

New localities of *Lyciasalamandra luschani luschani* (Steindachner, 1891) (Amphibia: Urodela: Salamandridae)

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Abstract. Additional data on the distribution of the terrestrial salamander *Lyciasalamandra luschani luschani* endemic to Turkey are presented, based on fieldwork conducted in 2012-2013. Four new localities near Fethiye (Muğla province) were recorded. These localities are situated around the Babadağ Mountain. They considerably extend the range of *L. luschani* at about 25 km air distance to the north.

Key words: Lycian salamander, Turkey, range extension

The Lycian salamander was originally described by Steindachner (1891) from Dodurga (Muğla, Turkey) as *Molge luschani*. It was transferred to the genus *Mertensiella*, established by Wolterstorff in 1925. In the light of molecular studies performed by Weisrock et al. (2001) and Veith & Steinfartz (2004), the taxonomy of these terrestrial salamanders has been reorganized and the genus *Lyciasalamandra* has been established with the detailed and comprehensive mitochondrial genome and allozyme studies by Veith & Steinfartz (2004). At present, *Lyciasalamandra* contains twelve allopatric species and subspecies (Pieper 1963, Başoğlu 1967, Başoğlu & Atatür 1974, 1975, Başoğlu & Baran 1976, Baran & Atatür 1980, Franzen & Klewen 1987, Mutz & Steinfartz 1995, Göçmen et al. 2011, Göçmen & Akman 2012).

The nominate species and subspecies *L. l. luschani* is currently known from only four fragmented populations (Dodurga, Letoon, Boğaziçi ve Karadere) between Fethiye and Patara in Muğla province (Turkey); altitudes between 80-400 m asl (Fig. 1) (Franzen et al. 2008, Göçmen et al. 2013). In recent years, Göçmen et al. (2011) and Göçmen & Akman (2012) have described three new *Lyciasalamandra* species: *Lyciasalamandra irfani* Göçmen, Arıkan & Yalçinkaya 2011; *L. arikani*

Göçmen & Akman 2012 and *L. yehudahi* Göçmen & Akman 2012. Also Akman et al. (2011, 2013) and Göçmen et al. (2013) have reported 14 new locality records for *L. atifi*, *L. antalyana*, *L. arikani*, *L. l. basoglui* and *L. l. finikensis*. These findings emphasize the need for additional field research outside the known distribution of the species of the genus *Lyciasalamandra* in Turkey. In April 2012, February 2013 and March 2013, we surveyed the actual distribution area of *L. l. luschani* and, as a result, we detected four new localities of the subspecies in the Patlangıç district/Fethiye [1], in the Kıdrak district (Uzunyurt village (Ölüdeniz)/Fethiye) [2], in the Bozyer village/Fethiye [3] and in the Minare village/Fethiye, respectively) (Table 1, Fig.1).

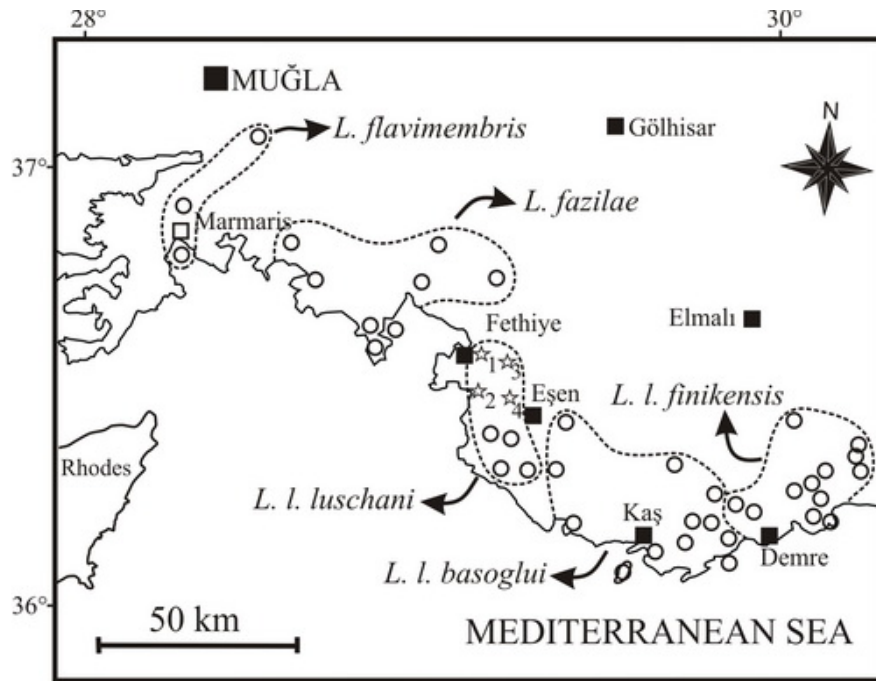


Figure 1. Map showing the new (asterisks) and known localities (open circles) of *Lyciasalamandra luschani luschani* and adjacent taxa (numbers correspond to those in the text and Table 1).

The first locality is located in an olive grove area in the west of Patlangıç district in the northern part of Babadağ Mountain (Fig. 2a), close to the city center of Fethiye. Five specimens (2 ♂♂, 3 ♀♀) were collected from this area from inside walls, which were formed by stones. The other locality is located in Kıdrak district

Table 1. Geographic and some climatic information of the new localities, as well as their museum codes (ZMHRU: Zoology Museum of Harran University, Şanlıurfa, Turkey).

Museum codes (ZMHRU)	Localities	Altitude (m)	Latitude (DMS)	Longitude (DMS)	Collected specimens	Temp. (°C)
2012/178	Patlangıç district / Fethiye [1]	30	36° 37' N	29° 08' E	01. Apr. 2012 1 specimen (1 ♀)	15
2013/3					16. Feb. 2013 4 specimens (2 ♂♂, 2 ♀♀)	
2013/4	Kıdrak district-Uzunyurt village (Ölüdeniz) / Fethiye [2]	232	36° 31' N	29° 08' E	16. Feb. 2013 8 specimens (2 ♂♂, 6 ♀♀)	11
2013/31	Bozyer village, Fethiye [3]	350	36°36' N	29°14' E	22. Mar. 2013 8 specimens (2 ♂♂, 6 ♀♀)	20
2013/30	Pinara Mevkii-Minare village, Eşen [4]	530	36°29' N	29°14' E	22. Mar. 2013 10 specimens (4 ♂♂, 6 ♀♀)	20

of Uzunyurt village (Ölüdeniz) in the western part of Babadağ Mountain (Fig. 2b). Here we collected eight specimens (2 ♂♂, 6 ♀♀) under stones. The third and fourth localities are situated respectively in the northeastern and southeastern part of Babadağ Mountain, Bozyer village (Fethiye) (Fig. 3a) and Pinara mevkii-Minare village (Eşen-Fethiye) (Fig. 4a). Bozyer and Minare villages are similar to Patlangıç district in term of habitat. The specimens (2 ♂♂, 6 ♀♀ from Bozyer; 4 ♂♂, 6 ♀♀ from Minare) collected from these areas were found from inside stone walls in an olive grove with light vegetation like at Patlangıç district. At each sites we found many more specimens; however, in order to protect the population only a restricted number of specimens was collected. The standard methods on fixation and measurements used in our previous papers were applied, and measurements of body proportions and their ratios follow previously published papers on *Lyciasalamandra* by us (see Göçmen et al., 2011; Akman et al., 2011, 2013; Göçmen & Akman, 2012). Measurements of body proportions of all specimens and their ratios are summarized in Table 2.

The specimens collected from the new populations are regarded as *L. l. luschani* because they have whitish upper eyelids and the projection at the base of the tail in

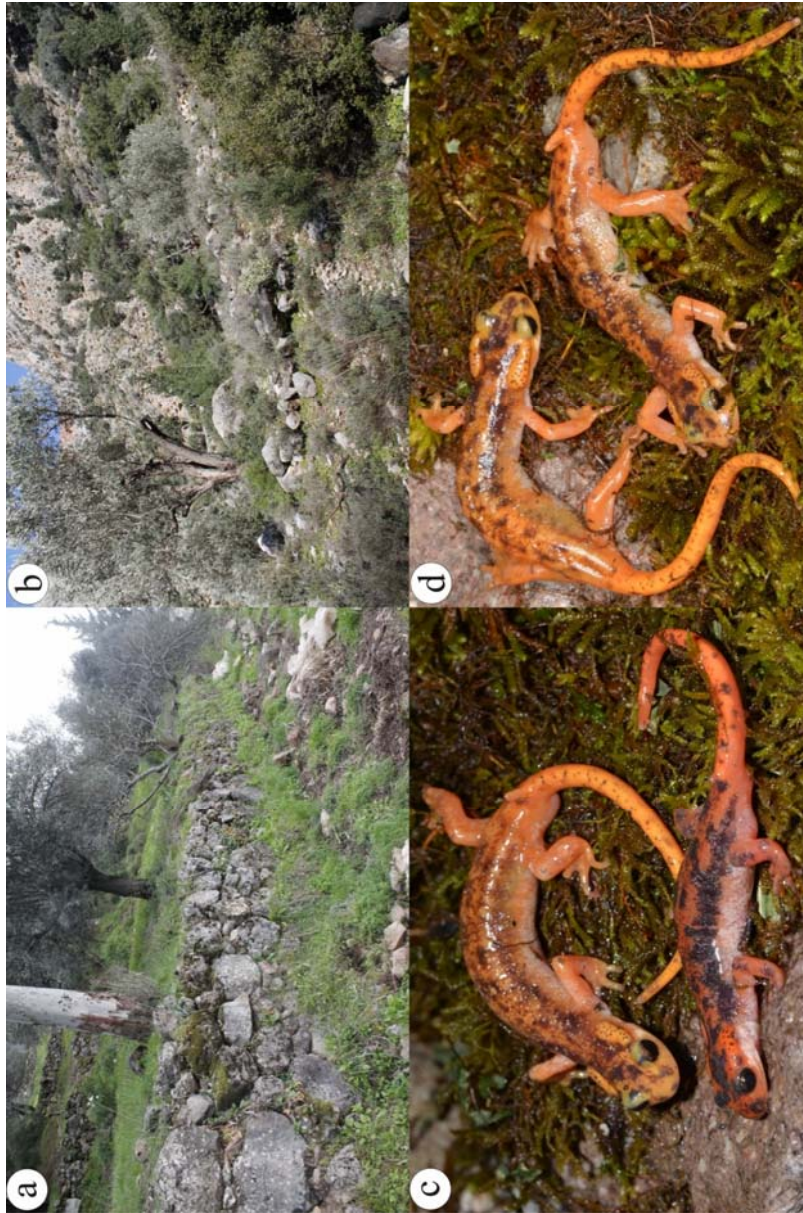


Figure 2. a) General view of new Patlangıç district/Fethiye; b) General view of Kıdrak district-Uzunyurt village (Ölüdeniz)/Fethiye; c) Males of *Lyctisalamandra luschani luschani* from Patlangıç district/Fethiye (upper) and *L. fazilae* from Gökçeovacak (bottom); d) A pair of *Lyctisalamandra luschani luschani* from Kıdrak district.

the ten males is extremely high and advanced (Fig 2c-d; 3b; 4b and d). However, Patlangıç and Kıdrak district specimens have a lighter dorsal ground color than typical for *L. l. luschani* (Fig. 2c-d; 5). Moreover, when the specimens collected from



Figure 3. a) General view of Bozyer village/Fethiye; b) A male of *Lyciasalamandra luschani luschani* from Bozyer village; c-d) Females of *Lyciasalamandra luschani luschani* from Bozyer village.

the new localities are compared with original description of the *L. l. luschani* given by Başoğlu and Atatür (1974), the new populations do not differ much in terms of measurements.



Figure 4. a) General view of Pınara mevkii-Minare village (Eşen)/Fethiye; b) A pair of *Lyciastlamandra luschni* from Minare village; c) A female of *Lyciastlamandra luschni* from Minare village; d) A male of *Lyciastlamandra luschni* from Minare village.

When analyzed in terms of coloration, the specimens belonging to the newly detected two localities, Patlangıç and Kızrak district, have a lighter orange color than the Dodurga specimens (Fig 2b-d, 5a-b). The closest population of the

Table 2. Some mensural and proportional characters (in mm) of the newly collected specimens of *Lyciasalamandra luschani luschani*. 1: Values in raw data; 2: Index values in PERCRA (percents of rostrum-anus length: [each metric character/RA] × 100), according to Werner (1971). N: number of specimens; SD: Standard deviation.

	Juveniles						Adults						
	N	Mean	Min	Max	SD	SE	N	Mean	Min	Max	SD	SE	
TBL	1	2	104.00	98.00	110.00	8.49	6.000	28	125.96	101.00	143.00	11.26	2.128
	2	2	1.94	1.92	1.96	0.03	0.021	28	1.81	1.70	2.03	0.06	0.012
RA	1	2	53.50	51.00	56.00	3.54	2.500	29	69.59	56.00	80.00	5.91	1.097
LT	1	2	37.31	36.48	38.14	1.17	0.830	29	46.74	38.05	56.90	4.41	0.818
	2	2	0.70	0.68	0.72	0.02	0.017	29	0.67	0.59	0.75	0.03	0.006
TL	1	2	50.50	47.00	54.00	4.95	3.500	28	56.36	42.00	70.00	6.15	1.163
	2	2	0.94	0.92	0.96	0.03	0.021	28	0.81	0.70	1.03	0.06	0.012
NED	1	2	2.05	1.63	2.46	0.59	0.415	29	2.62	2.05	3.37	0.35	0.066
	2	2	0.04	0.03	0.04	0.01	0.006	29	0.04	0.03	0.05	0.00	0.001
DBN	1	2	4.25	4.19	4.30	0.08	0.055	29	4.76	4.09	6.67	0.58	0.108
	2	2	0.08	0.07	0.08	0.01	0.005	29	0.07	0.06	0.09	0.01	0.001
ED	1	2	3.89	3.78	3.99	0.15	0.105	29	4.15	3.12	4.85	0.44	0.082
	2	2	0.07	0.07	0.08	0.01	0.005	29	0.06	0.05	0.07	0.01	0.001
HL	1	2	14.16	13.76	14.56	0.57	0.400	29	16.16	13.95	18.78	1.16	0.215
	2	2	0.27	0.25	0.29	0.03	0.020	29	0.23	0.21	0.27	0.02	0.003
HW	1	2	9.56	9.40	9.72	0.23	0.160	29	11.00	9.50	12.30	0.71	0.132
	2	2	0.18	0.17	0.19	0.02	0.011	29	0.16	0.15	0.18	0.01	0.002
PL	1	2	6.50	5.82	7.17	0.95	0.675	29	7.74	6.51	9.13	0.63	0.116
	2	2	0.12	0.10	0.14	0.03	0.018	29	0.11	0.10	0.13	0.01	0.001
PW	1	2	2.88	2.74	3.02	0.20	0.140	29	3.15	2.33	3.83	0.42	0.078
	2	2	0.05	0.05	0.06	0.01	0.005	29	0.05	0.03	0.06	0.01	0.001
FL	1	2	17.47	17.42	17.51	0.06	0.045	29	20.49	16.50	23.01	1.65	0.306
	2	2	0.33	0.31	0.34	0.02	0.014	29	0.29	0.28	0.34	0.01	0.002
HLL	1	2	19.48	19.05	19.91	0.61	0.430	29	24.34	19.58	27.46	1.76	0.328
	2	2	0.37	0.34	0.39	0.04	0.025	29	0.35	0.33	0.39	0.02	0.003
DFHL	1	2	30.98	30.21	31.74	1.08	0.765	29	38.97	31.51	48.30	4.15	0.770
	2	2	0.58	0.57	0.59	0.02	0.013	29	0.56	0.51	0.68	0.03	0.006
KKDTY	1							10	3.56	2.66	4.23	0.55	0.175
	2							10	0.05	0.04	0.06	0.01	0.002
HW/HL	1	2	0.68	0.67	0.68	0.01	0.008	29	0.68	0.61	0.75	0.03	0.006
TL/TBL	1	2	0.49	0.48	0.49	0.01	0.006	28	0.45	0.41	0.51	0.02	0.004
PW/PL	1	2	0.45	0.42	0.47	0.04	0.025	29	0.41	0.33	0.51	0.04	0.008
NED/HL	1	2	0.15	0.11	0.18	0.05	0.033	29	0.16	0.12	0.20	0.02	0.004



Figure 5. General views of the *Lyciaslamandra luschani luschani* specimens from the type locality Dodurga (a & b) and Karadere (c & d), a-c) Males, b-d) Females.

neighboring taxon, *L. fazilae*, to the new population in Patlangıç district (Fethiye) lives at Gökçeovacık, the type locality of *L. fazilae*. It is situated only ca. 20 km (air distance) north of Patlangıç district. In terms of dorsal ground color, the specimens

collected from Fethiye and Ölüdeniz (Fig 2) more resemble *L. fazilae* from Gökçeovacık (Fig. 2c) than *L. l. luschani* from the type locality at Dodurga (Fig. 5a-b). The coloration of specimens from the Bozyer and Minare village is a darker, too. The dorsal ground colors of the new specimens from Bozyer and Minare village (Fig 3-4) are similar to Karadere population (Fig. 5c-d) rather than to the type locality Dodurga (Fig. 5a-b). Karış (2012) stated that Karadere specimens resemble Letoon population in term of coloration. However, preliminary DNA barcoding using a fragment of the mitochondrial 16S rRNA gene of samples from all new populations showed only haplotypes of *L. l. luschani* (data not shown). However, Veith et al. (2008) stated that some Lycian salamanders from Letoon which morphologically comply with *L. l. luschani* were genetically affiliated to the neighboring subspecies *L. l. basoglu*. Hence, more comprehensive field and laboratory works is needed to unambiguously rule out that the somehow intermediate phenotypes of the specimens from the four newly detected populations is not due to introgression from *L. fazilae*.

In conclusion, the new records of *L. l. luschani* extend the known distribution range of the species approximately 25 km air distance to the north and substantially narrow the distance between *L. luschani* and *L. fazilae*.

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