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ON THE TAXONOMICAL STATUS OF STEPPE VIPER FROM FOOTHILLS OF THE SOUTH MACROSLOPE OF THE EAST CAUCASUS

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The analysis of steppe vipers from different parts of the Caucasian Isthmus and from isolated part of the area in the foothills of southern macroslope of the East Caucasus showed the specific status of the latter that it made it possible to describe new species — *Pelias shemakheninsis* sp. nov.

Keywords: steppe vipers; the Caucasus; *Pelias shemakhensis* sp. nov.; relative species.

INTRODUCTION

Problem on taxonomical status of steppe vipers from foothills of left-bank basin of the Kura River lower flow is discussed in herpetological literature for a long time and is of considerable interest especially due to activation of problems on taxonomy and phylogeny of shield-head vipers (*Pelias* Merrem, 1820) of the Caucasian Ecoregion on the whole (Tuniyev B. and Ostrovskikh, 2001; Joger et al., 2002; Geniez and Teynié, 2005; Murphy et al., 2007, 2007a; Tuniyev B. et al., 2009; Avcı et al., 2010; Patrick and Vogel, 2010; Tuniyev S. et al., 2011; Zinenko et al., 2011; Ferchaud et al., 2012; Tuniyev et al., 2012).

Quit long period all steppe vipers of East and South Transcaucasia were attributed to the east steppe viper — *Vipera ursinii renardi* [= *Pelias renardi* (Christoph, 1861)] (Muskhelishvili, 1968; Alekperov, 1978; and others), in connection with opinion of Kramer (1961), considering non-valid such taxa, as *Vipera eriwanensis*, *V. ebneri* [= *Pelias eriwanensis* (Reuss, 1933), *P. ebneri* (Knopfler and Sochurek, 1955)] and uniting all the finds of steppe vipers from Great Caucasus, Precaucasia and Transcaucasia as *Vipera ursinii renardi* (= *Pelias renardi*). Later (Nilson et al., 1995; Nilson and Andrén, 2001) the steppe vipers from South Transcaucasia and contiguous regions of the Armenian Highland in Turkey were considered as distinct taxon — *Pelias eriwanensis* and animals from the regions located more east in the northwestern Iran and extreme south of the Lenkoran Province of Azerbaijan — as *Pelias ebneri*, when vipers from north-eastern Azerbaijan and, probably, north-eastern districts of East Georgia were traditionally placed to *Pelias renardi* (Muskhelishvili, 1968; Alekperov, 1978; Nilson and Andrén, 2001; Ananjeva et al., 2006) together with the vipers of north slopes of central and east part of Great Caucasus and all of Precaucasia.

The taxonomical revisions of shield-head vipers of the Great Caucasus (Orlov and Tuniyev, 1986; Vedmederya et al., 1986; Nilson et al., 1994; Tuniyev and Ostrovskikh, 2001) reveal the complicated pattern of cryptic speciation in two lineages of vipers — "*kaznakovi*" complex and "*ursinii*" complex, with morphologically hardly distinctive species mainly in the east sector of Great Caucasus. As a result of these revisions, it was shown distribution of *Pelias dinniki* (Nikolsky, 1913) along of high-mountain belts of all Great Caucasus, when *Pelias lotievi* (Nilson, Tuniyev, Hoggren, Orlov et Andrén, 1995) was described from middle-mountain belts of Central – East Caucasus. Its natural habitat is limited by north macroslope of Great Caucasus from the Karachay-Cherkessia Republic eastward to Dagestan (Nilson et al., 1995). In the same work it was confirmed the taxonomical status of *Pelias eriwanensis*, *P. ebneri* and belonging of vipers from Precaucasia to *Pelias renardi*. Vipers from north-eastern Azerbaijan were not considered by Nilson et al. (1994, 1995), but later (Nilson and Andrén, 2001) in their monograph "The steppe and steppe vipers of Europe and Asia — the *Vipera* (*Acridophaga*) *ursinii* complex," referred animals from foothills population isolated from

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Fig. 1. *Pelias shemakhensis* sp. nov., Azerbaijan, vicinity of Maraza town, 11.05.2012.

Precaucasia in vicinity of Shemakha, to *Pelias renardi*. B. S. Tuniyev et al. (2009) had the same opinion. Two circumstances were in a great deal instrumental in forming of such point of view: 1) low hypsometric marks associated with records of vipers in Shemakha (700 m a.s.l. according to Alekperov, 1978) by analogy with the Precaucasian finds of *P. renardi*, different from middle-mountain and alpine finds of *Pelias lotievi* and *Pelias eriwanensis*; and 2) consolidated opinion about distribution of *P. lotievi* exceptionally on the north slope of Great Caucasus and *P. eriwanensis* — in South Transcaucasia and North-Eastern Anatolia.

Later, the analysis of distributional borders and variability of Lotiev's viper, conducted by S. B. Tuniyev with co-authors (2011) from one side revealed considerable heterogeneity of morphological characters of this species, and substantially extended knowledge of altitude range from another side. So, in seashore Dagestan this species was found in vicinity of Izerbash settlement on an altitude about 900 m a.s.l. (Tuniyev et al., 2011). The important conclusion of this work was a selection of two groups of "macropopulations": "eastern" — inhabiting greater part of mountain Dagestan and "western" uniting area from the extreme west of Dagestan — Chechen Republic to the extreme east of the Krasnodar Territory. The Bogosskiy Ridge in Dagestan was depicted as a border between "macropopulations." The vipers of "eastern macropopulation" are marked by the pink coloration of labial shields and lesser number of zigzag wings.

In the same work (Tuniyev et al., 2011) the authors express an opinion on ancient origin of *Pelias lotievi*, existing on East Caucasus from Pliocene and extending its distribution range to Central and Western Caucasus in Interglacial warm periods of Pleistocene, reaching in Holocene the western limit of distribution along the corresponding landscapes. Presence of unique characters in most populations studied testify their prolonged "insularization" and speciation with formation of intraspecies forms. The recent presence of populations with mixed characters in specimens along the whole distribution range can be the evidence of multiplied hybridization between groups long being in isolation (Tuniyev et al., 2011).

It is necessary to underline that for different reasons neither the authors of monograph «Snake of the Caucasus» (Tuniyev et al., 2009) nor Nilson and Andrén (2001)

Fig. 2. Coloration of sublabials of Caucasian steppe vipers: *a*, *Pelias shemakhensis* sp. nov.; *b*, *Pelias renardi*; *c*, east *Pelias lotievi*; *d*, *Pelias eriwanensis*.

were not able to examine animals from north-eastern Azerbaijan. That is why these vipers were considered as *Pelias renardi* only taking into account the above indicated circumstances influencing on forming of such an opinion. It should be noted that, at least, for the last 10 years a number of attempts of many herpetologists to find vipers in north-eastern Azerbaijan ended with a failure. There were no results also after special searches of vipers in contiguous East Georgia in more early periods. An idea was expressed that a steppe viper in East Georgia indeed occurred once, but it was extinct later (Muskhelishvili, 1968).

In this light the paper of Kukushkin et al. (2012) presents large interest. The 12 preserved specimens from the north-eastern Azerbaijan are kept in herpetological collection of Museum of Nature of the Kharkov National University (Ukraine) and Institute of Zoology of Azerbaijan National Academy of Sciences (Baku) were analyzed. Materials on morphology and presented photos of some preserved specimens were analyzed. As a result unexpected conclusions were done about possible belonging of these vipers to *Pelias eriwanensis*. In addition, in the distributional area of *Pelias eriwanensis* were also included a few finds from south-west Georgia and north-eastern Turkey. Earlier (Vedmederya et al., 2007) two specimens from Shemakha stored in Museum of Nature of the Kharkov National University (No. 27070, G-148) were also identified as *Vipera* (*Pelias*) *eriwanensis*.

On 11th of May 2012 during the entomological expedition by S. O. Kakunin the photographs of steppe viper from north-eastern Azerbaijan in a neighborhood

Fig. 3. *Pelias eriwanensis*, Armenia, Zangezur Ridge system, vicinity of village Verin Giratkh.

Fig. 4. *Pelias eriwanensis*, Armenia, Sevan Lake basin, vicinity of village Drakhtik.

of Maraza (40°19′58.728″ N 48°32′43.224″ E) were made (Fig. 1).

The analysis of these images allowed to select a number of characters, with the high probability all owing identification of the viper.

First of all it is the absence of characteristic dark pigmentation of labial shields (Fig. 2*a*) testifies that this viper does not belong to *Pelias renardi* (Fig. 2*b*). The pink color of labials is characteristic for two species of shield-head vipers of the Caucasian Ecoregion: *Pelias eriwanensis* and "eastern" *P. lotievi* (Fig. 2*c*, *d*). Thus, *P. eriwanensis* (Figs. 3 and 4) is characterized by such color pattern as continuous winding zigzag with the rounded wings on the light background of the back, contrasting with more dark lateral sides, by presence of dark pigmentation on sutures of labials in some populations, by high percent of specimens with two apicals. For "eastern" *P lotievi* is typical the uniform but variable coloration of the back and the lateral sides (Figs. 5 and 6) as well as more sharp wings of zigzag, which is often divided into separate spots. The absolute predominance of specimens with one apical shield and complete absence of dark pigmentation even of part of labials are also characteristics for this form.

Thus, the number of external characters of the color in life and color pattern of vipers from north-eastern Azerbaijan with the high level of probability can be the base for identification as representatives of east branch of the complex of *Pelias lotievi*. At the same time, the noted similarities of "eastern" *Pelias lotievi* and *Pelias eriwanensis* in color of labials (Fig. 2*c*, *d*) can be both an evidence of common origin and close relations of the discussed forms and a result of convergence in the similar conditions of open semiarid landscapes.

These conclusions impelled us to the careful revision of old collections stored in Zoological Institute of Russian Academy of Sciences in St. Petersburg (ZISP), where the specimen of steppe viper was found which was collected on the 14th of April 1974 by L. A. Erukh in the vicinity of Shemakhan (= Shemakha), north-eastern Azerbaijan.

MATERIAL AND METHODS

A total 100 specimens of vipers from the Caucasian Ecoregion, related to the "*ursinii*" complex were examined. Data on morphology for 10 specimens from Shemakha and 2 specimens from Demirchi (north-eastern Azerbaijan), published by Kukushkin et al. (2012) were also used. In statistical, cluster and discriminant analyses information is used for 63 adult and 48 juvenile specimens of vipers from Russia — Dagestan Republic, Adyghe Republic, Krasnodar Kray, Stavropol Kray, Republic of Kalmykia, Astrakhan Oblast'; Azerbaijan, Armenia and East Kazakhstan. Material is stored in herpetological collection of the Sochi National Park (SNP), Zoological Institute of Russian Academy of Sciences in St. Petersburg (ZISP) and Scientific Center of Zoology and Hydroecology of National Academy of Sciences of Republic Armenia (ZIRA) in Yerevan (Table 1). Material is combined according to geographical localities into 5 samples: 1. *Pelias eriwanensis* (Armenia), 2. *Pelias lotievi* (East Daghestan), 3. *Pelias* sp. (Shemakha, Demirchi,

Fig. 5. *Pelias lotievi*, Russia, Dagestan Republic, Djufudag Ridge, vicinity of village Shari.

Fig. 6. *Pelias lotievi*, Russia, Dagestan Republic, Djufudag Ridge, vicinity of village Shari.

north-eastern Azerbaijan) 4. *Pelias renardi* "west" (Adyghe Republic, Krasnodar Kray), 5. *Pelias renardi* "east" (Stavropol Kray, Republic of Kalmykia, Astrakhan Oblast', and East Kazakhstan).

The methods of classic morphology were used on morphological characters offered by Nilson and Andrén (2001) with some our corrections. To eliminate influence of sexual variation, comparison of adult and juvenile males and females were made separately only on meristic characters (Table 2). Age-dependent variability of these characters was separately examined. Material was treated statistically using standard methods of variation statistics (Lakin, 1990) and one of methods of multidimensional statistics — Canonical Discriminate Analysis (CDA), and also cluster analysis (Tyurin et al., 2003) by the package of STATISTICA 6.0 for Windows.

The results of meristic comparison between samples (Tables 3 – 5) show following differences:

Males. The number of preventrals at *P. eriwanesis* and *P. lotievi* is lesser than in *P. renardi* "west." The maximal number of crown shields of head is recorded for specimens from Shemakha when higher number of ventrals and subcaudals is typical for *P. lotievi* and *P. renardi* "west." The maximal number of supralabials is observed in *P. renardi* "west" and *P. renardi* "east." The maximal number of sublabials is marked for *P. lotievi*, the minimal one — for *P. renardi* "east." The number of shields round the eyes and loreals for *P. lotievi* is lesser than for *P. renardi* "west" and *P. renardi* "east." Number of scales around a neck of *P. eriwanesis* and *P. lotievi* lesser than in *P. renardi* "west." Number of scales around distal part of body for *P. eriwanensis* higher whereas number of sublabials and number of wings of zigzag are lower than for *P. lotievi*.

Females. Number of preventrals, ventrals and subcaudals for *P. lotievi*, *P. renardi* "west," and *P. renardi* "east" are higher than for vipers from Shemakha and *P. eriwanesis*. For Shemakha specimens the maximal number of crown shields of head and minimal number of wings of zigzag are recorded. In both samples of females of *P. renardi*, as well as for males, a maximal number of supralabials and minimal of sublabials are marked. The minimal number of loreals and shields round the eyes is marked for *P. lotievi* "east." Number of scales around a neck, midbody and posterior part of body for *P. eriwanesis*, and *P. lotievi* is lesser than for *P. renardi* "west" and *P. renardi* "east."

Due to heterogeneity and limited number of some samples, also because of individual variability we found that the sexual dimorphism in samples is expressed in the different sets of characters. We will consider characters with sexual dimorphism for each population separately (Tables 4 and 5):

P. eriwanensis ($n = 21$). Males have higher number of subcaudals and wings of zigzag, but lesser number of ventral shields than females.

Pelias sp., Shemakha population ($n = 12$). Males have higher number of subcaudals than females.

TABLE 1. Examined Specimens of *Pelias lotievi*, *P. eriwanensis*, *P. renardi*, *P. shemakhensis* sp. nov., Stored in Herpetological Collections of Sochi National Park (SNP), and Zoological Institute of Russian Academy of Sciences in St. Petersburg (ZISP), 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
ZIRA 40715	*Pelias eriwanensis*	1	1	Armenia, Ararat Marz, "Khosrov Forest" Reserve, above Kakavaberd Castle, place Tapchan Elakh	06.2011	A. Malkhasjan
ZIRA 40717	*Pelias eriwanensis*	1	1	Armenia, Ararat Marz, "Khosrov Forest" Reserve, above Kakavaberd Castle, place Tapchan Elakh	06.2011	A. Malkhasjan
ZIRA 40713	*Pelias eriwanensis*	1	1	Armenia, Ararat Marz, "Khosrov Forest" Reserve, above Kakavaberd Castle, place Tapchan Elakh	06.2011	A. Malkhasjan
ZIRA 40718	*Pelias eriwanensis*	1	1	Armenia, Ararat Marz, "Khosrov Forest" Reserve, above Kakavaberd Castle, place Tapchan Elakh	06.2011	A. Malkhasjan
ZIRA 40714	*Pelias eriwanensis*	1	1	Armenia, Ararat Marz, "Khosrov Forest" Reserve, above Kakavaberd Castle, place Tapchan Elakh	06.2011	A. Malkhasjan
ZIRA 40716	*Pelias eriwanensis*	1	1	Armenia, Sjunik Marz, Sisian, vicinity of villages Getatakh and Lor, place Jabrail	12.05.2006	A. Malkhasjan
ZIRA 40721	*Pelias eriwanensis*	1	1	Armenia, Sjunik Marz, Sisian, vicinity of villages Getatakh and Lor, place Jabrail	12.05.2006	A. Malkhasjan
ZIRA 40719	*Pelias eriwanensis*	1	1	Armenia, Sjunik Marz, Sisian, vicinity of villages Getatakh and Lor, place Jabrail	12.05.2006	A. Malkhasjan
ZIRA 40720	*Pelias eriwanensis*	1	1	Armenia, Sjunik Marz, Sisian, vicinity of villages Getatakh and Lor, place Jabrail	12.05.2006	A. Malkhasjan
ZIRA no No.	*Pelias eriwanensis*	1	1	Armenia, Sjunik Marz, Sisian, vicinity of villages Getatakh and Lor, place Jabrail	12.05.2006	A. Malkhasjan
SNP 890	*Pelias eriwanensis*	1 subadult + + 1 adult	1	Armenia, Areguni Ridge, vicinity of village Drakhtik	19 – 20.05.2012	S. B. Tuniyev
SNP 894	*Pelias eriwanensis*	1 adult	1	Armenia, Khustup-Katar Ridge, branch of Mt. Katar above the village Verin Giratakh	11.05.2012	B. S. Tuniyev
ZIRA unnumbered	*Pelias eriwanensis*	2 subadults + + 1 juv.	1	Armenia, Khustup-Katar Ridge, branch of Mt. Katar above the village Verin Giratakh		A. Malkhasjan
ZIRA 708	*Pelias eriwanensis*	1 subadult + + 2 juv.	1	Armenia, south slope of Urc Ridge	8 and 18.05.1939	S. K. Dal'
ZIRA 812	*Pelias eriwanensis*	2 subadults	1	Armenia, Urc Ridge Armenia near village Asni	10.05.1950	P. P. Gambaryan
ZIRA 615	*Pelias eriwanensis*	1 subadult	1	Armenia, Akhty (Razdan) District, village Sukhoy Fontan	03.06.1936	Izmailov
SNP 733	*Pelias lotievi*	3 juv.	3	Russia, Dagestan Republic, Agulsky District, Djufudag Ridge, vicinity of village Shari.	21.08.2007	B. S. Tuniyev, S. B. Tuniyev
SNP 738	*Pelias lotievi*	1 adult + + 3 juv.	3	Russia, Dagestan Republic, Agulsky District, Djufudag Ridge, vicinity of village Shari	21.08.2007	B. S. Tuniyev, S. B. Tuniyev
SNP 739	*Pelias lotievi*	1 adult + + 4 juv.	3	Russia, Dagestan Republic, Agulsky District, Djufudag Ridge, vicinity of village Shari	21.08.2007	B. S. Tuniyev, S. B. Tuniyev
SNP 740	*Pelias lotievi*	1 adult	3	Russia, Dagestan Republic, Agulsky District, Djufudag Ridge, vicinity of village Shari	21.08.2007	B. S. Tuniyev, S. B. Tuniyev
SNP 743	*Pelias lotievi*	1 adult	3	Russia, Dagestan Republic, Agulsky District, Djufudag Ridge, vicinity of village Shari	21.08.2007	B. S. Tuniyev, S. B. Tuniyev
SNP 744	*Pelias lotievi*	1 adult	3	Russia, Dagestan Republic, Agulsky District, Djufudag Ridge, vicinity of village Shari	21.08.2007	B. S. Tuniyev, S. B. Tuniyev
SNP 745	*Pelias lotievi*	1 adult	3	Russia, Dagestan Republic, Agulsky District, Djufudag Ridge, vicinity of village Shari	21.08.2007	B. S. Tuniyev, S. B. Tuniyev
SNP 746	*Pelias lotievi*	1 adult + + 4 juv.	3	Russia, Dagestan Republic, Agulsky District, Djufudag Ridge, vicinity of village Shari	21.08.2007	B. S. Tuniyev, S. B. Tuniyev
SNP 750	*Pelias lotievi*	1 adult	3	Russia, Dagestan Republic, Agulsky District, Djufudag Ridge, vicinity of village Shari	21.08.2007	B. S. Tuniyev, S. B. Tuniyev
SNP 749	*Pelias lotievi*	1 adult	3	Russia, Dagestan Republic, Agulsky District, Djufudag Ridge, vicinity of village Burshag.	21.08.2007	B. S. Tuniyev
SNP 735	*Pelias lotievi*	19 adult + + 1 juv.	3	Russia, Dagestan Republic, Charodinskiy Reservation, vicinity of village Ritlyab.	19.08.2007	B. S. Tuniyev, S. B. Tuniyev

TABLE 1 (continued)

Coll. No.	Species	*n*	Sample	Collection locality	Date	Collector
SNP 764	*Pelias lotievi*	2 adult + + 1 juv.	3	Russia, Dagestan Republic, Shamil District, vicinity of village Tidip.	22.06.2008	Z. Sultanova
SNP 901	*Pelias renardi* "west"	2 adult	4	Russia, Krasnodar Kray, vicinity of settlement Saratovskaya	20.04.2012	I. N. Timukhin, S. B. Tuniyev
SNP 912	*Pelias renardi* "west"	1 adult + + 3 juv.	4	Russia, Krasnodar Kray, vicinity of settlement Saratovskaya	06.10.2012	B. S. Tuniyev, S. B. Tuniyev
SNP 913	*Pelias renardi* "west"	1 subadult	4	Russia, Krasnodar Kray, vicinity of settlement Saratovskaya	20.04.2012	I. N. Timukhin, S. B. Tuniyev
SNP 914	*Pelias renardi* "west"	1 adult	4	Russia, Krasnodar Kray, vicinity of settlement Saratovskaya	20.04.2012	I. N. Timukhin, S. B. Tuniyev
SNP 549	*Pelias renardi* "west"	1 adult	4	Russia, Krasnodar Kray, vicinity of settlement Saratovskaya	04.2000	B. S. Tuniyev
SNP 557	*Pelias renardi* "west"	1 adult + + 1 subadult	4	Russia, Krasnodar Kray, vicinity of settlement Yasenskaya Pereprava	26.06.2001	S. B. Tuniyev
SNP 560	*Pelias renardi* "west"	1 adult	4	Russia, Krasnodar Kray, vicinity of settlement Yasenskaya Pereprava	22.06.2001	S. B. Tuniyev
SNP 821	*Pelias renardi* "west"	7 juv.	4	Russia, Adyghe Republic, Maykop District, vicinity of settlements Timiryazevo and Pervomaysky	16.08.2007	A. A. Kidov
SNP 849	*Pelias renardi* "west"	2 adult	4	Rostov-on-Don Oblast', vicinity of Volgodonsk	05.2009	
SNP 785	*Pelias renardi* "east"	1 adult + + 1 subadult	5	Russia, vicinity of Kislovodsk town, Mt. Kaban	23.05.2009	K. Yu. Lotiev, S. B. Tuniyev
SNP 819	*Pelias renardi* "east"	1 adult + + 3 juv. + + 1 subadult	5	East Kazakhstan, Kapchagay Basin, Zmeiniy Island		Yu. Zhuravlev
SNP 850	*Pelias renardi* "east"	1 adult	5	Russia, Astrakhan Oblast', vicinity of settlement Djang	08.2009	S. G. Pykhov
SNP 782	*Pelias renardi* "east"	5 adult	5	Russia, Republic of Kalmykia, northern bank of lake Manych, protected area of Chernye Zemli Reserve, Kirista peninsular	18.05.2009	S. B. Tuniyev, B. S. Tuniyev
ZISP 21720	*P. shemakhensis* sp. nov.	1 subadult	2	Azerbaijan, Shemakhan (= Shemakha)	14.04.1974	L. A. Erukh

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 Sublabials 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)

TABLE 2 (continued)

No.	Conditional shortening	Name	Notice
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	Number of supralabial shields below eye

TABLE 3. Comparison of Meristic Characters of All Age Groups (adult + juvenile) of *P. eriwanensis*, *P. shemakhensis* sp. nov., *P. lotievi*, *P. renardi* "west," and *P. renardi* "east"

Group	Pr.	Ven.	S.c.	Ap.	C.s.	Can.	Sq.1	Sq.2	Sq.3	Supralab.	Sublab.	F.c.	ZZ	Lor.
♂♂ 1/2 $n = 11$	0	0	0	0	**	—	—	0	—	0	0	0	—	0
♂♂ 1/3 $n = 22$	0	***	***	0	0	0	0	0	**	0	**	0	**	0
♂♂ 1/4 $n = 16$	*	*	0	0	0	0	**	0	0	0	***	0	0	0
♂♂ 1/5 $n = 12$	0	0	*	0	0	0	0	0	0	***	*	0	0	0
♂♂ 2/3 $n = 15$	0	**	***	0	***	—	—	0	—	0	0	0	—	0
♂♂ 2/4 $n = 9$	0	0	0	0	**	—	—	0	—	0	0	0	—	0
♂♂ 2/5 $n = 5$	0	0	0	0	0	—	—	0	—	***	*	0	—	0
♂♂ 3/4 $n = 21$	*	0	0	0	0	0	**	0	0	***	**	0	0	**
♂♂ 3/5 $n = 17$	0	0	0	0	0	0	0	0	0	***	***	*	0	*
♂♂ 4/5 $n = 10$	0	0	0	0	0	0	0	0	0	0	0	0	0	0
♀♀ 1/2 $n = 22$	0	0	0	0	***	—	—	0	—	**	0	0	**	0
♀♀ 1/3 $n = 45$	0	***	**	0	0	0	0	0	0	*	*	***	0	***
♀♀ 1/4 $n = 29$	0	***	**	0	0	0	***	**	0	***	**	0	0	0
♀♀ 1/5 $n = 17$	0	*	**	0	0	0	0	0	0	***	0	0	0	0
♀♀ 2/3 $n = 43$	*	***	**	0	***	—	—	0	—	0	*	***	***	*
♀♀ 2/4 $n = 27$	0	***	**	0	***	—	—	0	—	***	***	0	***	0
♀♀ 2/5 $n = 15$	0	**	**	0	**	—	—	0	—	***	***	0	0	0
♀♀ 3/4 $n = 50$	0	***	0	0	0	0	***	***	**	***	***	**	0	**
♀♀ 3/5 $n = 38$	0	0	0	0	0	0	*	0	0	***	***	***	0	0
♀♀ 4/5 $n = 22$	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes. Levels of meaningfulness: * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$; 0, there are not reliable differences; «—», data absent.

P. lotievi ($n = 46$). Number of subcaudals, shields round the eyes and wings of zigzag higher for males while preventrals, ventrals and loreals are lesser.

P. renardi "west" ($n = 24$). Number of preventrals, subcaudals and wings of zigzag higher for males, females have higher number of supralabials and scales round a neck.

P. renardi "east" ($n = 8$). Number of subcaudal shields higher for males than for females.

Due to heterogeneity and limited number of some samples the age-dependent variability is recorded only for the females of *P. renardi* "west." Adult specimens have more high number of ventrals, supralabials and loreal shields than juveniles. This data are associated with the presentation in sample specimens from one litter which show at least 50% likenesses with maternal specimens.

The careful consideration of images and table of morphological characteristics of vipers in the paper of Kukushkin et al. (2012) from Shemakha – Demirchi shows differences in the method of count of the number of crown shields on the head and number of supralabials by these authors and for us whereas the counting of other eight characters is identical. Due to these reasons we consciously eliminated methodologically different information on two indicated characters and utilized in cluster and discriminant analyses only eight meristic characters (Pr., Ven., S.c., Sq.2, Sublab., F.c., ZZ., Lor.).

TABLE 4. Comparison of Meristic Characters of Joint Adult and Juvenile Males and Females

Character	*Pelias eriwanensis*				*Pelias shemakhensis* sp. nov.				*Pelias lotievi* "east"			
	♂♂ (*n* = 9) min – max / $\bar{x} \pm m$	♀♀ (*n* = 12) min – max / $\bar{x} \pm m$	*t*	*P*	♂♂ (*n* = 2) min – max / $\bar{x} \pm m$	♀♀ (*n* = 10) min – max / $\bar{x} \pm m$	*t*	*P*	♂♂ (*n* = 13) min – max / $\bar{x} \pm m$	♀♀ (*n* = 33) min – max / $\bar{x} \pm m$	*t*	*P*
Pr.	0 – 3 / 1.7 ± 0.3	1 – 3 / 2.1 ± 0.2	1.4	>0.05	2 – 3 / 2.5 ± 0.5	1 – 3 / 1.7 ± 0.2	1.5	>0.05	0 – 3 / 1.8 ± 0.3	1 – 4 / 2.4 ± 0.1	2.06	<0.05
Ven.	128 – 139 / 132.8 ± 1.5	131 – 143 / 136.6 ± 1	2.22	<0.05	133 – 135 / 134 ± 1	129 – 141 / 134.9 ± 0.1	0.3	>0.05	135 – 142 / 138.2 ± 0.6	136 – 148 / 140.2 ± 0.4	2.5	<0.01
S.c.	32 – 37 / 34.6 ± 0.6	22 – 30 / 26.5 ± 0.6	9.4	<0.001	32 – 34 / 33 ± 1	24 – 29 / 26.3 ± 0.5	5.8	<0.001	36 – 40 / 37.5 ± 0.4	20 – 32 / 28.5 ± 0.4	13.4	<0.001
Ap.	1 – 2 / 1.2 ± 0.2	1 – 2 / 1.1 ± 0.1	0.9	>0.05	1	0 – 1 / 0.9 ± 0.1	0.4	>0.05	1	1 – 2 / 1.1 ± 0.1	1.1	>0.05
Crown scales	5 – 9 / 6.9 ± 0.6	4 – 9 / 6.5 ± 0.5	0.5	>0.05	11 – 14 / 12.5 ± 1.5	6 – 17 / 13.3 ± 1	0.3	>0.05	3 – 9 / 5.8 ± 0.4	3 – 10 / 6.2 ± 0.3	0.8	>0.05
Can.	5 – 6 / 5.2 ± 0.2	5 – 6 / 5.1 ± 0.1	0.9	>0.05	—	—	—	—	5	3 – 6 / 5 ± 0.1	—	—
Sq.1	19 – 21 / 20.3 ± 0.3	20 – 21 / 20.9 ± 0.1	1.9	>0.05	—	—	—	—	19 – 22 / 20.6 ± 0.2	19 – 22 / 20.9 ± 0.1	1.6	>0.05
Sq.2	19 – 21 / 20.7 ± 0.2	20 – 21 / 20.8 ± 0.1	0.7	>0.05	21	21	—	—	20 – 21 / 20.4 ± 0.3	19 – 21 / 20.6 ± 0.1	1	>0.05
Sq.3	17	17 – 18 / 17.1 ± 0.1	0.9	>0.05	—	—	—	—	16 – 17 / 16.5 ± 0.1	16 – 18 / 16.8 ± 0.1	1.8	>0.05
Supralab.	8 – 9 / 8.95 ± 0.05	7 – 10 / 9.2 ± 0.2	1.2	>0.05	9	9	—	—	7 – 10 / 8.6 ± 0.2	8 – 10 / 8.8 ± 0.1	1.3	>0.05
Sublab.	8 – 10 / 9.4 ± 0.2	8 – 11 / 9.6 ± 0.2	0.5	>0.05	10	11 – 12 / 10.5 ± 0.2	1.02	>0.05	9 – 11 / 10.1 ± 0.2	8 – 11 / 10 ± 0.2	0.7	>0.05
F.c.	8 – 11 / 9.55 ± 0.25	7 – 11 / 9.6 ± 0.2	0.05	>0.05								
ZZ	68 – 84 / 73.5 ± 1.6	46 – 82 / 65.4 ± 2.85	2.26	<0.05	53 – 64 / —	46 – 62 / 54.8 ± 1.55	—	—	73 – 93 / 80 ± 1.8	55 – 81 / 69.25 ± 1	5.4	<0.001
Lor.	2 – 6 / 4.6 ± 0.35	4 – 8 / 5.5 ± 0.3	1.8	>0.05	4 – 5 / 4.5 ± 0.5	3 – 7 / 5.05 ± 0.35	0.7	>0.05	2 – 6 / 3.75 ± 0.3	2 – 6 / 4.4 ± 0.2	2.03	<0.05
In	–94.4% +5.6%	–87.5% +12.5%	—	—	–50% +50%	–63.6% +36.4%	—	—	–37.5% +62.5%	–9.1% +90.9%	—	—

Note. «—», data absent.

As a result of cluster analysis we have dendrograms from 8 meristic characteristic of pholidosis forming three clades: the most early division happened between Transcaucasian and North Caucasus populations with the subsequent division of the South clade into *P. eriwanensis* and *Pelias* sp. from Shemakha, by a north — on *P. lotievi* and *P. renardi* (Figs. 7 and 8), minimum distance is marked between clades of *P. renardi* "east" and *P. renardi* "west."

Geographical variability of morphological characters in populations of steppe vipers is considered also with the use of CDA, allowing a comparison of the preliminary selected groups in the complex of characters (Tyurin et al., 2003). For comparison of *Pelias eriwanensis*, east group of *P. lotievi* and vipers from north-eastern Azerbaijan as out-groups *Pelias renardi* ("west"/"east") was taken. Due to limited number of specimens we use a complex of 7 meristic characters for males (Pr., Ven., S.c., Sq.2, Sublab., F.c., Lor.) and of 8 meristic characters for females (Pr., Ven., S.c., Sq.2, Sublab., ZZ., F.c., Lor.). Reliable differences were obtained in statistical analysis. Snakes a priori were divided into ten sexual and geographical groups.

The results of CDA showed relatively high accuracy of division of geographical groups. Accuracy for males is the following: *P. eriwanensis* — 66.7%, *Pelias* sp. from Shemakha — 100%, *P. lotievi* — 92.3%, *P. renardi* "west" — 85.7%, *P. renardi* "east" — 100%; for females: *P. eriwanensis* — 75%, *Pelias* sp. from Shemakha — 80%, *P. lotievi* — 93.5%, *P. renardi* "west" — 82.4%, *P. renardi* "east" — 40%.

TABLE 5. Comparison of Meristic Characters of All Age Groups Both Sexes *Pelias renardi* from East and West Groups of Populations

Character	*Pelias renardi* "west"				*Pelias renardi* "east"			
	♂♂ (n = 7) min – max / $\bar{x} \pm m$	♀♀ (n = 17) min – max / $\bar{x} \pm m$	t	P	♂♂ (n = 3) min – max / $\bar{x} \pm m$	♀♀ (n = 5) min – max / $\bar{x} \pm m$	t	P
Pr.	2 – 3 / 2.6 ± 0.2	1 – 3 / 2.1 ± 0.1	2.07	<0.05	2 – 3 / 2.3 ± 0.3	2 – 3 / 2.2 ± 0.2	0.4	>0.05
Ven.	133 – 146 / 138.6 ± 1.9	137 – 148 / 142.9 ± 0.8	2.5	<0.01	137 – 142 / 138.7 ± 1.7	138 – 150 / 141.8 ± 2.3	0.9	>0.05
S.c.	34 – 39 / 36.3 ± 0.7	23 – 31 / 28.6 ± 0.5	8.6	<0.001	36 – 40 / 37.3 ± 1.3	27 – 31 / 29.4 ± 0.7	6	<0.001
Ap.	1	1	—	—	1	1	—	—
Crown scales	4 – 9 / 6.3 ± 0.6	5 – 9 / 7.1 ± 0.3	1.2	>0.05	3 – 8 / 6 ± 1.5	5 – 11 / 7.4 ± 1.02	0.8	>0.05
Can.	5	5	—	—	5	5	—	—
Sq.1	21 – 22 / 21.6 ± 0.7	21 – 23 / 22.4 ± 0.2	2.8	<0.01	21	20 – 23 / 21.6 ± 0.5	0.9	>0.05
Sq.2	21	21 – 23 / 21.5 ± 0.2	1.6	>0.05	20 – 21 / 20.7 ± 0.3	20 – 21 / 20.8 ± 0.2	0.4	>0.05
Sq.3	16 – 18 / 17 ± 0.2	16 – 19 / 17.4 ± 0.2	1	>0.05	17	16 – 17 / 16.8 ± 0.2	0.75	>0.05
Supralab.	9 – 10 / 9.7 ± 0.1	9 – 11 / 10.2 ± 0.2	2.4	<0.05	10	10 – 11 / 10.3 ± 0.2	1.1	>0.05
Sublab.	9 – 11 / 9.35 ± 0.2	8 – 10 / 9 ± 0.1	1.6	>0.05	8 – 9 / 8.5 ± 0.3	8 – 9 / 8.9 ± 0.1	1.6	>0.05
F.c.	8 – 11 / 9.5 ± 0.3	7 – 10 / 9.15 ± 0.15	1.1	>0.05	10 – 11 / 10.15 ± 0.2	8 – 11 / 9.8 ± 0.45	0.6	>0.05
ZZ	67 – 85 / 77 ± 2.65	58.5 – 80 / 69.9 ± 3.4	2.3	<0.05	58 – 92 / 75.15 ± 9.8	53 – 82 / 64 ± 5.7	1.1	>0.05
Lor.	3 – 7 / 5 ± 0.4	3 – 7 / 5 ± 0.5	—	—	4 – 6 / 5.2 ± 0.45	3 – 6 / 5.1 ± 0.45	0.1	>0.05
In	–7.1% +92.9%	–61.8% +38.2%	—	—	–33.3% +66.7%	–40% +60%	—	—

Note. «—», data absent.

The results of CDA show that in space of discriminant functions males formed five groups (Fig. 9). In the first one the males of *P. eriwanensis* originated from Armenia, in the second — *Pelias* sp. from Shemakha (Azerbaijan), in the third — *P. lotievi* (Russia, Dagestan), in the fourth — *P. renardi* "west," in the fifth — *P. renardi* "east." By the first discriminant function animals were divided into two groups: *P lotievi* form a cloud separate from all other taxa which differentiate from each other by the second function.

Distributing in space of discriminant functions of females (Fig. 10) appeared more heterogeneous with formation of four independent groups. It is necessary to notice that these groups are well isolated by both discriminant functions. At specific level (on the first function) we see differences at *P. renardi*, *P. eriwanensis* from *P. lotievi* — *Pelias* sp. from Shemakha, while the last two taxa are characterized rather as forms of subspecific level, whereas differences between *P. renardi* "east" and *P. renardi* "west" demonstrate low population differences only.

It is known that the narrow norm of reaction of males makes them less plastic in ontogenesis, which results in evolutional transformations among males which can be considered as an evolutional "advance-guard" of population, and populational sexual dimorphism as a vector of variability (Geodakyan, 1985).

The results obtained confirm the high degree of morphological separation of the compared samples of vipers. Degree of likeness between the selected samples in a CDA estimated on the size of distance of Makhalonobis (Tyurin et al., 2003). The distances between the centers of samples of vipers varied from 6.2 to 34.3. Minimum value was shown between males of *P. renardi* "east" and *P. renardi* "west" (6.2), males of *P. renardi* "west" and *P. eriwanensis* (6.8) and males of *P. renardi* "west" and *P. lotievi* (7.9); maximal (34.3) — between males from Shemakha and *P renardi* "east" (Table 5). For the fe-

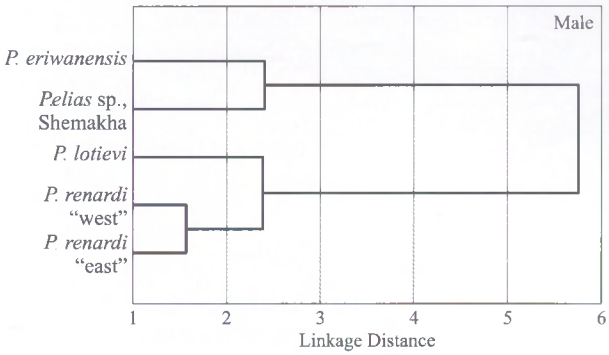

Fig. 7. Results of cluster analysis (UPGMA method) of five groups of males of steppe vipers based on features of pholidosis.

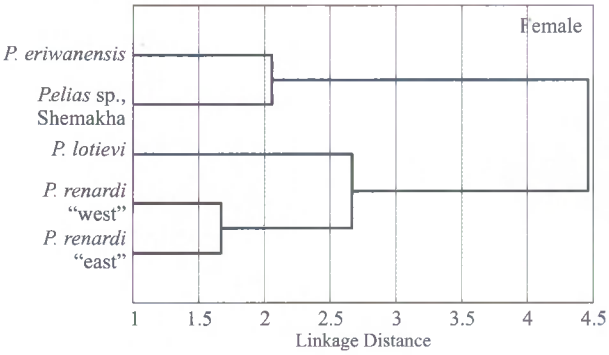

Fig. 8. Results of cluster analysis (UPGMA method) of five groups of females of steppe vipers based on features of pholidosis.

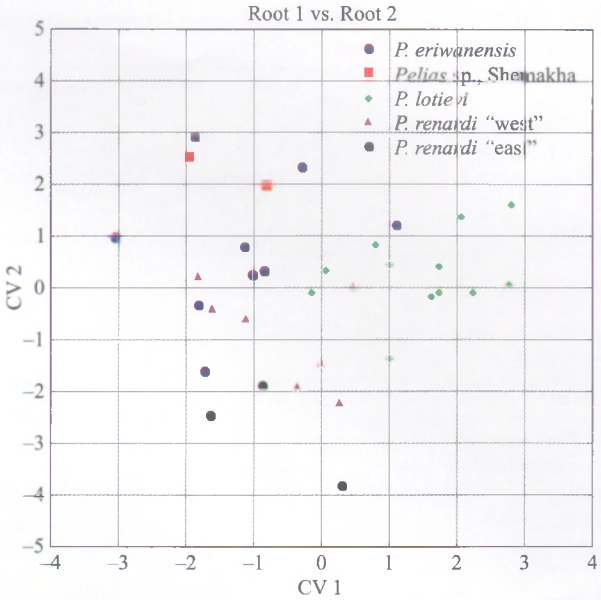

Fig. 9. Two-dimensional scatterplot of samples of mails of steppe vipers in space of CDA function on the complex of morphometric characters.

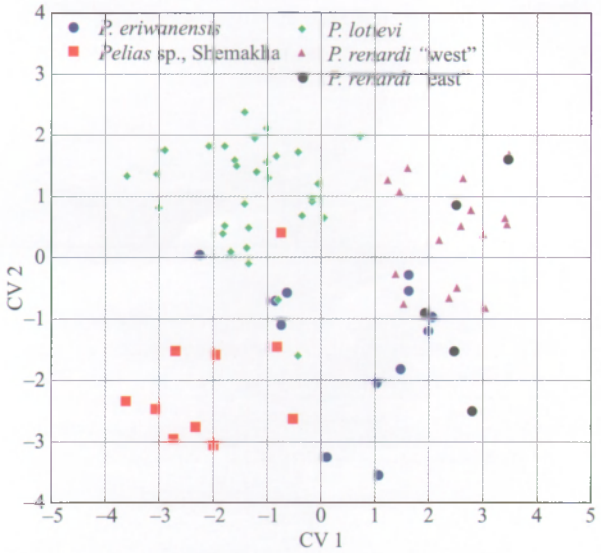

Fig. 10. Two-dimensional scatterplot of samples of females of steppe vipers in space of CDA function on the complex of morphometric characters.

males this distance between the centers of samples varied from 3.5 to 28.1. Minimum (3.5) was recorded between the females of *P. renardi* "east" and *P. renardi* "west," the females of *P. renardi* "east" and *P. eriwanensis* (9.4), *P. renardi* "west" and *P. eriwanensis* (9.1); maximal (28.1) — between females from Shemakha and *P. renardi* "east" (Table 6).

The contribution of different morphological characters to discrimination of groups is different. Because the first discriminant function takes into account the most percent of dispersion and dividing of animals into basic groups occurs exactly along it, we will describe the contribution of characters to the division of groups on the basis of values of this function (Tables 7 and 8).

A maximal contribution to discrimination of groups of males (Table 7) was made by the followings characters: number of scales round the midbody, number of shields round an eye, number of preventral shields, number of loreals, number of ventrals, number of subcaudals, number of sublabials.

A maximal contribution to discrimination of groups of females (Table 8) was made by the followings characters: number of loreals, number of preventrals, number of subcaudals, number of ventral shields, number of wings of zigzag, number of scales round the midbody, number of shields round an eye, number of sublabials.

During our study new information was obtained about the morphology and geographical variability of four species of vipers. Most valuable is revealing of substantial differences in the mean values in a number of

TABLE 6. Mahalonobis Distances and Levels of Significance Among the Groups of Males *P. eriwanensis*, *P. shemakhensis* sp. nov., *P. lotievi*, *P. renardi* "west," *P. renardi* "east" on CDA Results

Sample	*P. eriwanensis*	*P. shemakhensis* sp. nov.	*P. lotievi*	*P. renardi* "west"	*P. renardi* "east"
P. eriwanensis	—	11.4	10.6	9.1	9.4
P. shemakhensis sp. nov.	0.000005	—	11.6	27.6	28.1
P. lotievi	0.000000	0.0	—	15.4	20.4
P. renardi "west"	0.000005	0.0	0.0	—	3.5
P. renardi "east"	0.005030	0.0	0.0	0.290113	—

TABLE 7. Mahalonobis Distances and Levels of Significance Among the Groups of Females *P. eriwanensis*, *P. shemakhensis* sp. nov., *P. lotievi*, *P. renardi* "west," *P. renardi* "east" on CDA Results

Sample	*P. eriwanensis*	*P. shemakhensis* sp. nov.	*P. lotievi*	*P. renardi* "west"	*P. renardi* "east"
P. eriwanensis	—	8.7	9.6	6.8	14.6
P. shemakhensis sp. nov.	0.538439	—	17.9	13.1	34.4
P. lotievi	0.001155	0.122162	—	7.9	16.6
P. renardi "west"	0.036898	0.305161	0.009589	—	6.2
P. renardi "east"	0.036183	0.039427	0.015550	0.420612	—

TABLE 8. Value of Different Morphological Characters in Separation of Males Group *P. eriwanensis*, *P. shemakhensis* sp. nov. and *P. lotievi* (on CDA Results)

Character	Standardized coefficient of first discriminant function	Character rank
Pr.	0.83	3
Ven.	0.69	5
S.c.	0.58	6
Sq.2.	0.89	1
Sublab.	0.55	7
F.c.	0.88	2
Lor.	0.80	4

TABLE 9. Value of Different Morphological Characters in Separation of Females Group *P. eriwanensis*, *P. shemakhensis* sp. nov. and *P. lotievi* (on CDA Results)

Character	Standardized coefficient of first discriminant function	Character rank
Pr.	0.85	2
Ven.	0.79	4
S.c.	0.84	3
Sq.2	0.73	6
Sublab.	0.4	8
F.c.	0.70	7
ZZ.	0.76	5
Lor.	0.86	1

metric and meristic characters of snakes (Tables 2 – 4), and also discrimination of four groups from five samples, selected on principle of geographical and sexual identity using a cluster analysis and CDA (Figs. 7 – 10; Tables 5 and 6).

The results obtained allow to make a conclusion about taxonomical status of all of five groups, four from which differ at the species level and two at subspecies level.

DESCRIPTION OF A NEW SPECIES

Family Viperidae Laurenti, 1768
Genus *Pelias* Merrem, 1820
Pelias shemakhensis Tuniyev, Orlov, Tuniyev et Kidov sp. nov.

Diagnosis. Small viper, different from other species by minimal number of wings in zigzag (54.8), by the presence of specimens with unique combination from four canthal shields under the absence of apicals. Brown cervical zigzag with small wings is located on the dirty-white back. On each side of body dark shallow patches are located chequer wise in 2 – 3 rows, unlike one row of large dark patches mainly typical for other representatives of "*ursinii*" complex in the Caucasian Isthmus.

Holotype. Herpetological collection of Zoological Institute of Russian Academy of Sciences in St. Petersburg, ZISP, No 21720, Vicinity of Shemakhan (= Shemakha, north-eastern Azerbaijan), 25.04.1972, Coll. E. A. Erukh (Fig. 11*a*, *b*).

Description of holotype. Subadult male. Length of body from the snout to the anus (L.) — 145 mm, length of tail (L.cd.) — 28 mm, preventrals 2, ventrals 133, subcaudals 33, apical is absent, canthals 4. Number of crown shields (Cr) — 4. Upper preocular shield in touch with nasal, round a neck and midbody 21 scales, round the posterior end of body 17 scales. Supralabials on the right 10, on the left 9, sublabials 8, round eyes on the

Fig. 11. Holotype of *Pelias shemakhensis* sp. nov.: *a*, from above; *b*, from below.

right 11 on the left 9 shields. Wings of zigzag on the right 63 on the left 64. Loreals 3, length of head — 11.6 mm, width — 5.3 mm, height — 3.9 mm, length of pileus — 7.16 mm. Parietal, frontal and nasal shields are not divided. A throat is painted in light almost white tones. Lips pigmentation is rose-gray tones. A belly and ventral part of tail is dark, almost black.

Etymology. The species is named after geographical name of Shemakha District of Azerbaijan which is marked as type location (terra typica) of the described species.

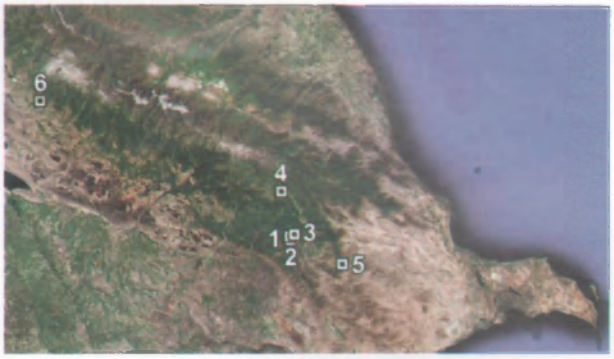

Fig. 12. Distribution of *Pelias shemakhensis* sp. nov.: 1, Shemakha town; 2, Village Khynysly; 3, Village Angekharan; 4, Village Demirchi; 5, Village Maraza; 6, Nukhi (= Sheki) town.

Geographical distribution and biotopes. Recent distribution of species is limited by the Shemakha District of Azerbaijan, from where it is known from vicinity of Shemakha town, Village Demirchi; Gobustan District — Village Maraza. Aliev (1973) noted finds of steppe vipers in the north Azerbaijan in Shemakha District (Villages Khankend, Ortabulag, Eddi, Krumbez, and others) and in Sheki District (Villages Akhmedbeli, Gazakend). Alekperov (1978) specified finds in town Shemakha, between Shemakha and Village Angekharan, between Shemakha and Village Khynysly, at the foot of Mt. Pirdirechidag, on the slopes of Mt. Gyzkalasy. Alekperov also specified on specimens, stored in State Museum of Georgia (Tbilisi) from village Karatala and city Nukhi (= Sheki), now located in Azerbaijan. Finding of species in the north-eastern steppe districts of East Georgia requires clarification. The area of distribution is obviously relict, of oppressed type (Fig. 12).

Alekperov (1978) specified that in vicinity of Shemakha a viper occurs on the altitude of a 700 m a.s.l. on the stony areas of mountains, covering by a xerophylous grasses and shrub vegetation, also in the small agricultural sowing, in the heaps of stone on the plough-lands and along the roads. For Shirak Steppe in East Georgia Dzhanashvili (1951) noted its occurrence along a highway.

According to our observations the biotopes of species are presented by shibliaks of *Paliurus spina-christy* and ecotones of dry *Andropogon* steppes and derivates of the broad-leaved forests on the stony slopes of foothills (Figs. 13 and 14). By other words, vipers are pushed now from steppes habitats into unusual for them biotopes, quite recently presenting areas of the broad-leaved for-

Fig. 13. Habitats of *Pelias shemakhensis* sp. nov., below Shemakha town.

Fig. 14. Biotopes of *Pelias shemakhensis* sp. nov. near village Khynysly: shibliaks of *Paliurus spina-christy* and ecotones of dry *Andropogon* steppes and derivates of the broad-leaved forests.

ests the extreme variant of which degradation is a *Paliurus* shibliak.

Presumably this viper was earlier locally numerous. So Dzhanashvili (1951) noted that in 1944 13 specimens were killed in Shirak Steppe within 15 km. Alekperov (1978) recorded the numerous specimens originated from Shemakha: only for feeding study 22 specimens were dissected. Aliev (1973) observed on the 05/24/1972 eight specimens together in Shemakha District and he assumed it was matting.

Presently, as discussed higher, a species became very rare in north-eastern Azerbaijan and in north-eastern Georgia it possibly was extinct. As rare taxa, limited in a natural habitat and a number *Pelias shemakhensis* sp. nov. needs to be included in the Red List of IUCN and Red Data Book of Azerbaijan with the category of status of CR B1ab (i, ii, iii, iv, v).

DISCUSSION

Modern molecular study (Ferchaud et al., 2012) of the members of "*ursinii*" complex on the basis of mitochondrial cytochrome b and NADH dehydrogenase subunit 4 (ND4) genes, according to presented cladograms evidently demonstrate the relation of *P. lotievi* and *P. renardi* with the division of these two forms at the end of Pleistocene. In the same time the clades of *P. eriwanensis* and *P. ebneri* have sister relations with the division of these forms at the beginning of Pleistocene (Fig. 5). In accordance with information of these authors (Ferchaud et al., 2012), penetration of representatives of "*ursinii*" complex to the Caucasus and to Transcaucasia took a place from the Balkan Peninsula, through Asia Minor, as it was assumed earlier in a number of authors. We can suppose the divergence into two branches, one of which engulfs the Caucasus and Precaucasia with forming of such forms as *P. lotievi* and *P. renardi* "west"/"east," and other branch occurs in Transcaucasia and Alburz from where more ancient *P. eriwanensis* and *P. ebneri* are known.

According to results of cluster analysis dendrograms is obviously, that all taxa studied are clearly distant and form four clades: *P. eriwanensis*, P. *shemakhensis* sp. nov., *P. lotievi* and *P. renardi* (Figs. 7 and 8). Minimum distance is marked between clades of *P. renardi* "east," *P. renardi* "west" and *P. lotievi*; notably, that distance between *P. renardi* "east" and *P. lotievi* is more high than between *P. renardi* "west" and *P. lotievi*.

Some data obtained by us and by other authors (Zinenko et al., 2011; Ferchaud et al., 2012; Gvozdik et al., 2012) confirming relations of *P. lotievi* and *P. renardi* can reflect the results of frequent hybridizations, influencing the external morphology and origin of different combination of haplotypes, but be not directly associated with relations and ways of dispersion of ancestors of complex of steppe vipers. Thus, use in the genetic analysis of specimens of *P. lotievi*, obtained from trade (pet trade) and use in the analysis the limited number of forms of steppe vipers of "*ursinii-renardi*" complexes leaded Gvozdik et al. (2012) to mixing of different taxa without understanding of the real history of evolution of landscapes and biota of the Caucasian Isthmus. As it was marked above, the existence of populations of *P. lotievi* with mixed morphological characters along whole its distribution range can be considered as an indirect evidence of frequent hybridization different forms long being in an isolation and periodically contacting in different historical periods (Tuniev et al., 2011). The data of Ferchaud et al. (2012) confirm the idea about the polytypic origin of *P. lotievi*. It is noteworthy that most of the authors consider the Asia Minor path of penetration of steppe vipers ancestors to the Caucasus, but actually in Asia Minor of members "*ursinii*" complex is present only *Pelias anatolica*, which systematic position remains controversial. *P. eriwanensis* is absent in Asia Minor and distributed in the South Transcaucasia and adjacent regions of the Armenian Highland in north-eastern Turkey. Practically all the records of *P. eriwanensis* out of the Armenian Highland in Turkey, on a check, appeared as members of "*kaznakovi*" complex (Tuniyev et al., 2012). Doubtful is indication Kukushkin et al. (2012) to belong to *P. eriwanensis* the vipers from the former Bogdanovka, located in close proximity to the area of distribution *P. darevskii*. In describing the Darevsky's viper (Vedmederya et al., 1986), this specimen was identified by the first author of the description, perfectly aware of vipers of the Caucasus, exactly as *P. darevskii*. At the same time other specimens originated from Javakheti part of Armenian Highland in southern Georgia, noted in the paper of Kukushkin et al. (2012), may indeed belong to *P. eriwanensis*.

It is known that in the Paleogene of the Caucasus already occur all recent families (Bakradze and Chkhikvadze, 1988); thus on the Caucasus and in the nearest environs of this Isthmus lived both mesophylous and various xerophylous species of herpetofauna, identical or close relative to the recent species of the Caucasus. Darevsky (1963) considers that by the end of Pliocene in the Caucasus already was formed a primary nuclei of its recent herpetofauna with such genus as *Agama* (= *Laudakia*), *Lacerta* sensu lato (Darevskia, *Lacerta* sensu stricto), *Ophisaurus* (= *Pseudopus*), *Anguis*, *Typhlops*, *Malpolon*, *Vipera*.

Taking into account the ancient origin of representatives of small shield-head vipers of the Caucasian Ecoregion and astonished variety of forms of "*kaznakovi*"

Fig. 15. *Pelias renardi* "west," Krasnodar Kray, vicinity of village Saratovskaya.

complex and "*ursinii*" complex both on Great Caucasus and in the south-west sector of Lesser Caucasus, logically to suppose this group of vipers as autochthonous for the Caucasus, but not to search ancestors in South Europe and, the more so, in Asia Minor. Nilson and Andrén (2001) are very close to this idea, considering the hypothetical scenario of origin and distribution of steppe vipers from the northeast to the southwest as well as the Caucasus as one of Pliocene refugia for the members of "*ursinii*" sensu lato. In any case, this question requires plenty of additional material from all of the Caucasian Ecoregion.

Especially interesting the noted unique combination of apical and canthal shields in specimens of *Pelias shemakhensis* sp. nov. (it is marked in 2 of 13 specimens, including holotype), which is absent for other members of "*ursinii*" complex.

Nilson and Andrén (2001) offer the following identification keys for species of *P. lotievi*, *P. eriwanensis*, and *P. renardi* in their monograph:

1(2) Supralabials and throat marked blackish; dark ventral side; belly black or blackish with light dots; large adult size (>44 cm); laterial body patterns of large blotches; 135 – 150 ventrals; lowland and foothill steppe habitats; S. Russia, N. Azerbaijan, Ukraine, Kazakhstan . . . . ***Pelias renardi***

2(1) Supralabials and throat whitish; white ventral side; small adult size (<44 cm); laterial body pattern of narrow stripes; 123 – 151 ventrals; from hilly steppe to alpine steppe and steppe habitats. 3

3(4) Preocular(s) often separated from nasal (in about 77% of the snakes); frontal undivided; posterior scale row reduction (mean at ventral 95); infrequently two apicals (in 27% of the snakes); Armenia, Azerbaijan, east Turkish Anatolia . . . . . ***Pelias eriwanensis***

4(3) Preocular(s) in contact with nasal; parietals and frontal divided in 14.3% of the snakes; 7 – 16 intercantals and intersupraoculars; normally with nasal split (in more than half of the specimens); polymorphism in color pattern (classic pattern of "seoanei" and "dinniki"-type, or uniform (= "bronze"-type)); when zigzag pattern present, a higher number of windings (50 – 81: $X = 65.5$); Great Caucasus (Russia, Georgia Azerbaijan). . . . . ***Pelias lotievi***

In the light of description of new species — *Pelias shemakhensis* sp. nov. from north-eastern Azerbaijan, which was considered by Nilson and Andrén (2001) as *P. renardi*, we provide the renewed identification key for all species of "*ursinii*" complex, distributed around the Great Caucasus and in the Lesser Caucasus with the Armenian Highland.

Identification Key, for Species of "*ursinii*" Complex

1(7) Sublabial shields painted in pink tones. **2**

2(4) Number of wings of zigzag on the average lesser than 60, color pattern on each lateral side of body from small dots, located in a chess order. **3**

3 Upper preocular separated from nasal in 50% males and in 63.6% females, on the average 134 ventrals for males, for females — 135, preventrals for males — 1.7, for females — 2.5, wings of zigzag 46 – 64 (for males on the average 58.5, for females — 54.8). Foothills of the south macroslope of the East Caucasus in north-eastern Azerbaijan and, possibly, in north-eastern Georgia . . . . . ***Pelias shemakhensis* sp. nov.**

4(2) Number of wings of zigzag on the average more high than 60, color pattern on each lateral side of body from row of large dark spots **5**

5(6) Upper preocular separated from nasal in 94.4% males, and 87.5% females. The shields of overhead part of head sometimes fragmented (frontal and parietal for 17.6% snakes); nasal shield often divided (for 52.9% snakes); not often two apicals (23.8% snakes); average number of ventrals for males — 132, for females -137, preventrals of males — 1.7, females — 2.1, subcaudals of males — 34.5, females — 26.5; number of shields round eyes in both sexes — 9.6, loreals in males — 4.6, females — 5.5; number of wings of zigzag 46 – 84: in males on the average 73.5, in females — 65.4; Armenian Highland (Armenia, Nagorno-Karabakh, north-eastern Turkey and possibly contiguous districts of Georgia). . . ***Pelias eriwanensis***

6(5) Upper preocular separated from nasal in 37.5% males, and 9.1% females. One apical of males, in females very rare 2 (9.1% of studied specimens). The shields of overhead part of head sometimes fragmented (frontal and parietal in 29.3% snakes); up to 20% snakes have divided nasal; average number of ventrals in males — 138.2, in females — 140.2, preventrals of males — 1.8, females — 2.4, subcaudals of males — 37.5, females — 28.5; number of shields round eyes for males — 9.25, for females — 8.4, number of loreals of males — 3.25, females — 4.4; number of wings of zigzag 55 – 93: average for males 80, for females — 69.25; Middle-Mountain and alpine belts of north macroslope of the East Caucasus within the limits of

Fig. 16. *Pelias renardi* "east," Republic of Kalmykia, Lake Manych.

Dagestan is Russia, partly in Georgia, records can be expected in Azerbaijan . . . . . ***Pelias lotievi***

7(1) Sublabial shields brown, or gray with large dark iron patches; one apical; average number (♂♂ – ♀♀) of scales around neck (21.6 – 22.4), midbody (21 – 21.5) and posterior part of body (17 – 17.4). Upper preocular separated from nasal in 7.1% males, and 61.8% females. Precaucasia Steppe and foothills biotopes of north macroslope of the Great Caucasus . . . . . ***Pelias renardi*** (Figs. 15 and 16).

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