

## CONTRIBUTION TO THE DISTRIBUTION AND MORPHOLOGY OF *Pelias darevskii* (VEDMEDERJA, ORLOV ET TUNIYEV 1986) (REPTILIA: SQUAMATA: VIPERIDAE) IN NORTHEASTERN ANATOLIA

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Two specimens of the viper *P. darevskii* which is only known from two localities are recorded from Posof, Ardahan, northeastern Anatolia. The meristic and metric characters and the color-pattern features of the viper specimens of *P. darevskii* captured from a new locality are given in detail and compared with the specimens from other localities with regard to literature. The present record of *P. darevskii* extends from its known distribution (Zekeriya Village, 26 km SE of Ardanuç, Artvin) almost 85 km distance to the north-east direction in northeastern Anatolia.

**Keywords:** *Pelias darevskii*, viper, distribution, morphology, northeastern Anatolia, Turkey.

### INTRODUCTION

The genus *Vipera* Laurenti, 1768 divided three subgenera (*Pelias* Merrem, 1920 — *Montivipera* Nilson, Tuniyev, Andrén, Orlov, Joger and Hermann, 1999; *Vipera* sensu stricto) comprised of about 30 species inhabiting northern Africa, Europe and Asia (Leviton et al., 1992; Ananjeva et al., 2006). The subgenus *Pelias* Merrem, 1920 inhabiting Europe and northern Asia includes 16 species (Ananjeva et al., 2006). The fauna of Turkey contains 6 species [*Pelias anatolica* (Eiselt and Baran, 1970); *Pelias barani* (Böhme and Joger, 1983); *Pelias darevskii* (Vedmederja, Orlov and Tuniyev, 1986); *Pelias kaznakovi* (Nikolsky, 1909); *Pelias eriwanensis* (Reuss, 1933); *Pelias pontica* (Billing, Nilson et Sattler, 1990)] including subgenera *Pelias* (Baran and Atatür, 1998; Sindaco et al., 2000).

Darevsky's Viper, *Pelias darevskii*, was first described as *Vipera darevskii* from Mountain Legli, Arme-

nia (Vedmederja, Orlov and Tuniyev (1990). Darevsky's Viper, is extremely rare viper known only two localities in northwestern Armenia and northeastern Turkey (Vedmederja et al., 1986; Orlov and Tuniyev, 1990; Geniez and Teynié, 2005). The species is classified as critically endangered by IUCN (<http://www.iucnredlist.org/details/23000>).

The Mount Legli population, type locality of *P. darevskii*, was evaluated as *Vipera kaznakovi dinniki* Nikolsky, 1913 by Darevsky (1956). Vedmederja et al. (1986) reevaluated these specimens and described them as new species (*Vipera darevskii*). According to Vedmederja et al. (1986), new species is to be part of *kaznakovi* complex. Orlov and Tuniyev (1990) gave additional information on comparative morphological and ecological characters of species and discussed its phylogenetic relationship with *P. kaznakovi* and *P. dinniki*.

Geniez and Teynié (2005) subsequently discovered this poorly known species from one locality in northeastern Anatolia (Zekeriya Village, 26 km SE of Ardanuç, Artvin) and excluded its distribution range. They also detected some additional diagnostic characters of this viper in addition them mentioned in Orlov and Tuniyev (1990).

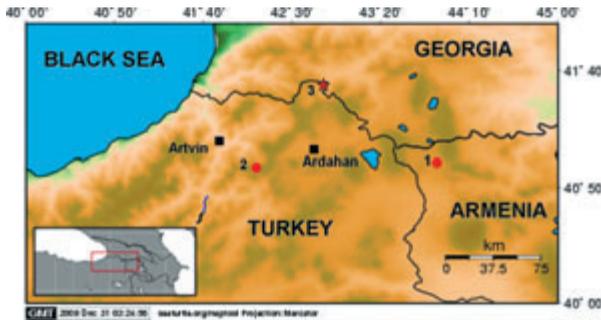
The main goal of this study is to present a detailed description of the new specimens of *P. darevskii* collected by us from new locality in the northeastern

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**Fig. 1.** Distribution of *Pelias darevskii*, showing the known distribution according to literature, with star for the new locality: 1, Mount Legli, Armenia, (Orlov and Tuniyev, 1990); 2, Zekeriya Village, 26 km SE of Ardanuç, Artvin, Turkey (Geniez and Teynié, 2005); 3, Türkgözü Plateau, Posof, Ardahan, Turkey.

Anatolia. Also the possible distribution range of species is evaluated.

## MATERIAL AND METHODS

A scientific excursion was conducted to the north-eastern Anatolia on the month of May, 2005. Two specimens belonging to *P. darevskii* were collected from the region. The locality specimens captured is given in Fig. 1. Specimens examined were fixed (95%) and preserved (70%) in ethanol after etherization according to the method described by Başoğlu and Baran (1977). The specimens were incorporated into the collection of ZDEU (Zoology Department, Ege University, Turkey) and kept in the Zoology Lab. of the Department of Biology at Buca Education Faculty.

**Material:** ZDEU 270/2005. 1♂, 2♀♀, 05/21/2005, Türkgözü Plateau, Posof, Ardahan, leg. Ş. Başkaya.

Color and pattern characteristics were recorded and color slides were taken while the animals were alive. Meristic pholidolial pattern (zigzag bands) characteristics were determined under a stereomicroscope. The following meristic pholidolial and pattern (zigzag bands) characteristics were taken: number of supralabials (SpL) and sublabials (SbL); number of apical (Ap); number of canthals (Ca); number of intercanthals (InC); number of circumoculars (Cic); number of intercanthals (InC); number of intersupraoculars (InS); number of ventrals (V); number of anals (A); number of subcaudals (SC); number of dorsals on body one head length posterior of the head (DPH); dorsals at mid-body (DMB); dorsals one head length anterior of the anal plate (DA) and the number of zigzag bands on the body (ZZB). Metric morphological measurements except SVL (snout-vent

length) and TL (tail length), were taken using digital calipers with an accuracy of 0.01 mm. SVL and TL were measured to the nearest millimeter using a ruler. Metric dimensions measured are: snout-vent length (SVL); tail length (TL); pileus length (PL); pileus width (PW); pileus height (PH); supraocular width (SW); rostral height (RH); rostral width (RW); frontal length (FL); frontal width (FW); parietal length (PaL); parietal width (PaW); horizontal orbit diameter (HOD); distance between nostrils (DBN); the distance between anterior edge of the frontal and the rostral (DAFR); and prefrontal length (PFL). The terminology used in describing the specimens conforms to Orlov and Tuniyev (1990), Nilson and Andrén (2001) and Dowling's (1951) system.

## RESULTS

The specimens were found on moist humid zone with short subalpine meadows (*Veratrum lobelianum* and *Rumex alpinus* are present) and numerous piles of stone, above the upper altitudinal limit of the forest at elevation of approximately 2050 m (Fig. 2). The specimens captured location was not far away from the stream with shrub of *Salix caprea*. The specimens were found during day excursion around 09:30; air temperature was 15°C. The syntopic reptile and amphibian species where specimens were collected at Türkgözü Plateau were *Anguis fragilis* Linnaeus 1758, *Natrix natrix* (Linnaeus 1758), and *Rana macrocnemis camerani* (Boulenger 1886).

The snout-vent and tail lengths of male specimen are 426.22 and 56.72 mm, respectively, latter equal to 11.7% of total length. Head covered by large non-fragmented frontal and parietal scales is slightly impressed dorsally and hardly separated from body. Lateral edges of snout are slightly pointed. Anterior edge is little rounded. Rostrum is narrow. Its width and height are 3.74 and 3.40 mm, respectively. There is only one apical plate is in contact with rostrum. Nostril is not contact in the lower part of the nasal. The latter is separated from the rostral by broad scale. Frontal is narrow and its length (4.28 mm) is equal to 1.22 of its width (3.40 mm). The distance between anterior edge of the frontal and the rostral is equal to 1.26 of the frontal edge. Prefrontal is rectangle, almost two times shorter than the frontal, and is separated from the rostral by 2 scale rows. Parietals (4.90 mm) are slightly longer than the frontal (4.28 mm). Large lower oculars are separated from frontal only by a single row of small scales. The frontal is separated from supraoculars by one row of scales on the



Fig. 2. Habitat of *Pelias darevskii* Türkgözü Plateau, Posof, Ardahan, northeastern Anatolia. Photo by Şağdan Başkaya.

left side and two rows of scales on the right side. The upper preocular is not in contact with nasal. Nasal does not touch rostral on each side of head. There are 6 rows of throat scales from posterior inframaxillary plate to first ventral plate rows. There are two canthals between supraocular and supranasal on each side. Except supraocular, circumocular rings contain 10 scales on both sides of the head, respectively. Dorsal scales have strongly expressed keels, except for two scale rows on both sides adjacent to the ventrals, which are smooth. There are 21 transversal scale rows on mid-body. One preventral followed by 132 ventrals and two anal plates.

The ground color of the dorsum is grayish with a dark-brownish black color zigzag band continuing up to tip of tail (Fig. 3). The outer edges of these blotches are darker than the inner ones. Number of dorsal blotches in pattern is 72 on body. Zigzag band is not in contact with pileus. The basic color of the pileus is dark with two longitudinal black blotches from posterior edge of plates

to lateral of head. Except these blotches, there is clear-cut temporal stripe on each side of the pileus. Lateral ground color is gray with one series of oval vertical dark small blotches on each flank. The basic color of the neck is yellowish white with black dots. The posterior edges of 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup>, and 5<sup>th</sup> supralabials are dark as in sublabials. The ground color of the gular region is dirty white with blackish spots. The belly is dark with numerous black dots and whitish scale edges. These dots are dense at the anterior part of body.

The snout-vent and tail lengths of female specimen are 386.72 and 43.76 mm, respectively, latter equal to 10.2% of total length. Head covered by large non-fragmented frontal and parietal scales is slightly impressed dorsally and hardly separated from body. Lateral edges of snout do not have any points. Anterior edge is little rounded. Rostrum is narrow. Its width and height are 3.74 and 3.40 mm, respectively. There is only one apical plate is in contact with rostrum. Nostril is not contact in



Fig. 3. General view of male *Pelias darevskii* specimen collected from Posof. Photo by Şağdan Başkaya.

the lower part of the nasal. The latter is separated from the rostral by broad scale. Frontal is narrow and its length (4.72 mm) is equal to 1.74 of its width

**TABLE 1.** The Meristic Pholidolial (L/R), Pattern (Blotches), and Metric Dimensions (mm) Obtained from *Pelias darevskii* Specimens. For abbreviations see *Material and Methods*

Specimens	Characters			
	PL	PW	PH	SW
270/2005-1♂	13.74	8.46	7.10	1.78
270/2005-2♀	13.02	8.40	7.54	1.84
	PaW	HOD	DBN	DAFR
270/2005-1♂	2.34	3.18	4.86	5.12
270/2005-2♀	2.82	3.00	4.08	4.40
	PFL	SpL	SbL	InC
270/2005-1♂	2.28	9/8	10/10	6
270/2005-2♀	2.20	7/7	8/10	5
	InS	SC	DPH	DA
270/2005-1♂	9	31	23	19
270/2005-2♀	5	26	23	19

(2.72 mm). The distance between anterior edge of the frontal and the rostral is equal to 0.93 of the frontal edge. Prefrontal is rectangle, almost two times shorter than the frontal, and is separated from the rostral by 2 scale rows. Parietals (5.16 mm) are slightly longer than the frontal (4.72 mm). Large lower oculars are separated from frontal only by a single row of small scales. The frontal is separated from supraoculars by two rows of scales on the left side and one row of scales on the right side. The upper preocular is not contact with nasal. Nasal is in contact with rostral only on right side of head. There are 4 rows of throat scales from posterior inframaxillary plate to first ventral plate rows. There are two canthal between supraocular and supranasal on each side. Except supraocular, circumocular rings contain 8 and 10 scales on left and right sides of the head, respectively. Dorsal scales have strongly expressed keels, except for two scale rows on both sides adjacent to the ventrals, which are smooth. There are 21 transversal scale rows on mid-body. There are 136 ventrals and one anal plate. Other meristic characters and metric measurements of the specimens are given in Table 1.



Fig. 4. General view of female *Pelias darevskii* specimen collected from Posof. Photo by Şağdan Başkaya.

The ground color of the dorsum is yellowish brown with a dark-brownish black color zigzag band continuing up to tip of tail (Fig. 4). The outer edges of these blotches are usually darker than the inner ones. Number of dorsal blotches in pattern is 65 on body. Zigzag band is not in contact with pileus. On the dark colored pileus, in addition to less distinct dark spots two distinct longitudinal black blotches from posterior end of parietals to lateral sides of the head are present. There is clear-cut temporal stripe on each side of the pileus. There is one series of oval vertical dark small blotches on each flank. The belly is dirty-white with numerous black spots and dots which are more dense at posterior part of body than the anterior. These dots which are rare at near the neck and are invisible at the side of lower part of head. The upper sides of supralabials are pale brown while lower sides are white without maculation. Posterior ends of sublabials are pale brown with dots and while anterior ends of sublabials are white.

## DISCUSSION

The complex of *kaznakovi* – *ursinii* are differentiated from other viper taxa by general habitus and color pattern, rounded snout and presence of large non-fragmented frontal and parietal scales on the pileus (Orlov and Tuniyev, 1990; Nilson and Andrén, 2001; Geniez and Teynié, 2005). The Posof vipers are the small size (TBL: 482.9 and 430.5 mm for male and female, respectively) and have large non-fragmented frontal and parietal scales on the pileus as in *V. darevskii* and *V. eriwanensis* that spread at northeastern part of Turkey (Baran and Atatür, 1998; Geniez and Teynié, 2005; Ananjeva et al., 2006). Previous studies show that *P. darevskii* separate from *V. eriwanensis* in having relatively high head with a much less pointed upper anterior snout edge, yellowish general coloration, clear contrasted pattern, a rather angular canthus rostralis, one series large oval vertical dark blotches on each flank, two contrasted light dorsolateral stripes, the clear-cut anterior edge of the vertebral zigzag, yellow colored venom and different

pholidosis characters (Orlov and Tuniyev, 1990; Geniez and Teynié, 2005).

The pholidotic characters of Posof vipers agree almost completely in pholidosis (in having 21 dorsal scales at midbody, 132 – 136 (mean: 134) ventrals, nostrils cut through in the lower part of nasal) to *P. darevskii*, except some characters with all the descriptions given by Orlov and Tuniyev (1990) and Geniez and Teynié (2005) (Table 2). Orlov and Tuniyev stated that the upper preocular is in contact with the nasal in majority of Mount Legli vipers. However there is no contact between upper preocular and the nasal in Posof vipers as in stated by Geniez and Teynié (2005). In contrast to previous studies (Orlov and Tuniyev, 1990; Geniez and Teynié, 2005), the Posof vipers have only one apical scale touching the rostral. According to Orlov and Tuniyev (1990) and Geniez and Teynié (2005), the frontal is usually larger than the parietals for *P. darevskii*. However, the parietal is larger than frontal in Posof vipers. The total body length of male specimen collected from Posof is the longest size (482.9 mm) amongst the given values up to date by different authors (Orlov and Tuniyev, 1990; Geniez and Teynié, 2005). Also the general color and pattern characteristics of Posof vipers (in having one series of oval vertical dark blotches on each flank, clear-cut anterior edges, dark belly (dirty white in female) with numerous black dots and whitish scale edges) are

similar to *P. darevskii* mentioned in previous studies (Orlov and Tuniyev, 1990 and Geniez and Teynié, 2005). In addition, the venom of two vipers was yellowish as in stated by Geniez and Teynié (2005).

*P. darevskii* is classified as critically endangered species and it has been known only two localities up to know. The discovery of Posof population is extended the distribution of *P. darevskii* in northeastern Anatolia. We think that the distribution range of *P. darevskii* can extend to inner part of northeastern Anatolia through mountains chain.

Orlov and Tuniyev noted that appearance of *V. darevskii* can be explained by the hybridization of *P. ursinii eriwanensis* and *P. kaznakovi*. They also stated that *P. darevskii* is an intermediate between the *ursinii* and *kaznakovi* complexes. Nilson and André (2001) noted that external morphology of *P. darevskii* evolved as typical for many alpine taxa within the *ursinii* complex, but shares many similarities with the *kaznakovi* complexes. Molecular studies on viper species showed that *P. darevskii* is a well differentiated species from *ursinii* and *kaznakovi* complexes (Joger et al., 2005; Kalyabina and Hauf, 2004). Geniez and Teynié noted that the phylogenetic affinity of *P. darevskii* is still unclear. They also stated that morphological characters of *V. darevskii* do not link it with the *kaznakovi* – *dinniki* subgroup.

**TABLE 2.** Comparison of Meristic Pholidolial and Metric Dimensions of Posof Vipers with Those Given in Previous and This Studies

Character	Sex	This study [n = 2, (1 male and 1 female)]		Orlov and Tuniyev, 1990 [n = 9, (3 males and 5 females)]		Geniez and Teynié, 2005 [n = 8 (3 males, 4 females, and 1 newborn)]	
		mean ± S.E.	range	mean ± S.E.	range	mean ± S.E.	range
TBL	Overall	456.7 ± 26.2	430.5 – 482.9	—	—	360.6 ± 39.3	131 – 440
	♂♂	482.9	—	249.3 ± 5.5	236 – 258	—	—
	♀♀	430.5	—	331.8 ± 28.2	233 – 421	—	—
SVL	Overall	406.5 ± 19.8	386.7 – 426.2	—	—	327.1 ± 32.1	109 – 390
	♂♂	426.2	—	—	—	—	—
	♀♀	386.7	—	—	—	—	—
TL	Overall	50.3 ± 6.5	43.8 – 56.7	—	—	42.4 ± 4.6	22 – 60
	♂♂	56.7	—	—	—	—	—
	♀♀	43.8	—	—	—	—	—
DMB	Overall	21.0 ± 0.0	21 – 21	20.6 ± 0.2	19 – 21	19.8 ± 0.4	19 – 21
V	Overall	134.0 ± 2.0	132 – 136	135.5 ± 0.8	134 – 140	137.4 ± 1.7	129 – 144
SC	Overall	28.5 ± 2.5	26 – 31	—	—	33.0 ± 1.7	26 – 39
	♂♂	—	—	32.3 ± 1.4	29 – 35	—	—
	♀♀	—	—	27.0 ± 0.8	25 – 30	—	—
Ap	Overall	1.0 ± 0.0	1 – 1	—	1 – 2	1.9 ± 0.1	1 – 2
SpL	Overall	8.0 ± 1.0	7 – 9	9.2 ± 0.1	9 – 10	8.4 ± 0.3	7 – 9
SbL	Overall	9.5 ± 0.5	9 – 10	9.5 ± 0.2	9 – 10	—	—
Cic	Overall	9.0 ± 1.0	8 – 10	8.4 ± 0.2	8 – 9	9.6 ± 0.2	9 – 10

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