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A new Lycian Salamander, threatened with extinction, from the Göynük Canyon (Antalya, Anatolia), *Lyciasalamandra irfani* n. sp. (Urodela: Salamandridae)

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Abstract. A new species of the Lycian Salamander, *Lyciasalamandra irfani* n. sp. is described and its relation with similar previously known taxa is discussed. The new species characterized by having rather darkly coloured head part and also an aubergine reddish brown ground colour on dorsum with irregularly scattered white flecks. It originates from Göynük Canyon (Antalya) in southwestern Anatolia. At present, the distribution is limited to its type locality. Some information is added in regard to its habitat.

Key Words: New salamander species, *Lyciasalamandra irfani* n.sp., serology, taxonomy, Turkey.

Introduction

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. During the following 70 years, eight additional taxa have been described as subspecies of *M. luschani*, accepting the Dodurga specimens as nominate race (Pieper 1963, Başoğlu 1967, Başoğlu & Atatür 1974, 1975, Başoğlu & Baran 1976, Baran & Atatür 1980, Franzen & Klewen 1987, Başoğlu et al. 1994, Mutz & Steinfartz 1995; Budak & Göçmen 2005).

Franzen & Steinfartz (1999) has stated that the Lycian salamanders can be distinguished from all other genera of salamanders within Salamandridae by an additional phalanx at first digit of forelegs and hind limbs. Then, in the light of recent molecular studies (Weisrock et al. 2001, Veith & Steinfartz 2004) the taxonomy of these terrestrial viviparous tailed-amphibians 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 nine allopatric species and subspecies from an area of approximately 350 km along the Mediterranean coast of Turkey between Alanya (Antalya) and Marmaris (Muğla) and some adjacent islands (Veith et al. 2001, Öz et al. 2004, Franzen et al. 2008). These taxa and their distributions can be summarized in chronologic order as follows (Veith et al. 2001, 2008, Franzen et al. 2008):

(1) *L. luschani luschani* (Steindachner, 1891) - Between Finike and Patara in fragmented populations in Muğla province (Turkey)**;** altitudes 80-400 m asl.

(2) *L. helverseni* (Pieper, 1963) - Carpatos island and the neighbouring islets, Saria and Kasos, Greece.

(3) *L. atifi* (Başoğlu, 1967) - Along the Taurus range for about 110 km, from Turbelinaz (Dereköy, Alanya) to the vicinity of antique city, Selge (Altınkaya, Serik) near the Köprülü Kanyon) in Antalya province, Turkey; altitudes 190-1300 m asl

(4) *L. fazilae* (Başoğlu & Atatür, 1974) - From north-west of Fethiye to the eastern shore of Köyceğiz Lake; from sea level up to 1,000m asl. Also on the nearby islands of Tersane and Domuz.

(5) *L. luschani finikensis* (Başoğlu & Atatür, 1975) - In Finike (Antalya province); altitudes 0-750 m asl.

(6) *L. antalyana* (Başoğlu & Baran, 1976) - In the NW and W of Antalya, including Termessos National Park, Turkey; altitudes 120-655 m asl.

(7) *L. luschani basoglui* (Baran & Atatür, 1980) - In Kaş, Antalya province, Turkey including Meyisti and Kekova islands; altitudes 60-800 m asl.

(8) *L. billae* (Franzen & Klewen, 1987) - In a small area in the southwest of Antalya, along a line of 15 km north-south direction on the north and east slopes of the Sarıçınar Mts., between Kedetler (Gedeller) and Beldibi; altitudes 15-230 m asl.

(9) *L. flavimembris* (Mutz & Steinfartz, 1995) – In the northeast Muğla province, Turkey, along a

north-south direction of about 30 km from Marmaris to the vicinity of Ula (including Gokova Special Protected Area); altitudes 80-620 m asl.

In February 2011, during a photographical-herpetological trip to SW Anatolia, we encountered an unusual juvenile Lycian salamander (ZMHRU 2011/84) which differed from the previously known ones, in a new locality, Göynük Canyon (Antalya). This canyon is situated in the Taurus Mountains (between the directions of Beldibi-Göynük at the east and Üçoluk-Ovacık at the west) nearly Göynük on the Mediterranean coast of Turkey, approximately 40 km south-west of the city of Antalya. At that time, we thought that it may be a Bille's salamander (*L. billae*) since it location was so close to its known distribution area, although it was rather darkly coloured especially on head part and also had an aubergine reddish brown ground colour on dorsum with irregularly scattered white flecks. The locality was interesting, because this seems to be first record from an "inland" locality, not directly connected to the coastal stripe. This finding has indicated that probably the distribution area of *L. billae* is larger than currently known or perhaps there is a new salamander, if there is a population showing stable characters, as mentioned above.

To clarify the taxonomic status of the population living in Göynük Canyon and its distribution area, we conducted two additional excursions, in early and late April, to the related and surrounding area. Although we found approximately 30 specimens, only 15 were collected, in consideration of conservation.

As a result of our survey, we concluded that the Lycian salamander population in Göynük Canyon represents a new species, *Lyciasalamandra irfani* n. sp.

Material and Methods

Material examined all in ZMHRU (The Zoology Museum of Harran University, Şanlıurfa, Turkey).

[1] *Lyciasalamandra irfani* n. sp. (N=16). 2011/84:1 (1 juv.), Göynük Canyon /Antalya, 10.02.2011, Leg. B. Göçmen, M. Karış; 2011/121:1-9 (2 ♂♂, 5 ♀♀, 2 juv.), Göynük Canyon/Antalya, 05.04.2011, Leg. B. Göçmen, B. Akman, D. Yalçınkaya; 2011/136:1-6 (1♂, 2♀♀, 3 juv.), Göynük Canyon/Antalya, 25.04.2011, Leg. B. Göçmen, B. Akman.

[2] *Lyciasalamandra flavimembris* (N=5). 2011/88:1-5 (1♂, 2♀♀, 2 juvenil), Marmaris/Muğla, 14.02.2011, Leg. B. Göçmen, M. Karış.

[3] *Lyciasalamandra fazilae* (N=10). 2011/86:1-5 (1♂, 4♀♀), Gökçeovacık/Muğla, 28.02.2011, Leg. B. Göçmen, M. Karış; 2011/87:1-5 (2♂♂, 3♀♀) Kayagediği Mevkii, Çöğmen/Muğla, 28.02.2011, Leg. B. Göçmen, M. Karış.

[4] *Lyciasalamandra luschani luschani* (N=18). 2011/92:1-9 (3♂♂, 4♀♀, 2 juv.), Belceğiz, Karadere/Muğla, 14.02.2011, Leg. B. Göçmen, M. Karış; 2011/93:1-9 (1♂, 4♀♀, 4 juv.), Dodurga/Muğla, 14.02.2011, Leg. B. Göçmen, M. Karış.

[5] *Lyciasalamandra luschani basoglui* (N=2): 2011/89:1-2 (1♂, 1♀) Bayındır, Kaş/Antalya, 13.02.2011, Leg. B. Göçmen, M. Karış.

[6] *Lyciasalamandra luschani finikensis* (N=4): 2011/90:1 (1♀) Arif, Finike/Antalya, 13.02.2011, Leg. B. Göçmen, M. Karış; 2011/91:1 (1♂), Arif, Finike/Antalya, 27.02.2011, Leg. B. Göçmen, M. Karış; 2011/100:1-2 (1♂, 1♀), Turunçova, Finike/Antalya, 03.04.2011, Leg. B. Göçmen, B. Akman, D. Yalçınkaya.

[7] *Lyciasalamandra billae* (N=11): 2011/85: 1-5 (3♂♂, 2♀♀), Gökdere, Konyaaltı/Antalya, 26.02.2011, Leg. B. Göçmen, M. Karış; 2011/166:1-3 (1♂♂, 1♀♀, 1 juvenil), Gedeller (=Kedetler), Konyaaltı/Antalya, 26.02.2011, Leg. B. Göçmen, M. Karış; 2011/101:1-3 (1♂, 1♀, 1 juv.) Çomaklar Mevkii, Göynük (Coastal strip)/Antalya, 05.04.2011, Leg. B. Göçmen, B. Akman, D. Yalçınkaya.

[8] *Lyciasalamandra antalyana* (N=12): 2011/82:1-12 (1♂, 3♀♀, 8 juv.), Hurma/Antalya, 25.02.2011, Leg. B. Göçmen, M. Karış.

[9] *Lyciasalamandra atifi* (N=6): 2011/83:1-6 (2♂♂, 3♀♀, 1 juv.), Güçlüköy (=Fersin), Akseki/ Antalya, 25.02.2011, Leg. B. Göçmen, M. Karış.

The localities where the specimens were collected and the distribution areas of the known Lycian salamander taxa based on the recent comprehensive studies by Veith at al. (2008) and Franzen et al. (2008) are shown on the map (Fig. 1). Although the geographical coordinates of the caught specimens were computed with a Magellan model XL GPS, to avoid commercial collecting, the detailed locations will not be given.

The collected specimens were kept alive for 3-30 days in a terrarium for colouration analyses and photography. Some adult specimens (at least one pair) from each population or taxon were used to facilitate interpopulation comparisons regarding blood-serum proteins. In this way, the polyacrylamide gel electrophoresis (PAGE) and densitometric analyses were utilized. Blood samples were taken in the laboratory within three days of collection after anaesthetizing with ether, by ventral abdominal vein puncture with heparinized hematocrit capillaries.

The separations of blood-serum proteins followed the polyacrylamid "disc" electrophoresis method of Davis (1964), slightly modified by Özeti & Atatür (1979).

Finally all specimens, were etherized, then injected with 96 % ethanol and stored in glass jars with 70 % ethanol (Göçmen et al. 2007, 2008) to facilitate future DNA studies.

We did not test for sexual dimorphism in each sample since the specimen numbers were low and it is well known for all *Lyciasalamandra* taxa (swollen cloacal region and hedonic protuberance above the tail base in males). Therefore, we decided to compare the populations (i.e. taxa) with the pooled material. For mensural ("metric")

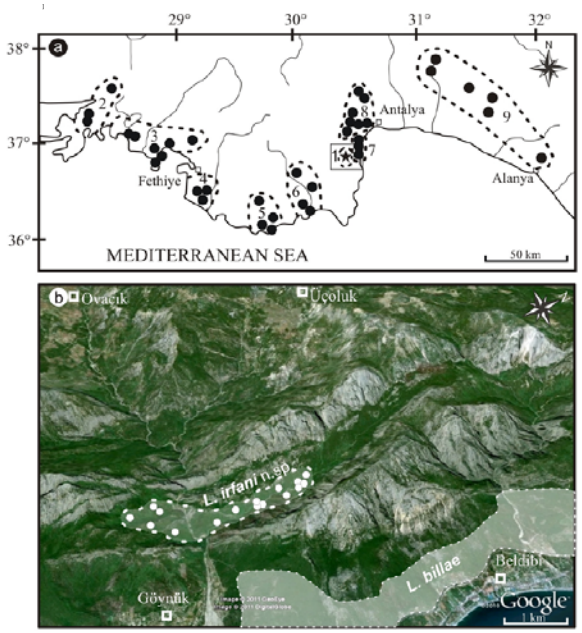

Figure 1. Maps of the localities (numbers correspond to those in the material list) where the specimens were collected. (a) The distribution areas of the known Lycian salamander taxa based on the data of the recent comprehensive studies and our collections (black circles). Asterisk indicates the location of the new species, *Lyciasalamandra irfani* n.sp. (b) An angular and close view from the eastern way showing the situation of Göynük Canyon and the distribution areas (watermarks) of the new species and nearby population of *L. billae*. White circles indicates the exact places where we observed and collected the new species.

characters we used only the adults, to avoid effects of allometry.

Measurements of body parts and the ratios used follow previously published papers (Başoğlu & Atatür 1974, Öz & Arıkan 1990, Mutz & Steinfartz 1995, Öz et al. 2004, Çiçek et al. 2010) on salamanders and 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 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), Parotid Length (PL), Parotid Width (PW), Fore Limb Length (FLL), Hind Limb Length (HLL), Distance between Fore- and Hind Limbs (DFHL), 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.

Summarized statistics of the metric values of the populations and inter-population (taxa) comparison analyses were conducted with "SPSS 15.0 for Windows". In comparing the metric characters, Student's T-test were used. Furthermore, to control the test results of raw data, data on raw metric characters were again exposed to Student's T test, taking index values of **PERCRA** (percents of rostrum-anus length; [each metric character/ RA] × 100), according to Werner (1971). So, the evaluations on similarities or differences between the populations/taxa were strengthened. The evaluations of all statistical analyses were based on the statistical significance level of "P≤0.05".

Results and Discussion

***Lyciasalamandra irfani* n. sp.**
(Figs. 2a & 4, Table 1)

Differential Diagnosis: The new species differs from the all other *Lyciasalamandra* taxa (Fig. 3) by its colouration and pattern: The ground colour of the dorsum of both sexes and juveniles is an aubergine reddish brown with irregularly scattered white flecks in varying sizes, having very tiny small blackish brown dots inside the white flecks. (Fig. 2). The ground colour of the upper eyelids is black and the front side of the eyes, around the snout is typically darker than the other parts of dorsum with blackish tinge. The posterior ca. 1/4 part of the parotids in adult a bit lighter (redish yellow). Parotids in juveniles are yellowish (especially obvious in the posterior half). Females a bit darker than males in dorsum ground colour and also have larger sized irregularly scattered white flecks. This situation also valid and more prominent for juveniles when compared to both sexes. The sides of the head, tail, legs and the upper parts of the posterior body flanks in females are reddish. In the flanks, there is an almost completely or complete whitish band. The venter is somewhat translucent and reddish coloured without any spots, showing the internal organs (Fig. 4).

The new species differs from the all *L. luschani* races (*L.l. luschani, L. l. basoglui* & *L. l. finikensis*) and *L.*

Figure 2. *Lyciaslamandra irfani* n. sp. (**a**) Typical adult male (Holotype, ZMHRU 2011/121:3); (**b**) Adult male showing a lighter mid-dorsal zone; (**c**) Adult female; (**d**) Juvenile (the inset is showing the details of the characteristic white flecks having blackish brown spots).

Figure 3. Colour photographs of the known Lycian salamander (*Lyciasalamandra*) taxa from Anatolia (all animals are adult males). (**a**) *L. flavimembris* from Marmaris, Muğla; (**b**) *L. fazilae* from Gökçeovacık, Muğla; (**c**) *L. luschani luschani* from Karadere (near Dodurga), Muğla; (**d**) *L. l. basoglui* from Bayındır, Kaş, Antalya; (**e**) *L. l. finikensis* from Arif, Finike, Antalya; (**f**) *L. billae* from Gökdere Köyü, Konyaaltı, Antalya; (**g**) *L. antalyana* from Hurma Köyü, Konyaaltı, Antalya; (h) *L. atifi* from Güçlüköy (=Fersin), Akseki, Antalya.

Table 1. Some mensural characters (in mm) and ratios of the *Lyciasalamandra irfani* n.sp. 1: Values in raw data; 2: Values in PERCRA; N: number of specimens; SD: Standard deviation; the other abbreviations of characters were given in Material and Method.

		Adults				Juveniles			
		N	Mean	Range	SD	N	Mean	Range	SD
TBL	1	10	119.20	102.00-131.00	11.09	6	85.50	76.00-93.00	6.16
	2	10	178.98	172.86-184.29	3.31	6	177.00	173.08-180.95	2.75
RA	1	10	66.60	57.00-72.00	6.06	6	48.33	42.00-52.00	3.83
LT	1	10	44.98	37.72-48.66	3.91	6	32.28	29.43-34.22	1.72
	2	10	67.57	65.93-70.00	1.26	6	66.94	63.29-70.07	2.69
TL	1	10	52.60	45.00-59.00	5.32	6	37.17	34.00-41.00	2.48
	2	10	78.98	72.86-84.29	3.31	6	77.00	73.08-80.95	2.75
NED	1	10	2.62	1.93-2.95	0.29	6	1.94	1.62-2.25	0.21
	2	10	3.93	3.39-4.39	0.32	6	4.02	3.48-4.89	0.47
DBN	1	10	4.64	3.50-5.20	0.55	6	3.67	3.17-3.93	0.27
	2	10	6.96	6.14-7.54	0.40	6	7.64	6.47-8.74	0.86
ED	1	10	4.10	3.64-4.66	0.33	6	3.58	3.32-3.89	0.23
	2	10	6.18	5.55-6.95	0.44	6	7.42	6.86-7.90	0.36
HL	1	10	16.05	14.21-17.19	0.96	6	12.56	11.85-13.88	0.79
	2	10	24.19	22.43-26.77	1.35	6	26.05	24.18-28.64	1.55
HW	1	10	10.74	9.45-11.55	0.62	6	8.83	8.18-9.46	0.46
	2	10	16.19	14.76-17.91	1.03	6	18.35	16.69-20.31	1.42
PL	1	10	7.59	6.44-8.40	0.63	6	6.02	5.20-7.17	0.74
	2	10	11.46	9.33-13.72	1.17	6	12.48	10.92-14.20	1.32
PW	1	10	2.52	1.48-3.30	0.60	6	2.18	1.66-2.49	0.31
	2	10	3.80	2.14-4.98	0.92	6	4.51	3.79-5.26	0.55
FL	1	10	21.26	18.64-23.43	1.53	6	16.96	13.85-21.81	2.72
	2	10	31.99	30.66-34.91	1.28	6	34.99	30.88-41.94	3.88
HLL	1	10	24.03	20.02-26.94	2.01	6	18.77	16.46-20.03	1.30
	2	10	36.16	34.03-39.37	1.96	6	38.93	35.29-43.54	2.70
DFHL	1	10	37.52	32.76-40.39	3.02	6	26.92	24.64-28.94	1.53
	2	10	56.42	53.12-58.12	1.76	6	55.79	52.56-58.67	1.95
HW/HL	1	10	0.67	0.62-0.73	0.04	6	0.70	0.66-0.75	0.03
TL/TBL	1	10	0.44	0.42-0.46	0.01	6	0.43	0.42-0.45	0.01
PW/PL	1	10	0.33	0.23-0.42	0.06	6	0.36	0.32-0.43	0.04
NED/HL	1	10	0.16	0.13-0.18	0.02	6	0.15	0.13-0.19	0.02

Figure 4. Ventral aspect of *Lyciasalamandra irfani* n. sp. (Holotype, ZMHRU 2011/121:3♂) showing the colouration of the venter.

antalyana in having completely black upper eyelids in addition the differences in their dorsum background colours and patterns (Fig. 2). In all *L. luschani* races the upper eyelids are whitish and in *L. antalyana* it is yellow coloured with a thin black stripe. It is unlike *L. fazilae*, in which the ground colour is typically red, bearing brown to black blotches, that can flow together near the white lateral line. *L. irfani* n.sp. can be easily distinguished from both *L. helverseni* of Carpatos island and *L. flavimembris* which, on a

dark brown color, have numerous yellowish spots mainly concentrated middorsally (in *L. helverseni*) or very few, small silvery-white and yellow spots (in *L. flavimembris*). It is also different in having a "continuous" whitish lateral line on the flanks from *L. flavimembris* that typically has no complete lateral line on its flanks. The new species is neither like *L. atifi* nor *L. billae*, although they can have white flecks or spots on their background colour of dorsum. The dorsum colour of *L. atifi* is black or blackish brown having a violent tinge, sometimes uniformly black and sometimes with tiny white spots. Beside of this, it is also distinctly the largest species described up to now, reaching a total length of over 170 mm. As in the new species, *L. billae* has some white spots that are distributed across the back and ordered regularly, forming two light dorsolateral bands. Whereas, in the new species these white spots or flecks are more numerous and also irregularly scattered on dorsum. Moreover, the ground colour of dorsum in *L. billae* can vary from salmon to black in contrast to the almost stable aubergine reddish brown ground colour of *L. irfani* n.sp.

Holotype and Terra Typica. (Fig. 2a & 4) Adult male. ZMHRU 2011/121:3. Göynük Canyon, Kemer, Antalya – Turkey. 280 m. a.s.l. Paratypes (N=15) as listed under Material Examined.

Derivatio nominis. The name of the newly described species is derived from the name of the senior author's late father İrfan GÖÇMEN (1920-1994).

Description of the holotype. The general body form resembles that of all other species of *Lyciasalamandra*. Snout-vent length (RA) and tail length (TL) are 70.00 and 51.00 mm, respectively. Head flat, longer than broad (HW/HL 0.62). Snout more or less rounded. Parotids long and narrow (PW/PL 0.32), with a slight inner curvature towards the anterior end which is narrower than the posterior part. Gular fold distinct. The protuberance above the base of the tail is 2.24 mm and towards the free end it is curved forwards. The cloacal region is swollen.

In life, the ground colour of dorsum including head, tail and extremities, except upper eyelids is aubergine reddish brown. On this ground colour there are numerous white flecks or spots in varying sizes, having many blackish brown dots (that are visible with a magnifying glass). The upper eyelids are almost black with some tiny, indistinct whitish dots and the front side of the eyes, around the snout is darker than the other parts of dorsum with blackish tinge. The posterior ca. 1/4 part of the parotids a bit lighter (redish yellow). The openings of the dorsal, caudal and parotoid glands are visible as black dots.

The lower parts of the body is reddish, especially on the ventral and lateral sides of the legs and the tail including the cloacal region. The throat is somewhat translucent without bearing any spots, showing the internal organs. Towards the sides, the colour changes to whitish with white flecks similar in structure that of dorsal side and form an almost continuous white lateral stripe that separates the dorsal and the ventral sides, extending anterior to under the eyes.

The other measurements of the holotype are (in mm): total body length (TBL) 121.00; length of trunk (LT) 47.47; head length (HL)16.53; head width (HW)10.33; nostril-eye distance (NED) 2.57; the distance between nostrils (DBN) 4.95; eye diameter (ED) 4.15; parotid length (PL) 7.94; parotid width (PW) 2.58; forelimb length (FLL) 21.81; hind limb length (HLL) 23.9; distance between fore- and hind limbs (DFHL) 40.03.

Paratypes and Variations. All the specimens investigated from the Göynük Canyon (except the holotype) (N=15) were accepted as paratypes (Fig. 2b,c,d). Variations observed in some mensural characters and ratios including those of holotype were summarized separately for adults and juveniles in Table 1. In addition, the projection at the base of the tail in the other two male specimens was measured as 0.77 and 1.83 mm (ZMHRU 2011/136:2 & 2011/121:1, respectively).

In colour pattern, the description given for the holotype would largely apply also to the other males (including males observed in the field but not collected), however one male (ZMHRU 2011/121:1) has a bit lighter (i.e. more reddish) vertebral line on the trunk (Fig.2b). In regard to the females and juveniles we may note first that they have bulky bodies as well as darker ground colour and larger white flecks and spots on their dorsum than the males (Fig. 2c,d). Also both females and juveniles lack any protuberance at their tail bases and have smooth or less swollen cloacal regions. In all juveniles, the parotids are yellowish, especially obvious in the posterior half. Along with the only observed specimens in the field, apparently the pattern, especially on the sizes of the flecks and spots, a bit changes in growth depending on sex and age.

Habitat, Range and Relations. The specimens belonging to the new species were collected from under varying sized stones of the more humid sloping rocky areas covered with plane (*Platanus orientalis*), pine (*Pinus brutia*), Greek strawberry trees (*Arbuthus andrachne*) and Mediterranean frigana-garrique elements, such as *Nerium oleander, Ditrichia viscosa, Osyris alba, Asplenium trichomanes, Umbilicus* sp., *Cyclamen* sp., *Smilax aspera, Tamus communis*. Some habitats are shown in Fig. 5.

Although we scanned the nearby areas surrounding the Göynük Canyon (around the towns of Göynük, Ovacık and Üçoluk) we found no terrestrial salamander. It seems that the range of distribution of the new species is strictly restricted in Göynük Canyon of 4-5 km² area at the altitudes between 90 m and 385 m asl. According to the criteria of IUCN Red list Annex-2 (IUCN 2001) the new species can be defined "critically endangered" since the estimated area of occupancy is less than 10 km² (B2a). The Göynük Canyon is a Special Protected Area opened to tourism by its historical Lycian roads and so many visitors use this area. This indicates that the species needs additional protection measures in Göynük Canyon.

Even though we found the first specimen in the middle of February, the majority were seen in April, being on the southern and western slopes of the mountains surrounding the canyon. The air temperatures were measured as 17, 19 and 21 °C around 11 a.m. during the three trips, respectively. As sympatric herptiles *Pseudoepidelea viridis, Ablepharus budaki anatolicus, Anatololacerta oertzeni ibrahimi, Blanus strauchi* and *Typhlops vermicularis* were observed.

The material used for comparisons of each taxon almost agrees with those of the previously published papers and their original descriptions in mensural characters and colouration. Therefore, the raw data and PERCRA values of the taxonomic characters of the other taxa are not given here, however we compared the values from other taxa with those of *Lyciasalamandra irfani* n. sp. using t-test to show the differences and similarities. Although our specimens from Göynük Canyon are similar to *L. antalyana* and *L. luschani finikensis* in almost all mensural taxonomic characters (P 0.05) (Table 2), they also show some affinities to *L. atifi* and *L. billae,* from the viewpoint of pattern: by having numerous white dots on dorsum and blackish upper eyelids, respectively. The new species also seems closely related with *L. antalyana* in the yellowish colouration of the parotids in juveniles.

In regard to relations of the new species with other neighbouring Lycian salamander taxa, we can state that in electrophoretic patterns (Fig. 6) it resembles more *L. antalyana* by having similar number of protein fractions, totally 11 (9 globulins, 1 postalbumin and 1 albumin) than any other taxon previously described, even from the closest species in distribution, *L. billae*. Whereas in *L. billae*, we detected totally 10 protein fractions (8 globulins, 1 postalbumin and 1 albumin). Among the Lycian salamander taxa examined, it was found that the total protein fraction number was lowest in *L. luschani finikensis* and highest in *L. atifi*. The blood protein fractions were found to be 9 in *L. luschani finikensis* (7 globulins, 2 albumins) and 13 in *L. atifi* (10 globulins, 1 postalbumin, 2 albumins).

Hinsbergen et al. (2010) have implied that Beydağları mountains which are now located parallel in the west of Göynük Canyon, underwent a

Figure 5. Some habitats of *Lyciasalamandra irfani* n. sp. where the pine trees and Mediterranean frigana-garrique elements are observed abundantly.

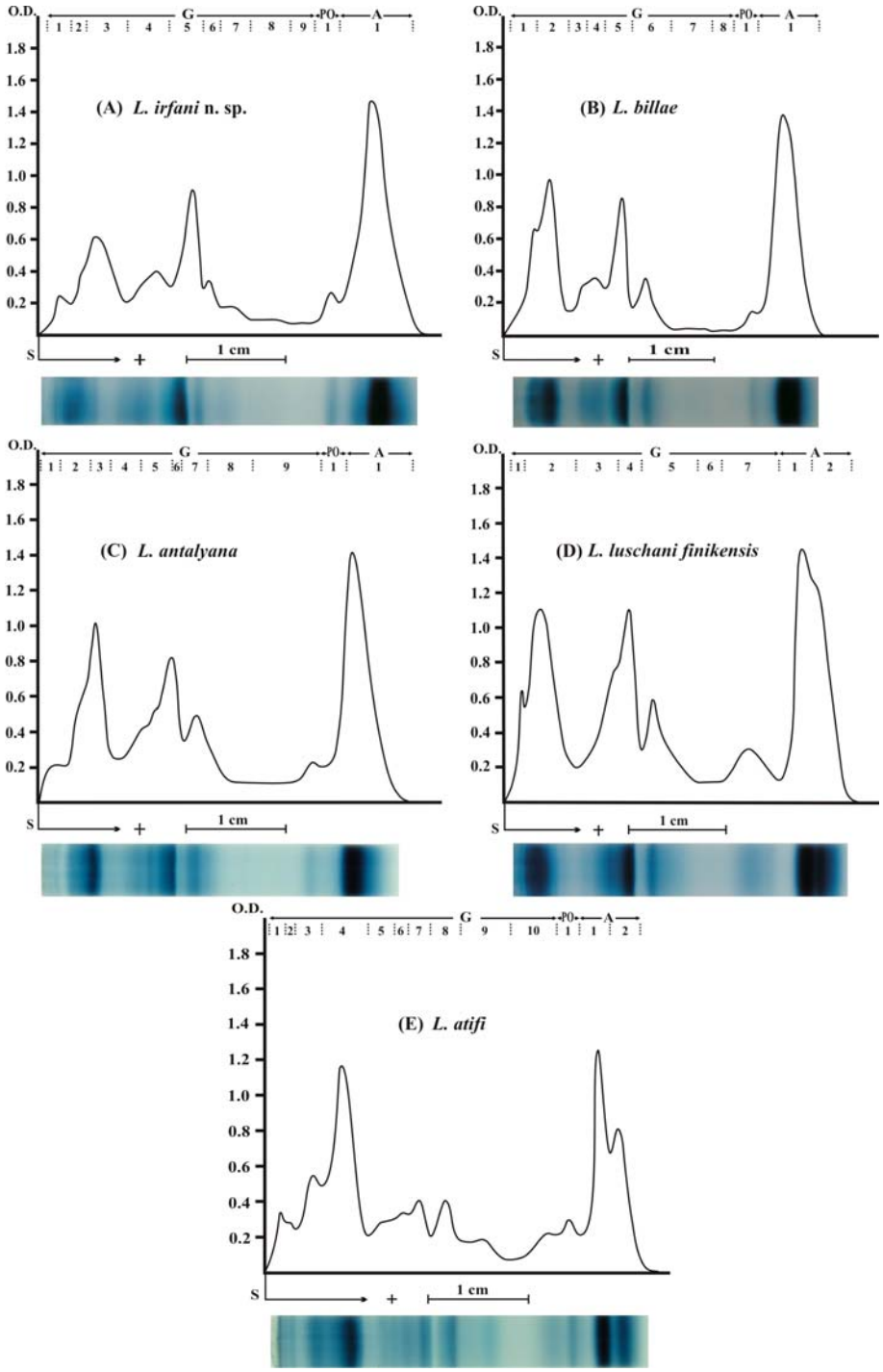

Figure 6. Electropherograms representing the electrophoretical separations of blood-serum proteins in some Lycian salamanders, together with their corresponding densitometric curves (OD: optical density, S: start -the border between the stacking and separation gels- , G: globulins zone, PO: Postalbumin zone, A: albumin-like proteins zone). All electopherograms used here are selected from those of adult males.

Table 2. Comparisons of mensural characters with the other Turkish Lycian salamander taxa with P values (significance of t-test). Values that are significantly different from those for *Lyciasalamandra irfani* n. sp. ($P \leq 0.05$) are boldfaced. 1: According to the values in raw data; 2: According to the values in PERCRA. The other abbreviations of characters were given in Material and Method.

Taxa		*L. flavimemris*	*L. fazilae*	*L. l. luschani*	*L. l. basoglui*	*L. l. finikensis*	*L. billae*	*L. antalyana*	*L. atifi*
TBL	1	.060	.067	.155	.925	.593	.178	.856	**.005**
	2	.494	.268	.625	.074	.253	.258	.876	**.023**
RA	1	**.005**	.052	.165	.846	.342	.099	.988	**.005**
LT	1	.074	**.019**	.237	.954	.245	.065	.772	**.007**
	2	.417	**.011**	.248	.388	.816	.613	.225	.745
TL	1	**.013**	.181	.158	.587	.952	.454	.728	**.007**
	2	.494	.268	.625	.074	.253	.258	.876	**.023**
NED	1	.098	.612	.216	.273	.498	.404	.812	.052
	2	.846	**.037**	.781	**.003**	.255	.344	.467	.332
DBN	1	.258	.252	.243	.714	.788	.430	.523	**.029**
	2	.183	.146	.650	.643	.444	.200	.293	.563
ED	1	.188	.213	.890	.240	.145	.100	.909	**.046**
	2	**.004**	.404	.054	**.002**	.501	**.017**	.994	.873
HL	1	.145	.261	.113	.240	.925	.095	.768	**.011**
	2	**.042**	**.027**	.432	.592	.211	.277	.527	.112
HW	1	.151	.492	.921	.329	.087	.604	.451	**.005**
	2	.178	**.004**	**.015**	.131	.279	.055	.445	.076
PL	1	**.014**	.538	**.070**	.134	.665	.776	.878	**.020**
	2	.248	**.002**	.809	.431	.862	.098	.821	.597
PW	1	**.003**	**.017**	.608	.612	.280	**.004**	.290	.632
	2	.084	.106	.203	.681	.563	**.016**	.301	.232
FL	1	**.027**	.058	.067	.709	.596	.182	.630	**.008**
	2	**.001**	.429	.897	.709	.536	.342	.655	.836
HLL	1	.069	**.027**	.173	.737	.633	.162	.874	**.005**
	2	.459	.974	.585	.758	.480	.430	.875	.420
DFHL	1	**.010**	**.044**	.186	.504	.599	**.024**	.343	**.014**
	2	**.044**	.502	.765	.358	.542	.211	.060	.536
HW/HL	1	.776	.521	**.040**	.485	**.004**	.110	.488	.968
TL/TBL	1	.485	.274	.637	.080	.252	.259	.807	**.019**
PW/PL	1	**.017**	**.002**	.066	.956	.327	**.001**	.276	.113
NED/HL	1	.074	.602	.713	.258	.472	.686	.298	.876

20^0 counterclockwise rotation between 16 and 5Ma, i.e. during the middle to late Miocene. When we take into consideration the current distribution areas of *Lyciasalamandra antalyana*, which also includes the northernmost parts of Beydağları mountains, and of *L. irfani* sp. we can speculate that the rotation could have divided a main ancestral population. In this way, the isolation would lead to the speciation of these closely related salamanders. Our findings on the similarities in mensural characters, electrophoretic patterns and the parotid colour of juveniles support this assumption. However, to obtain better idea on their phyllogenetic relations more detailed molecular studies based on nuclear and mitochondrial DNA should be conducted.

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