

## A Morphological and Taxonomic Study on *Lacerta parva* Boulenger, 1887 (Sauria: Lacertidae) from West Taurus, Turkey

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**Abstract.** - The morphometric measurements of taxonomically important characters, coloration, and pholidosis features of 74 *Lacerta parva* specimens collected from West Taurus, Turkey were investigated. Statistical analyses were done and these results were compared with those from relevant literature. Some of the characters were found to be different on the specimens from different localities. New localities from southwest Turkey were also discovered during this study.

**Key words.** - *Lacerta parva*, West Taurus, Turkey.

### Introduction

*Lacerta parva* was first identified as a new species based on a female specimen collected from Kayseri, Turkey (Boulenger, 1887). In later studies, the distribution of this species was extended to include all of Anatolia and the Caucasian region (Werner, 1902; Nesterow, 1912; Nikolsky, 1915; Bird, 1936; Bodenheimer, 1944; Mertens, 1952; Başoğlu and Baran, 1977; Baran et al., 1992; Baran and Atatür, 1998). The distribution of this species was extended to Europe by giving the locality from Tekirdağ, Turkey (Venchi-Bologna, 1996).

Peters (1962) compared the variations and similarities between Caucasian and Anatolian populations by examining the 131 and 74 specimens, respectively. Atagün (1984) also did a comparative study on the 208 specimens collected from six different sub-populations (Fethiye, Denizli, Konya, Ankara, Kayseri, Erzurum) from Anatolia. Recently, Mülayim et al. (2001) studied 46 specimens collected from Gölkaşı Village, Beyşehir-Konya and found much more similarities between Konya and Fethiye populations as previously mentioned by Atagün (1984).

This work investigates the distribution of this species in the west of Turkey and also provides morphometrical comparison of these specimens with previously collected specimens and relevant literature. We try to resolve the taxonomical situation of the sub-populations of *Lacerta parva* in Anatolia.

### Material and Methods

Most of the specimens were obtained from Taurus, southwest of Anatolia. A sum of 22 male, 38 female and 14 juvenile specimens were collected. These specimens, collected during the years of 1995-1997, were kept at ZDEU (Zoology Department of Ege University). The locations where the samples were collected are given in Figure 1. The list of material is given below as the Departmental Identification Code, sex, number of specimens, locality, date, initials, and surname of the collectors respectively.

#### List of Material

- 1) 140 / 1995, 1 male, Beyşehir, 19.09.1995, Leg. M. Öz.
- 2) 238 / 1996 1-9 males, 10-22 females, Bozhöyük Ovacık-Elmalı, 18.06.1996, Leg. Y. Kumlutaş, R. Tunç, S. H. Durmuş.
- 3) 239 / 1996, 1-5, 6-13, 14-27 Juv., Çayryakas - Gazipaşa, 23.08.1996, Leg. Y. Kumlutaş, M. Öz, R. Tunç.
- 4) 163 / 1997, 1-7, 8-24, Beyobası, 25.06.1997, Leg. Y. Kumlutaş, M. Öz, R. Tunç.

Coloration of living specimens was determined by eye, slides were taken, and then the specimens fixed with the traditional processes and kept in 70% alcohol. The morphometric measurements were done with a digital calliper with an accuracy of 0.02 mm. The body Measurements taken and their descriptions and indexes of the characters are as follows. **Pileus Width (PW):**

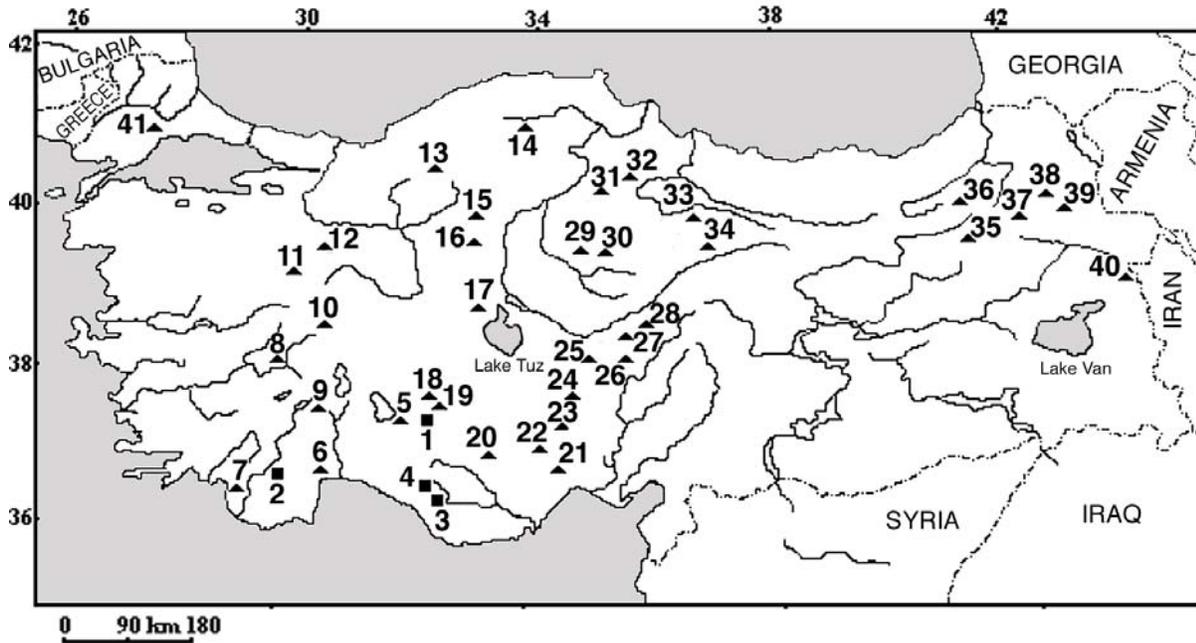


Figure 1. The distribution of *Lacerta parva* in Turkey.

■: Collection localities in this study. Refer to the materials list for details.

▲: Collection localities from literature (Peters, 1962; Atagün, 1984; Başoğlu-Baran, 1977; Baran et al., 1992; Venchi-Bologna, 1996; and Mülayim et al., 2001).

- |                             |                           |                                |
|-----------------------------|---------------------------|--------------------------------|
| 1- Beyşehir-Konya (30 km)   | 15- Çubuk-Ankara          | 29- Yozgat                     |
| 2- Bozhöyük-Ovacık          | 16- Ankara                | 30- Sorgun-Yozgat              |
| 3- Çayıryakası-Gazipaşa     | 17- Kulu-Konya            | 31- Between Mecitözü and Çorum |
| 4- Beyobası                 | 18- İnevi-Konya           | 32- Suluova-Amasya             |
| 5- Gökkaşıköyü-Beyşehir     | 19- Konya                 | 33- Tekneli Village-Tokat      |
| 6- Antalya                  | 20- Karaman               | 34- Akdağ-Sivas                |
| 7- Fethiye                  | 21- Dümbelek Mount-Mersin | 35- Erzurum                    |
| 8- Akdağ-Çivril             | 22- Akgöl                 | 36- Akdağ (Northeast Anatolia) |
| 9- Isparta                  | 23- Ulukışla              | 37- Horosan-Erzurum            |
| 10- Afyon                   | 24- Niğde                 | 38- Sarıkamış                  |
| 11- Kütahya                 | 25- Niğde-Kayseri arası   | 39- Kağızman                   |
| 12- Eskişehir-Alayurt arası | 26- Erciyes Dağı          | 40- Between Culfa and Lake Van |
| 13- Gerece                  | 27- Kayseri               | 41- Tekirdağ                   |
| 14- Kastamonu               | 28- Bünyan-Kayseri        |                                |

The widest distance between the parietal plates. **Pileus Length (PL)**: The distance from the posterior point of parietal plates to the tip of rostrum. **Head and Body Length (HBL)**: The distance between the front tip of rostrum and front edge of anus. **Body Length (BL)**: The total length of body from tip of rostrum to the end of tail. **Tail Length (TL)**: The length of tail from anus to the tip of tail. **Forelimb Length (FL)**: The length of forelimb from the body connection to the tip of longest finger. **Hind-limb Length (HL)**: The length of hind limb from the body connection to the tip of fourth fin-

ger. **Pileus Index (PI)**= $PW/PL \times 100$ , **Tail Index (TI)**= $TL/BL \times 100$  and **Forelimb Index (FI)**= $FL/BL \times 100$  were also calculated. The ANOVA statistical test were used in comparison of the measurements and the ratios (Minitab, 1991). The values of "Coefficient of difference (CD)" were used in comparison of some characteristics among the population (Mayr, 1969).

## Results

### Pholidosis and Morphometric Measurements

Table 1: The results of descriptive statistics on some of the characteristics of *L. parva* specimens (These measurements are given as millimeter).

Parameter		N	Mean (Min –Max)	SD	SE
<b>Pileus Width (PW)</b>		60	5.28 (4.38-6.90)	0.48	0.06
<b>Pileus Length (PL)</b>		60	10.31 (8.72-11.76)	0.74	0.09
<b>Head and Body Length (HBL)</b>		60	49.84 (42.12-58.81)	3.41	0.44
<b>Tail Length (TL)</b>		32	74.34 (53-96)	10.50	1.87
<b>Pileus Index (PI)</b>		60	51.17 (44.78-60)	2.17	0.28
<b>Tail Index (TI)</b>		29	60.32 (51.36-65.14)	3.25	0.60
<b>Forelimb Index (FI)</b>		59	29.70 (24.81-34.58)	2.34	0.30
<b>Supra-cilliar Granule</b>		74	6.24 (1-10)	2.03	0.24
<b>Supra-cilliar Plate</b>		74	5.36 (4-9)	0.76	0.08
<b>Median Gularia</b>		74	17.61 (15-19)	1.16	0.13
<b>No. of Lateral Lines in Ventrals</b>	male	22	28.27 (27-30)	0.94	0.20
	female	38	31.90 (28-34)	1.13	0.18
	male+female+Juv	74	30.47 (27-34)	2.08	0.24
<b>Dorsalia</b>		74	37.13 (33-43)	1.94	0.22
<b>Femoral Opening</b>	male	22	17.23 (14-26)	2.47	0.53
	female	38	15.95 (14-18)	1.31	0.21
	male+female+Juv	74	16.16 (14-20)	1.36	0.16
<b>No. of 4. Sub-digital Lamellae</b>		74	20.52 (17-23)	1.11	0.13

Rostrale were connected to the nostril and the numbers of postnasal plate were occasionally two (96%), only one (3%) in two specimens and one specimen had one on the left and two on the right. The number of occipital plates were also commonly one (97%) but divided into two in two (3%) specimens. The numbers of superciliary plates was five in 44 specimens (59.4%), six in 23 specimens (31.1%), four in four specimens (5.4%), seven in two specimens (2.7%) and nine in one specimen (1.4%). The numbers of supralabial plates, in front of the subocular plate, was usually four (74.3%); three in two specimens (2.7%); four (one small and three big) in three specimens (4.05%); five in two specimens as two small and three big ones; four big and one small in six (8.1%) other specimens; six (four big and two small) in two specimens, seven (four big and three small) in

two specimens. The distal end of the collaria was jagged in shape and the numbers varied between five and eight with a mean of 6.7. The results from statistical analyses of the above mentioned measurements are presented in Table 1; comparative results with other literature are presented in Table 2. There were no statistical differences (F-test,  $P > 0.05$ ) between the specimens collected from different locations in this study.

Although the T-test does not show any statistical differences ( $P > 0.05$ ) between males and females, males have relatively higher values than females. For example, the mean length of the pileus was 11.15 (Min.= 9.64 - Max.=16.60) in males and 9.99 (8.72 - 11.50) in females. The coefficient of differences (CD) was 0.59. The width of the pileus was 5.53 (4.74 - 6.23) in males and 5.14 (4.38 - 6.90) in females and the CD was 0.44.

Table 2: The comparison of some of characters between the populations of *L. parva* from Fethiye, Denizli, Konya, Ankara, Kayseri, Erzurum and Beyşehir with samples collected from Taurus.

Parameter	Fethiye specimens (Atagün, 1984)		Denizli specimens (Atagün, 1984)		Konya specimens (Atagün, 1984)		Ankara specimens (Atagün, 1984)		Kayseri specimens (Atagün, 1984)		Erzurum specimens (Atagün, 1984)		Beyşehir specimens (Mülayim et al., 2001)		Taurus specimens (In this study.)	
	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean
Dorsalia	12	36,58	28	37,96	24	39,04	55	37,85	74	38,45	15	35,86	46	36,70	74	37,13
Femoral Opening	11	15,54	28	15,79	24	16,79	55	15,80	74	16,64	15	16,13	46	15,63	74	16,16
4. Subdigital Lamellae	12	20,75	28	21,93	24	21,21	54	21,06	74	21,38	15	19,73	46	20,52	74	20,52
Supraciliar Granule							55	7,25			15	8,93	46	6,76	74	6,24
Median Gularia	12	17,50			24	19,13							46	16,67	74	17,61
Ventrals No. of lateral plate													46	29,98	74	30,47
HBL													46	48,04	60	49,84

The tail was longer in males (76.59) than females (70.62) and the CD of this measurements was 0.28.

**Color and Pattern.** - Dorsal coloration is more ground, grayish-brown in the Elmalı population and lighter brown in the other three populations studied. A slim dark line was present from posterior of occipital scute towards the posterior. This line does not stretch to the base of forelimbs in juveniles. There were few dark spots on the vertebrals of some specimens (11%). Dark blotches extending dorsoventrally from vertebral line formed bands, particularly on Beyobası specimens. The supra-temporal line was usually continuous until the middle part of body; broken lines continued posteriorly to the base of the tail or sometimes until the tip of tail in some specimens. Small spots are present, their central parts are greenish-blue and surrounding areas are dark starting at the base of the forelimb and usually continuing posteriorly. The subocular line is dirty white in color and continues to the hindlimbs. Dark spots were present under this line in some specimens.

Ventral scales are yellow in males, especially during the breeding season (which change to white later in the season), and lighter in females. However, the color under the hind limb was sometimes yellowish; the other parts were pinkish-white for females. Dark stains on ventralia were absent on the samples, except for the last ventral plate.

**Ecological Observations.** - The three specimen collection localities were new localities for *L. parva*, except for the Beyşehir population. These habitats were nearly 2000 m in altitude (i.e., Bozhöyük-Ovacık 1800 m., Çayıryakası-Gazipaşa 1850 m.,

Beyobası 1900 m.). The 22 specimens, from Bozhöyük-Ovacık population, were caught between bushes and small vegetation. The weather was a bit cloudy and the temperature was approximately 24°C. *Laudakia stellio* and *Ablepharus kitaibelii* species were also observed in the same habitat. The specimens from Çayıryakası and Beyobası were caught while active or under stones at the temperature around 29°C. The collection habitats of the specimens were covered mainly small bushy vegetation not big trees. *Lacerta danfordi*, *Mabuya vittata*, *Cyrtopodion kotschy* and *Natrix natrix* species were also observed in the same area.

## Evaluation and Discussion

There were no statistical differences between the different populations in this study, but tail length, pileus length, fore-limb and hind-limb lengths, and the number of femoral openings were higher in males than females.

The head and body length and the number of lateral plate lines were higher in females than males. Atagün (1984) reported that only one plate is present behind the postnasal plate in 26% of the specimens from the Erzurum population, but not present in the remaining five populations in his work. We did not record any such character from our specimens. Atagün (1984) also reported that the division of the occipital plate was also different in the Erzurum population by having a higher number of divisions. This population was also studied by Peters (1962), but he did not mention such differences. Only a small percent (3%) of our specimens showed a division in the occipital plate.

Peters (1962), in his study comparing *L. parva* populations between Caucasia and Anatolia, found that the mean number of dorsalia were different (males = 35.97; females = 34.76) in Caucasian population than Anatolian population (males= 38.52; females= 37.53). Our values from West Taurus (males= 37.68; females= 36.42) were very similar to Peters (1962) values from Anatolia. This value, along with other parameters, are presented in Table 2. As it can be seen from this table, the results of this work are very close to the results of the Beyşehir population reported by Mülayim et al. (2001).

Peters (1962) also reported the mean number of lamellae under the fourth finger to be very similar between the Caucasian (males= 21.6; females= 21.2) and Anatolian (males= 22.6; females= 22.1) specimens. Our results for this character were slightly lower than Peters' results but very close to the results of Mülayim et al. (2001) (Table 2). The number of femoral openings reported by Peters (1962) were slightly higher (males= 17.56; females= 16.46) for Caucasian than for Anatolian (males= 17; females= 15.91) specimens. The number of femoral openings in this study were found to be very close to the most eastern Anatolian population of Erzurum (Table 2). The HBL, the mean numbers of supraciliari plate, lateral plates in ventralia were very similar with the results of Mülayim et al. (2001), but the mean number of median gularia in this study was very close to the Fethiye population reported by Atagün (1984). There were no remarkable differences in color and pattern reported by others (Peters, 1962; Atagün, 1984; Baran et al., 1992; Mülayim et al., 2001) and our results.

As it can be seen from our present and other previous studies, phenotypic variation among the reptile populations from Turkey have been quantified extensively using morphological characters. Comparison of morphometric measurements may yield a new subspecies, but the different populations of *L. parva* from Turkey may vary even genetically. Unfortunately, genetic diversity at the intra-specific level is not available for any species in Turkey. Sequencing DNA, in particular mtDNA, may help to solve the taxonomic problems

present in the herpetofauna of Turkey, as it was done for other amphibian species (i.e. Garcia-Paris et al., 1998) and for sea turtles (i.e., Bowen et al., 1994; Kaska, 2000).

## Acknowledgments

This work is some part of the project [Project No: TBAG-1475 (196T021)] supported by TÜBİTAK (The Scientific and Technical Research Council of Turkey).

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