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DESCRIPTION OF A NEW SPECIES OF SHIELD-HEAD VIPERS — *Pelias olguni* sp. nov. FROM BASIN OF UPPER FLOW OF THE KURA RIVER IN TURKEY

S. B. Tuniyev,[1] A. Avcı,[2] B. S. Tuniyev,[1] A. L. Agasian,[3] L. A. Agasian[3]

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Localities of the records of *Pelias darevskii* indicated in the literature and known from the personal communications were inspected. The comparison of morphology and ecology of animals from northeastern Turkey and from the type locality of *Pelias darevskii* in Armenia made it possible to make conclusion about the specific independence of the vipers living in Turkey. It is given the description of the new species of shield-head vipers from basin of upper flow of the Kura River. The possible ways of speciation of the relict representatives of "*kaznakovi*" complex in the southwestern part of Caucasian Ecoregion are discussed.

Keywords: North-East Anatolia; Armenia; *Pelias darevskii* sensu lato; *Pelias olguni* sp. nov.; biogeographical notes; possible speciation.

INTRODUCTION

From the moment of Darevsky's viper — *Pelias darevskii* (Vedmederja, Orlov et Tuniyev, 1986) description this species was considered as a local endemic of northwestern Armenia. In spite of new finds of this species in Armenia (Agasian, Agasian, 2008) all of them are located on the slopes of one mountain massive (southern part of Dzhavakhet ridge) close to type locality. Therefore records in Turkey (Geniez and Teynie, 2005; Tuniev et al., 2009; Avcı et al., 2010) far from the known distribution range and in different ecological conditions were of interest in zoogeographical aspect and demonstrate geographical variation within species. We undertook the attempt of collection and examination of additional material, both in Turkey and in Armenia, for consideration of arising up questions.

MATERIAL AND METHODS

Material was collected by A. Avcı, S. B. Tuniyev, and B. S. Tuniyev during the summer expedition of 2011 in North-Eastern Turkey, additional material in Armenia was collected in 2006 – 2009 by A. L. Agasian and L. A. Agasian.

During the expedition of 2011 localities indicated in literature were inspected by us in Turkey: vicinity of Village Zekeriya, Artvin Province, Town Posof, Ardahan Province and basin of Chıldır Lake on the border of Ardahan and Kars provinces, due with present verbal reports about records there of *Pelias darevskii*. Near Chıldır Lake *P. eriwanensis* (Reuss, 1933) was found by us on slopes of the Mt. Kısır-dağ (Fig. 1). In vicinity of Vil. Zekeriya it was found only one female specimen of viper, related to "*kaznakovi*" complex, with intermediate morphologically characteristics between *P. darevskii* and

Fig. 1. *Pelias eriwanensis*: Mt. Kısır-Dağ, basin of Chıldır Lake, Turkey.

[1] Federal State Institution Sochi National Park, Sochi, Russia; e-mail: tuniev1@mail.ru, btuniyev@mail.ru

[2] Adnan Menderes University, Science and Art Faculty, Department of Biology, Aydın, Turkey; e-mail: rhynchocalamus@gmail.com, aavci09@yahoo.com

[3] Scientific center of Zoology and Hydroecology of National Academy of Sciences of Republic Armenia, Yerevan, Armenia; e-mail: agasaram@yahoo.com, agaslev@yahoo.com

high density of *Artemisia* sp. and scattered trees of *Amygdalus* sp. and *Pistacia terebinthus*. The climate of the area is cold mountainous (Fig. 8).

Comparison and relationships. About 18 generally accepted species have been identified in the genus *Eirenis* (www.reptiledatabase.org). A brief comparison of *Eirenis kermanensis* sp. nov. with other known species of *Eirenis* is as following:

Eirenis kermanensis sp. nov. differ than *Eirenis* (*Pseudocyclophis*) *persicus* by having 1 +2 temporal scales, while *Eirenis* (*Pseudocyclophis*) *persicus* specimens have 1 + 1 temporal scales. *Eirenis kermanensis* sp. nov. has 15 dorsal scales and so it is simply distinguished from *Eirenis* species with 17 dorsal scales including: *Eirenis lineomaculatus*, *Eirenis punctatolineatus*, *Eirenis hakkariensis*, *Eirenis africanus*, and *Eirenis modestus*.

Compared to *Eirenis* species with 15 dorsal scales (all belonging to the subgenus *Pediophis*), some of these species have an unique color pattern and so *Eirenis kermanensis* sp. nov. is distinguished from them simply in color pattern. These species include *Eirenis rechingeri* which is characterized by dorsolateral dark strips, *Eirenis collaris* which is characterized by a dark transverse strip on the collar region. *Eirenis rothii*, *Eirenis eiselti*, *Eirenis levantinus*, and *Eirenis barani* are usually distinguished by an unicolor body and different head patterns.

Eirenis kermanensis sp. nov. is distinguished from *Eirenis coronelloides* in the lower number of subcaudal scales of the latter, lower than 50 scales, whereas the number of subcaudals in the new species is higher than 50 subcaudalia.

On other hand the East Anatolian *Eirenis thospitis* differs from *Eirenis kermanensis* sp. nov. in the lack of a dorsal pattern in adults, as well in the number of ventral scales (*Eirenis thospitis* has a higher number of ventral scales (169 – 190 compared to 154 – 156 in *Eirenis kermanensis* sp. nov.)

Eirenis coronella, which has been reported in the southwestern lowlands of Iran, is distinguished than *Eirenis kermanensis* sp. nov. by the dorsal color pattern. *Eirenis coronella* has a dark, collar shape, stripe on the neck which is in contact with dorsal head dark blotch. This significant pattern is not seen in the new species.

Morphological differences of the *Eirenis kermanensis* sp. nov. and *Eirenis medus* have been discussed in detail above.

From the systematic point of view, the only comprehensive study on the systematics of the genus *Eirenis* is mainly based on sequenced gene data (Nagy et al., 2003). If we accept that *Eirenis kermanensis* sp. nov. is closely related to *Eirenis medus*, following Nagy et al. (2003) we may conclude that these two species, together with the *E. thospitis* and *E. hakkariensis* group, belong to a separate clade within the subgenus *Pediophis* Fitzinger, 1843. The authors hope that upcoming molecular data of *Eirenis kermanensis* sp. nov. will enlighten more the systematic position of this new species.

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TABLE 1. Examined Specimens of *Pelias*, Stored in Herpetological Collections of Sochi National Park (SNP), Dokuz Eylül University (ZDEU) and Scientific Center of Zoology and Hydroecology of National Academy of Sciences of Republic Armenia (ZIRA)

Coll. No.	Species	*n*	Sample	Collection locality	Date	Collector
ZDEU 270/2005	*Pelias olguni* sp. nov.	2	1	Turkey, Türkgözü Plateau, Posof, Ardahan Province	05/21/2005	Ş. Başkaya
SNP 866	*Pelias olguni* sp. nov.	1	1	Turkey, Çamyazı Village, Posof, Ardahan Province	07/21/2011	B. Tuniyev, S. Tumyev, and A. Avcı
SNP 874	*Pelias olguni* sp. nov.	3	1	Turkey, Çamyazı Village, Posof, Ardahan Province	07/21/2011	B. Tuniyev, S. Tuniyev, and A. Avcı
SNP 875	*Pelias olguni* sp. nov.	3	1	Turkey, Çamyazı Village, Posof, Ardahan Province	07/21/2011	B. Tuniyev, S. Tuniyev, and A. Avcı
SNP 876	*Pelias olguni* sp. nov.	3	1	Turkey, Çamyazı Village, Posof, Ardahan Province	07/21/2011	B. Tuniyev, S. Tuniyev, and A. Avcı
SNP 877	*Pelias olguni* sp. nov.	1	1	Turkey, Çamyazı Village, Posof, Ardahan Province	07/21/2011	B. Tuniyev, S. Tuniyev, and A. Avcı
SNP 878	*Pelias olguni* sp. nov.	1	1	Turkey, Çamyazı Village, Posof, Ardahan Province	07/21/2011	B. Tuniyev, S. Tuniyev, and A. Avcı
SNP 879	*Pelias olguni* sp. nov.	1	1	Turkey, Çamyazı Village, Posof, Ardahan Province	07/21/2011	B. Tuniyev, S. Tuniyev, and A. Avcı
SNP 880	*Pelias olguni* sp. nov.	1	1	Turkey, Çamyazı Village, Posof, Ardahan Province	07/21/2011	B. Tuniyev, S. Tuniyev, and A. Avcı
SNP 804	*Pelias darevskii*	3	2	Armenia, Shirak Marz, Ashotsk District, Mt. Legli (Sevsar)	July 2009	A. L. Agasian
ZIRA 27936	*Pelias darevskii*	1	2	Armenia, Shirak Marz, Ashotsk District, Mt. Legli (Sevsar), vil. Saragyukh	09/15/2006	A. L. Agasian
—	*Pelias darevskii*	1	2	Armenia, Shirak Marz, Ashotsk District, Mt. Legli (Sevsar), vil. Saragyukh	09/15/2006	A. L. Agasian
ZIRA 27937	*Pelias darevskii*	1	2	Armenia, Shirak Marz, Ashotsk District, Mt. Legli (Sevsar), vil. Saragyukh	September 2006	A. L. Agasian
ZIRA 27939	*Pelias darevskii*	1	2	Armenia, Shirak Marz, Ashotsk District, Mt. Legli (Sevsar), vil. Saragyukh	September 2006	A. L. Agasian
ZIRA 27944	*Pelias darevskii*	1	2	Armenia, Shirak Marz, Ashotsk District, Mt. Legli (Sevsar), vil. Saragyukh	September 2006	A. L. Agasian
ZIRA 27941	*Pelias darevskii*	1	2	Armenia, Shirak Marz, Ashotsk District, Mt. Legli (Sevsar), vil. Saragyukh	September 2006	A. L. Agasian
ZIRA 27946	*Pelias darevskii*	1	2	Armenia, Shirak Marz, Ashotsk District, Mt. Legli (Sevsar), vil. Saragyukh	09/15/2006	A. L. Agasian
ZIRA 27548	*Pelias darevskii*	10	2	Armenia, Shirak Marz, Ashotsk District, Mt. Legli (Sevsar), vil. Saragyukh	09/15/2006	A. L. Agasian
ZIRA 27920	*Pelias darevskii*	3	2	Armenia, Shirak Marz, Ashotsk District, Mt. Legli (Sevsar), vil. Saragyukh	09/15/2006	A. L. Agasian
ZIRA 27922	*Pelias darevskii*	1	2	Armenia, Shirak Marz, Ashotsk District, Mt. Legli (Sevsar), vil. Saragyukh	09/15/2006	A. L. Agasian
ZIRA 27943	*Pelias darevskii*	1	2	Armenia, Shirak Marz, Ashotsk District, Mt. Legli (Sevsar), vil. Saragyukh	September 2006	A. L. Agasian
ZIRA 27942	*Pelias darevskii*	1	2	Armenia, Shirak Marz, Ashotsk District, Mt. Legli (Sevsar), vil. Saragyukh	September 2006	A. L. Agasian
ZIRA 27945	*Pelias darevskii*	1	2	Armenia, Shirak Marz, Ashotsk District, Mt. Legli (Sevsar), vil. Saragyukh	September 2006	A. L. Agasian
ZIRA 27940	*Pelias darevskii*	1	2	Armenia, Shirak Marz, Ashotsk District, Mt. Legli (Sevsar), vil. Saragyukh	September 2006	A. L. Agasian
ZIRA 27938	*Pelias darevskii*	1	2	Armenia, Shirak Marz, Ashotsk District, Mt. Legli (Sevsar), vil. Saragyukh	September 2006	A. L. Agasian
ZIRA 27935	*Pelias darevskii*	1	2	Armenia, Shirak Marz, Ashotsk District, Mt. Legli (Sevsar), vil. Saragyukh	09/15/2006	A. L. Agasian
ZIRA 27549	*Pelias darevskii*	1	2	Armenia, Shirak Marz, Ashotsk District, Mt. Legli (Sevsar), vil. Saragyukh	09/15/2006	A. L. Agasian
ZIRA 27933	*Pelias darevskii*	1	2	Armenia, Shirak Marz, Ashotsk District, Mt. Legli (Sevsar), vil. Saragyukh	09/15/2006	A. L. Agasian
ZIRA 27550	*Pelias darevskii*	1	2	Armenia, Shirak Marz, Ashotsk District, Mt. Legli (Sevsar), vil. Saragyukh	09/15/2006	A. L. Agasian

TABLE 1 (continued)

Coll. No.	Species	*n*	Sample	Collection locality	Date	Collector
ZIRA 27947	*Pelias darevskii*	1	2	Armenia, Shirak Marz, Ashotsk District, Mt. Legli (Sevsar), vil. Saragyukh	09/15/2006	A. L. Agasian
ZIRA 40715	*Pelias eriwanensis*	1	3	Armenia, Ararat Marz, "Khosrov Forest" Reserve, above Kakavaberd Castle, place Tapchan Elakh	June 2011	A. Malkhasjan
ZIRA 40717	*Pelias eriwanensis*	1	3	Armenia, Ararat Marz, "Khosrov Forest" Reserve, above Kakavaberd Castle, place Tapchan Elakh	June 2011	A. Malkhasjan
ZIRA 40713	*Pelias eriwanensis*	1	3	Armenia, Ararat Marz, "Khosrov Forest" Reserve, above Kakavaberd Castle, place Tapchan Elakh	June 2011	A. Malkhasjan
ZIRA 40718	*Pelias eriwanensis*	1	3	Armenia, Ararat Marz, "Khosrov Forest" Reserve, above Kakavaberd Castle, place Tapchan Elakh	June 2011	A. Malkhasjan
ZIRA 40714	*Pelias eriwanensis*	1	3	Armenia, Ararat Marz, "Khosrov Forest" Reserve, above Kakavaberd Castle, place Tapchan Elakh	June 2011	A. Malkhasjan
ZIRA 40716	*Pelias eriwanensis*	1	3	Armenia, Sjunik Marz, Sisian, vicinity of villages Getatakh and Lor, place Jabrail	05/12/2006	A. Malkhasjan
ZIRA 40721	*Pelias eriwanensis*	1	3	Armenia, Sjunik Marz, Sisian, vicinity of villages Getatakh and Lor, place Jabrail	05/12/2006	A. Malkhasjan
ZIRA 40719	*Pelias eriwanensis*	1	3	Armenia, Sjunik Marz, Sisian, vicinity of villages Getatakh and Lor, place Jabrail	05/12/2006	A. Malkhasjan
ZIRA 40720	*Pelias eriwanensis*	1	3	Armenia, Sjunik Marz, Sisian, vicinity of villages Getatakh and Lor, place Jabrail	05/12/2006	A. Malkhasjan
—	*Pelias eriwanensis*	1	3	Armenia, Sjunik Marz, Sisian, vicinity of villages Getatakh and Lor, place Jabrail	05/12/2006	A. Malkhasjan

P. eriwanensis. After keeping at terrarium we got one young; from an analysis these specimens were excluded because of the small number.

A total of 60 specimens of genus *Pelias* were studied, including 34 *P. darevskii*, originated from Armenia, 16 from Turkey and 10 *P. eriwanensis* from two populations in Armenia (Table 1). In statistical and canonical analyses information was utilized on indicated 60 specimens of vipers. Pregnant females were kept in standard terrarium to birth of juveniles, which allowed getting additional materials on pholidosis and biology of reproduction. Material is kept in herpetological collection of the Sochi National Park, Russia (SNP); Zoology Department Ege University, Zoology Lab. of the Department of Biology at Buca Education Faculty, Turkey (ZDEU); and Scientific Center of Zoology and Hydroecology of National Academy of Sciences of Republic Armenia, Yerevan, Armenia (ZIRA) (Table 1). Snakes are united into 2 geographical samples: 1. Turkey (Ardahan Province, vicinity of Town Posof, Mt. Ilgar-Dağ and Türkgözü Plateau), 2. Armenia (Shirak Marz, Ashotsk District, Mt. Sevsar). Taking into account the opinion of possible introgressive hybridization of ancestral form of Darevsky's viper with *P. eriwanensis* (Orlov, Tuniyev, 1986), third sample of *P. eriwanensis* is presented by two populations from Armenia (Ararat Marz, "Khosrov forest" Reserve, vicinity of Kakavaberd and Syunik Marz, vicinity of town Sisian, Vil. Ketatakh). The methods of traditional morphological analysis were used based on characters offered by Nilson, Andrén (2001) with our modifications (Table 2). To eliminate influencing of sexual and possible age variation, comparison of adult and young males and females was conducted separately (Tables 3 – 8), and then was presented in the generalized samples (Tables 9 and 10). Single collections from other localities in Turkey were not included in a statistical analysis, but discussed in a text in the proper sections.

Materials were studied using standard methods of variation statistics (Lakin, 1990) and one of methods of multivariate statistics — Canonical Discriminate Analysis (CDA) (Tyurin et al., 2003) by the package of STATISTICA 6.0 for Windows. Geographical variability of morphological characters was analyzed using CDA, allowing making a comparison of the preliminary selected groups on the complex of characters (Tyurin et al., 2003).

RESULTS

It is shown that *P. darevskii* from analyzed populations in Armenia and Turkey is certainly showed differ-

TABLE 2. The Scheme of Viper's Morphological Characters and Indexes

No.	Conditional shortening	Name	Notice
1	L.t.	Longitudo totalis	Distance from tip of muzzle to point of tail
2	L.	Longitudo corporis	Distance from point of muzzle to point of cloacae fissure
3	L.cd..	Longitudo caudalis	From point of cloacae fissure to point of tail
4	Pr.	Preventrals	Number of preventral shields
5	Ven.	Ventrals	Number of ventral shields
6	S.c.	Subcaudals	Number of subcaudal shields
7	Ap.	Apicals	Number of apical shields
8	R.	Rostral h/br.	Rostral Index: ratio of height to broth
9	Pil.	Pileus	Distance from tip of muzzle to posterior point of parietals shields
10	Crown scales (C.s.)	Intercanthals + intersupraoculars	Number of shields, limited by frontals, canthals and supraoculars
11	In	Upper preoc. in cont. with nasal (+/–)	Upper preocular in contact with nasal (+/–) (left/right)
12	Can.	Canthals	Number of canthal shields
13	Sq.1	Squamare 1	Number of dorsal scales around the neck
14	Sq.2	Squamare 2	Number of dorsal scales around the midbody
15	Sq.3	Squamare 3	Number of dorsal scales around the posterior part of body
16	Supralab	Supralabials	Number of supralabial shields
17	Sublab	Sublabials	Number of sublabial shields
18	F.c.	1st circumoculars	Number of shields round eye (left/right)
19	ZZ	Windings in zigzag	Number of zigzag windings (left/right)
20	Lor.	Loreals	Number of loreal shields (left/right)
21	L.c.	Longitudo capitis	Distance from tip of muzzle to point of neck
22	Lt.c.	Latiudo capitis	Biggest width of head
23	Al.c.	Altitudo capitis	Height of head in parietal area
24	Par.	Parietals (hel/delad)	Parietals (hel/delad)
25	Front.	Frontal (hel/delad)	Frontal (hel/delad)
26	Nas.	Nasal (hel/delad)	Nasal (hel/delad)
27	Supralab.u.eye	Supralabials under eye	The number of subralabial shields below eye

TABLE 3. Comparison of Adult and All Age Groups of *Pelias darevskii*, *P. olguni* sp. nov., and *P. eriwanensis* Populations

Character	Adults						Juveniles		Adults + Juveniles					
	males			females			males	females	males			females		
	1/2 $n = 5$	1/3 $n = 9$	2/3 $n = 8$	1/2 $n = 10$	1/3 $n = 10$	2/3 $n = 8$	1/2 $n = 13$	1/2 $n = 13$	1/2 $n = 18$	1/3 $n = 11$	2/3 $n = 19$	1/2 $n = 23$	1/3 $n = 15$	2/3 $n = 16$
L.t.	0	0	0	0	0	0	*	**	—	—	—	—	—	—
L.	0	0	0	0	0	0	0	**	—	—	—	—	—	—
L.cd..	0	0	0	0	0	0	*	**	—	—	—	—	—	—
Pr.	0	0	0	**	0	0	**	**	***	0	**	***	0	0
Ven.	0	0	0	0	***	*	0	0	0	0	0	*	***	*
S.c.	0	0	**	0	0	0	0	0	0	0	0	0	0	0
Ap.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R.	0	0	0	0	0	0	0	0	—	—	—	—	—	—
Pil.	0	0	0	0	0	0	0	0	—	—	—	—	—	—
Crown scales	0	0	0	*	0	0	0	0	*	*	0	0	0	0
Can.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sq.1	0	0	0	0	0	0	*	0	**	*	0	0	0	0
Sq.2	0	0	0	0	0	0	*	0	**	0				
Sq.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Supralab	0	0	0	0	0	*	***	**	*	0	0	0	0	0
Sublab	0	0	0	0	0	0	**	**	*	0	0	*	*	0
F.c.	0	0	*	0	0	0	0	0	0	0	**	0	0	0
ZZ	0	0	0	0	0	0	***	*	***	0	***	***	0	**
Lor.	0	*	**	0	**	**	0	0	0	**	***	0	***	***
L.c.	0	0	0	0	0	0	0	***	—	—	—	—	—	—
Lt.c.	0	0	0	0	0	0	0	*	—	—	—	—	—	—

Note. Levels of meaningfulness: $*P < 0.05$; $**P < 0.01$; $***P < 0.001$; (0), there are not reliable differences; (–), no data.

ences both from *P. eriwanensis* and from each other in a number of morphometric characters (Table 3) and color pattern.

Vipers from Turkey differ by having smaller size than *P. darevskii* from Armenia although a maximal size for males (482.9 mm) is noted in Posof (Avcı et al.,

TABLE 4. Comparison of Adult Males and Females of *Pelias olguni* sp. nov. (Turkey, Posof)

Character	Males (n = 3), min – max / $\bar{x} \pm m$	Females (n = 6), min – max / $\bar{x} \pm m$	t	P
L.t.	288 – 482.9 / 360.3 ± 61.6	332 – 496 / 413.4 ± 24	0.9	>0.05
L.	253 – 426.2 / 315.4 ± 55.6	300 – 445 / 370.8 ± 21.4	1.2	>0.05
L.cd..	35 – 56.7 / 44.9 ± 6.3	32 – 51 / 42.6 ± 2.8	0.4	>0.05
Pr.	1 – 2 / 1.3 ± 0.3	1 – 3 / 1.7 ± 0.3	1	>0.05
Ven.	127 – 132 / 130 ± 1.5	131 – 136 / 133.7 ± 0.7	2.5	<0.05
S.c.	31 – 35 / 33.3 ± 1.2	25 – 31 / 27.3 ± 0.8	4.1	<0.01
Ap.	1	1 – 2 / 1.2 ± 0.2	0.7	>0.05
R.	67.4 – 83.5 / 74 ± 4.9	59.7 – 89.8 / 66.5 ± 4.7	1	>0.05
Pil.	11 – 13.7 / 11.9 ± 0.9	10.9 – 13.02 / 12 ± 0.4	0.05	>0.05
Crown scales	6 – 15 / 10.7 ± 2.6	7 – 12 / 8.7 ± 0.8	1	>0.05
Can.	5	5 – 6 / 5.2 ± 0.2	0.7	>0.05
Sq.1	20 – 23 / 22 ± 1	21 – 24 / 22 ± 0.5	0	0
Sq.2	20 – 21 / 20.7 ± 0.3	21 – 22 / 21.2 ± 0.2	1.5	>0.05
Sq.3	16 – 19 / 17.3 ± 0.9	15 – 19 / 17 ± 0.6	0.3	>0.05
Supralab	8 – 11 / 9.5 ± 0.6	7 – 11 / 9.8 ± 0.6	0.3	>0.05
Sublab	8 – 10 / 9 ± 0.6	9 – 10 / 9.4 ± 0.2	0.7	>0.05
F.c.	8 – 11 / 9.85 ± 0.8	8 – 12 / 9.4 ± 0.5	0.5	>0.05
ZZ	71 – 83 / 77.4 ± 3.4	68 – 79 / 72.7 ± 2.05	1.3	>0.05
Lor.	2 – 4 / 3.15 ± 0.6	3 – 6 / 3.9 ± 0.4	0.9	>0.05
L.c.	12.4 – 18.5 / 15.8 ± 1.8	18.2 – 21.3 / 20 ± 0.6	2.9	<0.05
Lt.c.	8.5 – 9.5 / 9 ± 0.3	8.4 – 13.7 / 11.4 ± 0.8	2	>0.05
Al.c.	6.4 – 7.1 / 6.6 ± 0.2	6.5 – 8.2 / 7.4 ± 0.3	1.7	>0.05
In	–33.3% +67.7%	–67.7% +33.3%		

TABLE 5. Comparison of Adult Males and Females of *Pelias darevskii* (Armenia, Mt. Sevsar)

Character	Males (n = 2) min – max / $\bar{x} \pm m$	Females (n = 4) min – max / $\bar{x} \pm m$	t	P
L.t.	359 – 380 / 369.5 ± 10.5	335 – 517 / 457.8 ± 42	1.4	>0.05
L.	302 – 323 / 312.5 ± 50.5	300 – 475 / 414.5 ± 39.6	1.7	>0.05
L.cd.	57	35 – 48 / 43.3 ± 3.1	2.3	<0.05
Pr.	3 – 6 / 4.5 ± 1.5	3 – 5 / 3.5 ± 0.5	1.2	>0.05
Ven.	125 – 135 / 130 ± 3.5	134 – 139 / 135.3 ± 1.3	2.4	>0.05
S.c.	37	24 – 30 / 26.3 ± 1.3	5.5	<0.01
Ap.	1 – 2 / 1.5 ± 0.5	1 – 2 / 1.5 ± 0.3	—	—
R.	66.3 – 74 / 70.2 ± 3.8	56.1 – 82.3 / 66.6 ± 6.3	0.4	>0.05
Pil.	11 – 11.9 / 11.5 ± 0.5	11.2 – 13.8 / 12.5 ± 0.5	1.2	>0.05
Crown scales	5	5 – 7 / 6 ± 0.6	1.2	>0.05
Can.	5 – 6 / 5.5 ± 0.5	5 – 6 / 5.5 ± 0.3	—	—
Sq.1	21	19 – 23 / 20.8 ± 0.9	0.2	>0.05
Sq.2	20	19 – 21 / 20.5 ± 0.5	0.7	>0.05
Sq.3	16 – 17 / 16.5 ± 0.5	16 – 17 / 16.8 ± 0.3	0.5	>0.05
Supralab	8 – 10 / 9.3 ± 0.8	9 – 10 / 9.7 ± 0.3	0.6	>0.05
Sublab	9 – 10 / 9.25 ± 0.25	9 – 10 / 9.4 ± 0.25	0.3	>0.05
F.c.	8 – 9 / 8 ± 0.5	7 – 10 / 9 ± 0.5	0.6	>0.05
ZZ	79 – 85 / 82.25 ± 2.8	76 – 88 / 81.35 ± 3.9	0.2	>0.05
Lor.	1 – 3 / 2 ± 0.5	2 – 5 / 3.5 ± 0.4	2.2	>0.05
L.c.	18.5 – 18.6 / 18.55 ± 0.1	18.9 – 23.3 / 21.9 ± 1	2.2	>0.05
Lt.c.	9.8 – 10 / 9.9 ± 0.1	10.2 – 12.9 / 11.7 ± 0.6	2.03	>0.05
Al.c.	6.5 – 7.4 / 7 ± 0.5	5.8 – 10.2 / 7.9 ± 1.1	0.6	>0.05
In	+100%	+62.5% –37.5%)		

2010). In spite of absence of reliable differences for adults in this work (because of small number of adult specimens from Armenia), it is quite clear on new-born individuals and size limits of mature snakes of compared populations. Interestingly that two females caught from the Mountain Ilgar-dağ were originally identified, as

TABLE 6. Comparison of Juvenile Males and Females of *Pelias olguni* sp. nov. (Turkey, Posof)

Character	Males (n = 2), min–max / $\bar{x} \pm m$	Females (n = 5), min–max / $\bar{x} \pm m$	t	P
L.t.	159–160 / 159.5 ± 0.5	81–163 / 123.2 ± 15.2	1.4	>0.05
L.	139–144 / 141.5 ± 2.5	73–146 / 110.2 ± 13.5	1.4	>0.05
L.cd.	16–20 / 18 ± 2	8–17 / 13 ± 1.7	1.6	>0.05
Pr.	0–3 / 1.5 ± 0.5	0–2 / 1.2 ± 0.4	1	>0.05
Ven.	130–131 / 130.5 ± 0.5	130–136 / 132.4 ± 1	1.7	>0.05
S.c.	33–34 / 33.5 ± 0.5	24–29 / 27 ± 0.9	4.3	<0.01
Ap.	2	1–2 / 1.6 ± 0.2	1	>0.05
R.	64.9–71.2 / 68.1 ± 3.2	60–79.7 / 69.2 ± 3.3	0.2	>0.05
Pil.	7.9–11.2 / 9.6 ± 1.7	6–9.2 / 7.6 ± 0.6	1.5	>0.05
Crown scales	9–13 / 11 ± 2	4–8 / 6.2 ± 0.7	3	<0.05
Can.	6	5–6 / 5.6 ± 0.2	1	>0.05
Sq.1	21–24 / 22.5 ± 1.5	19–24 / 21.4 ± 0.9	1.4	>0.05
Sq.2	21–22 / 21.5 ± 0.5	19–23 / 21 ± 0.6	0.6	>0.05
Sq.3	16–17 / 16.5 ± 0.5	17–18 / 17.2 ± 0.2	0.5	>0.05
Supralab	9–11 / 10.25 ± 0.75	9–11 / 9.8 ± 0.25	1.6	>0.05
Sublab	8	8–9 / 8.4 ± 0.25	0.8	>0.05
F.c.	9–10 / 9.25 ± 0.25	8–10 / 8.8 ± 0.25	1	>0.05
ZZ	65–68.5 / 66.75 ± 1.75	70–83 / 74.5 ± 2.7	1	>0.05
Lor.	2–3 / 2.5 ± 0.5	3–4 / 3.1 ± 0.1	1.9	>0.05
L.c.	11.4–11.7 / 11.6 ± 0.2	8.7–11.4 / 10.4 ± 0.5	1.5	>0.05
Lt.c.	7.3–7.4 / 7.35 ± 0.1	5.1–8 / 6.2 ± 0.5	1.4	>0.05
Al.c.	4.8–5.2 / 5 ± 0.2	3.7–4.8 / 4.3 ± 0.2	1.9	>0.05
In	–100%	–90% +10%		

TABLE 7. Comparison of Juvenile Males and Females of *Pelias darevskii* (Armenia, Mt. Sevsar)

Character	Males (n = 12) min–max / $\bar{x} \pm m$	Females (n = 7) min–max / $\bar{x} \pm m$	t	P
L.t.	158–183 / 170.2 ± 1.7	146–172 / 166.1 ± 3.6	1.1	>0.05
L.	137–159 / 148.1 ± 1.6	130–155 / 147.7 ± 3.1	0.1	>0.05
L.cd..	18–25 / 22.1 ± 0.6	15–21 / 18.4 ± 0.9	3.6	<0.01
Pr.	2–4 / 2.9 ± 0.2	1–4 / 2.8 ± 0.4	0.6	>0.05
Ven.	126–136 / 132.5 ± 1	128–142 / 136.6 ± 1.6	4.1	<0.001
S.c.	26–36 / 32.1 ± 1	22–27 / 26 ± 0.7	4.5	<0.001
Ap.	1–2 / 1.6 ± 0.2	1–2 / 1.3 ± 0.2	1.2	>0.05
R.	46.7–71.2 / 58.1 ± 2	59.2–73.8 / 61.5 ± 3.3	0.9	>0.05
Pil.	5.2–8.8 / 8 ± 0.3	7.2–8.7 / 7.8 ± 0.2	0.4	>0.05
Crown scales	2–11 / 7.4 ± 0.8	5–11 / 7.2 ± 1.1	0.1	>0.05
Can.	5–6 / 5.6 ± 0.1	5–6 / 5.3 ± 0.2	1.2	>0.05
Sq.1	18–21 / 19.8 ± 0.3	19–21 / 20.4 ± 0.4	1.1	>0.05
Sq.2	19–21 / 20 ± 0.2	19–21 / 20.6 ± 0.3	1.4	>0.05
Sq.3	16–17 / 16.6 ± 0.1	16–18 / 16.9 ± 0.3	1	>0.05
Supralab	8–10 / 9 ± 0.1	8–10 / 8.95 ± 0.15	0.6	>0.05
Sublab	9–11 / 9.65 ± 0.2	9–11 / 9.65 ± 0.25	0.1	>0.05
F.c.	7–10 / 8.75 ± 0.3	8–11 / 9.15 ± 0.25	0.9	>0.05
ZZ	79–102 / 89.1 ± 2.25	78–104 / 86.5 ± 3.25	0.6	>0.05
Lor.	2–4 / 2.65 ± 0.15	2–5 / 3.65 ± 0.3	3.5	<0.01
L.c.	11–15.4 / 13.1 ± 0.4	11.9–12.8 / 12.2 ± 0.1	2	>0.05
Lt.c.	6.6–9.9 / 8.2 ± 0.3	6.2–9.4 / 7.6 ± 0.4	1.2	>0.05
Al.c.	4.2–5 / 4.7 ± 0.1	4.3–5 / 4.6 ± 0.1	0.7	>0.05
In	–67.6% +33.3%	–42.9% +57.1%		

semiadults. However palpation allows to find developing youngs. Presumably, for these vipers the minimum sizes of adult females are marked among all of the known members of "*kaznakovi*" complex. Even in small-sized *P. magnifica* (Tuniyev and Ostrovskikh, 2001) males and females become adult at considerably more large sizes.

TABLE 8. Comparison of Adult Males and Females of *Pelias eriwanensis* (Armenia)

Character	Males (n = 5) min–max / $\bar{x} \pm m$	Females (n = 4) min–max / $\bar{x} \pm m$	t	P
L.t.	355–463 / 400.6 ± 20	313–492 / 429.8 ± 40.9	0.7	>0.05
L.	303–405 / 347.4 ± 18.9	280–437 / 379.3 ± 37.2	0.8	>0.05
L.cd..	51–58 / 53.2 ± 1.2	33–45 / 39.8 ± 2.9	4.7	<0.01
Pr.	0–3 / 1.6 ± 0.5	1–3 / 2.3 ± 0.5	0.9	>0.05
Ven.	128–139 / 132.8 ± 2.4	139–143 / 140.3 ± 0.9	2.6	<0.05
S.c.	33–35 / 34 ± 0.5	22–29 / 25.8 ± 1.4	6.1	<0.001
Ap.	1–2 / 1.2 ± 0.2	1–2 / 1.3 ± 0.3	0.2	>0.05
R.	66.4–88.9 / 74.4 ± 4	64.2–72.8 / 68 ± 2.2	1.3	>0.05
Pil.	10–12.3 / 11.2 ± 0.4	9.9–13 / 11.5 ± 0.7	0.4	>0.05
Crown scales	5–9 / 6.6 ± 1	4–9 / 6 ± 1.1	0.4	>0.05
Can.	5–6 / 5.2 ± 0.2	5–6 / 5.3 ± 0.3	0.2	>0.05
Sq.1	19–21 / 20.2 ± 0.5	21	1.4	>0.05
Sq.2	19–21 / 20.6 ± 0.4	21	0.9	>0.05
Sq.3	17	17	—	—
Supralab	8–9 / 8.9 ± 0.1	9	0.9	>0.05
Sublab	8–10 / 9.1 ± 0.25	9–11 / 9.9 ± 0.945	1.7	>0.05
F.c.	9–11 / 9.9 ± 0.25	9–10 / 9.65 ± 0.25	0.8	>0.05
ZZ	69–84 / 75.5 ± 2.45	64–82 / 70.65 ± 2.1	1.1	>0.05
Lor.	3–6 / 4.7 ± 0.4	4–7 / 5.75 ± 0.45	1.8	>0.05
L.c.	16.7–20 / 18.4 ± 0.5	17.2–23 / 20.7 ± 1.2	1.8	>0.05
Lt.c.	8.6–11.3 / 10.3 ± 0.5	8.5–14 / 10.9 ± 1.1	0.6	>0.05
Al.c.	6.6–8.8 / 7.6 ± 0.4	6–9 / 7.4 ± 0.6	0.4	>0.05
In	–90% +10%	–100%		

Comparison of adult males showed diminishing of number of loreal shields from *P. eriwanensis* (9.3) to *P. darevskii* from Turkey (6.3) and Armenia (4). In addition, a viper of Darevsky's viper from type locality possesses higher number of subcaudal shields (37) and lower number of shields round an eye (8.5) under comparison of these characters in *P. eriwanensis* (33.7 and 9.85, respectively).

Comparison of new-born males showed substantial differences in sizes: the length of trunk of Turkish *P. darevskii* (159.5 mm) is smaller than those from Armenian *P. darevskii* (170.4 mm). The length of tail of the Turkish vipers (18.0 mm) is smaller than those from Armenian vipers (22.2 mm). The Turkish vipers (1.5) have lower numbers of preventral shields than those from the Armenian vipers (2.9). Turkish *P. darevskii* (22.5) is having

TABLE 9. Comparison of Meristic Characters of All Age Groups of Males and Females of *Pelias olguni* sp. nov. (Turkey, Posof)

Character	Males (n = 5) min–max / $\bar{x} \pm m$	Females (n = 11) min–max / $\bar{x} \pm m$	t	P
Pr.	1–4 / 1.4 ± 0.2	0–3 / 1.4 ± 0.3	0.08	>0.05
Ven.	127–132 / 130.4 ± 0.9	130–136 / 133.1 ± 0.6	2.5	<0.05
S.c.	31–35 / 31.4 ± 0.7	24–31 / 27.2 ± 0.6	6.3	<0.001
Ap.	1–2 / 1.4 ± 0.2	1–2 / 1.4 ± 0.2	0.1	>0.05
Crown scales	6–15 / 10.8 ± 1.6	4–12 / 7.5 ± 0.7	2.3	<0.05
Can.	5–6 / 5.4 ± 0.2	5–6 / 5.4 ± 0.2	0.3	>0.05
Sq.1	20–24 / 22.2 ± 0.7	19–24 / 21.7 ± 0.5	0.5	>0.05
Sq.2	20–22 / 21 ± 0.3	19–23 / 21.1 ± 0.3	0.2	>0.05
Sq.3	16–19 / 17 ± 0.6	15–19 / 17.1 ± 0.3	0.2	>0.05
Supralab	8–11 / 9.8 ± 0.45	7–11 / 9.75 ± 0.3	0.04	>0.05
Sublab	8–10 / 8.6 ± 0.4	8–10 / 8.9 ± 0.2	0.7	>0.05
F.c.	8–11 / 9.6 ± 0.45	8–12 / 9.15 ± 0.25	0.9	>0.05
ZZ	65–83 / 73.1 ± 3.25	68–83 / 73.4 ± 3.2	0.09	>0.05
Lor.	2–4 / 2.9 ± 0.2	3–6 / 3.5 ± 0.5	1.3	>0.05
In	–60% +40%	–68.2% +31.8%		

higher number of scales round a neck than those from Armenian *P. darevskii* (19.7). Turkish specimens (21.5) have higher number of scales around the middle of body than those at Armenian (19.9). Vipers from Turkey (10.25) have higher number of supralabial shields than those from Armenia (9.05), and the Turkish vipers (8) have lower number of sublabial shields than those from Armenia (9.7). Vipers from Turkey substantially differ in having lower number of wings of zigzag (133.5) as compared to vipers from type territory (179.7).

Comparison of meristic characteristics of males of all of age groups showed the minimal number of preventral shields at Turkish *P. darevskii* (1) and maximal at Armenian *P. darevskii* (3.2), *P. eriwanensis* occupies intermediate position on this character (1.7). The Turkish vipers (10.8) have higher number of crown shields of head than those from Armenia (7.4). Turkish snakes (22.2) have higher number of scales around a neck than those from Armenia (19.9). *P. eriwanensis* again occupies intermediate position on this character (20). Turkish *P. darevskii* (21) has higher number of scales around the midbody than those in Armenian *P. darevskii* (19.9). The number of supralabial shields for the Turkish vipers (9.8) is higher than those from Armenian (9.1), and the number of sublabial shields at Turkish vipers (8.6) is lower than those from Armenia (9.6). The Turkish vipers (146.2) have slightly lower number of wings of zigzag than at *P. eriwanensis* (148.5) and substantially lower than that in Armenian *P. darevskii* (177.4). *P. eriwanensis* differs from Turkish *P. darevskii* (6.8, 2.9, 9.6) and Armenian *P. darevskii* (7.4, 2.6, 8.9) in the number of crown shields (10.8), loreals (4.65), and shields round the eyes (9.85). An upper preocular shield is separated by loreal from nasal for 60% specimens in Turkish specimens, 57.1% in specimens from Armenia and 90% at *P. eriwanensis* (Tables 8 – 10). Thus, for the small percent of specimens asymmetry of this character is noted, whereas contact of upper preocular and nasal shields is observed only from one side at 20% *P. eriwanensis* and 14.3% at *P. darevskii* from Armenia.

As the result of analysis of characters of males we can summarize that for vipers from Turkey length of trunk and body, the number of preventrals, sublabials and wings of zigzag are lower than those for vipers from Armenia whereas the number of scales round a neck and midbody, number of supralabials, and crown shields are higher.

Comparison of adult females also showed diminishing of the number of loreal shields from *P. eriwanensis* (5.6) to *P. darevskii* from Turkey (3.9) and Armenia (3.5). The number of preventrals of Turkish *P. darevskii* (1.7) is lower than in Armenian *P. darevskii* (3.5). The number of crown scales in Turkish vipers (8.7) is higher than in Armenian vipers (6.1). *P. darevskii* from type locality (135.3) takes intermediate position between *P. eriwanensis* (140.3) and vipers from Turkey (133.7) in terms of number of ventrals. The number of supralabials for Armenian *P. darevskii* (9.7) is higher than for *P. eriwanensis* (9).

Comparison of new-born females allows to record the smaller sizes of length of trunk (123.2 mm), body (110.2 mm) and tail (13.0 mm) of Turkish vipers, in comparison to the Armenian specimens (166.4, 147.6, and 18.8 mm, respectively). The Turkish specimens (1.2) have lower number of preventrals than Armenian vipers (2.8). Number of supralabial shields in Turkish vipers (9.8) is higher than those Armenian specimens (8.9). Turkish specimens (8.4) have lower number of sublabial shields than vipers from Armenia (9.7). Wings of zigzag for Turkish *P. darevskii* (149) are substantially lower than in Armenian *P. darevskii* (171.8). Animals from Turkey possess the smaller sizes of head (L.c. = 10.3 mm, Lt.c.

TABLE 10. Comparison of Meristic Characters of All Age Groups of Males and Females of *Pelias darevskii* (Armenia, Mt. Sevsar)

Character	Males (n = 13) min–max / $\bar{x} \pm m$	Females (n = 12) min–max / $\bar{x} \pm m$	t	P
Pr.	2 – 6 / 3.2 ± 0.3	1 – 5 / 3 ± 0.3	0.4	>0.05
Ven.	125 – 136 / 132.5 ± 1.1	128 – 142 / 136.1 ± 1.1	2.4	<0.05
S.c.	27 – 37 / 33.3 ± 0.8	22 – 30 / 26 ± 0.6	7.1	<0.001
Ap.	1 – 2 / 1.6 ± 0.1	1 – 2 / 1.3 ± 0.1	1.4	>0.05
Crown scales	2 – 11 / 7.4 ± 0.7	3 – 11 / 6.5 ± 0.7	0.8	>0.05
Can.	5 – 6 / 5.6 ± 0.1	5 – 6 / 5.3 ± 0.1	1.4	>0.05
Sq.1	18 – 21 / 19.9 ± 0.3	19 – 23 / 20.6 ± 0.3	1.4	>0.05
Sq.2	19 – 21 / 19.9 ± 0.2	19 – 21 / 20.6 ± 0.2	2.1	<0.05
Sq.3	16 – 17 / 16.6 ± 0.1	16 – 18 / 16.8 ± 0.2	0.6	>0.05
Supralab	8 – 10 / 9.1 ± 0.1	7 – 10 / 9.15 ± 0.15	0.3	>0.05
Sublab	9 – 11 / 9.6 ± 0.2	9 – 11 / 9.55 ± 0.15	0.02	>0.05
F.c.	8 – 10 / 8.9 ± 0.2	6 – 11 / 8.9 ± 0.3	0.9	>0.05
ZZ	79 – 102 / 88.7 ± 2.05	76 – 102 / 84.65 ± 2.35	1.3	>0.05
Lor.	1 – 4 / 2.6 ± 0.15	2 – 5 / 3.45 ± 0.25	3	<0.01
In	–57.1% +42.9%	–40.9% +59.1%		

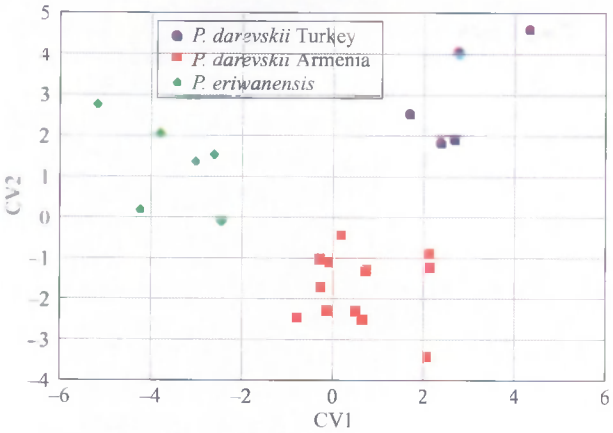

Fig. 2. Two-dimensional scatterplot of samples of males of vipers in space of CDA function by the complex of morphometric characters.

= 6.2 mm), as compared to vipers from type locality (L.c. = 12.4 mm, Lt.c. = 7.7 mm).

Comparison of meristic characteristics of females of all of age groups show the least number of preventrals in Turkish *P. darevskii* (1.5) and maximal one in Armenian *P. darevskii* (3.0). Turkish *P. darevskii* (8.9) has lower number of sublabials than Armenian *P. darevskii* (9.55) and *P. eriwanensis* (9.9). The Turkish vipers (133.1) have lower number of ventrals than Armenian (136.1) and *P. eriwanensis* (140.3). Turkish (3.5) and Armenian specimens (3.45) have lower number of loreals than those from *P. eriwanensis* (5.8). Turkish *P. darevskii* (146.8) and *P. eriwanensis* (141.3) have substantially lower number of wings of zigzag than Armenian *P. darevskii* (169.3). An upper preocular shield is separated from nasal shield by loreal shield at 100% of *P. eriwanensis*, 40.9% for vipers from Armenia and 68.2% from Turkey. Thus asymmetry is marked in both examined populations of *P. darevskii*: 9.1% in Turkey and 45.5% in Armenia (Tables 8 – 10).

Thus we conclude that for vipers from Turkey have smaller sizes of trunk, body, tail and proportions of head, and also lower number of preventrals, sublabials and wings of zigzag, in comparison to vipers from Armenia. The number of supralabials is higher than in vipers of Armenia.

Geographical variation of morphological characters of *P. darevskii* from Turkish and Armenian population also was studied using discriminant (canonical) analysis what allow to make a comparison of the preliminary selected groups on the complex of characters (Tyurin et al., 2003). For comparison *P. eriwanensis* was selected as outgroup. A complex from eight meristic characters (Pr., Ven., Crown scales, Sq.1., Supralab., Sublab., ZZ., Lor.) was used for which reliable distinctions were obtained in

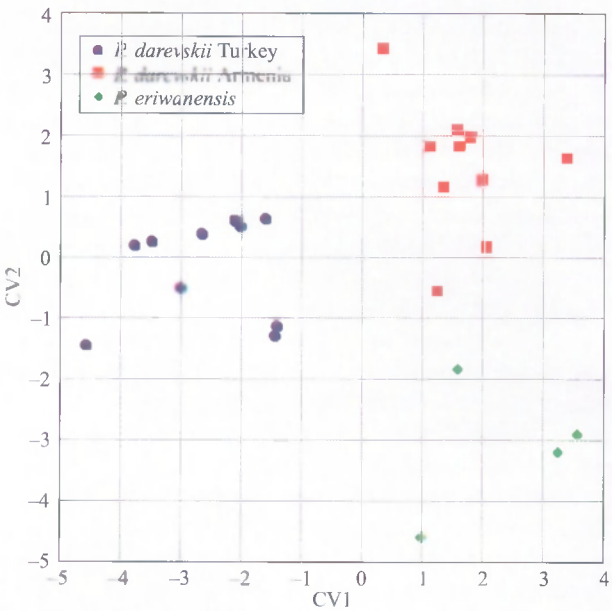

Fig. 3. Two-dimensional scatterplot of samples of females of vipers in space of CDA function by the complex of morphometric characters.

a statistical analysis. Snakes a priori were selected into six sexual and geographical groups.

The results of discriminant analysis showed relatively high accuracy of separation of geographical groups. The accuracy of reliability was 100% for specimens.

The results of discriminant analysis showed that in space of discriminant functions males of snakes formed three groups (Fig. 2). The first group composed males from Turkey, the second — from Armenia, and the third — *P. eriwanensis*, thus on the second discriminant function animals from Turkey were isolated from animals from Armenia, having only the insignificant overlapping in the first discriminant function.

Distributing in space of discriminant functions of females (Fig. 3) in three analyzed groups proved to be well isolated from each other. It is necessary to notice that animals from Turkey are well isolated on both discriminant functions, while disruption between *P. eriwanensis* and *P. darevskii* from Armenia in a greater degree expressed on the second discriminant function.

The results obtained confirmed the high degree of morphological separateness of the compared samples of vipers. The degree of likeness between the selected samples in a discriminant analysis was estimated by distance of Makhalonobis (Tyurin et al., 2003). The value of this distance between the centers of samples of males of vipers varied from 30.2 to 49.2. Minimal value were noted between males of *P. darevskii* from Armenia and *P. eriwanensis* (30.2), as well as between males of *P. da-*

revskii from Turkey and *P. eriwanensis* (30.5), and maximal one (49.2) — between males of *P. darevskii* from Turkey and Armenia (Table 11). For the females value of this distance between the centers of samples varied from 24 to 37.8. Minimal values (24) were noted between the females of *P. darevskii* from Armenia and by the females of *P. darevskii* from Turkey, and maximal one (37.8, 24.7) between the females of *P. darevskii* from Turkey, Armenia and by the females of *P. eriwanensis* (Table 12).

The contribution of different morphological characters is different in discrimination of groups. Because the highest percent of dispersion was taken into account by the first discriminant function, and it was sufficient in dividing of animals into basic groups, we will describe here the contribution of characters to the division of groups on the basis of values of this function (Tables 13 and 14).

A most high contribution to discrimination of groups of males (Table 13) was noted by the followings characters: number of loreals, crowns, supralabials, preventrals, sublabial shields, scales round a neck, wings of zigzag, ventral shields.

A most high contribution to discrimination of groups of females (Table 14) was noted by the followings characters: number of crowns, ventrals, preventrals, zigzag wings, supralabial shields, scales round a neck, loreals and sublabials.

Our study contributes a new information about the morphological characters and geographical variation of Darevsky's viper. We consider as the most meaningful substantial differences in the mean values of row of plastic and meristic signs of snakes from Armenia and Turkey in comparison to *P. eriwanensis* (Table 3), and also discrimination of six groups from three samples, selected on principle of geographical and sexual belonging, during a discriminant analysis (Figs. 2 and 3; Tables 11 and 12).

The results obtained allowed to make a conclusion about taxonomical independence of three groups — *P. darevskii* sensu lato from Turkey, *P. darevskii* from Armenia and *P. eriwanensis*.

TABLE 11. Mahalonobis Distances and Levels of Significance among the Groups of Males *Pelias darevskii*, *P. olguni* sp. nov., and *P. eriwanensis*, According CDA Results

Sample	*P. olguni* sp. nov.	*P. darevskii*	*P. eriwanensis*
P. olguni sp. nov.	—	30.5	49.2
P. darevskii	0.000553	—	30.2
P. eriwanensis	0.000215	0.000245	—

Note. Levels of significance/Mahalonobis distance.

TABLE 12. Mahalonobis Distances and Levels of Significance among the Groups of Females *Pelias darevskii*, *P. olguni* sp. nov., and *P. eriwanensis*, According CDA Results

Sample	*P. olguni* sp. nov.	*P. darevskii*	*P. eriwanensis*
P. olguni sp. nov.	—	24	37.8
P. darevskii	0.000230	—	24.7
P. eriwanensis	0.000806	0.006165	—

Note. Levels of significance/Mahalonobis distance.

DESCRIPTION OF A NEW SPECIES

Family Viperidae Laurenti, 1768
Genus *Pelias* Merrem, 1820

Pelias olguni **Tuniyev S., Avcı A, Tuniyev B., Agasian A. et Agasian L. sp. nov.**

Pelias darevskii — Tuniyev et al., 2009: 123 – 128 (part).

Pelias darevskii — Avcı et al., 2010: 1 – 7

Diagnosis. Small-sized snake, different from a related species Darevsky's viper by the having smaller sizes of trunk, body, tail, lower number of preventrals, sublabials and wings of zigzag; by the having higher number of scales round a neck and middle of body, supralabials and crown shields. Parietal shields have incision in most of the specimens. Animals from above are

TABLE 13. Contribution of Different Morphological Characters in Separation of Males Group *P. darevskii*, *P. olguni* sp. nov., and *P. eriwanensis* (on DCA Results)

Character	Standardized coefficient of first discriminant function	Character rank
Pr.	0.6	4
Ven.	0.2	8
Crown scales	0.9	2
Sq.1.	0.4	6
Supralab.	0.7	3
Sublab.	0.4	5
ZZ.	0.4	7
Lor.	1.3	1

TABLE 14. Contribution of Different Morphological Characters in Separation of Females Group *P. darevskii*, *P. olguni* sp. nov., and *P. eriwanensis* (on DCA Results)

Character	Standardized coefficient of first discriminant function	Character rank
Pr.	0.74	3
Ven.	0.79	2
Crown scales	0.92	1
Sq.1.	0.31	6
Supralab.	0.48	5
Sublab.	0.29	8
ZZ.	0.50	4
Lor.	0.30	7

Fig. 4. Holotype of *Pelias olguni* sp. nov. (SNP No. 866).

Fig. 5. Paratype of *Pelias olguni* sp. nov. (SNP No. 875).

Fig. 6. Paratype of *Pelias olguni* sp. nov. (SNP No. 879).

Fig. 7. Paratype of *Pelias olguni* sp. nov. (SNP No. 878).

Fig. 8. Paratype of *Pelias olguni* sp. nov. (SNP No. 880).

painted in gray and russet tones; a zigzag does not consist of numerous transversal prolate spots, only in some part united. Belly from dark spotted to almost black.

Holotype. Herpetological collection of the Sochi National Park, Sochi, SNP No. 866, adult female, Turkey, Ardahan Province, Town Posof, Mt. Ilgar-Dağ, (2020 m a.s.l.), 07/21/2011, collectors B. Tuniyev, S. Tuniyev, A. Avcı (Fig. 4).

Paratypes. Fifteen specimens: herpetological collection of the Sochi National Park, Sochi, 13 specimens, SNP No. 874 (1 adult female and 2 new-born females), No. 875 (1 adult female, 1 new-born female and 1 new-born male), No. 876 (1 new-born male and 2 new-born females), No. 877 (adult male), No. 878 (adult female), No. 879 (adult female), No. 880 (adult male), Turkey, Ardahan Province, town Posof, Mt. Ilgar-Dağ, (2020 m a.s.l.), 07/21/2011, collectors B. Tuniyev, S. Tuniyev, A. Avcı (Figs. 5 – 10); Zoology Department Ege University, Zoology Lab. of the Department of Biology at Buca Education Faculty, Turkey, 2 specimens, ZDEU No. 270/2005 (adult male and female), Turkey, Ardahan Province, Town Posof, Türkgözü Plateau, 05/21/2005, collector Ş. Başkaya.

Description of holotype. Adult female, length of trunk (L.t.) 496 mm, from the snout to anus (L.) 445 mm, length of tail (L.cd.) is 51 mm. Preventrals 2, ventrals

Fig. 9. Paratype of *Pelias olguni* sp. nov. — female with new-born snakes (SNP No. 875).

Fig. 10. Paratype of *Pelias olguni* sp. nov. — female with new-born snake (SNP No. 874).

135. Subcaudals (S.c.) 28. Apical 1. Length of pileus (Pil.) is 12.2 mm. The number of crown shields (Cr) 7. Upper preocular shield is separated from nasal by loreal (In). Canthals 5. Round a neck and middle of body there are 21 scales. Supralabial shields: 11 on each side (by 4 shields below eye), sublabials 9 on each side. Shields round eyes 12/11. Wings of zigzag 80/75. Loreals 4 on both sides. Length of head 21.1 mm, width is 13.4 mm, height is 8 mm. Parietal shields have incision at the anterior edge; a frontal shield is not divided. 1 – 5 supralabial shields on both sides in upper part are painted in darkly-gray tones. Coloring of throat is light, belly and tail are dark, end of tail is cream-yellow.

Description of paratypes. Paratypes are corresponding to description of holotype with insignificant variations in a size and meristic descriptions (Table 13).

The basic background of adults and juveniles varies from hazel, red-brown to pale-gray. A zigzag for females is painted in a hazel or umber color, for males black. Dark tones are brightly shown in coloring of pileus, especially strongly expressed in males. On each side of trunk the row of large dark patches is well expressed on tone a bit lighter than zigzag. These spots in a different degree proceed on each side of tail. A throat at all of specimens is light, belly from dark-spotted to almost black; the bottom of tail is rather yellow-cream for females and dark for males. There have gray tones in coloring of upper part of supralabial shields, on the sutures of supralabials males have dark strips, poorly expressed, or absent wholly for females. At more than half of specimens of both sexes, upper preocular shield is separated from a nasal by loreal shield.

Etymology. The species is named in honor of Prof. Dr. Kurtuluş Olgun.

Type locality. Turkey, Ardahan Province, Town Posof, Mt. Ilgar-Dağ.

Geographical distribution and biotopes. Modern distribution of species is limited by vicinities of Town Posof in the border-line district of Turkey with Georgia, from where this species is known within Türkgözü Plateau and slopes of mountain Ilgar-Dağ in the left-bank basin of upper flow Kura River (Fig. 11).

The first two specimens were found on moist humid zone with short alpine meadows and numerous piles of stone, above the upper altitudinal limit of the forest at elevation of approximately 2050 m on Türkgözü Plateau (Avcı et al., 2010). Biotopes of vipers on Mt. Ilgar-Dağ is presented by subalpine middle grass meadows with bushes, extending from the upper edge of the forest in a altitudinal range from 2020 up to 2100 m a.s.l. (see description below).

DISCUSSION

In spite of undoubted closeness of Colchis, it was difficult to explain the presence in north-western part of Armenian-Dzhavakhet Highland the member of "*kaznakovi*" complex, to which *P. darevskii* belongs. All of other species of shield-head vipers of "*kaznakovi*" complex inhabit different biotopes of forest and subalpine mountain belts of Great and Lesser Caucasus on territory of Russia, Abhazia, and Georgia, and also in Lazistan (Pontic) and Şavşat ridges in Turkey. We shall consider the known natural habitats of species of "*kaznakovi*" complex briefly.

P. kaznakovi (Nikolsky, 1909) is distributed within two cluster areas. The first (North-Colchian) extends from the environs of town Tuapse on a north-west with an irradiation on the north slope of Western Caucasus to the canyon of middle flow Belaya River (vil. Guzeripl', Adyghe) and proceeds on a southeast on the foot-hills of the Black Sea coast of the Krasnodar Kray (Russia) and

Fig. 11. Mt. Ilgar-Dağ, type locality of *Pelias olguni* sp. nov.

Fig. 12. Habitat of *Pelias darevskii*: Mt. Sevsar, Armenia.

Republic Abkhazia to right-bank of Ingur River on altitudes from a sea level exterminating to 950 – 1200 m a.s.l. The second (South-Colchian) cluster covers south part of Adzharo-Imeretinsky ridge from the environs of town Poti eastward with an irradiation in the canyon of middle flow Kura River — gorge Baniskhevi (Bakradze, 1969) to the north-eastern foothills Lazistan ridge, approximately to town Arhavi on the east, insignificantly getting to the basin of lower flow of Chorokh River north of mountain pass Chat and in the Kamili Biosphere Reserve on Şavşat ridge (Afsar and Afsar, 2009) within the territories of Georgia and Turkey. Species' habitats are presented by typical colchian forest cenosys and derivatives of them.

P. dinniki (Nikolsky, 1913) is widespread on both slopes of Great Caucasus, where inhabits the upper edge of the forest and subalpine meadows at altitudes from 1700 up to 2500 m a.s.l. (Tuniyev et al., 2009).

P. orlovi (Tuniyev et Ostrovskikh, 2001) inhabits both foothills slopes of the North-Western Caucasus from City Gelendzhik eastward to the environs of town Tuapse on the east. Species occurs in Sub Mediterranean forest biotopes in the interval of altitudes from 50 up to 1100 m a.s.l.

P. magnifica (Tuniyev et Ostrovskikh, 2001) is known from the south slope of the Skalistyy (Rocky) ridge within the territories of Adyghe Republic and Krasnodar Kray, where occurs derivatives of Colchian cenosys from 700 up to 1200 m a.s.l.

P. pontica (Billing, Nilson et Sattler, 1990) is known only from type territory — environs of town Borçka in a lower flow of Çoruh River, where two specimens were found in the belt of Sub Mediterranean shibliak of *Carpinus orientalis*.

P. darevskii till recently was known only from type locality — Mt. Legly (now Sevsar), now it is found as early as seven small sloping erosive canyons on the western slopes of quiet volcano of Sevsar (Agasian and Agasian, 2010). In spite of habitat location of *P. darevskii* in a subalpine mountain belt, steppe-meadows are presented here and strongly set of grazing short-grassy meadows. But actually biotopes of vipers are presented by flat stone talus slopes located on altitudes from 2300 up to 2800 m a.s.l.

Thereby, unlike all of other members of "*kaznakovi*" complex, *P. darevskii* is the unique species, dwelling in unusual for these snakes biotopes of north-west of the Armenian volcanic upland (Fig. 12). The unique structure of flat stone taluses as well as special feature of thermo-biological adaptation to the conditions of inhabiting they made possible inhabiting under the severe climatic conditions of this species.

In spite of some external similarity, there are three distinct species in three indicated for *Pelias darevskii* sensu lato localities (Mt. Sevsar, vicinity of Posof and Vil. Zekeriya). Substantial differences in external morphology of *P. darevskii* and *P. olguni* sp. nov. were shown above. Based on two available specimens of vipers from Vil. Zekeriya, and also photographs and short information on external morphology of eight specimens from this locality (Geniez and Teynie, 2005), we consider it an distinct taxon, differing by minimum sizes (L.t.max 450 mm, by comparison to *P. olguni* sp. nov. — 496 mm; *P. darevskii* — 517 mm), maximal values of ventrals and subcaudals numbers, and in the most specimens — by the rounded wings of basic part of zigzag (a sharp tigrina-similar zigzag is marked at found by us specimen) (Fig. 13). This viper show almost total presence of two apical shields (from ten specimens two apical is marked at nine), minimum value of sublabial shields. In the amount of scales around the midbody the viper from Vil. Zekeriya also is characterized by the least values and is more close on this pattern to *P. darevskii*, what to *P. olguni* sp. nov.

Fig. 13. *Pelias* sp. from vicinity of Village Zekeriya, Turkey.

Fig. 14. *Pelias dinniki* from upper flow of Terek River, Central Caucasus, Georgia.

Fig. 15. *Pelias darevskii*, male from type locality: Mt. Sevsar (= Legli).

Absence of sufficient material from vicinity of Vil. Zekeriya did not allow us to do taxonomical description of this form. At the same time, there is no doubt that it does not belong to *P. darevskii* and not *P. olguni* sp. nov. It is impossible also to agree with opinion outspoken by Geniez and Teynie (2005) on belonging of snake from Vil. Zekeriya (as well as *P. darevskii* sensu lato on the whole) to "ursinii" complex, in connection with the small size of new-born snakes, comparatively with relatively large sizes at new-born *P. kaznakovi*. New-born vipers, dwellings on the average and high mountain belts of Great Caucasus, differ by smaller sizes — *P. dinniki* and *P. magnifica*, which belonging to "*kaznakovi*" complex nobody doubts. So, in spite of small absolute sizes, new-born *P. olguni* sp. nov. differ in relatively large sizes by comparison to females (Figs. 9 and 10). Specimens collected by Geniez and Teynie (2005) were characterized by absence of contact between upper preocular and nasal shields, while collected by us female showed this contact. At the same time, as it was shown above, all three compared taxa include both individuals with a contact nasal and upper preocular shields and individuals with these shields separated by loreal shield, and also specimens with asymmetry in this character. Remarkable that this character normally considered as one of diagnostic for the members of "*kaznakovi*" complex, is presented almost in 100% observed by us *P. eriwanensis*. However large head, tiger pattern of zigzag in combination with the dark painting of belly and presence of two apical shields testify belonging of species to "*kaznakovi*" complex (Fig. 13). In addition frequently occurred dark pattern of head for all of representatives of *P. darevskii* sensu lato it is necessary to consider as an ancestral characteristic, uniting them with the joint ancestral form of "*praekaznakovi*". The analogical variant of pattern is characteristic for *P. dinniki* on the Great Caucasus, especially in it semiarid Central and East parts (Fig. 14). It is necessary to specify that two apical shields rarely could be met in representatives of "*ursinii*" complex. Thus it is special characteristically for *P. eriwanensis*, as noted Nilson and Andrén (2001) and shown in present article, but also recorded in *P. lotievi* (Nilson, Tuniyev, Orlov, Höggren et Andrén, 1995). Geniez and Teynie (2005) specify that their opinion of belonging of *P. darevskii* (sensu lato) to "*ursinii*" complex finds confirmation in the genetic results of Joger et al. (2002) and Kalyabina-Hauf et al. (2004). However the last study of Zinenko et al. (2011) witnesses that *P. dinniki*, *P. darevskii* and several specimens morphologically determined as *P. lotievi* clustered together with *P. kaznakovi* from Turkey and Georgia. Also obviously, that in forming of many species of small vipers an important role was played by hybridization (Zinenko et al., 2011).

Fig. 16. *Pelias darevskii*, female from type locality: Mt. Sevsar (= Legli).

Fig. 17. Habitat of *Pelias olguni* sp. nov.: Mt. Ilgar-Dağ, upper edge of forest.

At description of *P. darevskii*, Orlov and Tuniyev (1986) hypotheses the hybrid origin of this species on the base of intermediate position of a number of its morphological characters between *P. kaznakovi* and *P. eriwanensis* (Figs. 15 and 16). By a decade later, Agasian (1996) supposed that in hybridization with *P eriwanensis* participated not *P. kaznakovi*, but *P. dinniki*, that quite unacceptable, as a natural habitat of *P. eriwanensis* lies on the Armenian Highland and framings its south slopes of Lesser Caucasus, while natural habitat of *P. dinniki* wholly extends high-mountain belts of the Great Caucasus.

These hypotheses established originality of morphology of Darevsky's viper but did not explain its origin, or ways of penetration into the Wet Mountains (south extremity of Dzhavakhet ridge). And only relatively recent finds of alike representatives of "*kaznakovi*" complex in Turkey (for authors — *P. darevskii*) in the Artvin Province, vicinity of Vil. Zekeriya (Geniez and Teynie, 2005) and in vicinity of town Posof, Ardahan Province (Avcı et al., 2010) did possible explanation of find of *P. darevskii* in Armenia.

Above is was specified already, that *P. darevskii* is the unique species of "*kaznakovi*" complex, dwelling in unusual biotopes of flat stone talus deposits of the Armenian Highland. Habitats in type locality and recently discovered seven plots on present the slopes of quit volcano of western and south-west expositions. Relief on all eight plots is declivous at foundation of volcano, higher on slopes — steep from 15° to 45°. Meadow areas on canyons and crests of ridges are replaced by talus slopes and rock outcrops (Fig. 12).

Vegetation is presented by short-grassy subalpine meadows; there are insignificant areas of unserried shrub vegetation on stony slopes and talus. In grassy vegetation prevail *Cephalaria gigantea*, *Ranunculus caucasicus*, *Trifolium canescens*, *Stachis macrantha*, *Astrantia major*, *Anemonastrum facsiculatum*, *Ajuga orientalis*, *Plantago atrata*, *Primula macrocalex*, *Ornithogalum balansae*, *Hidesarum caucasicum*, *Alchemilla* sp. Rarely there are *Pedicularis schelkownikowi*, *Gentiana pontica*, *Huinhia pulchra*, *Fritillaria caucasica*, *Gallium* sp. On stony places parcels of *Myosotis* sp. is marked with *Muscari neglectum*, *Pulsatilla albana*, and *Pulsatilla violaceae*.

On near-snow spots the abundant flowering of *Scilla armena*, *Pushkinia scilloides*, *Corydallis emanueli*, *Ficaria ficarioides* is marked. Rarer there is *Gagea* sp. and *Colchicum szovitsii*.

Bushes almost in all of biotopes are presented by single specimens of *Daphne glomerata*, *Rubus buschii*, and *Rosa* sp. An exception is environs of Vil. Saragyukh, where the raspberry of Bush occupies enough large territories in viper's habitats.

Analyzing all the data, we can reveal the basic determining factors which allow with the large level of probability to forecast the presence of *P. darevskii* in different uninspected areas. Such terms are following: 1) altitude a.s.l. within the territories of 2300 – 2800 m in subalpine belt (most optimum altitudes); 2) areas with talus stony places and mountain moraines with large flat stone flags and rocky outputs. Thickness of elements must arrive at these flat flags of tali, at least, 1.5 – 2 m; 3) steepness of slope, not exceeding 30°; 4) presence of forage base (*Orthoptera*, rock lizards, shallow rodents); 5) microexposition of location of stony tali on a slope must be mainly south-east; 6) hydrological terms including a presence of permanent or temporal water courses (streams, small swamped areas) (Agasian, 2011).

Biotopes of *Pelias olguni* sp. nov. on Mt. Ilgar-Dağ are presented by upper edge of forest and subalpine elfin-woodland (*Betula litwinowii*), by subalpine glades with moraines among subalpine light forest (*Acer trautvetteri*, *Betula litwinowii*, *Salix caprea*, *Sorbus aucuparia*) (Fig. 17). Along the moraines and subalpine glades

Fig. 18. Habitat of *Pelias olguni* sp. nov.: Mt. Ilgar-Dağ, subalpine glades with shrubs.

Fig. 19. Habitat of *Pelias olguni* sp. nov.: Mt. Ilgar-Dağ, subalpine meadows and moraines.

in biotopes of vipers occur the single undersized trees and bushes, including *Pinus kochiana*, *Cerasus avium*, *Malus orientalis*, *Corylus avellana*, *Rosa spinosissima*, *Viburnum lantana*, *Rubus buschii*, *Lonicera orientalis*, *Ribes caucasicum*, *Ribes alpinum* (Fig. 18). Subalpine glades, transiting more high to subalpine meadows are presented by graminea-mixtoherbosum associations (Fig. 19) with such species as *Grossheimia macrocephala*, *Delphinium speciosum*, *Lapsana intermedia*, *Lilium szowitsianum*, *Achillea* sp., *Silene* sp., *Geranium psilostemon*, *Chaerophyllum roseum*, *Stachys macrantha*, *Stachys balansae*, *Campanula latifolia*, *Campanula collina*, *Rhinanthus colchicus*, *Astrantia maxima*, *Origanum vulgare*, *Vicia balansae*, *Ranunculus caucasicus*, *Briza* sp., *Rumex acetosa*, *Veratrum lobelianum*, *Heracleum apiifolium*, *Pyrethrum roseum*, *Lotus caucasicus*, *Securigera varia*, *Hymnadenia conopsea*, *Hypericum montanum*, on moraines — *Trifolium alpestre*, *Trifolium canescens*, *Alchemilla* sp., *Sibbaldia semiglabra*. Altitudinal variation of viper's biotopes changes from 2020 up to 2100 m a.s.l.

Biotopes of *Pelias* sp. in vicinity of Vil. Zekeriya is presented by subalpine hemixerophyt meadows close on edaphically signs to meadow-like steppes with juniper lying shrubs (*Juniperus oblonga*) on limestone's in altitudinal range 1990 – 2100 m a.s.l. Along all the habitats the stony areas, small talus, acanguares and rocky outputs of limestone are located (Fig. 20). In scattered stony places *Thymus* sp., *Helianthemum* sp., and *Gallium* sp. are widely presented. In grassy level of meadows are noted such species as *Anacamptis pyramidalis*, *Hedysarum caucasicum*, *Linum* sp., *Cephalaria gigantea*, *Verbascum* sp., *Lotus tenuis*, *Trifolium alpestre*, *Cirsium* sp., *Cichorium intybus*, *Salvia verticillata*, *Papaver oreophilum*, *Echium vulgare*, *Origanum vulgare*, *Achillea* sp., *Lamium album*, *Lapsana grandiflora*, and other.

Fig. 20. Biotopes of *Pelias* sp. in vicinity of Vil. Zekeriya, Turkey, subalpine hemixerophyt meadows on limestone massive.

Thus, we see that *Pelias olguni* sp. nov. and *Pelias* sp. from Vil. Zekeriya dwell in subalpine biotopes, very similar with such for *P. dinniki* on the Great Caucasus and radically different from habitats of *P. darevskii*.

We can hypothese that in the Great Caucasus was following trend of speciation: from the ancestral form of *P. kaznakovi* in the subalpine belt was originated *P. dinniki*, in Submediterranean cenosys — *P. orlowi*, and in derivatives of Colchian cenosys — *P. magnifica*. Similarly in south-west Transcaucasia from the ancestral form of *P. kaznakovi* in high-mountains in the subalpine belt was originated *P. darevskii*, *P. olguni* sp. nov. and *Pelias* sp. Thus the latest localities of these species are located in one chain along Arsiyan (Yanlızçam) ridge in Turkey, and then in north-eastern direction in the Dzhavakhet mountain knot. Such area of vicariant species could be considered as a sign of to the former wider distribution of common ancestral form, inhabiting the higher belts of the mountain systems in late Pliocene. The further Pleistocene glaciations which was recently conserved in Arsi-

Fig. 21. Upper flow of Akhurjan River below Amasia, Armenia.

Fig. 22. Upper flow of Kura River below Ardahan, Turkey.

yan ridge (Çiner, 2004), resulted in the break of primary common distribution range of ancestral form and speciation in separate microrefugiums, different by phyto-landscape and climatic terms. These forms accumulated original characters and were subjected by stabilizing selection in process of insularization. In general microevolutionary processes in shield-head vipers on the Caucasian Isthmus, including north-eastern Anatolia, are analogical to speciation of rock lizards of genus *Darevskia*, especially diverse in the examined sector of Caucasian Ecoregion.

In Turkey *Pelias olguni* sp. nov. inhabits typical subalpine meadows and moraines along the upper edge of the forest. In Armenia, *P. darevskii* also inhabiting the subalpics could be conserved exceptionally in microbiotopes with flat stones, as primary forest habitats are destroyed here, The reasons are following: very stormy volcanic activity, destroying the greater part of forest vegetation (Maruashvili, 1946; Yaroshenko, 1941) and anthropogenous overgrazing strongly decreasing a high-grassy subalpine vegetation. It is necessary to underline that a modern pattern of vegetation of Dzhavakhet-Ashotsk Highland is a result of human activity. Originally here at the elevation 2000 – 2100 m, the forest and forest-steppe vegetation of mountain-xerophylous type was dominated. A recent treeless pattern appeared as a result of deforestation and its replacement by meadow vegetation (Dzhakeli, 1986). Gvozdetskiy (1958) wrote about former forestation in north-western part of the Dzhavakhet-Armenian Highland too. According to historical documents "Spatial register of Gyurdzhistan vilayet" (1941, cited by Gulisashvili, 1964, p. 276), as early as XVI age all the Dzhavakhet Highland was forested. The spruce forests were developed here with the insignificant admixture of silver fir, hornbeam and forest pear. Presently the remains of the forests, consisting of pine-tree, aspen, oak, maple, birch and other, were preserved on the north-western and north-eastern outskirts of Dzhavakhet ridge (Dzhakeli, 1986) and in the upper flow of Akhurjan River.

In conditions of irreversible deforestation of primary biotopes the vipers can find the refuges, food and necessary temperatures only on small-stone talus places. Very likely *P. darevskii* was forced to go higher along slopes to the small-stone talus places after depriving protective forest biotopes on more low altitudes.

Remarkable that viper habitats lying considerably lower both on Akhurjan River in Armenia and in riverheads Kura River in Turkey today look practically identically (Figs. 21 and 22), while the subalpine landscapes located higher on mountains Sevsar and Ilgar-dağ differ radically.

Thus in zoogeographic sense all of three vipers (*P. darevskii*, *Pelias olguni* sp. nov., and *Pelias* sp. from Vil. Zekeriya) are the relict representatives of Colchian ecological-geographical group of reptiles. Tuniyev et al., (2009) attributed *P. darevskii* to the same group. At the same time the confirmation of hypothesis of hybrid origin of Darevsky's viper requires continuation of research and search of new markers of analysis of genome, as the last studies (Kalyabina-Hauf et al., 2004; Murphy et al., 2007) showed polyphyletic origin of the most species of genus *Pelias*. Polyphyletic origin of vipers from the Great Caucasus is also revealed by Zinenko et al. (2011).

Summarizing the material obtained, we will state that in the natural habitat of *P. darevskii* — *P. olguni* sp. nov. — *Pelias* sp. clinal variation of characters external morphology was not shown. All of three forms differ in greater, or to the less degree by originality of morphological characters, that testifies their long speciation.

Presumably, Arsiyan ridge is the center of origin of high-mountain species which look as analogues of *P. din-*

niki. Very possible that another center of subalpine viper forms of "*kaznakovi*" complex is located on still poorly observed Pontic (Lazistan) ridge.

Summarizing materials of morphometric analysis we will mark the increase if body size in the row of *Pelias* sp. from Vil. Zekeriya — *P. olguni* sp. nov. — *P. darevskii* for both sexes from south to north and in direction of more high altitudes. This tendency of increasing of body size in altitudinal and latitudinal directions is analog with a Bergman's principle known for mammals.

In some meristic characters, including the number of scales round a neck and midbody, as well as crown shields we record decreasing of their number from a south to the north and from lowland to high-mountains what corresponds to Dogel's principle of oligomerization. Vipers from more ancient and low elevated southern populations of *P. olguni* sp. nov. and *Pelias* sp. from village Zekeriya the number of pholidosis elements is higher, than at *P. darevskii* from younger northern alpine populations, which were formed considerably later, after an ice-age.

We share the opinion of Geniez and Teynie (2005) about still poor study fauna of viperin snakes of North-East Turkey and necessity of further research of snakes, inhabiting vicinity of Vil. Zekeriya. It is possible to expect new records of vipers in other parts of Arsiyan, Şavşat, Lazistan and other ridges of north-eastern Anatolia.

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TABLE 15. Morphological Characters of Paratypes of *Pelias olguni* sp. nov.

Coll. No.	*n*	Sex	L.t.	L.	L.cd.	Pr.	Ven.	S.c.	Ap.	Pil.	C.s.	In	Can.	Sq.1	Sq.2	Sq.3	Supr.	Sublab	F.c.	ZZ	Lor.	L.c.	Lt.c.	Al.c.
SNP 874	1	female	385	340	45	1	133	31	1	10.9	7	+/+	5	21	21	16	10/10	10/10	9/9	77/80	3/3	18.2	10.5	6.5
SNP 874	2	juv. female	100	90	10	1	136	26	1	7	8	+/–	5	24	23	17	11/10	9/9	9/8	71/75	3/3	9.9	5.9	4.7
SNP 874	3	juv. female	81	73	8	0	132	24	1	6	4	–/–	5	19	19	18	9/9	8/8	9/10	—	3/3	8.7	5.1	3.7
SNP 875	1	female	382	345	37	2	134	27	2	11.1	7	–/–	6	22	21	17	10/10	10/9	9/10	75/76	3/3	18.7	10.3	6.5
SNP 875	1	juv. male	160	144	16	1	130	33	2	11.2	9	–/–	6	21	21	17	10/9	8/8	9/9	68/69	2/2	11.7	7.3	5.2
SNP 875	2	juv. female	150	134	16	2	132	29	2	8.4	5	–/–	6	23	21	17	10/10	9/9	9/9	72/72	3/3	11.4	8	4.8
SNP 876	1	juv. male	159	139	20	2	131	34	2	7.9	13	–/–	6	24	22	16	11/11	8/8	9/10	63/67	4/2	11.4	7.4	4.8
SNP 876	2	juv. female	163	146	17	1	132	28	2	9.2	7	–/–	6	20	21	17	10/10	8/8	9/7	83/82	3/3	11.1	6.5	4.3
SNP 876	3	juv. female	122	110	14	2	130	28	2	7.3	7	–/–	6	21	21	17	9/10	8/8	9/9	70/71	4/3	10.6	5.6	3.8
SNP 877	1	male	288	253	35	1	132	35	1	11	6	+/+	5	20	20	16	10/9	9/9	9/8	82/83	2/2	16.4	9	6.4
SNP 878	1	female	455	408	47	3	131	27	1	12.9	12	–/–	5	21	21	15	10/10	9/10	9/10	71/66	3/3	21.2	12.2	7.9
SNP 879	1	female	332	300	32	1	133	25	1	11.8	9	+/+	5	24	22	18	10/11	9/9	8/8	68/68	4/5	19.3	13.7	8.2
SNP 880	1	male	310	267	43	2	127	34	1	11.1	11	+/+	5	23	21	17	11/10	8/8	11/11	79/78	4/4	12.4	9.5	6.4
ZDEU 270/2005	1	male	482.9	426.2	56.7	1	132	31	1	13.7	15	–/–	5	23	21	19	9/8	10/10	10/10	70/72	4/3	18.5	8.5	7.1
ZDEU 270/2005	1	female	430.48	386.22	43.76	0	136	26	1	13.02	10	–/–	5	23	21	19	7/7	9/9	8/10	70/66	5/6	21.3	8.4	7.5

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