al Naimi S, Al-Hemaidi AAM. First record of a gecko species to the fauna of Qatar: *Hemidactylus persicus* Anderson, 1872 (Gekkonidae), *QScience Connect* 2013:28 http://dx.doi.org/10.5339/connect.2013.28

QSCIENCE.com
Member of Qatar Foundation

## INTRODUCTION

Geckos of the genus *Hemidactylus* comprise taxa which are among the most widely distributed lizards. The genus is also very diverse with a rapidly increasing number of new species descriptions: 80 different species in 2006,[1] 111 in March 2012,[2] and 122 species in July 8, 2013, according to the Reptile Database.[3,4] These geckos show large intraspecific variation and it is sometimes difficult to distinguish among species.[5]

The Persian leaf-toed gecko, *Hemidactylus persicus* Anderson, 1872, is a nocturnal lizard of the family Gekkonidae, that occurs in Iran,[6–9] Iraq,[10–13] Pakistan, [14–17] India,[18,19] northeast Saudi Arabia,[20–22] Kuwait[23] and Bahrain.[23,24] Other populations were recorded in North Oman[25] and the UAE (Figure 1).[5] The known Omani populations, in the Hajar Mountains, belong to two recently described species.[26] Its type locality is in Persia (Iran),[27] but the exact location is unknown. Blandford[28] thought that the type specimen was obtained in Bushire, but Smith[29] restricted the type locality to Shiraz.

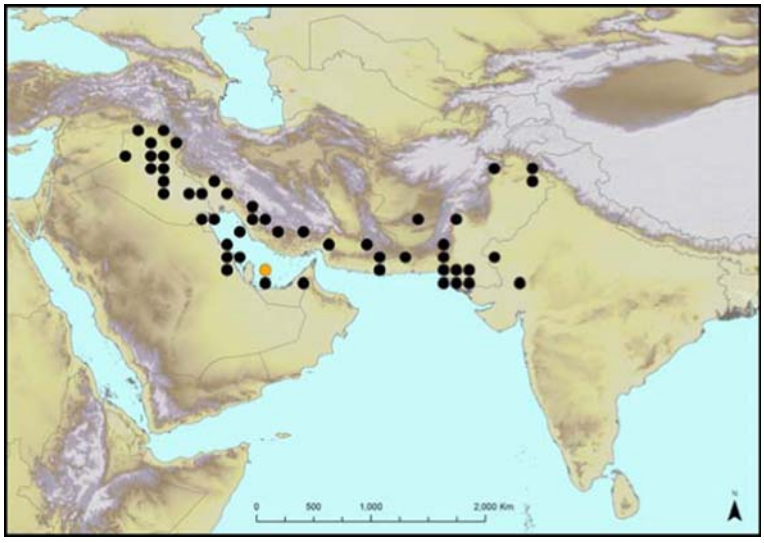


**Figure 1. Geographic distribution of *H. persicus*. Black dots represent known locations, and the orange dot is the new record for Halul Island. Map: Aitor Valdeón.**

The Persian leaf-toed gecko is a poorly known species and little is known about its biology and ecology. Considering the available recent scientific literature revised in July 2013[3,30] only a few publications exist about the Persian leaf-toed gecko and they are mainly related to their distribution range and the description of new records for the species (references above). There are few molecular studies concerning systematics and biogeography.[31] In this study, we report for the first time, the presence of *Hemidactylus persicus* in Qatar, and provide images and information about the morphology of the lizards.

## STUDY AREA

During two visits to Halul Island from 19$^{th}$–20$^{th}$ and 26$^{th}$–27$^{th}$ of April 2013, we found several specimens of the Persian leaf-toed gecko. Halul Island (25°40′26″N, 52°24′40″E) is located at approximately 96 km (52 nautical miles) northeast of the city of Doha. The island is pear-shaped and covers an area of approximately 1.5 km$^2$, extending a maximum of 1.7 km from north to south direction and 800 metres from east to west.[32] The island is hilly, rising to a maximum elevation of 56 metres, where a lighthouse is situated, and has a population of 2000 people employed by the Qatar Petroleum Company. The island is economically important for the State of Qatar. The harbour and field operations were established between 1964 and 1971. Before the start of oil exploitation, the island was used by fishermen and harvested for pearls and seabird eggs.[32]

Most native vegetation in the island has been removed to avoid fires. Most current vegetation is exotic and it is concentrated in enclosures or farms. More than 2000 trees were planted in the island in the last 20 years and a large variety of bushes (e.g., *Conocarpus lancifolius*, *Phoenix dactylifera*, *Opuntia ammophila*, *Lycaena thersamon*, *Mesembryanthemum* sp.). The vegetation on the island attracts a large variety of migratory birds to the island, and is also an important breeding area for terns.[32]

**Figure 2.** Habitat in Halul Island where some *H. persicus* were found, near *Acacia* trees (Photo: Aurora M Castilla).

## THE SPECIES

During the daily surveys we found 11 Persian leaf-toed geckos hidden under wood, rocks or dry leaves situated under trees and bushes (Figures 2, 3, 4). This is an interesting observation since this species in other areas is associated with vertical surfaces (referees, personal communication). We did not see any Persian leaf-toed geckos active at night; however, night surveys were less intensive than the daytime surveys. Nine Persian geckos captured by hand were measured and photographed (Table 1).

Following the description of Anderson[27] and other keys,[33–35] together with our own observations of the individuals we captured in Halul Island, Persian leaf-toed geckos can be recognised by different features. The dorsal colour is pale yellowish brown- green and the upper surface is covered with small granules and moderately large and strongly keeled tubercles, arranged in an irregular longitudinal series (Figures 5, 6).

Persian leaf-toed geckos show a darkish brown streak from the nostrils through the eye above the ear, with a whitish line above it. The upper eyelid is strongly fringed and the ear-opening

**Figure 3.** Habitat in Halul Island with palms, where *H. persicus* was observed (Photo: Aurora M Castilla).

**Figure 4. Habitat in Halul Island with bushes where *H. persicus* was present (Photo: Aurora M Castilla).**

is large (Figure 7). The ventral side of the head is white, with a pair of large first postmentals in contact behind the triangular mental scale, with second postmentals on either side of the first postmentals (Figure 8). Abdominal scales are small, smooth, rounded and imbricate (Figure 9), and 45 to 50 rows occur in the middle of the belly.[27] The tail is cylindrical and has transverse rows of tubercles on its upper surface.

Digits are free and show a large number of subdigital lamellae (Figure 10), normally having 8–10 under the first toe and 12–14 under the fourth toe.[27] In Halul, two individuals had 8 subdigital lamellae under the first toe, and five had 9. The number of subdigital lamellae under the fourth toe varied from 12 (in two individuals), 13 (in two individuals), and 14 (in one individual). Males of this species are known to have 8 to 13 preanal pores.[5] In Halul two males showed 8 preanal pores, but only 6 and 7 were clearly visible, respectively. Persian leaf-toed geckos from other populations in Saudi Arabia[20] and UAE[5] also showed 8 preanal pores.

Lizards were weighted using a Sartorious digital balance to a precision of 0.01 grams. The snout-vent length (SVL) and tail length (TL) was measured with a calliper (Mitutoyo) with a precision of 0.01 mm.

**Table 1. Morphological measurements of the Persian leaf-toed gecko (male: M, female: F, gravid female: Fg) captured in Halul Island. The sex of the juvenile (Juv) could not be identified. Body mass is indicated in grams and the snout vent length (SVL), the length of intact tails and of those that were broken or regenerated are in millimeters. Tail 1 is the part of the tail near the cloaca, tail 2 the regenerated tail and tail tot the sum of both, or the intact tails. Here we show the mean (X) and standard deviation (sd) for adult lizards only, and the sample size (n).**

| Date | Latitude | Longitude | Sex | Mass | SVL | Tail1 | Tail2 | Tail tot |
|---|---|---|---|---|---|---|---|---|
| Juveniles | | | | | | | | |
| 20 April | 25.677810 | 52.410700 | Juv | 0.805 | 32.9 | 37.7 | | 37.7 |
| Subadults | | | | | | | | |
| 19 April | 25.680114 | 52.412620 | M | 1.371 | 43 | 46.9 | | 46.9 |
| 19 April | 25.680510 | 52.412500 | F | 1.337 | 42.5 | 17.9 | lost | |
| 26 April | 25.677920 | 52.409870 | F | 1.762 | 46.8 | 48.2 | | 48.2 |
| 20 April | 25.677810 | 52.410700 | F | 1.737 | 44.2 | 14.7 | lost | |
| Adults | | | | | | | | |
| 26 April | 25.677940 | 52.409810 | M | 2.579 | 53.6 | 61.5 | | 61.5 |
| 19 April | 25.680798 | 52.412195 | M | 3.406 | 58.8 | 8.9 | 44.7 | 53.6 |
| 19 April | 25.680798 | 52.412195 | Fg | 3.331 | 57.2 | 12.5 | 47.9 | 60.4 |
| 19 April | 25.681070 | 52.411990 | M | 3.371 | 57.9 | 56 | lost | |
| | | | X | 3.17 | 56.88 | 34.73 | 46.3 | 58.50 |
| | | | sd | 0.40 | 2.28 | 27.87 | 2.26 | 4.28 |
| | | | n | 4 | 4 | 4 | 2 | 3 |

**Figure 5.** Adult *H. persicus,* showing dark dorsal coloration. Halul Island, Qatar (Photo: Aitor Valdeón).

**Figure 6.** Juvenile *H. persicus* showing pale dorsal coloration. Halul Island, Qatar (Photo: Aitor Valdeón).

**Figure 7.** Head of *H. persicus*. Halul Island, Qatar (Photo: Aitor Valdeón).

**Figure 8.** Ventral view of the head of *H. persicus*. Halul Island, Qatar (Photo: Aitor Valdeón).

Our data (Table 1) shows that the Persian leaf-toed gecko in Halul seems to be smaller (mean adult body size: 56.88 mm, range: 53.6–58.8 mm, $n = 4$) than those reported in other regions (maximum adult body size: 65–73 mm),[11,22] but similar to the specimens measured in UAE (mean adult body size: 57.33 mm, range: 57–58 mm, $n = 3$).[5]

Sexual dimorphism in body size has been reported for this species in other geographic areas, with males being bigger than females.[36] With the available data for the Halul population we are unable document the sexual differences in body size, as we would need to examine a larger sample of lizards from this island.

During our study we observed one juvenile, one gravid female with two oviductal eggs that could be seen easily through the ventral skin (Figure 11), and one individual shedding its skin. Our observations show that lizards of different size, sex and reproductive and physiological condition were active on the island at the end of April. That suggests that the population in Halul is healthy.

Five geckos had shown broken or regenerated tails (Table 1). We accidentally broke three tails during handling, but two of them had already been regenerated. This suggests that predation pressure on the island must be high. In fact, in the same habitat we found the lizards there were several farm birds (e.g. chicken, ostriches) and cats, as well as wild migratory birds.[32] The Persian leaf-toed gecko in Halul also shares the island with other lizards, including the yellow-bellied house gecko

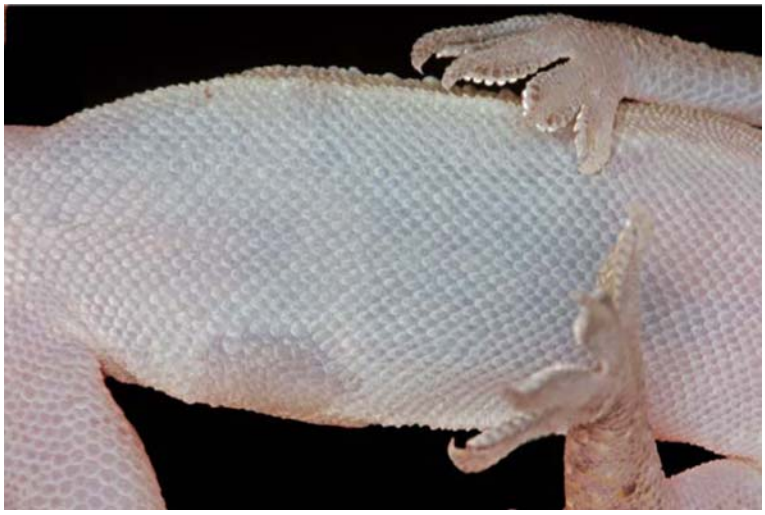

**Figure 9.** Ventral body scales of *H. persicus*. Halul Island, Qatar (Photo: Aitor Valdeón).

**Figure 10. Details of the lamellae under the digits of the left hind leg in one adult *H. persicus*. Halul Island, Qatar (Photo: Aitor Valdeón).**

**Figure 11. Figure 11. Gravid female of *H. persicus* showing two oviductal eggs. Halul Island, Qatar (Photo: Aitor Valdeón).**

(*Hemidactylus flaviviridis*), the rough-tailed bowfoot gecko (*Cyrtopodion scabrum*), the golden grass mabuya (*Trachylepis septemtaeniata*) and the rock semaphore gecko (*Pristurus rupestris*).

## DISCUSSION

According to the National Biodiversity Surveys and studies conducted in Qatar,[37] the Global Biodiversity Information Facility,[38] the Reptile Database[39] both verified on July 7, 2013, and Sindaco and Jeremčenko,[23] there are no records for the Persian leaf-toed gecko, *Hemidactylus persicus* in Qatar. Our finding therefore bridges the current geographic gap in the known distribution of the species from Saudi Arabia to Asia (Figure 1). We believe that the species could be present in other locations in the Qatar peninsula and possibly on other Qatar islands. In fact, previous studies have shown that a rapid

radiation and long distance dispersal in geckos of the genus *Hemidactylus* are more extensive than in any other reptilian genus.[1]

The Qatari population of Persian leaf-toed gecko, as well as populations from Bahrain, Saudi Arabia and UAE, showing a lower number of preanal pores, could be other cryptic species, different from *Hemidactylus persicus sensu stricto*. Future genetic and taxonomic analyses are necessary to clarify the identity of the *Hemidactylus* species in the region, as well as its biogeographic history.[4]

During our recent (2012–2013) biodiversity surveys in Qatar, we have inventoried 21 lizard species, in 605 geographic locations,[40] but the Persian leaf-toed gecko was only found on Halul Island. More surveys are needed to map the distribution range of this species in Qatar mainland and islands, and explore if this species is more vulnerable than other lizards. If this were the case it would require specific conservation measures for its survival in Qatar. If the only area for its local distribution is Halul Island, the species should be considered a threatened species in Qatar and the population in Halul should be highly protected and conserved.

Our study suggests that the lizard fauna of Qatar is insufficiently known. Basic knowledge of species ecology and distribution is required for a proper management and conservation plan of biodiversity in Qatar, and to comply with the requirements of the Convention on Biological Diversity (CBD) and the Aichi Biodiversity Targets for 2020.

## Acknowledgements

We thank the contribution of Dr Rabi Mohtar (Ex-director of QEERI) and of Dr Mohammad Khaleel (Executive director of QEERI) and the logistic support of Qatar Foundation, particularly to Mr Faisal M Alsuwaidi (President of Research and Development), to Dr Khalid Al-Subai (Director Coordination & Compliance, Research Division), and to many persons from Research Division, the Housing and Transport services and the Finances department, for their continuous support and invaluable help. We acknowledge the logistic support of the Ministry of the Environment in Qatar, particularly to Mr Mohammed El-Mohanady and Mr Khaled Helal Al-Enazi. We very much thank Mr Ahmad Amer Mohd Al-Hemaidi, Minister of the Environment and Ex-manager of Halul Terminal and Export Department, to provide all scientists with the needed permits and courses to fly to the island, also for providing transportation, accommodation and access to the facilities in the island during different trips. Many thanks to Dr Rodrigo Riera, Dr Alexey Sergeev, Dr Elena Bulmer, Mr. Mohomed Nasahir Mohomed, Mr Beer Bahadhur Bohara and Mr Jeeban Budha for their help during the fieldwork. We thank Dr Kuei-Chiu Chen for letting us use the dissecting scope from the laboratory at Weill Cornell Medical College to measure the morphological traits of the lizards. To Dr Drew Gardner and the reviewers for their constructive comments. We are also grateful to Mr Khalifa Jassim Al-Malki and the Qatar Petroleum team for their help during our visits to the island, particularly to Mr Mohammed Ali Humaid, Mr Nasser Haji, Mr Nabeel Alashi, Mr Abdulla Hamad Henzab, Mr Hatem Tageldin, Mr Mohammed Al-Hajri, Mr Jassim Mashhadi and Mr Qassim Keraib. The Department of Education of the Government of Navarre (Spain) granted Mr Aitor Valdeón. This study has been possible by the Project #QF.00.307.722011.QE11 (Qatar Foundation) to Dr Aurora M Castilla.

## REFERENCES

[1] Carranza S, Arnold EN. Systematics, biogeography, and evolution of Hemidactylus geckos (Reptilia: Gekkonidae) elucidated using mitochondrial DNA sequences. *Mol Phylogenet Evol*. 2006;38(2):531–545.
[2] Pincheira-Donoso D, Bauer AM, Meiri S, Uetz P. Global taxonomic diversity of living reptiles. *PLoS ONE*. 2013;8(3):e59741.
[3] The Reptile Database. Genus Hemidactylus [http://reptile-database.reptarium.cz/advanced_search?genus=Hemidactylus&submit=Search]. Accessed 30/07/2013.
[4] Šmíd J, Carranza S, Kratochvíl L, Gvoždík V, Nasher AK, Moravec J. Out of Arabia: A complex biogeographic history of multiple vicariance and dispersal events in the gecko genus *Hemidactylus* (Reptilia: Gekkonidae). *Plos One*. 2013;8(5):e64018.
[5] Gardner AS. Two new gecko species records for the United Arab Emirates: pristurus carteri and hemidactylus persicus. *Tribulus*. 2009;18:18–23.
[6] Fathnia B, Rastegar-Pouyani N, Sampour M, Bahrami AM, Jaafari G. The lizard fauna of Ilam province, Southwestern Iran. *IJAB*. 2009;5(2):65–79.
[7] Heidari N, Kami HG. Lizards of the Gando Protected area in Sistan and Baluchestan Province, southeastern Iran. *IJAB*. 2009;5(2):57–64.
[8] Zareian H, Esmaeili HR, Gholamhosseini A, Teimori A, Zohrabi H, Kami HG. A preliminary study on the herpetofauna of Gorm mountain non-hunting area in Fars Province. *J Taxonomy Biosystematics*. 2010;1(1):1–8.
[9] Gholamifard A, Rastegar-Pouyani N. Distribution of hemidactylus geckos (reptilia: gekkonidae) in fars province, Southern Iran. *Amphib Reptile Conserv*. 2011;5(1):1–6.
[10] Procter JB. Further lizards and snakes from Persia and Mesopotamia. *Journ Bombay Nat Hist Soc*. 1921;28:251–253.
[11] Nader IA, Jawdat SZ. Taxonomic study of the geckos of Iraq (Reptilia: Gekkonidae). *Bull. Biol. Res. Center Bagdad*. 1976;5:1–41.

[12] Al-Barwari SE, Nassir JK. First record of ten species of helminthic parasites from vertebrates in Iraq. *Iraqi J Sci*. 1983;24(2):101–108.
[13] Al-Barwari SE, Saeed I. On the helminth fauna of some Iraqi reptiles. *Turkiye Parazitol Derg*. 2007;31(4):330–336.
[14] Minton SA. An annotated key to the amphibians and reptiles of Sind and Las Bela, West Pakistan. *Am Mus novitates*. 1962;2081:1–60.
[15] Minton SA. A contribution to the herpetology of West Pakistan. *Bull Am Mus Nat Hist*. 1966;134:27–184.
[16] Khan MS, Mirza MR. An annotated checklist and key to the reptiles of Pakistan, part 2: Sauria-(Lacertilia). *Biologia Lahore*. 1977;23(1):41–64.
[17] Khan MZ, Hussain B, Ghalib SA, Zehra A, Mahmood N. Distribution, population status and environmental impacts on reptiles in Manora, Sandspit, Hawkesbay and Cape Monze areas of Karachi coast. *Can J Pure Appl Sci*. 2010;4(1):1053–1071.
[18] Vyas R, Giri V, Bauer A. First records of Hemidactylus persicus Anderson, 1872 (Squamata: Sauria: Gekkonidae) from the republic of India, with notes on its distribution. *Hamadryad*. 2006;30:211–213.
[19] Bansal R, Karanth P. Molecular phylogeny of *Hemidactylus* geckos (Squamata: Gekkonidae) of the Indian subcontinent reveals a unique Indian radiation and an Indian origin of Asian house geckos. *Mol Phylogenet Evol*. 2010;57:459–465.
[20] Haas G. Some amphibians and reptiles from Arabia. *Proc Cal Acad Sci*. 1957;29(3):47–86.
[21] Ross W. Notes on the behaviour of Cyrtopodion scaber, Hemidactylus flaviviridis and Hemidactylus persicus (Reptilia: Gekkonidae) with reference to syntopy. *Fauna Saudi Arabia*. 1993;13:368–374.
[22] Baha El Din Sherif M. An overview of Egyptian species of Hemidactylus (Gekkonidae), with the description of a new species from the mountains of South Sinai. *Zool Middle East*. 2005;34:11–26.
[23] Sindaco R, Jeremčenko VK. *The Reptiles of the Western Palearctic 1. Annotated Checklist and Distributional Atlas of the Turtles, Crocodiles, Amphisbaenians and Lizards of Europe, North Africa, Middle East and Central Asia*. Italy: Edizioni Belvedere, Latina; 2008:p.579.
[24] Gallagher MD. *The Amphibians and reptiles of Bahrain*. Bahrain 1971:p.40.
[25] Meinig H. Amphibians and reptiles of Jebel Shams, Oman Mountains (Amphibia; Reptilia). *Faunistische Abhandlungen (Dresden)*. 1998;21:85–88.
[26] Carranza S, Arnold EN. A review of the geckos of the genus Hemidactylus (Squamata: Gekkonidae) from Oman based on morphology, mitochondrial and nuclear data, with description of eight new species. *Zootaxa*. 2012;3378:1–95.
[27] Anderson J. On some Persian, Himalayan, and other Reptiles. *Proc Zool Soc London*. 1872;:371–404.
[28] Blandford WT. *Zoology and Geology of Eastern Persia*. London: Macmillan and Company; 1876:p.516.
[29] Smith MA. *The fauna of British India, including Ceylon and Burma. Reptiles and Amphibia, Vol. II. Sauria*. London: Taylor and Francis; 1935:p.440.
[30] ISI Web of Knowledge [http://apps.webofknowledge.com]. Accessed 06/08/2013.
[31] Bauer AM, Jackman TR, Greenbaum E, Giri VB, De Silva A. South Asia supports a major endemic radiation of *Hemidactylus* geckos. *Mol Phylogenet Evol*. 2010;57(1):343–352.
[32] Al-Misaifri H, Al-Hemaidi AAM. Halul Island. Environment and wildlife. Ed. Gillespie F and Ganesh N. Doha, Qatar. 2011:112.
[33] Arnold EN. A key and annotated check list to the lizards and amphisbaenians of Arabia. *Fauna of Saudi Arabia*. 1986;8:385–435.
[34] Leviton AE, Anderson SC, Adler K, Minton SA. *Handbook to Middle East Amphibians and Reptiles*. Oxford: Society for the Study of Amphibians and Reptiles; 1992:p.252.
[35] Anderson SC. *The lizards of Iran*. Ithaca: Society for the Study of Amphibians and Reptiles; 1999:p.442.
[36] Heidari N, Faizi H, Rastegar-Pouyani N. Sexual dimorphism in the Persian Gecko, *Hemidactylus persicus* Anderson, 1872, in Hormozgan Province, Southern Iran (Sauria: Gekkonidae). *Zool Middle East*. 2011;53:35–40.
[37] MOE. Ministry of the Environment. *Qatar National Biodiversity Strategy and Action Plan Assessment. Biodiversity Inventory, Final Report*. Doha, Qatar: Ministry of the Environment; 2004.
[38] Global Biodiversity Information Facility. [http://data.gbif.org/species/5959882/]. Accessed 1/8/2013.
[39] The Reptile Database. *Hemidactylus persicus*. [http://reptile-database.reptarium.cz/species?genus=Hemidactylus&species=persicus]. Accessed 1/8/2013.
[40] Castilla AM. Valdeón A, Cogălniceanu D, Gosá A, Mas P, Alkuwary A, Saifelnasr EOH, Al-Jaidah N, Richer R. A preliminary checklist and distribution of lizards of Qatar. Volume of Abstracts of the 17th SEH European Congress of Herpetology, Veszprém (Hungary), 22-27 August 2013. In press.