

**New Localities for *Hemidactylus turcicus* (Linnaeus, 1758)
(Sauria: Gekkonidae) in Anatolia, Turkey,
with notes on their morphology**

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Abstract: In this investigation, four new localities of *Hemidactylus turcicus* were recorded in Anatolia. Prior to this study all localities of the species were recorded to the west side of Euphrates (Firat River), an important dispersal barrier for animals. This study represents the first record of this species from the East side. The other new localities were detected within previously known distribution area the west of the river. As a result of our research, the distribution of *Hemidactylus turcicus* has been extended. The specimens collected from both sides of the river were evaluated with respect to morphological and pholidolial characteristics.

Key Words: *Hemidactylus turcicus*, distribution range, pholidosis, morphology, Anatolia

Introduction

The Turkish Gecko, *Hemidactylus turcicus* is widely distributed over large areas of the Mediterranean basin, Southern Europe, North Africa and Middle East (Başoğlu and Baran 1977, Salvador 1981, Baha El Din 2005, 2006). Previously described as monospecific, Morevec and Böhme (1997) recently described a subspecies, *H. t. lavadeserticus*, from the black lava desert of Syria. Then, Disi et al. (2001) extended its known distribution to

Jordan. Except *H. t. lavadeserticus* distribution area, animal in natural or non-natural area were recognized as the nominate subspecies (Moravec and Böhme 1997; Baha El Din 2005; 2006). The previously known distribution of *Hemidactylus turcicus* in Anatolia was restricted to the coastline of both the Aegean and Mediterranean seas (Başoğlu and Baran 1977, Budak and Göçmen 2005). Although it was also recorded at points along the coastline of both Marmara and Black seas, these seem

to be accidental distribution areas of *Hemidactylus turcicus* (Baran and Gruber 1982). Baran and Gruber (1982) have reported that the easternmost locality of the species was the Kilis province based on a single specimen. All localities of the species were recorded from the west side of the Euphrates, an important dispersal barrier for many terrestrial animals, until now.

In this paper, we evaluated the external features of all specimens and presented new distribution sites, extending the distribution boundaries of *Hemidactylus turcicus* in addition to recording specimens from previously known localities.

Materials and Methods

Materials were collected from four localities. 1- Akinci village (Kilis, five female and seven male specimens), at an altitude of 503 m, 2- Yuvabasi village (Kilis, one female specimen), at an altitude of 627 m, and 3- Cinar village (Kilis, one juvenile specimen), at an altitude of 651 m, 4. Seyh Maksut district (Sanliurfa, one juvenile, two female and two male specimens), at an altitude of 577 m. All specimens were anesthetized with ether, fixed by 96% ethanol injection into the body cavity and deposited in 70% ethanol (Tosunoğlu et. al. 2002).

This method was selected to allow the possibility of utilizing specimens for DNA studies in the future. The specimens were numbered and deposited in Zoology Department of Ege University (ZDEU) (Table 1). In addition to these specimens, we evaluated 56 museum specimens to make

comparisons with other population known from Anatolia (Appendix).

The following meristic pholidolial characteristics were taken: number of upper (UL) and lower labials (LL), interorbitals (IO) (count of scales across the interorbital region at level of mid orbits, excluding palpebral folds); gulars (GU) (scales counted between posterior edge of postmentals to a line between the ventral most points of the ears), longitudinal ventral scale rows (LVR), counted across mid abdomen; longitudinal dorsal tubercle rows (LDTR), counted across dorsum; scales between dorsal tubercles (SDT), number of preanal pores (PRP), scales between lower nasal and anterior border of orbit (SLNAO), lamellae under first (LUFS) and fourth (LUFT) toe and number of tail segments bearing a row of six transverse dorsal tubercles (NTS). Metric dimensions measured are: Snout-vent length (SVL); tail length (TL), head length (HL), from snout tip to the posterior edge of the lower jaw; head depth (HD); head width (HW); horizontal orbit diameter (HOD); horizontal ear diameter (HED); distance between posterior edge of orbit and anterior edge of ear (DPOAE), distance between anterior edge of orbit and snout tip (DAOST), contact between first upper labial and nostril (CFULN), transverse dark segments on tail (TDST) and contact with both nasal (CBN). For bilateral features measurements taken on the right side were used in most cases.

Pholidolial features were determined under a stereo-microscope and morphological measurements, except SVL (Snout-vent length) and TL (Tail length), were taken by digital calipers (Mitutoyo 500-181 U) with an accuracy of 0.01 mm. Snout-vent length and TL were measured to the nearest millimetre using a ruler. The geographic position of each sampling site was located by a GPS (Fig. 1).

Data were analyzed using SPSS 11.0 for windows. The *Chi-Square test* was utilized to

compare sexual differentiation in each population and *Mann-Whitney U* and *Student t test* were used to compare differentiation

between populations. The level for statistical significance was set at $P < 0.05$.

Table 1. Specimens collected in the study from new localities

Materials	Number of Specimens	Locality	Coordinates	Collecting Date
ZDEU 122/2006	1 (♀♀)	Yuvabasi village /Kilis	36°P 51' 03"N, 36°P 57' 25"E	22.04.2006
ZDEU 125/2006	12 (♂♂+♀♀)	Akinci village /Kilis	36°P 40' 45" N, 37°P 14' 08"E	28.05.2006
ZDEU 250/2005	1 (♂♂)	Seyh Maksut /Sanliurfa	37°P 08' 52" N, 38°P 47' 43"E	15.05.2005
ZDEU 186/2006	1 (J)	Cinar village /Kilis	36°P 48' 79" N, 37°P 06' 54" E	29.07.2006
ZDEU 231/2005	5(♂♂+♀♀)	Seyh Maksut /Sanliurfa	37°P 08' 52 "N, 38°P 47' 43"E	02.09.2005

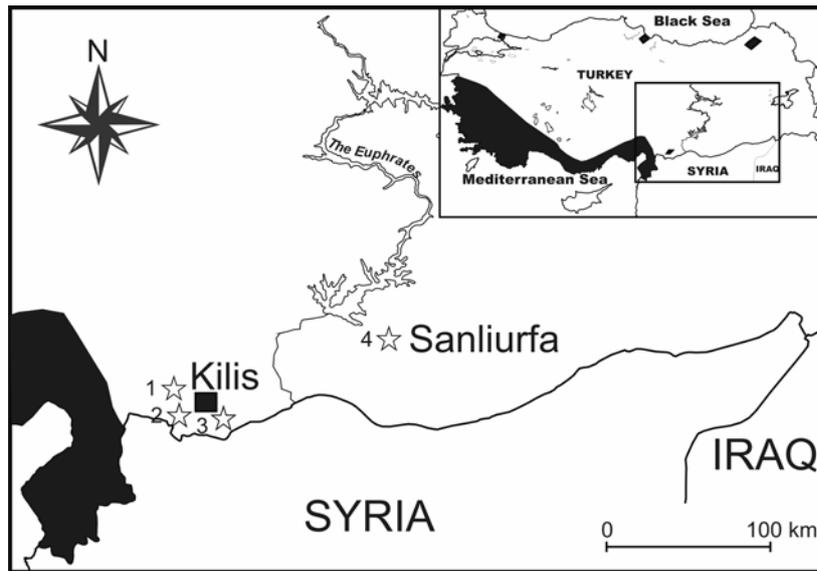


Figure 1: The localities of *Hemidactylus turcicus*.

Painted areas refer to old localities and asterisks refer to new localities.

1. Cinarkoy, 45 km N to Kilis, 2. Yuvabasi, 25 km NW to Kilis, 3. Akinci, 10 km SE to Kilis, 4. Seyh Maksut, Sanliurfa

Results

We collected a total of 20 specimens from Kilis (n = 15) and Sanliurfa (n = 5) provinces and we used 56 museum-registered samples to make comparison with the other known population from Anatolia. In order to account for sexual dimorphism, a frequent occurrence in reptiles, the data obtained for the sexes of each population were segregated and tested for significant differences. This preliminary treatment of the data showed that the meristic and metric characters recorded are not significantly different ($P>0.05$) between the sexes in the specimens studied. The only exception to this rule was the presence of pre-anal pores, which are specific to males. Thus, the values for males and females of species were evaluated together. Statistical comparisons were not made between the sexes of specimens from Sanliurfa specimens due to the small sample size.

Hemidactylus turcicus (based on Anatolia material, n=76) is a medium sized gecko, with maximum recorded SVL of 61 mm. Limbs moderately long. The first upper labial was in contact with the nostril (100%) and there were two scales between upper nasals (82.9%). The tail is slender, with dorsal tubercle extending almost

to the tail tip, and generally longer than SVL (81.25%). Subcaudals laterally expanded along the midline. Digital pads moderately expanded. Basic dorsal color is yellowish-brown and pinkish-grey with dark spots. Ventral coloration is yellowish-white and skin is translucent and delicate. The tail is covered with 7-13 dark and light bands, which increase in contrast distally, being black and white along its terminal portion, but usually only in young specimens (Figure 2).

Turkish Geckos of Kilis province averaged 42.9 mm in size (SVL). Upper labials 7-9; lower labials 6-8; gulars 49-58. Dorsal tubercles comprised 12-14 rows and there were 4-5 scales between them. Ventrals across mid abdomen 35-46; NTS (Number of tail segments bearing a row of six transverse dorsal tubercles) 1-8.

The mean SVL of Sanliurfa specimens SVL was 29.6 mm. Upper labials were 8-9; lower labials 6-7; gulars 44-49; ventrals across mid abdomen 38-41. Dorsal tubercles 13-14 rows and there were 4-5 scales between them. Transverse rows of six dorsal tubercles on tail were 2-6.

Specimens from the Aegean and Mediterranean region had a mean SVL of 43.9 mm. Upper labials 7-9; lower labials 6-8; gulars 43-67; ventrals 34-46. Dorsal tubercles ranged 12-16 and there were 4-5 scales

between them. NTS 2-7. All parameters were given in Table 2.

We are determined that Kilis province specimens differ from Aegean and Mediterranean region specimens with respect to the numbers of interorbitals, lamellae under first and fourth toes and scales between dorsal tubercles ($P < 0.01$). When we take into consideration of the range values, the gular numbers were found to be quite different between the specimens collected from the west of and the east side of Euphrates, 52.48 (SD: 4.13) and 45.8 (SD: 1.92) respectively.

Cyrtopodion scaber is found as a sympatric species with *Hemidactylus turcicus* in Sanliurfa. While we gathered *Cyrtopodion scaber* around light of lamps on building walls at night, we did not meet any *Hemidactylus turcicus* specimen during three different night trips. However, we also able to capture a few of *H. turcicus* specimens at the same nights around the boundary of the city centre (Figure 3).

Discussion

As stated earlier, the previously known distribution of *Hemidactylus turcicus* in Anatolia was restricted to the coastline of both the Aegean and Mediterranean seas (Başoğlu and Baran 1977, Budak and Göçmen 2005),

Although it was also recorded at costal line, in spot distribution, from both Marmara and Black seas, they seem to be accidental distribution areas of *Hemidactylus turcicus* (Baran and Gruber, 1982). The presence of the *Hemidactylus turcicus* in the west side of Euphrates River has been reported by Başoğlu and Baran (1977) and Baran and Gruber (1982). Baran and Gruber (1982) have reported that the easternmost locality of the species was Kilis province with a single specimen. However, they did not give detailed location knowledge.

According to Baha El Din (2005, 2006), *Hemidactylus turcicus* has 36-48 (mean, 43.5 SD: 2.8) gulars. However, we found out that gulars of the population of the west side Euphrates were 43-67 (mean 52.48, SD: 4.13). The numbers of gulars in the east side of Euphrates (Sanliurfa province) specimens are compatible with the data given by Baha El Din (2005, 2006). 4th toe lamellae numbers were counted as 8 in 20%, 60% and 82.1% of Kilis, Sanliurfa and Aegean-Mediterranean region specimens, respectively. But, Baha El Din (2005, 2006) has reported that these values were ranged between 9 and 12. Başoğlu and Baran (1977) have recorded the upper labial numbers as 7-10, coinciding with our data obtained. However, Baha El Din (2005, 2006) has given the upper labial numbers as 9-11. We statistically de-

Table 2. Some meristic and metric characters (mm) and derived ratio of investigated specimens.
SD= standard deviation and see materials and methods for abbreviation.

	Kilis		Seyh Maksut/Sanlıurfa		Aegean and Mediterranean region	
	n	Mean/SD/Range	n	Mean/SD/Range	n	Mean/SD/Range
UL	15	7.86 (0.52) /7-9	5	8.4 (0.55) /8-9	56	8.02 (0.56) /7-9
LL	15	6.73 (0.59) /6-8	5	6.6 (0.55) /6-7	56	6.63 (0.52) /6-8
IO	15	27.6 (3.09) /21-32	5	28.6 (2.30) /25-31	56	31 (3.05) /25-38
GU	15	52.14 (2.51) /49-58	5	45.8 (1.92) /44-49	56	52.57 (4.46) /43-67
LVR	15	40.5 (3.55) /35-46	5	38.8 (1.30) /38-41	56	40.46 (2.64) /34-46
LDTR	15	13.5 (0.74) /12-14	5	13.8 (0.45) /13-14	56	13.78 (0.99) /12-16
PRP	8	7.37 (1.06) /6-9	2	6.5 (0.70) /6-7	26	6.6 (1.15) /3-9
LUFS	15	7.5 (0.64) /7-9	5	7.2 (0.84) /6-8	56	7.07 (0.46) /6-9
LUFT	15	8.93 (0.59) /8-10	5	8.40 (0.55) /8-9	56	8.16 (0.50) /7-9
SDT	15	4.67 (0.49) /4-5	5	4 (0.45) /4-4	56	4.30 (0.46) /4-5
NTS	9	3.5 (2.19) /1-8	3	4.33 (2.08) /2-6	39	4.28 (1.35) /2-7
SLNAO	15	14 (1.36) /11-15	5	13.8 (0.84) /13-15	56	14.78 (2.05) /11-19
DPOAE	15	3.84 (0.74) /2.43-5.11	5	2.78 (1.05) /2.2- 4.63	56	3.88 (0.80) /2.4-5.1
DAOST	15	4.66 (0.95) /3.19-6.65	5	3.92 (1.21) /3.19-6.04	56	4.85 (0.83) /3.16-6.06
SVL	15	429 (0.89) /2.40-5.70	5	296 (1.34) /2.1-5.3	56	439 (0.89) /2.4-6.1
CBN	15	+ (100%)	5	+ (100%)	56	+ (100%)
CFULN	15	+ (100%)	5	+ (100%)	56	+ (100%)

Table 2. (continued)

	Kilis		Seyh Maksut/Sanlıurfa		Aegean and Mediterranean region	
	n	Mean/SD/Range	n	Mean/SD/Range	n	Mean/SD/Range
HOD	15	2.42 (0.41) /1.92-3.03	5	2.1 (0.48) /1.8-2.96	56	2.61 (0.43) /1.79-3.4
HED	15	0.40 (0.10) /0.25-0.59	5	0.34 (0.03) /0.32-0.38	56	0.47 (0.17) /0.12-1.03
TDST	6	9.67 (1.03) /8-11	2	12 (1.41) /11-13	28	9.78 (1.57) /7-13
HDX100/HL	15	45.38 (4.22) /36.97-53.66	5	44.19 (3.38) /40.08-49.44	56	45.00 (3.94) /36.40-57.38
HWX100/HL	15	70.74 (3.86) /62.83-76.35	5	68.97 (3.55) /65.95-74.64	56	72.24 (4.27) /58.74-79.19

termined that Kilis province specimens differ from the both Aegean and Mediterranean region specimens in the viewpoints of the numbers interorbitals, the lamellae under first and fourth toes and the scales between dorsal tubercles ($P < 0.01$). We think that more specimens must be evaluated from Kilis and Sanliurfa provinces to reveal the difference level between the populations of the Kilis and Sanliurfa and the other parts of Anatolia. We record three new localities from the west side and a new locality from the east side of the Euphrates which is an important dispersal barrier in Anatolia. Habitat of *Hemidactylus*

turcicus at the new locality is semi-arid with weakly developed vegetation, in contrast to the shrubby vegetation and temperate zone habitats of previous known localities of the Anatolia and. However, *Hemidactylus turcicus* is distributed in similar habitat in Syria (Moravec and Böhme 1997), North Africa (Başoğlu and Baran, 1977) and the Middle East (Baha El Din 2005, 2006).

As a result, in this paper we presented the new distribution localities, extending the distribution boundary of *Hemidactylus turcicus* in addition to previously known localities in Anatolia.



Figure 2: Dorsolateral view of *H. turcicus* from Sanliurfa



Figure 3. General view of the new locality, neighboring a human settlement, recorded for *H. turcicus* in Sanliurfa.

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Appendix

1. ZDEU 190/1957 2(♀♀), Istanbul 16.07.1956 Leg. M. BAŞOĞLU
2. ZDEU 64/1961 1(♂♂), Kadirli / Adana 20.8.1961 Leg. Unknown
3. ZDEU 110/1965 1(♀♀), Afyon, 18.09.1965 Leg. Unknown
4. ZDEU 122/1968 1(♀♀), Vezneciler/Istanbul, 08.11.1968 Leg. METE.
5. ZDEU 23/1969 1(♀♀), 1(♂♂), Manisa, 15.03.1969 Leg. F. SPITZEN, A. BUDAK.
6. ZDEU 61/1971 1(♂♂), Kilis, 25.04.1977 Leg. İ. BARAN.
7. ZDEU 70/1975 1(♀♀), Levent/Izmir 06.04.1975 Leg. S. SEZER.
8. ZDEU 166/1975 1(♂♂), Alarahan/Antalya 19.06.1975 Leg. E. ÇEVİK.
9. ZDEU 236/1976 4(♀♀), 4(♂♂), Anamur/Mersin 20.09.1976 Leg. İ. BARAN.
10. ZDEU 239/1976 3(♀♀), 6(♂♂), 3(J), Manavgat/Antalya, 20.09.1976 Leg. İ. BARAN.
11. ZDEU 137/1976 1(♀♀), Ceyhan/Adana, 20.05.1976 Leg. V. AKGÖL.
12. ZDEU 163/1976 1(♀♀), 2(♂♂), Bornova/Izmir, 24.05.1976 Leg. E. Çevik
13. ZDEU 21/1977 1(♂♂), Bornova/Izmir, 15.02.1977 Leg. Abdurrahman AKTAŞ.
14. ZDEU 233/1977 1(♂♂), Kahramanmaraş 10.06.1977 Leg. İ. BARAN.
15. ZDEU 368/1977 2(♀♀), 1(♂♂), Aydın, 17.09.1977 Leg. E. ÇEVİK.
16. ZDEU 232/1977 2(♀♀), 5(♂♂), Antakya, 09.06.1977 Leg. İ. BARAN.
17. ZDEU 103/1990 2(♀♀), 1(♂♂), Datça /Mugla, 02.09.1990 Leg. C.V. TOK.
18. ZDEU 33/1993 3(♀♀), 1(♂♂), Antakya, 08.05.1993 Leg. Unknown.
19. ZDEU 13/1997 1(♀♀), 1(♂♂), Kas/Antalya, 09.04.1997 Leg. V. TOK, A. MERMER.
20. ZDEU 220/2005 2(♀♀), Seyhan/Adana, 05.09.2005 Leg. D. YALÇINKAYA.
21. ZDEU 231/2005 2(♀♀), 3(♂♂), Seyhmaksut/Sanlıurfa, 02.05.2005 Leg. M.Z. YILDIZ.
22. ZDEU 250/2005 1(♂♂), Seyhmaksut/Sanlıurfa, 15.05.2005 Leg. M.Z. YILDIZ.
23. ZDEU 125/2006 5(♀♀), 7(♂♂), Akinci/Kilis, 28.05.2006 Leg. E.A. YAĞMUR.
24. ZDEU 121/2006 1(♀♀), Bornova/Izmir, 21. 06.2006 Leg. R. URANLI
25. ZDEU 186/2006 1(J), Cinarkoy/Kilis, 29.07.2006 Leg. M.Z. YILDIZ.
26. ZDEU 122/2006 1(♀♀), Yuvabasi/Kilis, 22.02.2006 Leg. E.A. YAĞMUR.