Zootaxa 1387: 27–38 (2007)
www.mapress.com/zootaxa/

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

A new subspecies, *Eumeces schneiderii barani* n. ssp (Reptilia: Sauria: Scincidae) from Turkey

YUSUF KUMLUTAŞ[1,5], HÜSEYIN ARIKAN[2], ÇETIN ILGAZ[3] & YAKUP KASKA[4]

[1]*Dokuz Eylül University, Faculty of Education, Department of Biology, 35150, Buca, İzmir, Turkey.*
E-mail: yusuf.kumlutas@deu.edu.tr
[2]*Ege University, Faculty of Science, Department of Biology, Zoology Section, 35100, Bornova, İzmir, Turkey.*
E-mail: huseyin.arikan@ege.edu.tr
[3]*Dokuz Eylül University, Fauna and Flora Research and Application Center, 35150, Buca, İzmir, Turkey.*
E-mail: cetin.ilgaz@deu.edu.tr
[4]*Pamukkale University, Faculty of Science and Arts, Department of Biology, Denizli, Turkey. E-mail: caretta@pamukkale.edu.tr*
[4]*Corresponding author*

Abstract

This study describes a new subspecies of lizard, *Eumeces schneiderii barani* **n. ssp.**, from western Anatolia, Turkey. The new subspecies is differentiated from other two subspecies in Anatolia (*E. s. princeps* and *E. s. pavimentatus*) by its characteristic colour and colour-pattern as well as by the scales along the dorsal midline. Results obtained from polyacrylamide gel disc electrophoresis support this differentiation.

Key words: *Eumeces schneiderii barani* **n. ssp.**, Sauria, Scincidae, blood-serum proteins, polyacrylamide gel disc electrophoresis, lizards, Turkey

Introduction

The scincid lizard *Eumeces schneiderii* has been recorded from North Africa (from Algiers in the west to Egypt including Sinai), Syria, Lebanon, Israel, Jordan, Cyprus, Anatolia, Transcaucasia (northwards to Dagestan) and from West and Central Asia (Eiselt 1940; Mertens 1946; Baran 1977; Werner 1971; Darevsky 1981; Leviton *et al.* 1992; Disi & Böhme 1996; Atatür & Göçmen 2001; Göçmen *et al.* 2002). Two subspecies inhabit the known distribution zone of *E. schneiderii* in Anatolia (Baran & Atatür 1998; Sindaco *et al.* 2000). The subspecies of *E. s. princeps* (Eichwald) is present mainly in central, southeast and eastern Anatolia, whereas *E. s. pavimentatus* (Geoffroy–St. Hilaire) is distributed only in the eastern Mediterranean region (Vilayets of Mersin, Adana and Hatay). Recently, new localities were reported from western Anatolia for this species (Kumlutaş *et al.* 2004a, b). Those studies report that the specimens from western Anatolia (Denizli, Bozdağ-İzmir) differ from the other two known subspecies in terms of certain morphological features such as colour-pattern and the number of scales along the dorsal midline.

We compared both the morphological characteristics (pholidosis, morphometric measurements and ratios, and colour-pattern) and electrophoretic analyses of the blood-serum proteins of the specimens collected from western Anatolia with the values of the other two known subspecies.

Accepted by S. Carranza: 10 Nov. 2006; published: 8 Jan. 2007

Material and methods

The materials used in this study were collected from Denizli and Bozdağ (İzmir) on different dates in 2002 and 2004. They were deposited in the Zoology Laboratory of the Department of Biology at Buca Education Faculty, Dokuz Eylül University, and incorporated into the collection of ZDEU (Zoology Department Ege University).

Material examined

Eumeces schneiderii barani. Holotype: ZDEU 163/2002. 1♀, Pamukkale, Denizli, Turkey, 25.05.2002, leg. Y. Kumlutaş, Y. Kaska, Ç. Ilgaz.

Paratypes: ZDEU 164/2002. 1-2♂, 3♀, 4-5juv., Pamukkale, Denizli, Turkey, 18.05.2002, leg. Y. Kumlutaş, Y. Kaska, Ç. Ilgaz; ZDEU 164/2002. 1subad.♂, Bozdağ, Ödemiş, İzmir, Turkey, 28.05.2002, leg. Y. Kumlutaş, Ç. Ilgaz; ZDEU 125/2003. 1-2♂, 3♀, Bozdağ, Ödemiş, İzmir, Turkey, 24.05.2004, leg. Y. Kumlutaş, Ç. Ilgaz.

Material compared

E. s. princeps ZDEU 91/1999. 1♂, 2♀, Karapınar, Konya, 07.06.1999, leg. Ö. Özender; ZDEU 92/1999. 1-2♂, 3♀, Karapınar, Konya, 06.06.1999, leg. Ö. Özender.

E. s. pavimentatus. ZDEU 104/2000. 1♂, Kuyuluk, Mersin, 23.05.2000, leg. H. A. Uçar; ZDEU 126/2003. 1♂, Botaş, Ceyhan, Adana, 02.05.2003, leg. A. Avcı, F. Kiremit; ZDEU 127/2003. 1♂, Karaisalı, Mersin, 13.05.2003, leg. L. Seyhan; ZDEU 31/2004. 1♂, Mersin, 10.05.2004, leg. H. A. Uçar; ZDEU 263/2005. 1subad.♀, Mersin, 20.05.2005, leg. H. A. Uçar.

The colour and colour-pattern characteristics were recorded while the specimens were still alive; colour slides were taken of the living the animals and evaluated in this study. The living animals were then transported to the laboratory.

Only sexually mature specimens were only used for electrophoretic analysis. Blood samples for electrophoretic analysis were obtained from the postorbital sinuses via heparinized hematocrit capillary tubes according to method described by MacLean *et al.* (1973). Blood samples were centrifuged for 5 minutes at 600 g. and stored in equal amounts (4 µl per sample) for each separation until analysis. Blood–serum samples were separated according to Davis (1964) using polyacrylamide disc gel electrophoresis, slightly modified after Özeti and Atatür (1979). Electrophoretic separations were carried out at room temperature (approx. 20–25°C) with a Canalco Model 1200 electrophoresis apparatus. Separation gels were stained with 0.5% Amido Black (Naphthol Blue Black 10–B), later de-stained passively with repeated 7% acetic acid baths. Gels were qualitatively evaluated directly from the electropherograms, and densitometric curves of the separations were obtained using a Gelman ACD–15 Model 39430 densitometer at 500 nm. The gels were subsequently photographed with a digital camera. There were no variations between the sexes in the electropherograms, and therefore both sexes were pooled.

After the electrophoretic process, specimens were anaesthetized with ether, fixed with a mixture of 5% formalin and 70% ethanol, and then kept in 70% ethanol according to the method described by Başoğlu and Baran (1977). Morphometric measurements were taken using a dial calliper with an accuracy of 0.02 mm.

One-way analyses of variance (ANOVA) were applied to compare similarities and differences between the new subspecies and other two known subspecies. Morphometric indices and ratios were used to test for similarities and differences among the subspecies. Ratios were used due to uncertainties regarding age groups and because it was unknown whether growth was isometric. Data were examined for conformation to normality (Kolmogorov-Smirnov test) and homogeneity (Fmax). The distribution functions of the pholidosis charac-

ters of the subspecies were tested with the Mann-Whitney U test. Statistical significance in all tests was set at 0.05. Statistical analyses were carried out using the programs SPSS 11.0 and STATISTICA 6.0.

Results and discussion

Diagnosis: The specimens from Denizli and Bozdağ can easily be distinguished from other forms of *E. schneiderii* based on colour, colour-pattern and number of scales along the dorsal midline. The electrophenograms of the blood-serum proteins also differed both quantitatively and qualitatively (Figures 1–4).

E. s. barani **n. ssp.** is similar to *E. s. princeps* in terms of the number of scales along the dorsal midline (usually 26), but is quite different in colour and colour-pattern. The main differences were thin, white, interrupted dorsal longitudinal lines in juvenile and adult female *E. s. barani* **n. ssp.** (Figure 5). White longitudinal lines are also known in both juvenile and adult *E. s. pavimentatus* (Figure 6), but these lines are much thicker and less pale than in *E. s. barani* **n. spp.** Moreover, *E. s. pavimentatus* usually has 24 scales along the dorsal midline, distinctly different from *E. s. barani* **n. spp**.

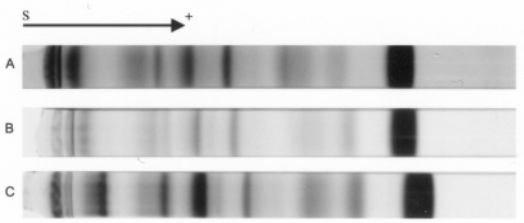

FIGURE 1. Blood-serum electropherograms of *Eumeces schneiderii barani* **n. ssp.**, *E. s. pavimentatus* and *E. s. princeps* (S: Start, junction between the stacking and separation gels)

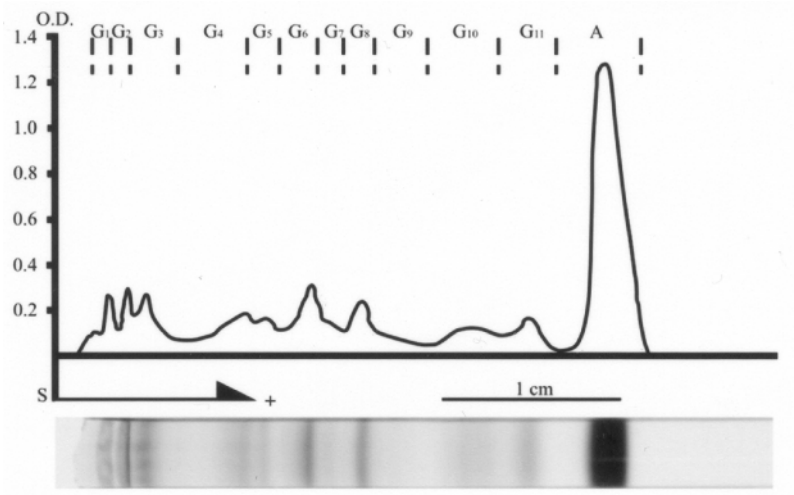

FIGURE 2. Gel photograph showing the electrophoretic separation of the blood-serum protein sample obtained from *E. s. barani* ***n. ssp.***, together with its densitometric curve (OD: Optical density, S: Start, junction between the stacking and separation gels).

Description of the holotype (female): The ground colour of the head scales is olive greenish brown without dark spots. This ground colour extends to the upper borders of supralabial plates. The ground colour of the supralabial and sublabial plates are clearer. The ground colour of the dorsum is olive greenish brown with white spots formed as longitudinal bands running from the edges of the forelimbs to the first 1/3 of the tail on the dorsum and flanks of the body. A yellow band stars from the lower border of the subocular plate under the

eye and continues to behind the subocular plate. This band is dark yellow up until the hind limbs but paler thereafter and on the side of the tail. The band is interrupted at the ear openings. Two reddish spots are present on the laterals, starting from the dorsal midline and formed as continuous lines towards posterior. This band is darker up until the onset of the tail, but paler thereafter, ending after the first half of the tail.

Body measurements obtained from the holotype are as follows: snout–vent length 140.12 mm; total body length (including tail) 350.12 mm; head length 24.42 mm; head width 14.96 mm; fore limb length 33.22 mm; hind limb length 47.18 mm; length of fourth toe of hind limb 13.80 mm. Upper head shields flat; supranasals (2/2) in contact with rostrum and frontonasale; supraoculars (6/6) in contact with prefrontals; supraciliar plates (5/5); supralabials (7/8); scales along the dorsal midline were 26; dorsal scales from occipit to above cloaca were 64; subdigital lamellae under the fourth toes of the hind limb (12/12).

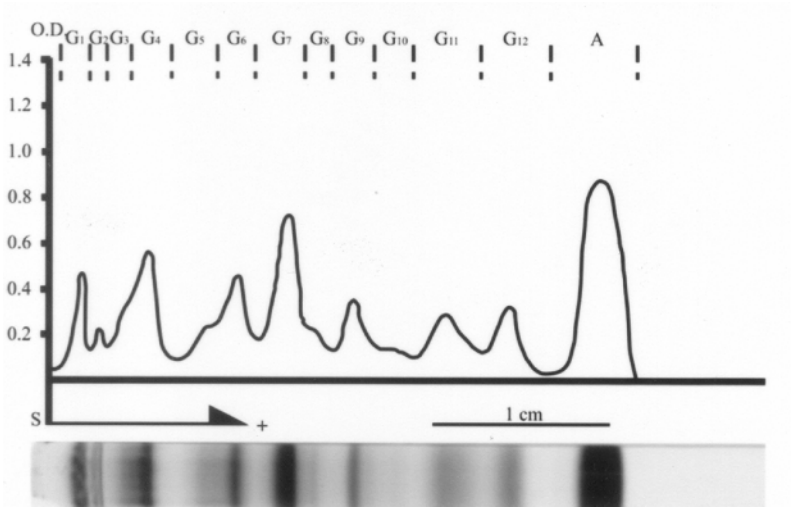

FIGURE 3. Gel photograph showing the electrophoretic separation of the blood-serum protein sample obtained from *E. s. pavimentatus*,, together with its densitometric curve (OD: Optical density, S: Start, junction between the stacking and separation gels).

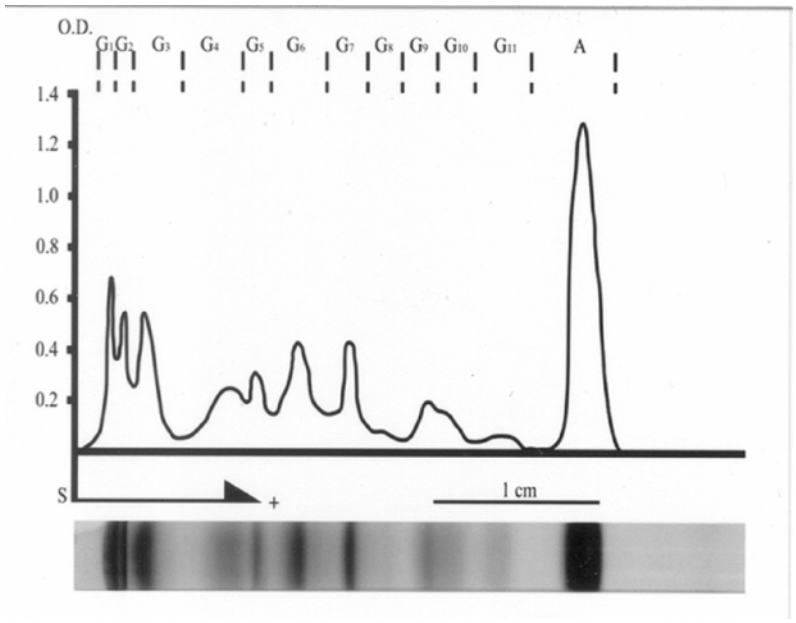

FIGURE 4. Gel photograph showing the electrophoretic separation of the blood-serum protein sample obtained from *E. s. princeps*, together with its densitometric curve (OD: Optical density, S: Start, junction between the stacking and separation gels).

FIGURE 5. *E. s. barani* **n. ssp.** General view of holotype (adult ♀ ZDEU 163/2002). Photo S. Üçüncü.

FIGURE 6. *E. s. pavimentatus*. General view of subad. ♀ (ZDEU 263/2005) Photo: Ç. Ilgaz.

Variation: Variations in most external morphological characters are given in Table 1 and 2. Nasals (2/2); frontonasale in contact with 2 supranasals; prefrontal plates in contact each other with broad suture; supraoculars (6/6); supraciliar plates 4/4 in 3 paratypes, 6/6 in 2 paratypes, 5/5 in 2 paratypes, 4/5 in 1 paratype and 6/5 in 1 paratype; supralabials 8/8 in 7 paratypes, 7/8 in 1 paratype and 8/7 in 1 paratype; mid-body scales 26–28

(mean: 26.70); subdigital lamellae 12-14 (mean: 13.20).

The mean snout–vent length in adult specimens was 130.26 mm (110.88–143.20) mm and the mean head length: head width ratio was 1.52 (1.38–1.77). Head length was approx. 17-18% of snout-vent distance; the tail was 1.35–1.64 times snout-vent length.

The colour and colour-pattern features of juveniles and other females were quite similar to the holotype but different from male specimens (Figure 7). The ground colour of the dorsal surface in males was greyish brown and continues until the starting point of tail; the remainder of the tail was yellowish brown. The orange spots in the middle of dorsal surface were sparse up until the tail in males. The longitudinal pale white lines seen on the young and adult females were absent in males. The lateral orange band starts from the supraoculars and continues posteriorly, extending even onto the tail. The ventral colour was yellowish white.

FIGURE 7. *E. s. barani* **n. ssp.** General view of the paratype (ZDEU 125/2003-1♂).

Comparison with other subspecies. **Morphological comparison:** The scales along the dorsal midline were usually 24 (rarely 22–26) in *E. s. pavimentatus*, one of two previously defined subspecies from Anatolia (Eiselt 1940; Mertens 1946; Başoğlu & Baran 1977). The scales along the dorsal midline were between 23 and 25 (mean 24.00) in *E. s. pavimentatus*, and between 26 and 28 (mean 26.60) in *E. s. barani* **n. ssp.** collected from Denizli and Bozdağ (Ödemiş-İzmir). Comparing pholidosis features of these two subspecies with Mann-Whitney U test reveals statistically significant differences in the numbers of scales around the left parietal scale (U: 5,000; Z: -3,191; p = 0.013), along the dorsal midline (U: 0,000; Z: -3,253; p = 0.001) and in the numbers of right subdigital lamella (U: 4,500; Z: -2,647; p = 0.008). The mean numbers of scales around the left parietal scale and the mean numbers of right subdigital lamella were higher in *E. s. pavimentatus*, whereas the mean numbers of scales around the middle body were higher in *E. s. barani* **n. ssp.** (Figure 8). ANOVA showed that the limb index in *E. s. barani* **n. ssp.** differed (lower mean values) from the other two subspecies (df:1; F: 16,816; p = 0,003 – df:1; F: 19,912; p = 0,00) (Figures 9–10).

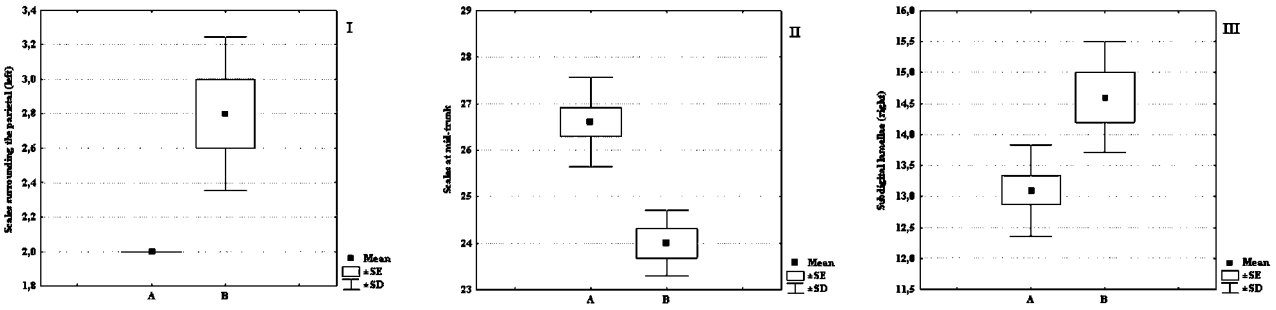

FIGURE 8. Box and whisker plots of the pholidosis characters showed significant differences between *E. s. barani* **n. ssp.** and *E. s. pavimentatus* according to the Mann-Whitney U test (A: *E. s. barani* **n. ssp.**, B: *E. s. pavimentatus*).

TABLE 1. Pholidosis characters of *E. s. barani* **n. ssp.**, *E. s. pavimentatus* and *E. s. princeps*.

	E. s. barani **ssp. n.**					*E. s. pavimentatus*					*E. s. princeps*				
Characters*	N	Mean	Range	SD	SE	N	Mean	Range	SD	SE	N	Mean	Range	SD	SE
1	10	7.8	7.0–8.0	0.4	0.1	5	8.0	8.0–8.0	0.0	0.0	5	8.0	8.0–8.0	0.0	0.0
2	10	7.9	7.0–8.0	0.3	0.1	5	8.0	8.0–8.0	0.0	0.0	5	8.0	8.0–8.0	0.0	0.0
3	10	4.9	4.0–6.0	0.9	0.3	5	5.2	5.0–6.0	0.5	0.2	5	4.2	3.0–5.0	0.8	0.4
4	10	4.9	4.0–6.0	0.7	0.3	5	5.0	5.0–5.0	0.0	0.0	5	4.6	4.0–5.0	0.6	0.3
5	10	6.0	6.0–6.0	0.0	0.0	5	6.0	6.0–6.0	0.0	0.0	5	6.0	6.0–6.0	0.0	0.0
6	10	6.0	6.0–6.0	0.0	0.0	5	6.0	6.0–6.0	0.0	0.0	5	6.0	6.0–6.0	0.0	0.0
7	9	1.8	1.0–2.0	0.4	0.2	5	2.0	2.0–2.0	0.0	0.0	5	2.0	2.0–2.0	0.0	0.0
8	9	1.8	1.0–3.0	0.7	0.2	5	2.0	2.0–2.0	0.0	0.0	5	2.0	2.0–2.0	0.0	0.0
9	10	1.0	1.0–1.0	0.0	0.0	5	1.0	1.0–1.0	0.0	0.0	5	1.0	1.0–1.0	0.0	0.0
10	10	1.0	1.0–1.0	0.0	0.0	5	1.0	1.0–1.0	0.0	0.0	5	1.0	1.0–1.0	0.0	0.0
11	10	2.0	2.0–2.0	0.0	0.0	5	2.8	2.0–3.0	0.5	0.2	5	2.6	2.0–3.0	0.6	0.2
12	10	2.2	2.0–3.0	0.4	0.1	5	2.2	2.0–3.0	0.5	0.2	5	2.2	2.0–3.0	0.5	0.2
13	10	4.0	4.0–4.0	0.0	0.0	5	3.6	3.0–4.0	0.6	0.2	5	3.6	3.0–5.0	0.9	0.4
14	10	4.0	4.0–4.0	0.0	0.0	5	3.6	3.0–4.0	0.6	0.2	5	4.0	3.0–5.0	1.0	0.5
15	10	64.4	64.0–66.0	0.7	0.2	5	64.8	63.0–67.0	10.6	0.7	5	64.0	63.0–65.0	1.0	0.5
16	10	1.0	1.0–1.0	0.0	0.0	5	1.0	1.0–1.0	0.0	0.0	5	1.0	1.0–1.0	0.0	0.0
17	10	26.6	26.0–28.0	1.00	0.3	5	24.0	23.0–25.0	0.7	0.3	5	26.4	26.0–28.0	0.9	0.4
18	10	8.0	8.0–8.0	0.0	0.0	5	8.0	8.0–8.0	0.0	0.0	5	8.2	8.0–9.0	0.5	0.2
19	10	2.0	2.0–2.0	0.0	0.0	5	2.0	2.0–2.0	0.0	0.0	5	2.0	2.0–2.0	0.0	0.0
20	10	2.0	2.0–2.0	0.0	0.0	5	2.0	2.0–2.0	0.0	0.0	5	2.0	2.0–2.0	0.0	0.0
21	10	2.0	2.0–2.0	0.0	0.0	5	2.0	2.0–2.0	0.0	0.0	5	2.0	2.0–2.0	0.0	0.0
22	10	13.1	12.0–14.0	0.9	0.3	5	14.2	13.0–15.0	0.8	0.4	5	13.6	12.0–15.0	1.1	0.5
23	10	13.1	12.0–14.0	0.7	0.2	5	14.6	14.0–16.0	0.9	0.4	5	14.0	13.0–15.0	0.7	0.3

* 1. Supralabials-left, 2. Supralabials-right, 3. Supraciliaries-left, 4. Supraciliaries-right, 5. Supraoculars-left, 6. Supraoculars-right, 7. Preoculars-left, 8. Preoculars-right, 9. Nuchals-left, 10. Nuchals-right, 11. Scales surrounding the parietal-left, 12. Scales surrounding the parietal-right, 13. Auriculars-left, 14. Auriculars-right, 15. Dorsal scales from occipit (parietalia) to above cloaca, 16. Interparietal, 17. Scales along the dorsal midline around, 18. Preanals, 19. Anals, 20. Nasals-left, 21. Nasals-right, 22. Subdigital lamellae under the fourth toes of the hind limbs-left, 23. Subdigital lamellae under the fourth toes of the hind limbs-right.

TABLE 2. Morphometric measurements of *E. s. barani* **ssp. n.**, *E. s. pavimentatus* and *E. s. princeps*.

	E. s. barani **ssp. n.**					*E. s. pavimentatus*					*E. s. princeps*				
Characters*	N	Mean	Range	SD	SE	N	Mean	Range	SD	SE	N	Mean	Range	SD	SE
1	6	328.19	260.88–378.20	42.61	17.40	3	373.15	291.64–423.16	71.19	41.10	5	305.49	268.84–361.32	35.36	15.81
2	7	131.67	110.88–143.20	14.12	5.34	4	151.04	131.64–167.16	15.17	7.59	5	122.89	113.72–131.32	6.51	2.91
3	6	196.67	150.00–235.00	28.68	11.71	3	230.67	189.00–256.00	36.36	20.99	5	182.60	148.00–230.00	31.56	14.11
4	7	23.59	19.34–26.80	2.59	0.98	4	26.51	23.02–29.82	2.78	1.39	5	22.14	21.00–22.92	0.83	0.37
5	7	15.51	12.00–18.50	2.56	0.97	4	17.98	16.08–19.52	1.66	0.83	5	14.716	14.24–15.36	0.52	0.23
6	7	11.18	9.26–12.76	1.41	0.53	4	12.60	11.70–13.38	0.79	0.39	5	10.69	10.26–11.10	0.32	0.14
7	7	19.81	17.00–22.12	1.98	0.75	4	22.98	21.38–25.66	1.86	0.93	5	19.32	19.00–19.60	0.29	0.13
8	7	44.83	31.12–52.62	7.37	2.79	4	52.78	51.28–54.70	1.42	0.71	5	45.44	43.20–47.82	1.86	0.83
9	7	33.72	28.18–47.34	6.45	2.44	4	35.03	34.24–35.64	0.68	0.34	5	30.06	28.38–32.16	1.59	0.71
10	7	12.79	10.58–14.66	1.44	0.54	4	14.04	13.12–15.86	1.25	0.62	5	12.31	11.88–12.74	0.36	0.16
11	7	65.53	56.39–72.70	5.82	2.20	4	67.95	64.04–72.46	3.89	1.94	5	66.55	63.46–72.38	3.65	1.63
12	7	56.34	53.69–60.30	2.36	0.89	4	54.96	51.13–59.73	3.56	1.78	5	55.34	53.94–56.63	0.95	0.43
13	7	45.32	40.08–67.74	9.94	3.76	4	66.40	63.40–67.73	2.05	1.02	5	66.18	60.72–69.83	3.35	1.50
14	7	0.18	0.17–0.19	0.01	0.01	4	0.18	0.17–0.18	0.01	0.01	5	0.18	0.17–0.19	0.01	0.01
15	7	0.15	0.14–0.16	0.01	0.01	4	0.15	0.14–0.16	0.01	0.01	5	0.16	0.14–0.17	0.01	0.01
16	6	0.34	0.23–0.38	0.05	0.02	4	0.35	0.31–0.39	0.03	0.02	5	0.37	0.34–0.38	0.02	0.01
17	6	0.67	0.61–0.74	0.05	0.02	3	0.70	0.64–0.82	0.10	0.06	5	0.69	0.57–0.82	0.11	0.05
18	6	0.60	0.57–0.62	0.02	0.01	3	0.59	0.55–0.61	0.03	0.02	5	0.59	0.55–0.64	0.04	0.02

* 1: Total length, 2: Snout-vent length, 3: Tail length, 4: Head length, 5: Head width, 6: Pileus width, 7: Pileus length, 8: Hind limb length, 9: Fore limb length, 10: The length of the fourth toe of the hind limb, 11: Head indices [(Head width / Head length) * 100], 12: Pileus indices [(Pileus width / Pileus length) * 100], 13: Leg indices [(Fore limb length / Hind limb length) * 100], 14: Head length / Snout-vent length, 15: Pileus length / Snout-vent length, 16: Hind limb length / Snout-vent length, 17: Snout-vent length / Tail length, 18: Tail length / Total length.

There were no distinct differences between male and sub-adult female *E. s. pavimentatus* in terms of colour or colour-pattern. The examined specimens had longitudinal rows of interrupted white spots (every white spot covers the entire scale) (Figure 6), as reported in the literature (Eiselt 1940; Mertens 1946; Baran 1977; Başoğlu & Baran 1977). These longitudinal spots were absent in other subspecies (*E. s. princeps*) (Figure 11). In *E. s. barani* **n. spp.**, such dorsal spots (not covering the entire scale) were only seen in young and adult females (Figure 5) in *E. s. pavimentatus* they were present in both males and females. Moreover, these

spots turned pale in fixed specimens of the new subspecies, but never disappeared in *E. s. pavimentatus* after fixation.

Serological comparison: There were no quantitative or qualitative differences in electropherograms of specimens collected from Denizli and Bozdağ (Ödemiş-İzmir) populations, and both were therefore evaluated together.

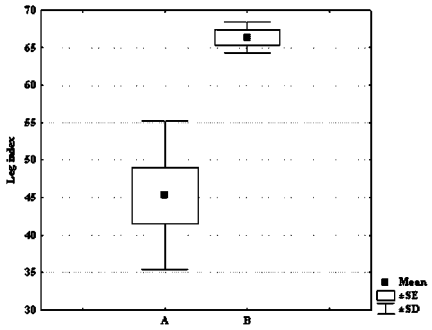

FIGURE 9. Box and whisker plots of the morphometric measurement showed significant differences between *E. s. barani* **n. ssp.** and *E. s. pavimentatus* according to one-way analyses of variance (ANOVA) (A: *E. s. barani* **n. ssp.**, B: *E. s. pavimentatus*).

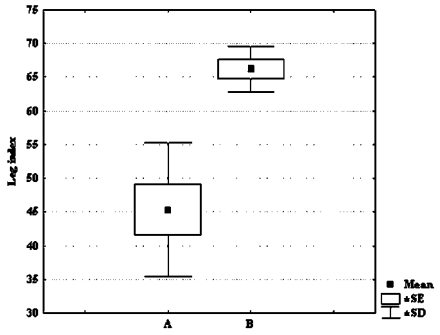

FIGURE 10. Box and whisker plots of the morphometric measurement showed significant differences between *E. s. barani* **n. ssp.** and *E. s. princeps* according to one-way analyses of variance (ANOVA) (A: *E. s. barani* **n. ssp.**, B: *E. s. princeps*).

TABLE 3. The mean percentage of albumins obtained from *E. s. barani* **ssp. n.**, *E. s. pavimentatus* and *E. s. princeps* specimens collected from Denizli-Bozdağ, Mersin and Karapınar populations and the ratio of calculated albumin to globulin (A/G).

Subspecies	Albumin	A / G
Eumeces schneiderii barani **n. spp.**	36.820	0.583
Eumeces schneiderii pavimentatus	22.100	0.284
Eumeces schneiderii princeps	30.480	0.439

The gel pictures of blood-serum proteins of these three subspecies are given in Figure 1, and the gel pictures of electrophoretic separation of blood-serum proteins of a representative sample from each population, together with densitometric curves, are given in Figures 2–3 and 4 for *E. s. barani* **n. ssp.**, *E. s. pavimentatus* and *E. s. princeps*, respectively. Thirteen fractions or fraction groups were present in the blood serum proteins of *E. s. pavimentatus*: 1 in the albumin and 12 in the globin regions (Figure 3); there were one albumin and 11 globin region fractions or fraction groups in both *E. s. princeps* and *E. s. barani* **n. ssp.** (Figures 2, 4). The corresponding fractions of the globin regions of *E. s. barani* **n. spp.** and *E. s. princeps* populations varied remarkably. There were also quantitative variations in the corresponding fractions of the three populations. The mean

albumin and calculated albumin to globins (A/G) ratios were 22.10 and 0.284 in the *E. s. pavimentatus* population, 30.48 and 0.439 in the *E. s. princeps* population, and 36.82 and 0.583 in the *E. s. barani* **n. ssp.** population (Table 3).

FIGURE 11. *E. s. princeps.* General view of adult ♂ specimen (ZDEU 91/1999). Photo: S. Üçüncü.

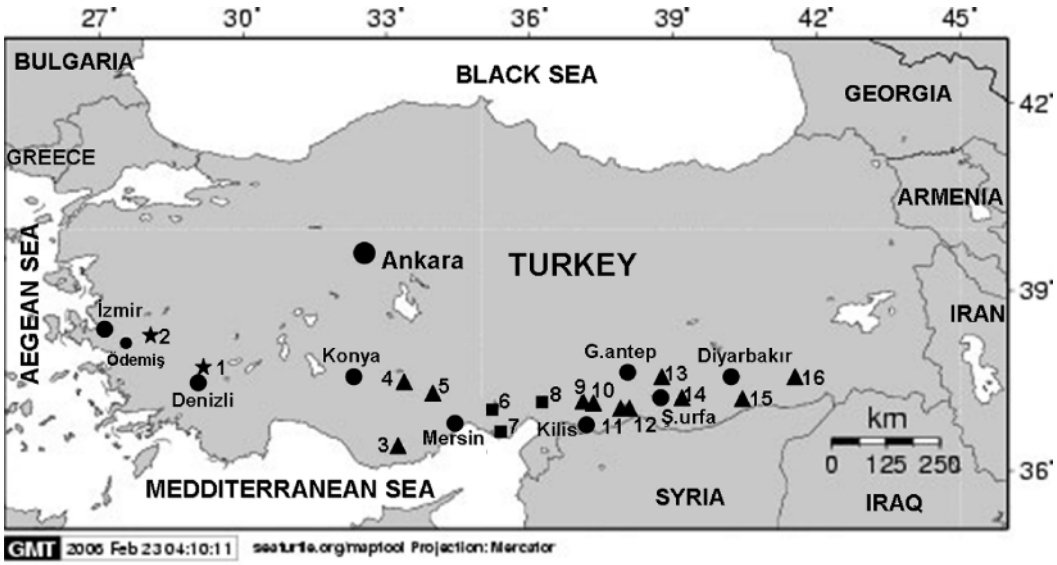

FIGURE 12. The main localities of *E. s. barani* **n. ssp.** (stars), *E. s. pavimentatus* (squares) and *E. s. princeps* (triangles) in Turkey. [Data source: Baran (1977). 1. Bozdağ-Ödemiş-İzmir, 2. Pamukkale-Denizli, 3. Mut-Mersin, 4. Karapınar-Konya, 5. Ereğli-Konya, 6. Adana, 7. Karataş-Adana, 8. Haruniye-Adana, 9. Ürünlü Village-Kilis-Gaziantep, 10. Söğütlü Village-Kilis-Gaziantep, 11. Adacık Village-Birecik-Şanlıurfa, 12. Akarçay Village-Birecik-Şanlıurfa, 13. Tekerli Village-Şanlıurfa, 14. Kapaklı Village-Şanlıurfa, 15. Mardin, 16. Siirt]

Many researchers have underlined the taxonomic importance of the density, speed and fraction numbers obtained from electrophoretic separation of blood-serum proteins of amphibians and reptiles (Dessauer & Fox 1956; Chen 1967; Ferguson 1980; Arıkan *et al.* 1998, 1999). The qualitative differences of fractions could be caused by genetic variations, and the quantitative differences could reflect age, gender, environmental and physiological factors (Ferguson 1980); therefore, qualitative differences are important for taxonomic studies.

The serologic analyses of electropherograms revealed both qualitative and quantitative differences between the samples from Denizli-Bozdağ and specimens of *E. s. pavimentatus* and *E. s. princeps*, which were only morphologically analysed (pholidosis, morphometric measurement and ratios, colour and colour-pattern) defined accordingly. Both the morphological and serologic distinction of the Denizli-Bozdağ specimens population justifies erecting a new subspecies (*E. s. barani* **n. ssp.**).

Ecology and Distribution: Hierapolis (Pamukkale) is located in the Inner Aegean region about 20 km from the province of Denizli. Pamukkale is located between 29º03´ and 29º27´ longitude and 37º49´ and 38º09´latitude. It has a sloping morphology from north to east. The high hills and slopes are mostly formed by earlier Mesozoic units. Brown forest soil and brown Mediterranean soil, which are the major soil groups in the study area, consist of clay stone including a rich amount of $CaCO_3$, schist and gneisses. The above-mentioned soil groups reflecta typical Mediterranean climate (Çiçek & Çelik 2004).

The study area has a semi-arid upper cold type of Mediterranean climate (Akman 1982). The closest meteorological station is in Denizli. The total amount of annual rainfall here is 556.3 mm. The wettest months are January, February, March, November and December. The annual mean temperature is 15.7ºC, with the hottest temperatures usually recorded in June, July, August and September when rainfall is lowest.

Hierapolis (Pamukkale) is between the Mediterranean region and the Irano-Turanian region belonging to the Old Mediterranean (Tethys) subkingdom of the Holoarctic flora region (Zohary 1973). The forest vegetation in some parts of the area is well developed, while in others, the vegetation had been destroyed. In some areas forest has degraded, and in some areas steppe vegetation replaced it. Maquis (*Quercus coccifera, Q. cerris*), forest (*Pinus brutia, P. nigra pallasiana, Cedrus libani*), Mediterranean mountain steep (*Astragalus angustiflorus* subsp. *anatolicus, A. depressus, Genista anatolica, G. lydia* var. *lydia*) and sulalpine vegetation (*Sideritis libanotica* subsp. *linearis*, *Teucrium chamaedrys* subsp. *chamaedrys*, *Euphorbia. anacampseros var. anacampseros, E. valerianifolia, Minuartia anatolica* var. *polymorpha, Campanula erinus*) are common here (Çiçek & Çelik 2004).

The specimens were caught under stones around the ancient city of Hierapolis (Pamukkale–Denizli) at an altitude of about 100 m. They were more active during morning hours (09.00–11.00) and in the afternoon (16.00–18.00). The air temperatures were between 28ºC–32ºC during sample collection. The vegetation covers of the habitat were grass and bushy plants (i.e., ephorbium, harmal plant). Other reptilian species here included *Testudo graeca* Linnaeus, *Laudakia stellio* (Linnaeus), *Hemidactylus turcicus* (Linnaeus), *Ophisops elegans* Menetries, *Lacerta trilineata* Bedriaga, *Ablepharus kitaibelii* (Bibron & Bory), *Mabuya aurata* (Linnaeus), *Typhlops vermicularis* Merrem, *Eryx jaculus* (Linnaeus), *Dolicophis jugularis* (Linnaeus) and *Eirenis modestus* (Martin).

Bozdağ, lies in an east-west direction and is located within the borders of Manisa and İzmir. This area has the combined characteristics of the 2 Mediterranean climate types: subarid-mild and subhumid-cool (Oflas & Bekat 1988). The mountain peak is 2159 m, and macchie (*Quercus coccifera*), forest (*Pinus brutia, P. nigra pallasiana, Castanea sativa*), Mediterranean mountain steep (*Astragalus tmoleus var. tmoleus, Genista lydia* var. *lydia*) and subalpine vegetation (*Sideritis taurica, Euphorbia anacampseros* var. *tmolea*, *Minuartia juressi juressi*, *Campanula teucroides*) are common here (Bekat & Oflas 1990).

The specimens were caught on different dates in Bozdağ (Ödemiş-İzmir) in the morning hours (09.00–11.00) and afternoons (16.00–17.00). The air temperatures were between 28–32ºC, the altitude between 800 and 1000 m. The habitats of the captured specimens were mainly covered by oak (*Quercus coccifera*) trees. Other reptiles and amphibians in this biotope were *Triturus karelinii* (Strauch), *Rana ridibunda* Pallas, *Rana macrocnemis* Boulenger, *Hyla arborea* (Linnaeus), *Bufo bufo* (Linnaeus), *Bufo viridis* Laurenti, *Testudo graeca* Linnaeus, *Laudakia stellio* (Linnaeus), *Hemidactylus turcicus* (Linnaeus), *Pseudopus apodus* (Pallas), *Lacerta trilineata* Bedriaga, *Lacerta danfordi* (Günther), *Ophisops elegans* Menetries, *Ablepharus kitaibelii* (Bibron & Bory), *Mabuya aurata* (Linnaeus), *Blanus strauchi* (Bedriaga), *Typhlops vermicularis* Merrem, *Eryx jaculus* (Linnaeus), *Platyceps collaris* (Miller), *Platyceps najadum* (Eichwald) and *Eirenis modestus* (Martin).

To date, this new subspecies has only been found in two localities: Hierapolis Pamukkale (Denizli) as the type locality and Bozdağ (Ödemiş, İzmir) (Figure 12), although it may well be present in other western Anatolian localities.

Derivatio nominis: The new subspecies is named in honour of Prof. Dr. İbrahim Baran, who has been working on the herpetofauna of Turkey since 1962.

Acknowledgements

We are most grateful to Ö. Özender, A. Avcı, F. Kiremit, H. A. Uçar and L. Seyhan for the loans of specimens necessary to our research. We would like to thank S. Üçüncü for the photographs. We are also grateful to M. Stackhowitsch for English corrections on an earlier manuscript version.

References

Akman, Y. (1982) Climats et bioclimats Mediterranéens en Turquie. *Ecologia Mediterranea*, 8 (1/2), 73–87.

Arıkan, H., Atatür, M.K. & Mermer, A. (1998) An investigation on the blood serum proteins of *Chalcides ocellatus* (Sauria: Scincidae) populations from Southern Anatolia. *Turkish Journal of Zoology*, 22, 175–177.

Arıkan, H., Atatür, M.K., Çevik, İ.E. & Kumlutaş, Y. (1999) A serological investigation of *Lacerta viridis* (Laurenti, 1768) (Sauria: Lacertidae) populations in Turkey. *Turkish Journal of Zoology*, 23, 227–230.

Atatür, M.K. & Göçmen, B. (2001) *Amphibians and Reptiles of Northern Cyprus*. Ege Üniversitesi Fen Fakültesi Kitaplar Serisi, No. 170, Ege Üniversitesi Basımevi, Bornova, İzmir, Turkey, 63 pp.

Baran, İ. (1977) Türkiye'de Scincidae familyası türlerinin taksonomisi. *Doğa*, 1, 217–223.

Baran, İ. & Atatür, M.K. (1998) *Turkish Herpetofauna (Amphibians & Reptiles)*. Republic of Turkish Ministry of Environment, Ankara, Turkey, 214 pp.

Başoğlu, M. & Baran, İ. (1980) *Türkiye Sürüngenleri, Kısım I, Kaplumbağa ve Kertenkeleler.* Ege Üniversitesi Fen Fakültesi Kitaplar Serisi, No: 76, Bornova, İzmir, Turkey, 272 pp.

Bekat, L. & Oflas, S. (1990) *Bozdağ (Ödemiş) Vejetasyonu*. X. Ulusal Biyoloji Kongresi, Erzurum, Turkey, 418 pp.

Chen, P.S. (1967) Seperation of serum proteins in different amphibian species by polyacrylamide gel electrophoresis. *Experienta*, 23, 483–485.

Çiçek, M. & Çelik, A. (2004) Flora of Çökelez Mountain (Denizli-Turkey) and its environs. *Bulletin of Pure and Applied Sciences*, 23 (2), 127–145.

Darevsky, I.S. (1981) *Eumeces schneideri* (Daudin 1802), Tüpfelskink. *In:* Böhme, W. (Ed.), *Handbuch der Reptilien und Amphibian Europas*. Aula Verlag, Wiesbaden, pp. 355–365.

Davis B.J. (1964) Disc electrophoresis-II. Method and application to human serum proteins. *Annals of New York Academy Sciences*, 121, 404–427.

Dessauer, H.C. & Fox, W. (1956) Characteristics electrophoretic pattern of orders of amphibia and reptilia. *Science*, 124, 225–226.

Disi, A.M. & Böhme, W. (1996) Zoogeography of the amphibians and reptiles of Syria, with additional new. records. *Herpetozoa*, 9 (1/2), 63–70.

Eiselt, J. (1940) Der rassenkreis *Eumeces schneideri* Daudin. *Zoologischer Anzeiger*, 131, 209–228.

Ferguson, A. (1980) Biochemical systematics and evolution. *Blackie and Son*, 1–14.

Göçmen, B., Şenol, A. & Mermer, A. (2002) A new record of Schneider's Skink, *Eumeces schneideri* Daudin, 1802 (Sauria: Scincidae) from Cyprus. *Zoology in the Middle East*, 25, 19–22.

Kumlutaş, Y., Özdemir, A., Ilgaz, Ç. & Tosunoğlu, M. (2004a) The amphibian and reptile species of Bozdağ (Ödemiş). *Turkish Journal of Zoology*, 28, 317–319.

Kumlutaş, Y., Kaska, Y., Ilgaz, Ç. & Böhme, W. (2004b) First record of *Eumeces schneiderii* (Daudin, 1802) (Sauria: Scincidae) from western Anatolia. *Zoology in the Middle East*, 32, 111–113.

Leviton, A.E., Anderson, S.C., Adler, K. & Minton, S.A. (1992) *Handbook to Middle East Amphibians and Reptiles.* SSAR, Oxford, Ohio, 252 pp.

MacLean, G.S., Lee, S.K. & Wilson, K.J. (1973) A simple method of obtaining blood from lizards. *Copeia*, 2, 338–339.

Mertens, R. (1946) Dritte mitteilung über die rassen der Glattechse, *Eumeces schneideri*. *Senckenbergiana*, 27, 53–62.

Oflas, S. & Bekat, L. (1988) *Bozdağ (Ödemiş) Florası*. IX Ulusal Biyoloji Kongresi, Sivas, Turkey, 476 pp.

Özeti, N. & Atatür, M.K. (1979) A preliminary survey of the serum proteins of a population of *Mertensiella luschani finikensis* Başoğlu and Atatür from Finike in Southwestern Anatolia. *İstanbul Üniversitesi Fen Fakültesi Mecmuası*, 44B, 23–29.

Sindaco R., Venchi A., Carpaneto G.M. & Bologna M.A. (2000) The reptiles of Anatolia: a checklist and zoogeographical analysis. *Biogeographia*, 21, 441–554.

Werner, Y.L. (1971) Lizards and snakes from Transjordan, recently acquired by the British Museum (Natural History). *Bulletin of the British Museum (Natural History), Zoology*, 21 (6), 215–256.

Zohary, M. (1973) *Geobotanical Foundation of the Middleeast*. Gustav Fisher Verlag, Stutgart, 739 pp.