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Notes on the Heyden's gecko (*Hemidactylus robustus*) (Squamata: Gekkonidae) from Tunb-e Bozorg and Faror Islands, Persian Gulf

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Abstract

The Heyden's gecko (*Hemidactylus robustus*) is a rare taxon in the Iranian herpetofauna, and its distribution range in Iran has remained largely unclear. In this study, we report on relatively recently collected three specimens from Tunb-e Bozorg and Faror Islands, Persian Gulf, and compare them with published data. The specimens examined show morphological congruence in the main taxonomic features and colour patterns with those previously described in the existing literatures. This study provides for the first time molecular evidence for the specimens of *Hemidactylus robustus* on the southern coast of Iran. The results show that the prevailing hypothesis of a recent, possibly anthropogenically favored dispersal of the species in its range is not sufficiently supported.

Keywords: Iranian Islands, Persian Gulf, Gekkonidae, mtDNA, Haplotype, taxonomy.

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Hemidactylus robustus Heyden, 1827 is a gecko belonging to the diverse genus that includes 199 recognized species, making it one of the most species-rich genera of reptiles worldwide, seven of which have been recorded in Iran ([Uetz et al., 2025](#)). This species is widely distributed and inhabits the coastal regions of the Red Sea, Arabian Sea and Persian Gulf, but also extends its range to the interior regions of the Horn of Africa and Arabia ([Sindaco and Jeremcenko, 2008](#); [Uetz et al., 2025](#)).

For an extended period, *Hemidactylus robustus* has been regarded as a junior synonym of *H. turcicus* due to morphological similarities and the absence of comprehensive taxonomic studies. Nevertheless, it has been recognized as a distinct species by several researchers ([Baha El Din, 2003, 2005, 2006](#); [Lanza, 1990](#); [Moravec & Böhme, 1997](#)). Genetic analyses have corroborated its status as a distinct taxon ([Carranza & Arnold, 2006](#)). Further investigations have reinforced this taxonomic classification ([Carranza & Arnold, 2012](#); [Moravec et al., 2011](#); [Šmíd et al., 2013, 2015](#)).

Although *Hemidactylus robustus* is recognized as a component of the Iranian herpetofauna ([Bauer et al., 2006](#); [Hosseinzadeh et al., 2014](#)), molecular phylogenetic analyzes of specimens from the Iranian coast of the Persian Gulf have not yet been performed. In this study, a segment of the mitochondrial gene encoding the fourth subunit of NADH dehydrogenase (ND4) is used to determine the phylogenetic position of three specimens originating from Tunb-e Bozorg and Faror islands. In addition, a table comparing the morphological characters between the specimens and the existing scientific literature is provided.

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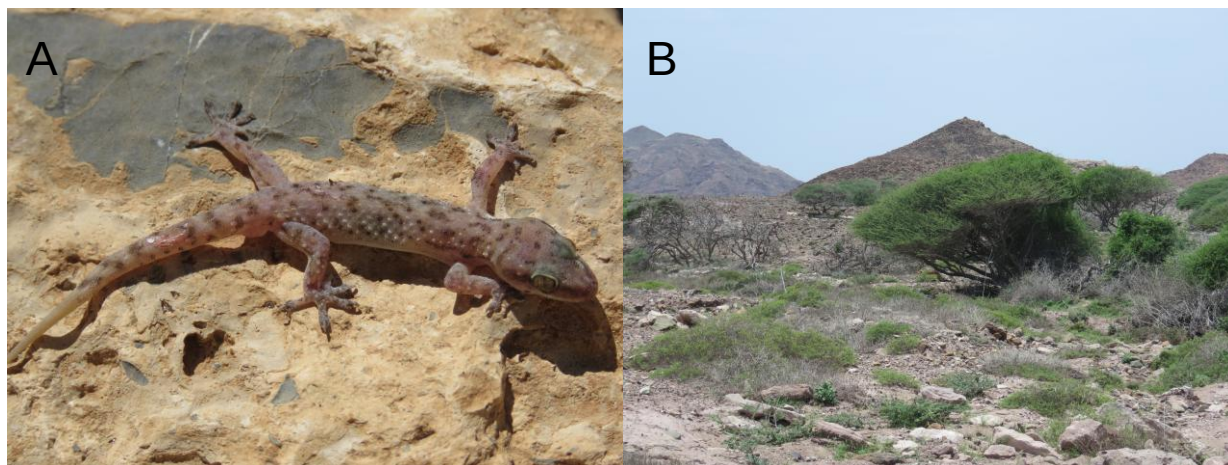


FIGURE 1. Live specimens of *Hemidactylus robustus* caught on the island of Faror, Persian Gulf (A); Natural habitats of *Hemidactylus robustus* on the island of Faror, Persian Gulf (B).

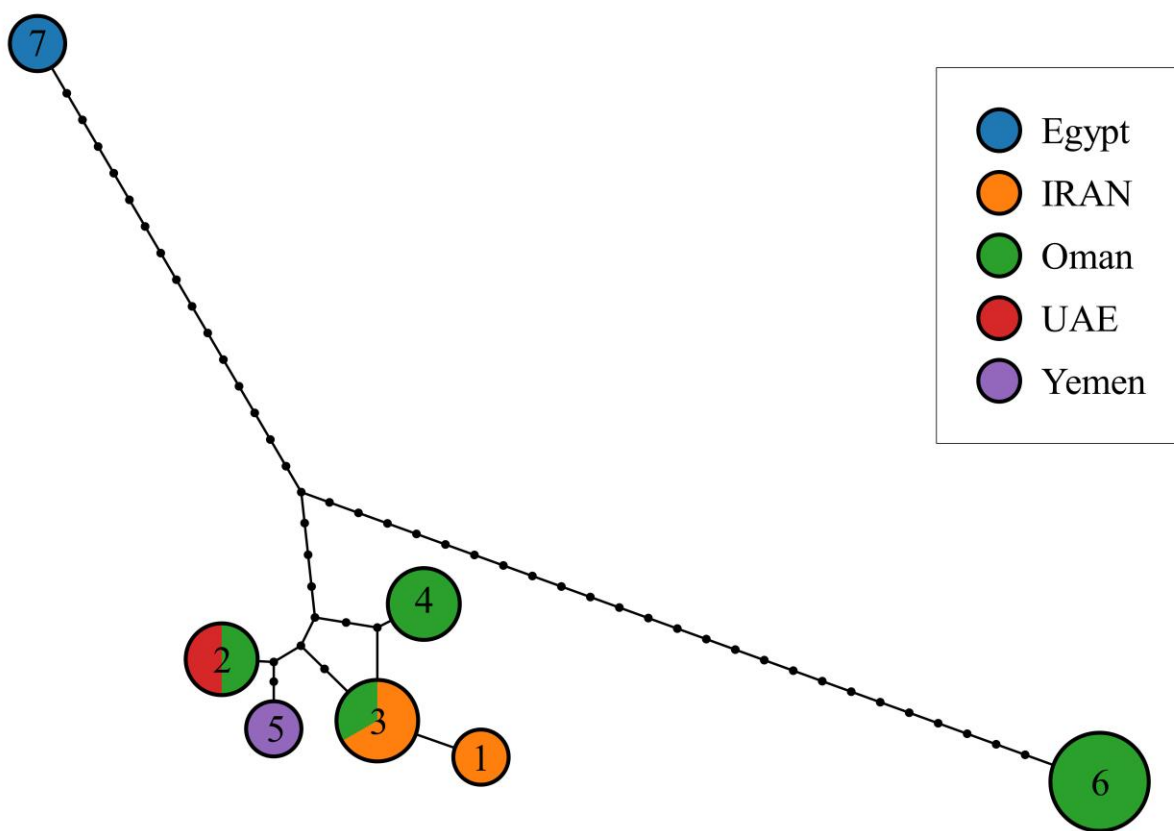


FIGURE 2. Phylogenetic network based on haplotypes for the *ND4* fragment (491bp) in *Hemidactylus robustus*. Circles correspond to haplotypes, with size proportional to the number of individuals per haplotype. Vertical lines correspond to mutational steps. Colors represent geographic origins of haplotypes according to Table S1.

On the islands of Tunb-e Bozorg and Faror, *Hemidactylus robustus* was easily found in most of the natural habitats of these islands (Figure 1). They were active at night and could be found hiding under rocks during the day. The examined specimens show morphological congruence in the main taxonomic features and color patterns with those previously described in the existing literature (Table 1). A segment comprising 585 base pairs of the mitochondrial DNA sequences pertaining to the ND4 gene was sequenced in the present investigation and subsequently archived in the National Center for Biotechnology Information (NCBI) (PV863223 (HAC 1376); PV863222 (HAC 1370); PV863221 (HAC 1381)). The sequences underwent editing utilizing Bioedit version 7.0.0 (Hall 1999) and were aligned employing the CLUSTAL W algorithm (Thompson et al. 1994). Furthermore, existing sequences of ND4 for *H. robustus* were retrieved from GenBank (Table S1). The obtained sequences were subjected to trimming, culminating in the creation of a dataset characterized by a final sequence length of 491 nucleotides. An unrooted phylogenetic network delineating the ND4 haplotypes of *Hemidactylus robustus* was established through the application of the TCS network algorithm (Clement et al. 2002), incorporated within Hapsolutely 0.2.2 (Vences et al. 2021), utilizing the default parameters. Comparison of the DNA sequences obtained showed that our samples belonged to two mitochondrial haplotypes. One of them is a unique haplotype and the other two belong to a haplotype that is also found in Oman (Al Zaiba) (Figure 2). The highest haplotype diversity is found in samples from Oman (Figure 2), although this result could be due to a sampling gap in the distribution ranges of this species. The pattern of haplotype diversity discovered in this study clearly contradicts the hypothesis of a recent, potentially anthropogenically facilitated, dispersal of the species in this region (Šmíd et al., 2015). It seems that we need further studies with more samples to better understand the distribution pattern of this species.

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TABLE S1. Data pertaining to all *Hemidactylus robustus* sequences incorporated in this study, together with their geographical distributions and corresponding NCBI accession numbers.

CODE	Haplotype no.	Geographic Origin	NCBI Accession Number
H_robustus_AO3_Oman	3	Oman	JQ957388
H_robustus_AO164b_Oman	4	Oman	JQ957387
H_robustus_AO165_Oman	4	Oman	JQ957387
H_robustus_S1688_Oman	2	Oman	JQ957390
H_robustus_R1415_Yemen	5	Yemen	JQ957392
H_robustus_SPM001859_Egypt	7	Egypt	JQ957394
H_robustus_SPM001503_UAE	2	UAE	JQ957393
H_robustus_S1677_Oman	6	Oman	JQ957389
H_robustus_S2150_Oman	6	Oman	JQ957391
H_robustus_S2151_Oman	6	Oman	JQ957389
H_robustus_S1905_Oman	6	Oman	JQ957389
H_robustus_S1962_Oman	6	Oman	JQ957389
H_robustus_S1778_Oman	6	Oman	JQ957389
HAC_1381_Faror	3	IRAN, Island of Faror	PV863221
HAC_1370_Tunb-e Bozorg	3	IRAN, Island of Tunb-e Bozorg	PV863222
HAC_1376_Tunb-e Bozorg	1	IRAN, Island of Tunb-e Bozorg	PV863223