

New records of the Turkish Lycian salamanders (*Lyciasalamandra*, Salamandridae)

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Abstract. During fieldwork conducted between end of February and mid-April 2012 14 new localities were ascertained for four different taxa of the amphibian genus *Lyciasalamandra* (*L. l. basoglui*, *L. l. finikensis*, *L. arikani* and *L. atifi*). This paper represents the first record of *L. l. basoglui* from Muğla province (Saklıkent, Fethiye). Unlike the common belief in previous researches based on literature we determined that there are almost no gaps between the distributional areas of the known subspecies of *L. luschani*, moreover the subspecies were found in contact. The recently discovered populations of *L. arikani* and *L. atifi* were found to have some distinctive morphological differences compared to other populations of the respective species.

Key Words: Distribution, Turkey, *Lyciasalamandra*, Lycian salamanders, Urodela.

Introduction

The Lycian salamander, first described by Steindacher in 1981 from Dodurga village of Eşen town (Muğla), has been subjected to much research. Since then numerous new taxa have been diagnosed and new localities have been discovered (Pieper 1963, Başoğlu 1967, Başoğlu & Atatür 1974, 1975, Başoğlu & Baran 1976, Baran & Atatür 1980, Franzen & Klewen 1987, Başoğlu et al. 1994, Mutz & Steinfartz 1995, Veith et al. 2001, Budak & Göçmen 2005, Öz et al. 2004, Franzen et al. 2008, Akman et al. 2011, Göçmen et al. 2011, Göçmen & Akman 2012).

On the other hand, due to their cryptic life form and their passing all their time underground except for the rainy season, their distribution has not been fully uncovered yet. As a matter of fact, many new localities and three new species (*Lyciasalamandra irfani*, *L. arikani* and *L. yehudahi*) have been diagnosed and described during our field trips in the last two years (Göçmen et al., 2011; Akman et al., 2011, 2013, Göçmen & Akman, 2012). In view of finding these new taxa in previously unexplored territories of Beydağları-Olympos mountain range we felt encouraged to search for further new localities outside the currently known territories. In 2012, a series of regular field trips has been carried out and as a result, many new localities for several taxa have been recorded.

Material and Methods

Material examined of the new populations which was collected between February and April 2012 is deposited at ZMHRU (The Zoology Museum of Harran University, Şanlıurfa, Turkey). The standard methods of fixation and measurements used in our previous papers were applied (see Göçmen et al. 2011, Göçmen & Akman 2012), therefore they will not be mentioned here again. Measurements of body proportions and their ratios follow papers previously published by us (Göçmen et al. 2011, Akman et al. 2011, 2013, Göçmen & Akman 2012) on *Lyciasalamandra*. They are as follows: Total Body Length – the length of the whole body including the tail (TBL), Rostrum-Anus Length – length from the snout to the posterior end of the cloacal opening (RA), Length of Trunk – length from the gular fold to the anterior edge of cloacal opening (LT), Tail Length (TL), Nostril-Eye Distance (NED), Distance Between Nostrils (DBN), Eye Diameter (ED), Head Length – distance from the snout to the gular fold (HL), Head Width (HW), Parotoid Length (PL), Parotoid Width (PW), Fore Limb Length (FLL), Hind Limb Length (HLL), Distance between Fore- and Hind Limbs (DFHL), The length of the protuberance above the base of the tail (PABT), ratios of HW/HL, TL/TBL, PW/PL, NED/HL. Metric characters were measured with Mitutuyo digital calipers of 0.02 mm sensitivity, except RA, TL and TBL, which were measured with a millimetric ruler.

The material list, some ecological parameters and GPS logs have been summarised in Table 1.

Results and Discussion

During fieldworks, 14 new localities of three Lycian

Table 1. Geographic and some climatic information of the localities of new populations, as well as the museum numbers of the specimens. The numbers in brackets correspond to the localities shown in Fig. 1. Temp.: Temperature - air on the day of collection, ZMHRU - Museum numbers, Spec -specimens.

Taxa	ZMHRU	Localities	Altitude (m)	Latitude (DM)	Longitude (DM)	Collection date, number of specimens	Temp. (°C)
<i>L. luschanti basoglutii</i>	2012/28	Saklıkent/Fethiye, Muğla [1]	360	36° 28' N	29° 24' E	28.02.2012, 24 spec (8 ♂♂, 12 ♀♀, 4 juv.)	9
	2012/30	Çavdır/Kaş [2]	228	36° 22' N	29° 22' E	28.02.2012, 5 spec (2 ♂♂, 2 ♀♀, 1 juv.)	10
	2012/27	Bezirgan, Kalkan/Kaş [3]	77	36° 14' N	29° 25' E	28.02.2012 / 2 spec (2 juv.)	10
	2012/29	Devirgen (Demre kanyonu) /Kaş [4]	117	36° 19' N	29° 49' E	01.03.2012, 3 spec (1 ♂, 1 ♀, 1 juv.)	11
<i>L. luschanti finikensis</i>	2012/35	Demre kanyonu/Kaş [5]	71	36° 17' N	29° 52' E	01.03.2012, 6 spec (2 ♂♂, 2 ♀♀, 2 juv.)	11
	2012/36	Myra, Demre kanyonu/Kaş [6]	47	36° 17' N	29° 53' E	29.02.2012 / 1 spec (1 ♀)	11
	2012/37					01.03.2012, 11 spec (2 ♂♂, 3 ♀♀, 6 juv.)	11
	2012/34	Yatıkardıç-Boldağ/Finike [7]	1150	36° 18' N	30° 05' E	02.03.2012 / 3 spec (3 ♀♀)	8
	2012/33	Belören-Boldağ/Finike [8]	715	36° 17' N	30° 06' E	02.03.2012, 6 spec (2 ♂♂, 2 ♀♀, 2 juv.)	9
<i>L. arikani</i>	2012/40	Adrasan-(Çavuşköy)/Kumluca [9]	200	36° 21' N	30° 27' E	13.04.2012, 14 spec (4 ♂♂, 7 ♀♀, 1 juv.)	17
	2012/41	Adrasan-(Çavuşköy)/Kumluca [10]	40	36° 20' N	30° 27' E	13.04.2012 / 1 spec (1 juv.)	17
	2012/46	Güzelbağ/Alanya [11]	829	36° 42' N	31° 53' E	11.04.2012, 11 spec (6 ♀♀, 5 juv.)	14
	2012/47					12.04.2012, 9 spec (5 ♂♂, 3 ♀♀, 1 juv.)	16
	2012/14					10.03.2012, 10 spec (4 ♂♂, 4 ♀♀, 2 juv.)	18
	<i>L. atifi</i>	2012/48	Karaçukur/Gazipaşa [12]	525	36° 16' N	32° 24' E	12.04.2012, 6 spec (2 ♂♂, 2 ♀♀, 2 juv.)
2012/15		Çıglık/Gazipaşa [13]	984	36° 17' N	32° 32' E	10.03.2012, 7 spec (2 ♂♂, 3 ♀♀, 2 juv.)	18
	2012/16	Gürçam/Gazipaşa [14]	751	36° 13' N	32° 28' E	10.03.2012 / 1 spec (1 juv.)	18

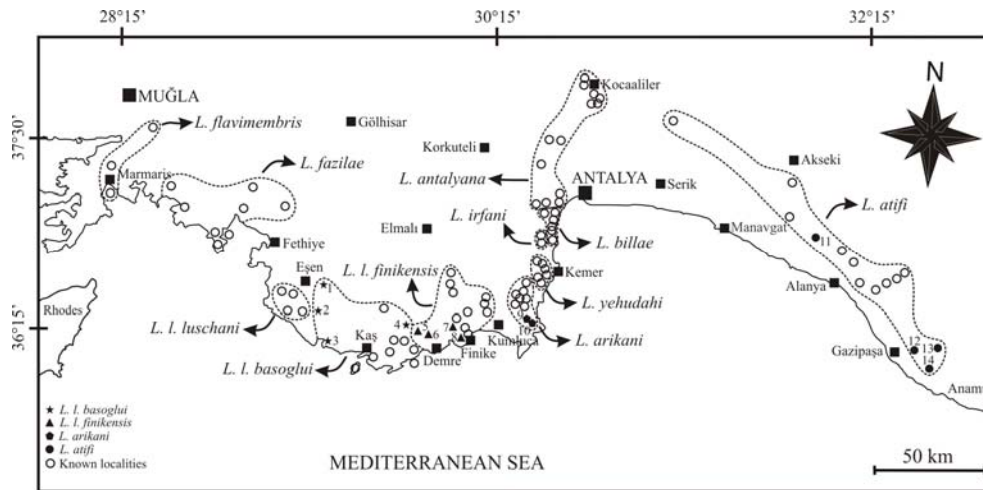


Figure 1. Map showing known localities of the taxa under *Lyciasalamandra* genus which is distributed in Turkey (open circles) and new localities found during our fieldworks (numbered solid symbols). Solid squares indicate towns.

Table 2. Summarized statistics of *Lyciasalamandra luschani basoglui* individuals collected from new localities. 1: Values in raw data; 2: Values in PERCRA (Werner 1971); N: number of specimens; SD: Standard deviation; the abbreviations of characters were given in Material and Methods. Measurements are given in millimetres (mm).

		Juveniles						Adults					
		N	Mean	Min	Max	SD	SE	N	Mean	Min	Max	SD	SE
TBL	1	8	81.25	71.00	93.00	7.74	2.737	26	114.88	93.00	136.00	11.04	2.165
	2	8	173.22	154.35	189.58	9.88	3.493	26	171.08	159.74	177.19	4.72	0.925
RA	1	8	46.88	44.00	53.00	3.04	1.076	26	67.19	54.00	78.00	6.64	1.302
	2	8	31.97	28.58	34.54	2.16	0.762	26	44.21	33.97	53.34	4.51	0.885
LT	1	8	68.24	64.95	73.20	3.07	1.085	26	65.82	62.24	70.37	2.46	0.482
	2	8	34.38	25.00	43.00	5.55	1.963	26	47.69	39.00	58.00	5.08	0.997
TL	1	8	73.22	54.35	89.58	9.88	3.493	26	71.08	59.74	77.19	4.72	0.925
	2	8	2.03	1.23	2.47	0.36	0.128	26	2.77	2.27	3.71	0.34	0.067
NED	1	8	4.32	2.80	5.15	0.77	0.273	26	4.14	3.23	5.23	0.46	0.090
	2	8	3.45	2.85	3.69	0.29	0.101	26	4.46	3.57	5.54	0.48	0.095
DBN	1	8	7.36	6.48	7.98	0.49	0.173	26	6.66	5.72	7.62	0.57	0.111
	2	8	3.04	2.62	3.61	0.37	0.129	26	3.85	3.27	5.02	0.39	0.077
ED	1	8	6.48	5.70	7.52	0.57	0.202	26	5.74	5.03	6.44	0.40	0.072
	2	8	12.88	11.75	14.76	1.05	0.370	26	17.36	13.88	46.56	6.04	1.185
HL	1	8	27.49	26.10	30.75	1.59	0.563	26	25.87	21.77	65.58	8.24	1.617
	2	8	8.15	7.29	9.13	0.68	0.241	26	10.41	9.01	11.88	0.71	0.140
HW	1	8	17.39	16.22	18.80	0.93	0.328	26	15.57	13.53	17.13	1.00	0.197
	2	8	6.06	5.44	7.27	0.62	0.220	26	7.41	6.09	10.70	0.99	0.193
PL	1	8	12.92	11.39	13.80	0.91	0.323	26	11.09	8.58	16.46	1.56	0.305
	2	8	2.61	2.02	2.94	0.31	0.108	26	3.05	2.07	3.67	0.40	0.078
PW	1	8	5.57	4.39	6.30	0.57	0.200	26	4.56	2.96	5.20	0.57	0.112
	2	8	14.16	12.57	16.68	1.40	0.496	26	19.43	15.75	22.88	1.81	0.355
FLL	1	8	30.21	27.65	34.75	2.46	0.869	26	28.96	26.13	31.33	1.25	0.245
	2	8	17.08	15.05	19.99	1.53	0.541	26	23.18	18.46	25.91	2.08	0.407
HLL	1	8	36.45	33.28	41.65	2.54	0.897	26	34.62	27.64	39.53	2.59	0.507
	2	8	26.33	24.01	28.89	1.72	0.607	26	37.12	28.29	46.61	4.39	0.860
DFHL	1	8	56.23	51.98	59.41	2.66	0.940	26	55.18	49.94	61.56	2.43	0.477
	2	8						11	4.23	3.34	5.05	0.58	0.176
PABT	1							11	5.91	4.64	7.11	0.77	0.232
	2	8	0.63	0.60	0.69	0.03	0.012	26	0.63	0.24	0.71	0.08	0.016
HW/HL	1	8	0.42	0.35	0.47	0.03	0.012	26	0.42	0.37	0.44	0.02	0.003
TL/TBL	1	8	0.43	0.37	0.53	0.05	0.019	26	0.42	0.24	0.54	0.06	0.012
PW/PL	1	8	0.16	0.10	0.19	0.03	0.010	26	0.17	0.06	0.21	0.03	0.005
NED/HL	1	8											

salamander species belonging to four taxa [*Lyciasalamandra luschani basoglui* (Baran & Atatür 1980), *L. l. finikensis* (Başoğlu & Atatür 1975), *L. arikani* Göçmen & Akman, 2012 and *L. atifi* (Başoğlu, 1967)] were recorded (Fig. 1).

Lyciasalamandra luschani basoglui
(Baran & Atatür 1980)

On the west of the known distribution of the subspecies three new localities were found of which one was in Saklıkent/Muğla, whereas the other two localities are Çavdır village (Palamut) and Bezirgan (Kalkan), respectively. On the east of the known distribution of the subspecies a new locality was discovered in Demre Canyon in contact with the neighbouring subspecies of *L. luschani finikensis*. The new findings extend the distribution

area of the subspecies 30 km in the W-NW direction beginning from the Akkuyu area (Kaş) and 3,5 km in an E direction beginning from Yavu village. Recently found localities in the West are mostly olive groves where specimens were collected out from rock piles just after rainfall and beneath boulders along the riverbed. The specimens from Demre Canyon were found in mixed oak and pine forest habitats beneath limestone boulders and in cracks.

Collected specimens agree with the description of *L. l. basoglui* in terms of colour-pattern (Fig. 2) and morphometric measurements (Table 2). This research represents the first records of *L. l. basoglui* from Muğla province which is almost in contact with its eastern neighbouring nominate subspecies [*L. l. luschani* (Steindachner 1891)]

Table 3. Summarized statistics of *Lyciasalamandra luschani finikensis* individuals collected from new localities. 1: Values in raw data; 2: Values in PERCRA (Werner 1971); N: number of specimens; SD: Standard deviation; the abbreviations of characters were given in Material and Methods. Measurements are given in millimetres (mm).

		Juveniles						Adults					
		N	Mean	Min	Max	SD	SE	N	Mean	Min	Max	SD	SE
TBL	1	10	75.90	54.00	91.00	11.92	3.770	17	118.47	91.00	134.00	11.64	2.822
	2	10	174.22	158.82	182.00	8.06	2.548	17	176.65	150.72	185.71	7.94	1.926
RA	1	10	43.40	34.00	50.00	5.40	1.707	17	67.06	52.00	75.00	5.72	1.387
LT	1	10	28.95	20.67	34.44	4.19	1.325	17	45.10	34.20	50.21	4.24	1.028
	2	10	66.56	60.79	70.29	2.97	0.941	17	67.24	63.00	71.63	2.36	0.573
TL	1	10	32.50	20.00	41.00	6.67	2.110	17	51.41	35.00	60.00	7.11	1.724
	2	10	74.22	58.82	82.00	8.06	2.548	17	76.65	50.72	85.71	7.94	1.926
NED	1	10	2.14	1.74	2.50	0.24	0.077	17	2.69	2.06	3.50	0.38	0.093
	2	10	4.97	4.14	5.60	0.48	0.153	17	4.01	3.18	4.67	0.40	0.097
DBN	1	10	3.38	2.28	4.04	0.54	0.170	17	4.54	3.76	5.05	0.40	0.098
	2	10	7.77	6.71	9.12	0.84	0.265	17	6.79	6.06	7.55	0.49	0.119
ED	1	10	2.96	1.64	3.78	0.62	0.195	17	3.88	3.03	4.63	0.40	0.097
	2	10	6.77	4.82	8.48	0.98	0.309	17	5.78	5.12	6.34	0.35	0.084
HL	1	10	11.92	10.02	13.62	1.17	0.370	17	16.20	13.56	17.55	1.09	0.265
	2	10	27.58	25.31	29.48	1.40	0.444	17	24.23	22.56	26.70	1.35	0.328
HW	1	10	7.72	6.50	9.06	0.89	0.281	17	10.46	9.23	11.56	0.67	0.163
	2	10	17.84	16.18	19.68	1.06	0.336	17	15.65	14.65	17.75	0.79	0.190
PL	1	10	5.56	4.08	6.59	0.73	0.232	17	7.99	6.89	9.47	0.68	0.165
	2	10	12.85	10.89	14.53	1.17	0.372	17	11.96	9.73	13.31	0.98	0.237
PW	1	10	2.33	1.59	2.79	0.31	0.097	17	3.16	2.59	3.55	0.28	0.068
	2	10	5.39	4.53	6.07	0.57	0.179	17	4.73	3.88	5.82	0.48	0.118
FLL	1	10	13.21	9.79	15.01	1.88	0.596	17	19.37	15.25	21.87	1.56	0.380
	2	10	30.38	28.29	32.63	1.45	0.459	17	28.92	27.32	30.38	1.03	0.251
HLL	1	10	15.78	10.91	19.26	3.00	0.949	17	23.50	19.67	26.90	1.67	0.406
	2	10	36.12	28.71	41.37	3.41	1.077	17	35.13	31.89	38.52	1.80	0.437
DFHL	1	10	23.22	16.76	27.40	3.19	1.007	17	37.84	29.36	42.36	3.92	0.951
	2	10	53.46	49.14	56.50	2.56	0.811	17	56.39	51.14	61.63	2.57	0.624
PABT	1							6	3.39	1.22	4.81	1.29	0.526
	2							6	4.78	2.03	6.59	1.63	0.664
HW/HL	1	10	0.65	0.61	0.69	0.02	0.008	17	0.65	0.59	0.69	0.03	0.007
TL/TBL	1	10	0.42	0.37	0.45	0.03	0.009	17	0.43	0.34	0.46	0.03	0.007
PW/PL	1	10	0.42	0.34	0.56	0.06	0.019	17	0.40	0.33	0.44	0.03	0.008
NED/HL	1	10	0.18	0.15	0.20	0.01	0.004	17	0.17	0.13	0.20	0.02	0.004

where Eşen stream constitutes an isolating barrier between the two subspecies. The closest points of these two subspecies are Letoon (*L. l. luschani*) and Çavdır (*L. l. basoglui*), the distance in-between is approximately 6 km. Further research may reveal a contact zone between the two subspecies. As a matter of fact, Veith et al. (2008) stated that the Letoon population which was morphologically diagnosed as *L. l. luschani* is genetically mixed, showing mitochondrial haplotypes of both *L. l. basoglui* and *L. l. luschani*. The new localities of *L. l. basoglui* in the west support the discovery of Veith et al. (2008).

Lyciasalamandra luschani finikensis
(Başoğlu & Atatür 1975)

Two new localities were found along a 15 km long

line starting from ancient Myra ruins west of Demre stream in Demre Canyon (Table 1, Fig. 1). The other two localities (Belören and Yatıkardıç area) were found on Boldağ on the West of Finike town. Non iridophore, almost spotless, dark brown or blackish individuals were recorded by Beukema et al. (2009) from Gölcüktepe (Finike), further North of Boldağ. Same characteristics were witnessed in some of our specimens collected from the Belören area (Fig. 3). Specimens collected from other new localities agree with the original description of the subspecies (Başoğlu & Atatür 1975) and with the existing literature in terms of colour and pattern as far as other measurements (Table 3). Franzen et al. (2008) stated that the vertical distribution of *L. l. finikensis* is at maximum 750 m, and Beukema et al. (2008) raised this to 800m; however, in our research



Figure 2. *Lyciasalamandra luschni basoglui* individuals from the new locality of Saklıkent (Muğla province). (a) Adult female, (b) Adult male, (c) Juvenile.

the maximum elevation reached 1150 m at Yatıkardıç Mevkii. Some individuals collected from all new localities showed defensive behaviour shaping their body like a coil and leaning their head while making a high-pitched sound. All specimens were collected beneath boulders on the forest ground. Existence of *L. l. finikensis* on the West of the Demre river proves that this stream does not constitute a distributional barrier.

On the North of the Demre canyon between the recently discovered localities of the *L. l. basoglui* and *L. l. finikensis*, a gap of less than five km exists. However, further research may reveal a contact or even hybrid zone. The steep topography and dense vegetation were very challenging, but in the future with more time and adequate equipment a detailed and extensive field research is planned to be done.

With the newly found localities the distribution of the subspecies has expanded about 20 km beginning from Finike towards the West and almost no distributional gap has been left towards the neighbouring subspecies *L. l. basoglui*.



Figure 3. A female *Lyciasalamandra luschni finikensis* which exhibited defensive position and warning sound at Myra in Demre Canyon (a) and a non-iridophore female at Belören, Boldag (b).



Figure 4. One of an array of marble quarries in Demre canyon which threatens the species by destroying its habitat.

The contact zone of these two subspecies (*L. l. basoglui* and *L. l. finikensis*) in Demre Canyon is subjected to severe habitat destruction and the populations are threatened by rock quarries (at least one in each 2-3 km section along the stream) (Fig. 4). Without any precaution measure this biodiversity will unfortunately be lost forever. We are inviting the decision makers to react against this destruction.

Lyciasalamandra arikani Göçmen & Akman 2012

Two new localities of the species which was recently diagnosed by Göçmen & Akman (2012) were found

Table 4. Summarized statistics of *Lyciasalamandra arikani* individuals collected from new locations found around Adrasan peninsula. 1: Values in raw data; 2: Values in PERCRA (Werner 1971); N: number of specimens; SD: Standard deviation; the abbreviations of characters were given in Material and Methods. Measurements are given in millimetres (mm).

		Juveniles						Adults					
		N	Mean	Min	Max	SD	SE	N	Mean	Min	Max	SD	SE
TBL	1	4	88.00	78.00	96.00	8.91	4.453	11	120.18	112.00	129.00	5.40	1.628
	2	4	164.21	133.87	179.25	21.08	10.542	11	177.87	154.43	192.19	10.19	3.073
RA	1	4	54.00	47.00	62.00	6.16	3.082	11	67.73	63.00	79.00	4.31	1.301
LT	1	4	36.66	31.01	41.69	4.38	2.192	11	45.80	38.80	49.71	2.80	0.843
	2	4	67.85	65.98	69.11	1.52	0.759	11	67.96	49.11	73.86	6.64	2.003
TL	1	4	34.00	21.00	42.00	10.10	5.050	11	52.45	43.00	60.00	5.43	1.637
	2	4	64.21	33.87	79.25	21.08	10.542	11	77.87	54.43	92.19	10.19	3.073
NED	1	4	2.46	2.21	2.60	0.18	0.091	11	2.77	2.44	3.17	0.20	0.061
	2	4	4.57	4.19	4.80	0.26	0.132	11	4.10	3.41	4.59	0.39	0.119
DBN	1	4	4.06	3.36	4.53	0.52	0.259	11	4.89	4.44	5.39	0.28	0.086
	2	4	7.52	7.03	8.55	0.70	0.348	11	7.23	6.16	7.93	0.48	0.144
ED	1	4	3.51	3.18	3.88	0.33	0.163	11	4.24	3.74	4.79	0.36	0.107
	2	4	6.52	6.23	6.81	0.32	0.159	11	6.27	5.49	6.84	0.50	0.151
HL	1	4	14.22	12.67	15.10	1.13	0.564	11	16.36	15.25	17.19	0.56	0.168
	2	4	26.43	24.35	27.80	1.47	0.735	11	24.23	20.41	26.49	1.61	0.486
HW	1	4	9.25	8.08	10.95	1.21	0.606	11	10.98	9.45	11.93	0.73	0.220
	2	4	17.12	16.54	17.66	0.46	0.231	11	16.26	13.91	18.64	1.40	0.422
PL	1	4	6.61	5.56	7.30	0.78	0.389	11	7.50	6.29	8.23	0.54	0.164
	2	4	12.31	10.49	13.83	1.62	0.810	11	11.10	9.57	12.86	0.95	0.286
PW	1	4	1.85	1.62	2.21	0.26	0.130	11	2.29	1.99	2.63	0.20	0.059
	2	4	3.42	3.23	3.56	0.14	0.071	11	3.40	2.78	4.11	0.38	0.115
FLL	1	4	16.50	14.45	18.64	1.79	0.895	11	20.19	18.92	22.20	1.10	0.333
	2	4	30.58	29.83	31.67	0.82	0.412	11	29.95	24.41	34.10	2.74	0.827
HLL	1	4	20.08	17.12	22.15	2.21	1.103	11	24.91	22.37	26.76	1.36	0.409
	2	4	37.21	35.73	39.41	1.60	0.798	11	36.90	30.43	40.95	2.89	0.872
DFHL	1	4	29.70	25.93	35.41	4.06	2.031	11	38.38	35.58	43.03	2.00	0.602
	2	4	54.92	52.06	57.11	2.10	1.051	11	56.80	48.06	62.36	3.50	1.057
PABT	1							4	2.60	2.45	2.86	0.18	0.092
	2							4	3.76	3.28	4.27	0.41	0.203
HW/HL	1	4	0.65	0.59	0.73	0.05	0.027	11	0.67	0.62	0.71	0.03	0.009
TL/TBL	1	4	0.38	0.25	0.44	0.09	0.044	11	0.44	0.35	0.48	0.03	0.010
PW/PL	1	4	0.28	0.25	0.31	0.03	0.017	11	0.31	0.25	0.35	0.03	0.008
NED/HL	1	4	0.17	0.17	0.17	0.00	0.001	11	0.17	0.15	0.18	0.01	0.004

at the edge of the Musa Dağı (Olympos Mt.) located in Adrasan (Çavuşköy) peninsula, approximately 10 km East of the known location (Erentepe, Ulupınar) (Table 1 and Fig. 1). Although all specimens collected from both localities are similar to the original description of *L. arikani* (Göçmen & Akman 2012) in terms of habitat and morphometric measurements (Table 4), their dorsum has large and small yellow patches (Fig. 5). The territory around neighbouring Çıralı (Chimaera) was also scanned; however, no *Lyciasalamandra* was found. This condition indicates that the Adrasan population is a group isolated from the known distribution of the species. It is very possible that the specimens collected from Adrasan peninsula represent an independent lineage due to their dorsal patches/spots. Further research is planned in order to clarify their taxonomic status.

The new localities found at Adrasan have extended the known distribution of the species about 10 km to the South.

Lyciasalamandra atifi (Başoğlu 1967)

Four new localities have been found of which one was within the known distribution of the species (Güzelbağ, Alanya) while others (Karaçukur, Çıgıllık ve Güreçam villages) were outside of this area near Gazipaşa (Table 1, Fig. 1).

Specimens collected from new localities agree with the original description of *L. atifi* by Başoğlu (1967) and to the known literature (Figs. 6-7) in terms of basic morphometric characteristics (Table 5) and colour patterns, while individuals of Güzelbağ and Gazipaşa populations exhibit some morphometric differences. Especially male indi-



Figure 5. Individuals of *L. arikani* from newly discovered localities at Adrasan.
a, b, d: Females, **c:** Male, **e, f:** Juveniles.

viduals of the Güzelbağ population are much more white-spotted (Fig. 6) than any other known *L. atifi* population living around Selge, Fersin, Dikmen, Türbelinaz and Cebireis Mt. These spots differ in size without showing any order. The distance between the Güzelbağ population on eastern neighbour Turbelinaz (Dereköy, Alanya) and Fersin (Akseki) in the West is approximately 18 km and 17 km, respectively.

On the other hand, specimens collected from around Gazipaşa, including the juveniles, do not have irodophores which give yellow/orange colouration (Fig. 7). In other populations, at least among juveniles, yellow/orange coloration can be seen behind parotids and occasionally on the tail;

however, this phenomenon was not found in the specimens collected from localities of Gazipaşa. As it was stated before the easternmost known specimens of *L. atifi* were reported from Cebireis Mt. (Alanya) by Akman et al. (2011). With this study the easternmost distribution of the species extends its known territory 42 km toward to the Southeast, beginning from Cebireis.

The lithology of Güzelbağ (Alanya) mainly consists of granitic rocks which are covered with maquis vegetation. Gürçam (Gazipaşa) shares the same conditions (Fig. 7d) however two other localities found at Gazipaşa are covered with forest vegetation. The specimens were collected both from forested parts and from open areas outside

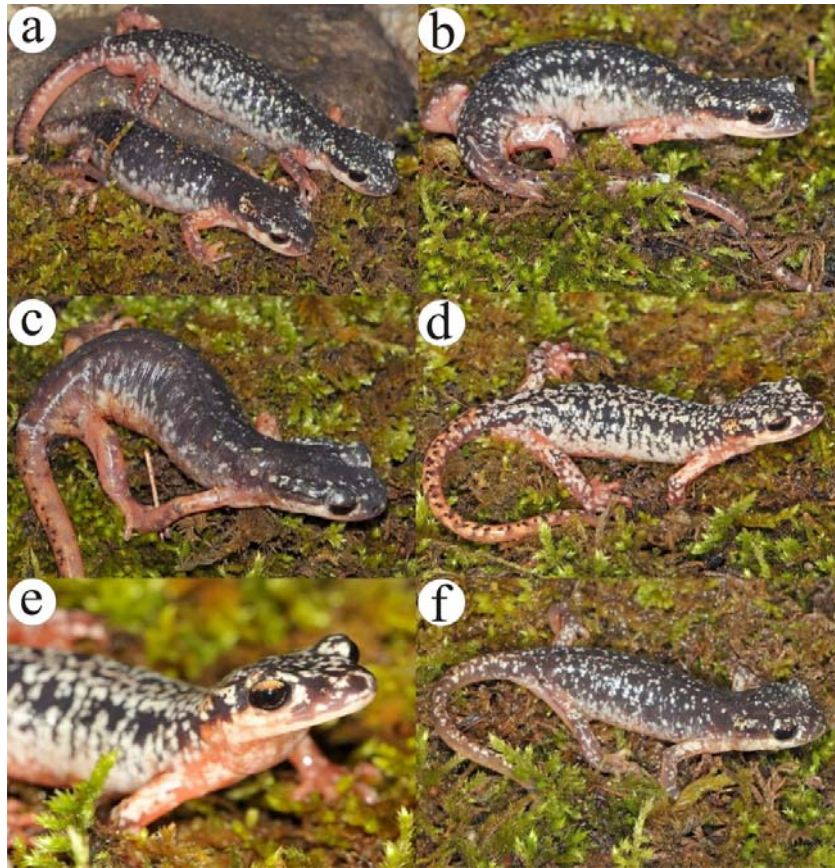


Figure 6. Individuals of *Lyciasalamandra atifi* from newly discovered localities in Güzelbağ (Alanya). **a:** Pair, **b:** Adult male, **c:** Adult female, **d-e:** sub-adult female, **f:** Juvenile.

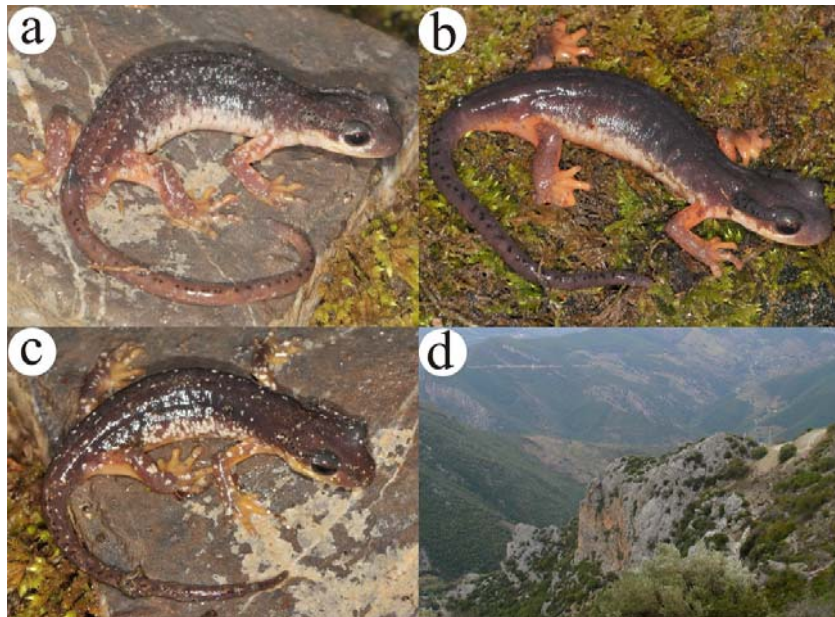


Figure 7. Individuals of *Lyciasalamandra atifi* from Karaçukur, Gazipaşa (**a-c**) and a general view of the habitat at Gürçam (Gazipaşa) (**d**). **a:** Adult female, **b:** Adult female, **c:** Juvenile.

Table 5. Summarized statistics of *Lyciasalamandra atifi* individuals collected from new locations found at Güzelbağ (Alanya) and from around Gazipaşa. 1: Values in raw data; 2: Values in PERCRA (Werner 1971); N: number of specimens; SD: Standard deviation; the abbreviations of characters were given in Material and Methods. Measurements are given in millimetres (mm).

		Juveniles						Adults					
		N	Mean	Min	Max	SD	SE	N	Mean	Min	Max	SD	SE
TBL	1	13	98.38	69.00	124.00	15.52	4.303	31	142.32	120.00	164.00	10.92	1.961
	2	13	180.16	169.57	187.72	5.31	1.473	31	185.08	177.11	193.67	4.08	0.732
RA	1	13	54.46	40.00	67.00	7.43	2.062	31	76.90	66.00	87.00	5.69	1.023
	2	13	67.98	63.67	71.22	1.97	0.545	31	68.10	62.96	72.49	1.94	0.349
LT	1	13	37.09	27.61	47.72	5.73	1.589	31	52.39	42.79	59.61	4.39	0.789
	2	13	67.98	63.67	71.22	1.97	0.545	31	68.10	62.96	72.49	1.94	0.349
TL	1	13	43.92	29.00	57.00	8.18	2.269	31	65.42	54.00	77.00	5.71	1.025
	2	13	80.16	69.57	87.72	5.31	1.473	31	85.08	77.11	93.67	4.08	0.732
NED	1	13	2.59	2.13	3.60	0.42	0.117	31	3.38	2.49	4.03	0.42	0.076
	2	13	4.81	3.21	6.00	0.81	0.224	31	4.41	3.32	5.16	0.50	0.090
DBN	1	13	4.06	2.98	5.07	0.55	0.154	31	5.36	4.06	6.51	0.53	0.095
	2	13	7.47	6.49	8.04	0.49	0.137	31	6.97	6.15	7.90	0.42	0.076
ED	1	13	3.71	2.79	4.39	0.49	0.137	31	4.61	3.92	6.14	0.52	0.093
	2	13	6.83	5.89	7.69	0.43	0.118	31	6.01	4.90	7.30	0.60	0.108
HL	1	13	14.65	11.77	16.87	1.57	0.434	31	18.43	16.97	21.60	1.22	0.219
	2	13	27.03	24.64	29.43	1.45	0.401	31	24.00	21.97	26.24	0.99	0.178
HW	1	13	9.50	7.34	11.60	1.26	0.349	31	12.36	10.56	14.75	0.91	0.163
	2	13	17.47	15.82	18.49	0.87	0.241	31	16.10	14.58	18.15	0.94	0.169
PL	1	13	6.75	4.82	8.99	1.12	0.309	31	9.05	7.43	11.96	1.10	0.197
	2	13	12.41	10.23	14.76	1.22	0.339	31	11.76	9.99	14.24	0.97	0.174
PW	1	13	2.49	1.82	3.36	0.43	0.118	31	2.92	2.31	3.95	0.39	0.070
	2	13	4.59	3.82	5.60	0.53	0.147	31	3.80	3.08	4.82	0.49	0.088
FLL	1	13	17.90	13.27	22.82	2.62	0.725	31	23.53	20.09	27.91	1.60	0.288
	2	13	32.87	28.85	35.67	1.76	0.488	31	30.65	26.54	33.96	1.52	0.274
HLL	1	13	20.08	15.04	25.40	2.97	0.823	31	27.99	24.33	32.20	1.87	0.335
	2	13	36.85	34.69	39.08	1.39	0.387	31	36.46	32.60	40.46	1.69	0.303
DFHL	1	13	30.20	19.99	41.09	5.64	1.564	31	43.38	34.60	50.10	3.94	0.707
	2	13	55.13	48.33	61.33	3.54	0.981	31	56.37	51.19	60.36	2.21	0.397
PABT	1							13	2.84	2.22	3.61	0.36	0.101
	2							13	3.67	2.81	4.57	0.47	0.130
HW/HL	1	13	0.65	0.58	0.74	0.04	0.012	31	0.67	0.61	0.72	0.03	0.006
TL/TBL	1	13	0.44	0.41	0.47	0.02	0.005	31	0.46	0.44	0.48	0.01	0.002
PW/PL	1	13	0.37	0.30	0.51	0.06	0.017	31	0.32	0.23	0.43	0.04	0.008
NED/HL	1	13	0.18	0.13	0.23	0.03	0.008	31	0.18	0.13	0.22	0.02	0.004

the forest.

The colour-pattern aberrations indicate that the Güzelbağ and Gazipaşa populations are isolated populations. In order to clarify their taxonomic status further research is required.

The new localities found with this study support the species distribution modelling of Rödder et al. (2011) for identifying possible new populations of species which have a limited distribution and only a few records. On the other hand, not all of the new localities fit to the potential distribution shown by Rödder et al. (2011), such as the Gazipaşa population.

Future research in favourable seasons and during rainy periods will certainly result in the discovery of further new populations of *Lyciasala-*

mandra as well as contact zones of neighbouring taxa. This will not only help solving the taxonomic problems, but will also provide new and valuable information about the biology of the taxa which is crucial for their protection.

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