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Y. Pysanets[1], O. Kukushkin[2], O. Manuilova[1]

[1] National Museum of Natural History NAS Ukraine,
B. Khmelnitsky Str., 15, Kyiv, 01601 Ukraine
[2] Zoological Institute, Russian Academy of Sciences,
Universitetskaya nab. 1, St. Petersburg, 199034 Russian Federation

A PRELIMINARY COMPARISON OF CRANIAL AND EXTERNAL MORPHOLOGICAL VARIABILITY OF SOUTHERN CRESTED NEWT (*TRITURUS KARELINII*) FROM THE CRIMEA AND THE CAUCASUS

The *Triturus karelinii* group of crested newts comprises the eastern, central and western lineages that differ by mitochondrial DNA. The eastern lineage largely retains the ancestral cranium shape and is distributed throughout the Crimean Peninsula, the Caucasus Isthmus, and the Caspian Sea southern shore in Iran. In this report the comparison of the Crimean and Trascaucasian *T. karelinii* cranium shape, differences in the dimensional characteristics variability and body colouring patterns is presented. The samples of *T. dobrogicus* from the Danube River Delta have been employed for outgroup comparison. Data of the differences between several populations within the eastern lineage suggest that it is not uniform and *T. karelinii* from the Crimean Peninsula is considered to be somewhat different.

K e y w o r d s : Southern crested newt, *Triturus karelinii*, the Crimea, cranium, external morphology, taxonomic status.

Introduction

Crimean newt has been noticed by P.S. Pallas as a "water lizard" *Lacerta aquatica*: "Rossis a voice Ukola. In temperatioribus et australioribus rarius in stagnis observatur; frequentior in Chersoneso Taurica..." (Pallas, 1811, p. 34). In turn, K. Kessler in travel notes of his Crimean visit in September 1878 reported about the newt as "*Triton cristata*" (Kessler, 1878, p. 212). In the monograph about vertebrates of the Crimean peninsula (Никольский, 1895) newt species *Molge cristata* has been referenced to as a common amphibian species of the peninsula. Moreover, G. Boulenger also supported the validity of the "variation" *karelinii* within the genus *Molge*, i.e. *Molge cristata* var. *karelinii* (Boulenger, 1882). Five years later, B. Dürigen mentioned this "variation" within the genus *Triton* as *Triton cristatus* var. *karelinii* (Dürigen, 1897). However, A. Brauner (Браунер) indicated newt from the Crimea as "*Molge cristata*... var. *Karelinii*" (Strauch, 1870) (Браунер, 1904). Wolterstorff described a new form *taurica* within the subspecies *ka-*

relinii ─ *Triton cristatus karelinii* forma *taurica* (Wolterstorff, 1923). Nevertheless, its validity has been never confirmed, since the International Code of Zoological Nomenclature does not recognize infra-subspecies taxa (art. 1. 3. 4, 45.5 & 45.6). Furthermore, Mertens and Müller (1928) obviously included the subspecies *T. cristatus karelinii* in the European amphibians and reptiles checklist. Finally, N. Shcherbak (1966) used this name for newt found at the Crimean Peninsula and summarized all available data regarding its biology, distribution and variation. Based on the comparative analysis of genomic characters as well as on the results of cytogenetic studies of hybrids, Bucci-Innocenti et al. (1983) proposed to consider its species level as specific (*Triturus karelinii*). Later it was supposed (Litvinchuk et al., 1999), the species divide on two subspecies, where *T. karelinii karelinii* range includes the Crimea, the Caucasus, Northern Iran and partially Anatolia, while *T. karelinii arntzeni* Litvinchuk, Borkin, Džukić and Kalezić, 1999 is attributed to the Balkan Peninsula. The taxonomic status of the last taxon later has been changed to the species level. However, the name *T. arntzeni* Litvinchuk, Borkin, Džukić, Kalezić, 1999 appiared a junior synonym of *T. macedonicus* (Karaman, 1922) that inhabits the western and north-western parts of the Balkan Peninsula (Wielstra et al., 2014).

The recent study of *T. karelinii* sensu lato based on nuclear and mitochondrial DNA revealed the existence of three deeply diverged lineages: earstern, central and western (Wielstra et al., 2010; Wielstra and Arntzen, 2011). These lineages comprised at least two species: *T. karelinii* from Northern Iran, the Caucasus, and the Crimean Peninsula, and *T. ivanbureschi* Arntzen & Wielstra, 2013 from the south-eastern Balkans and western and northern parts of Anatolia (Aegean Sea, Marmara Sea, and apparently the Black Sea regions) (Wielstra et al., 2013 a, 2014).

At the same time, some authors indicated that the skull shape does not clearly support the presence of three discrete geographical groups as suggested by mitochondrial DNA data (Ivanović et al., 2013, p. 269). Besides that, they have registrated no significant sexual dimorphism in cranium size and shape within eastern lineage (*T. karelinii* sensu stricto), while the newts of central and western lineages (*T. ivanbureschi*) shows the statistically significant sexual dimorphism in cranium size/shape (Ivanović et al., 2013). The external morphology study of southern crested newt in the Crimean and Asia Minor Peninsulas, the Caucasus and the Balkans "revealed the relative uniformity of populations of the species by dimensional characteristics" (Litvinchuk and Borkin, 2009, p. 81). In addition, the stability of the spotted colour throat patterns and their geographical variation were also found in this newt group (Wielstra et al., 2013 a). Hence, previous authors compared mitochondrial DNA data of the newts from three discrete geographical groups representing two different species, *T. ivanbureschi* and *T. karelinii*. Some differences between these species in mitochondrial DNA variability, sexual dimorphism in cranium *(skull)* characteristics and features of body coloration have been also indicated.

Therefore, the aim of our study was to compare the variability of cranium architecture *(skull structure)*, dimensional characreristics of the external morphology and some features of the body coloration within the representatives of eastern lineage from the Crimea and the Caucasus.

Materials and Methods

Species localities, samples sizes, number of males and females are presented in figure 1, ***a***, and table 1. As outgroup we employed *T. dobrogicus* (Kiritzescu, 1903) sample (cranium and external morphology). Skulls of adult newts were cleared with Na_2CO_3 (solution ─ 10−12%, 12−14 hours) and put into hydrogen peroxide (3%) up to 20−30 min. Images of dorsal, ventral, lateral and posterior sides were obtained with digital camera with the cranium roof positioned parallel to the photographic plane. The

Table 1. **Summary of *Triturus karelinii* and *T. dobrogicus* (referred to as outgroup) characteristics: locality; decimal degrees (latitude (N) specifies the north-south position, longitude (E) ─ east-west position); No.F ─ females number; No.M ─ males number; skulls; morphometry; throat color pattern.**

N	Samples (from museum funds lables)	Latitude (N)	Longitude (E)	No.F.			No.M.		
				skulls	morphometry	throat color pattern	skulls	morphometry	throat color pattern
1	*T. dobrogicus*, Ukraine, Odesa Province, Vilkovo town, 1974	45°23′57″	29°35′37″	8	10	10	4	18	18
2	*T. karelinii*, Crimea, Sevastopol City Council, Bakhchisaraiskiy District, Ternovka village, Southern Mangup, June 8−9, 2003	44°34′55″	33°48′30″	3	11	11	3	10	10
3	*T. karelinii*, Crimea, Krymskyi Nature Reserve, Mt. Chuchel, 1959	44°39'12"	34°14'8"		6	6		8	8
4	T. *karelinii*, Crimea, Alushta City Council, 2 km S-SW from Angar Pass, Lake Kutuzovskoe near the foot of SE slope of Mt. Chatyrdag, 870 m a. s. l., 2015	44°44'21"	34°20'9"			13			15
5	*T.karelinii*, Crimea, near Alushta, Luchistoe village, April 30 2004, 2005, 2005	44°44′40″	34°22′15″		15	15		7	7
6	*T. karelinii*, Georgia, Borzhomskiy District, Lake Kakhisy, Chobis-Khevi village, July 6−9, 1979	41°51′15″	43° 24′ 45″	1	23	23	1	16	16
7	*T. karelinii*, Azerbaijan, Lerikskiy District, Mts. Talysh, Almu settlement, 1974	38° 42′00″	48°18′00″	1	16	16	1	18	18
8	*T. karelinii*, Russia, Krasnodarskyi krai, Adigeya, Afinsip settlement, 07.04.1975	44°54′00″	38°50′00″	1			2		
9	*T. karelinii*, Russia, Krasnodarskyi krai, Novorossiysk City, Abrau-Dyurso, 27.05.1961	44°42′10″	37°36′06″	3			1		
10	*T. karelinii*, Russia, Krasnodarskyi krai, Goryachiy Klyuch, 10.04.1975	44°38′	39°08′	2					
	In total			19	81	94	12	77	92

positions and names of cranium bones were identified following special protocols (Dunaev, 1996; Ivanović et al., 2008; 2013). The external 18 morphometric characteristics were measured with dial calliper (0,1 mm scale) (Писанець, 2007; Litvinchuk and Borkin, 2009; Naumov and Tzankov, 2009; Çiçek et al., 2010; Писанець, 2012 with some modifications): SVL (snout-vent. post length) ─ measured from the snout to the posterior edge of the base of the cloaca; L (snout-vent. ant length) ─ measured from the snout to the anterior edge of the base of the cloaca; Lcd (tail length) ─ measured from the anterior edge of the base of the cloaca to the tail tip; TL ─ total length (L.+L.cd.); Lcd1 (tail length1) ─ measured from the posterior edge of the base of the cloaca to the tail tip; LiE (distance between fore and hindlimbs) ─ measured from the anterior base of posterior forelimb to the posterior base of hindlimb; L.pc. (distance between snout and hind limbs) ─ measured from snout tip to the anterior base of hind limbs; L. m. (distance between snout and jaw articulation) ─ measured from snout tip to the jaw articulation; Lt.c. (head width) ─ measured between the posterior of the mouth jaw articulations; Alt.c. (head height) ─ measured between the upper and below head sufaces after the eyes; P.a. (length of the forelimb) ─ measured between the base to the tip of forelimbs; P.p (length of the hindlimb) ─ measured between the base to the tip of hindlimbs; C.l. (length of the cloaca) ─ measured from anterior and posterior edges of cloaca; D.t. (lenght of the the third toe of forelimb) ─ measuring from the base of toe to its tip; Sp.in. ─ distance between the nostrils; D.n.o.(distance between the eye and the nostril) ─ measuring between the anterior corner of the eyes aperture and the nostril; L.o. ─ horizontal length of the eyes aperture; Sp.ino.1 ─ distance between the anterior margins of the eyes; Sp.ino.2 ─ distance between the posterior margins of the eyes.

Means of replicates were subjected to statistical analysis using Statistica 6.0 software package. Pattern of geographical variability was analyzed by principial component analysis (PCA) on standardized morphometric characters (see above).

Results and Discussion

Cranial characteristics and their variation. The general view of *T. karelinii* female skull structure are presented on figure 1, ***b***. External views of female and male skulls of *T. karelinii* from the Crimea (Sevastopol City Council, Ternovka village vicinity) are shown on figure 1, ***c***. Even though male and female skulls look much alike (fig. 1, ***c***), visual comparison of cranium dorsal sides indicates that males have: (1) a much wider anterior fontanel; (2) a shorter distance between the rear end of the premaxilla and the front end of the pterygoideum. At the same time, others characteristics for the comparison between males and females skulls (e.g., ventral and lateral sides) have not revealed any significant differences.

Generally, the comparison of *T. karelinii* skulls from the Crimea and the Caucasus shown similarities in the shape and positioning of the majority of elements, however, with some differences. Pronounced sexual dimorphism in the linear dimensions of Transcaucasian newts (especially in the sample from South-Eastern Azerbaijan, Mts.Talysh) characterized by larger skulls has been revealed (fig. 2, ***a***). The structure of the Crimean and Caucasian *T. karelinii* skulls differs clearly from *T. dobrogicus* ones taken for outgroup comparison (fig. 2, ***b***), first of all, in smaller size of the latter and the lack of postfrontal processes that has been indicated earlier in other studies (Litvinchuk and Borkin, 2009). Some unexpected differences in several characteristics of skulls have been revealed in southern crested newt from the Crimea compared with the Transcaucasian *T. karelinii*. For instance, the quadratum of the Crimean *T. karelinii* were smaller than those of the Caucasian species, what affects relative cranium height that was much lower at the Crimean *T. karelinii* in most cases (fig. 2, ***c***).

At the same time, any clear diagnostic characteristics of the cranium shape able to distinguish evidently *T. karelinii* from the Crimean Peninsula and continental newts

from the Caucasus have not been found at the current level of studies, and the differences described above have been proven only statistically. Another osteological examination revealed species-specific cranium shape of *T. karelinii* from the Caucasus (Dunaev, 1996). It was emphasised one year later that Karelin's newt differs from other three taxa of *T.cristatus* complex in cranium shape by 6 characteristics: "Cavum internasale or intermaxillare (dorsal view)... Processus postfrontalis (dorsal and ventral views)... Processus occipetalis (dorsal and ventral views)... Foramen magnum (caudal view)... Posterior margin of parietale (dorsal view)... Basal part of pterigoid..." (Litvinchuk, Borkin, 2009, p. 532). It has been also noticed that all species of the complex *T. cristatus* are well differentiated from each other on the cranium structure (Litvinchuk, Borkin, 2009).

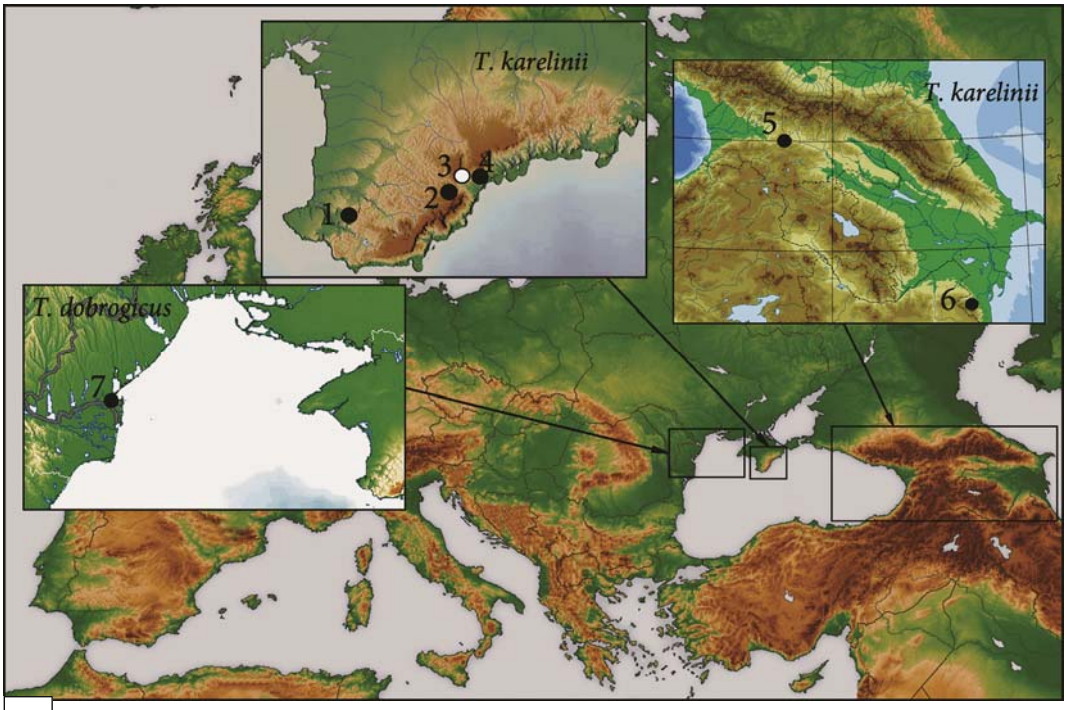
Differences in male and female craniums shape of southern crested newt have been also mentioned in another special study of Ivanović et al. (2013). Osteological characteristics analysis of 197 specimens of *T. karelinii* from different parts of species range (including 16 individuals from the Crimea) showed that among three phylogenetic branches of this taxon (central, eastern and western, fig. 1, ***a***) the statistically significant differences in the size and configuration of the cranium between males and females were inherent only for the representatives of the first two groups. Ivanović et al. (2013) also emphasized that the variability of cranium size was statistically significant only for cranium dorsal side in males.

Variation of the external morphology. It has been established that Wolterstorff index (P.a./LiE) and relative head width (Lt.c./L.) had the greatest value among the *T. cristatus* complex (Litvinchuk, Borkin, 2009). Comparative characteristics of *T. karelinii* (the Crimea and the Caucasus) and in *T. dobrogicus* (Ukraine, Odesa Province) are shown in tables 2, 3 and 4.

The data mentioned above indicate that both indexes clearly distinguish *T. dobrogicus* from *T. karelinii* from the Crimea and the Caucasus; in turn, *T. karelinii* from these two regions show reliable difference on the basis of Lt.c./L ratio. Our results corroborate to some extent with the geographical variation data for *T. karelinii* that indicate variation in the range of 0.68–0.88 (males) and 0.59–0.79 (females) for P.a./LiE, and 0.18–0.22 (males) and 0.17–0.20 (females) for Lt.c./L. (Litvinchuk and Borkin, 2009). These data are presented on page 83 (Litvinchuk and Borkin, 2009); on page 484 other indeces are indicated: 0.56–0.97 (0.73±0.07) (males) and 0.50–0.79 (0.62±0.06) (females) for Pa/LiE; 0.15–0.22 (0.19±0.01) (males) and 0.15–0.23 (0.18±0.01) (females) for Ltc / L.

The Crimean *T. karelinii* and representatives of this group from six different regions including the Caucasus, the Balkans, and Asia Minor were analysed by multivariate statistical approach using "indices of high taxonomic interest" (Litvinchuk and Borkin, 2009, p. 79) and the logarithmic conversion of characteristics, however, unfortunately, without the outgroup comparison. Comparative uniformity of populations by morhpometric characteristics has been emphasised (Litvinchuk, Borkin, 2009).

Fig. 1. **a** ─ *T. karelinii* localities in terms of skull differentiation, morphometrics measurements, coloration patterns. Solid circles (1, 2, 3, ,5, 6, 7), colorless circles (4) and squares (8, 9, 10) indicate analyzed samples number (see Table 1). **b** ─ *T. karelinii* female skull, right ─ dorsal view, left ─ ventral view. Location: Crimea, Sevastopol City Council, Bakhchisaraiskiy District, environs of Ternovka village. Names of skull elements and abbreviations (by Dunaev, 1996; Ivanović et al., 2008; Ivanović et al., 2013 with some modifications): PA ─ parietal, OC ─ occipital, SQ ─ squamosum, MX ─ maxilla, F ─ frontal, FP ─ frontalis processus, N ─ nasal, PRF ─ prefrontal, PMX ─ premaxilla; Q ─ quadratum, OCC ─ occipital condyle, PT ─ pterygoideum, OF ─ oval fenestra, V (VPAL) ─ vomer (vomero-palatine), FI ─ fenestra intermaxillaris, PS ─ parasphenoid, CHO ─ choane. **c** ─ Dorsal (up) and ventral (down) view of *T. karelinii* female and male skulls (left and right, respectively). Location the same as of **b**. Arrows indicate the differences in anterior fontanelle size and form (i), and distance between pterygoideum and maxilla (ii).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T. karelinii
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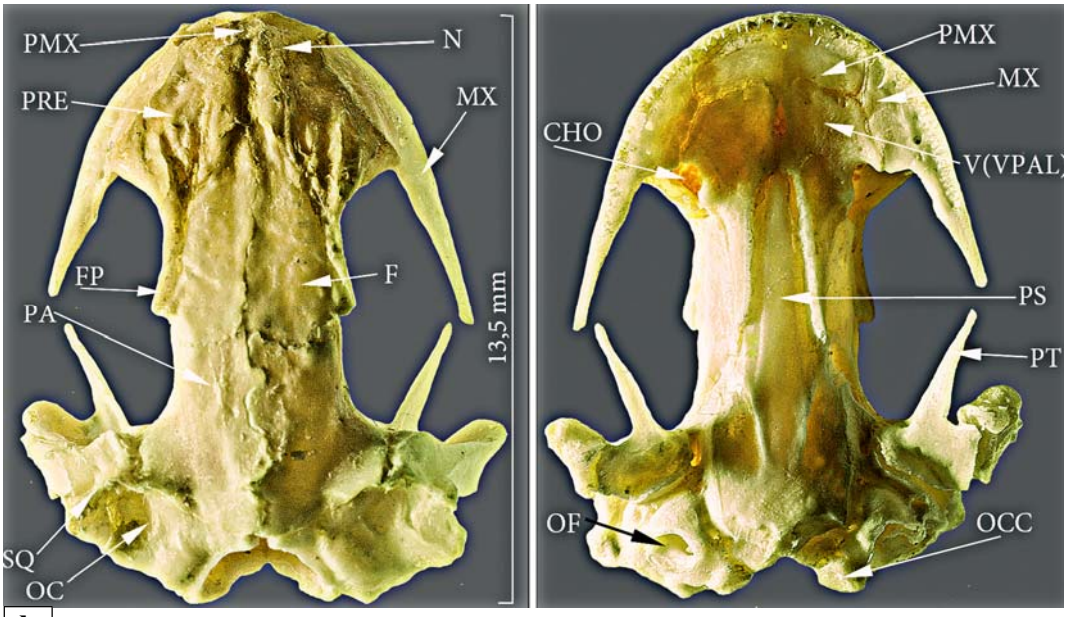
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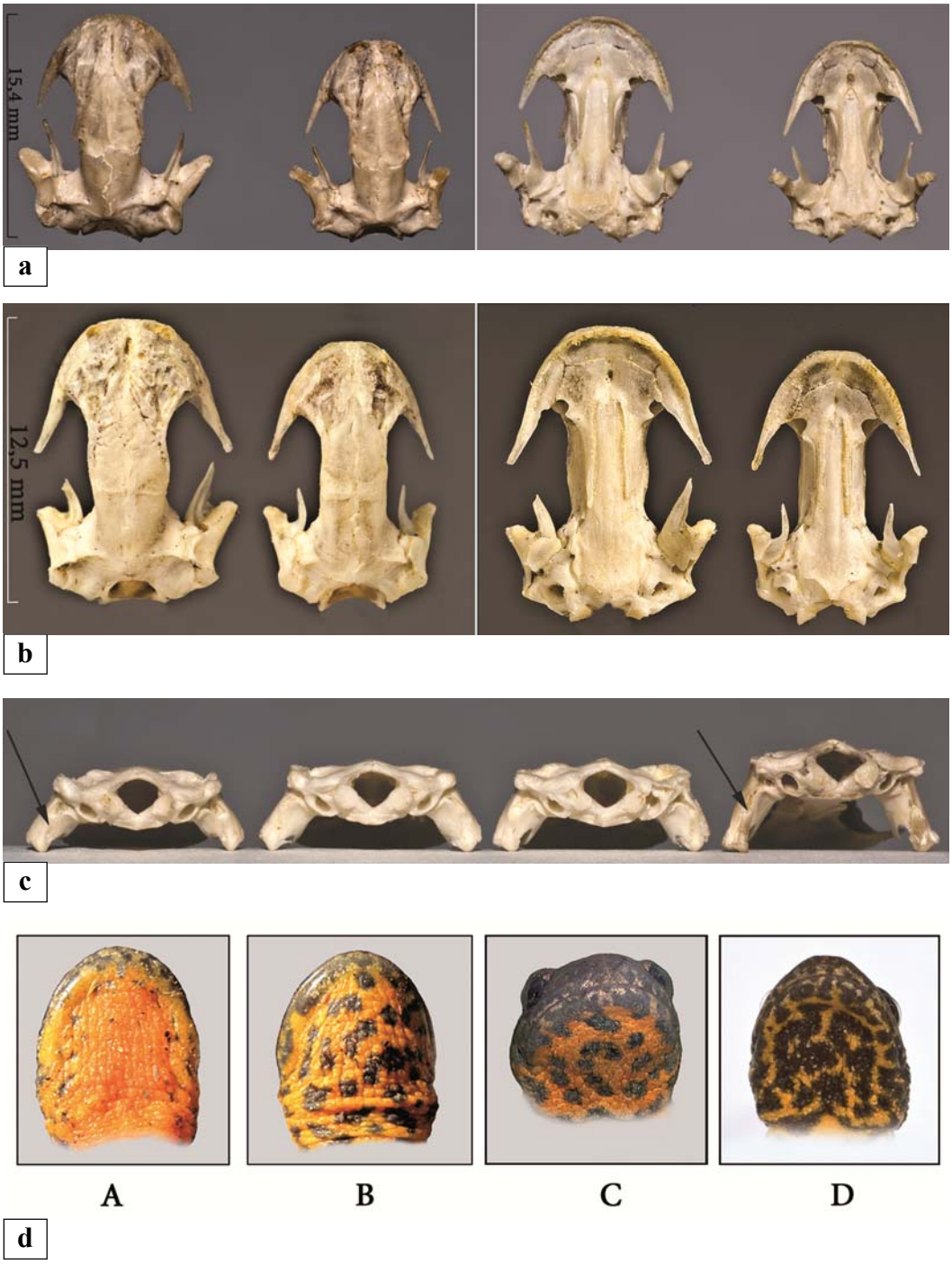

Fig. 2. **a** ─ Female and male *T. karelinii* skulls (left and right, respectively) dorsal (right) and ventral (left) view. Location: Azerbaijan, Lerikskiy District , Mts.Talysh, Almu settlement. **b** ─ Female and male *T. karelinii* skulls (left and right, respectively) dorsal (right) and ventral (left) view. Location: Ukraine, Odesa Province , Vilkovo town. **c** ─ *T. karelinii,* male skulls, posterior side. Left three skulls ─ Sevastopol City Council, Balaklava Distrcit, environs of Ternovka village; fourth (right) ─ Azerbaijan, Lerikskiy District, Mts.Talysh, Almu settlement. Arrows indicate quadratum bones. **d** ─ Throat coloration patterns of alive *T. karelinii* from different populations in the Crimea: A, B ─ Lake Kutuzovskoe, Alushta City Council; C, D ─ near Luchistoe village, Alushta City Council.

Table 2. **Comparison of Wolterstorff index (P.a./LiE) and relative head width (Lt.c./L.) in representatives of different taxa and populations in the newts from genera *Triturus*.**

	T. karelinii The Crimea		*T. karelinii* Transcaucasia: Georgia and Azebaijan (Talysh Mts.)		*T. dobrogicus* Ukraine, Odesa Province	
Index	males n=25	females n=21	males n=34	females n=39	males n=18	females n=10
Wolterstorff index P.a./LiE	0.70 ±0.011 0.60−0.82	0.58 ±0.008 0.53−0.67	0.70 ±0.011 0.59−0.93	0.62± 0.008 0.52−0.75	0.57±0.08 0.51−0.64	0.40 ±0.027 0.21−0.49
Relative head width Lt.c./L.	0. 21 ±0.003 0.16−0.22	0.18 ±0,002 0.16−0.20	0.21 ±0.002 0.19−0.24	0.21 ±0.002 0.19−0.23	0.16 ±0.002 0.14−0.17	0.14 ±0.004 0.12−0,17

Table 3. **Coefficients of differences reliability (t) for Wolterstorff index (P.a./LiE) and relative head width (Lt.c./L.) in males of different taxa and populations of the newts from genera *Triturus* (significant difference p < 0.05 marked bold).**

Species, samples, number	*T. karelinii,* The Crimea, n= 25	*T. karelinii,* Transcaucasia: Georgia and Azerbaijan (Talysh Mts.) together, n = 34	*T. dobrogicus,* Odesa Region, n= 18
		Pa/LiE	
T. karelinii, The Crimea, n = 25	0	0.4	**8.8**
T. karelinii, Transcaucasia: Georgia and Azerbaijan (Talysh Mts.) together, n = 34	0.4	0	**7.9**
T. dobrogicus, Odesa Province, n = 18	**8.8**	**7.9**	0
		Ltc/L	
T. karelinii, The Crimea, n = 25	0	**4.1**	**10.3**
T. karelinii, Transcaucasia : Georgia and Azerbaijan (Talysh Mts.) together, n = 34	**4.1**	0	**18.4**
T. dobrogicus, Odesa Province, n = 18	**10.3**	**18.4**	0

Table 4. **Coefficients of differences reliability (t) for Wolterstorff index (P.a./LiE) and relative head width (Lt.c./L.) in females of different taxa and populations of the newts from genera *Triturus* (significant difference p < 0,05 marked bold).**

Species, samples, number	*T. karelinii,* The Crimea, n = 21	*T. karelinii,* Transcaucasia: Georgia and Azerbaijan (Talysh Mts.) together, n = 39	*T. dobrogicus,* Odesa Region, n = 10
		Pa/LiE	
T. karelinii, The Crimea, n = 21	0	0,3	**8.2**
T. karelinii, Transcaucasia: Georgia and Azerbaijan (Mt. Talysh) together, n = 39	0.3	0	**10.9**
T. dobrogicus, Odesa Region, n = 10	**8.2**	**10.9**	0
		Ltc/L	
T. karelinii, The Crimea, n = 21	0	**6.0**	**8.1**
T. karelinii, Transcaucasia: Georgia and Azerbaijan (Mt. Talysh) together, n = 39	**6.0**	0	**14.4**
T. dobrogicus, Odesa Region, n = 10	**8.1**	**14.4**	0

Moreover, we have compared the external morphology variability of the Crimean southern crested newt and the Caucasian species by the methods of multivariate statistics (fig. 3) while the Danube newt (*T. dobrogicus*) from South-Western Ukraine (Odesa Province,Vilkovo) was employed as the taxon for outgroup comparison. It was found that the variability of characteristics was determined by the first three principal components, namely taxonomic status, gender, and geographical variation. The first principal component characterizes the distant location of *T. dobrogicus* and clearly indicates the importancy of taxonomic status on the graph. The second principal component is different males and females location. It emphasizes the significance of gender. The third principal component characterizes presence of geographical variation as samples distribution from differents regions do not offen coincide.

It has to be noticed that the current data allow to assume the interpopulation level of differences between *T. karelinii* from the Crimea and the Caucasus. Generally, males were smaller comparing to females (e. g., sample from Ternovka village had the following parameters for females (n=16) L. = 62.2±0.7 mm and L.cd. = 50.2±1.13; males (n=15) L. = 58.2±1.19 and L.cd. = 47.2±1.09 mm). Furthermore, the special difference was revealed between sizes of the newts collected in the Crimea in the whole by N. Szczerbak in 1950's and those collected near Ternovka village by the first author of this paper in 2003. The first sample had the following parameters: L. = 63.33±7.04 mm, L. cd. = 58.73±7.97, P. a. = 24.62±4.01 mm, P. p. = 25.98±5.27 mm, while the sample collected later had other values: L. = 60.3±0.76 mm, L. cd. = 48.7±0.82, Lt. c. = 12.3±0.14, P. a. = 20.4±0.27, P. p. = 22.1±0.27, DiE = 32.4±0.58, IW = 63.2±0.98. It might be suggested that the difference is influenced by males that represented about 72% of the first sample (Щербак, 1966).

The exclusive attention has to be paid to the specificity of the throat coloration (spotted pattern) of *T. karelinii* from the Crimea. The particular features of this characteristic in the representatives of different taxa of *T. karelinii* sensu lato and the pattern of its geographical variation have been studied before. All researchers agreed that southern crested newt has the numerous spots on the throat (Olgun et al., 2001; Litvinchuk and Borkin, 2009; Çiçek et al., 2010; Wielstra et al., 2013 a). At the same time, some of them pointed out "to the absence of the distinctive *T. karelinii* throat pattern..." on the s. l. in holotype and paratypes of *T. arntzeni* (Wielstra et al., 2013 a, p. 444).

Our analysis of seven *T. karelinii* samples from the Crimea, the North (Ciscaucasia) and the South Caucasus (Transcaucasia) regions as well as *T. dobrogicus* (Ukraine, Odesa Region) revealed that only about 10% of the Crimean population has no distinctive throat spotted pattern (fig. 2, ***d***).

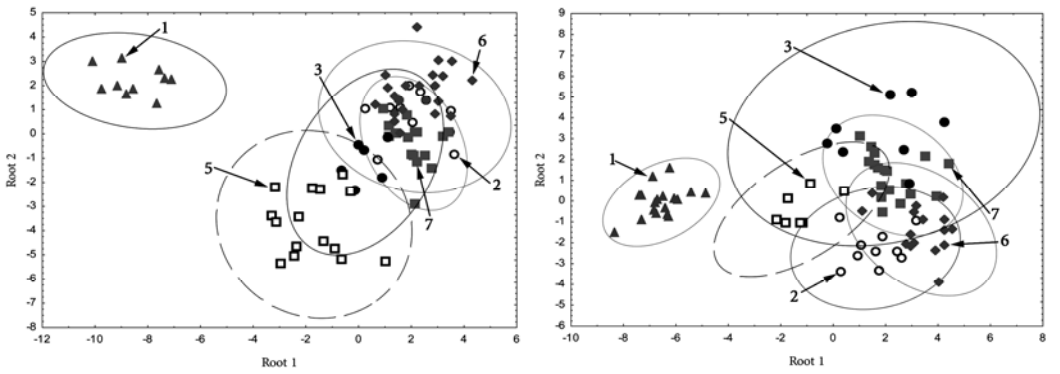

Fig. 3. Females (***a***) and males (***b***) distribution in coordinates of the first two principal components according to the results of the discriminant analysis based on the external morphomeric characteristics (females numbers are presented in Table 1).

Conclusions

Our data confirm that *T. karelinii* from the Crimea is related to Karelin's newt from the Caucasus that belongs to the same (eastern) mitochondrial DNA gene pool lineage (Wielstra et al., 2013 b). On the other hand, the newts from these regions demonstrated some differences in skull structure, external morphometric characteristics and throat coloration patterns. Further detailed studies of *T.karelinii* from the Crimea are required.

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Є. Писанець, О. Кукушкін, О. Мануілова

ПОПЕРЕДНЄ ПОРІВНЯННЯ КРАНІАЛЬНОЇ І ЗОВНІШНЬОЇ МОРФОЛОГІЧНОЇ МІНЛИВОСТІ ТРИТОНА КАРЕЛІНА (*TRITURUS KARELINII*) З КРИМУ ТА КАВКАЗУ

Група *Triturus karelinii* з числа гребінчастих тритонів включає східну, центральну і західну гілку, які відрізняються за мітохондріальною ДНК. Східна гілка значною мірою зберігає анцестральну форму черепної коробки і поширюється всім Кримським півостровом, Кавказьким перешийком і південним узбережжям Каспійського моря в Ірані. Проведено порівняння кримської і закавказької черепної форми *T. karelinii*, вказано на відмінності мінливості розмірних характеристик і забарвлення тіла. Екземпляри *T. dobrogicus* з дельти Дунаю були використані для порівняння. Дані про відмінності між декількома популяціями в межах східної гілки припускають, що вони не є однорідним, і *T. karelinii* з Кримського півострова дещо відрізняється.

Ключові слова: тритон Кареліна, *Triturus karelinii*, Крим, Кавказ, череп, зовнішня морфологія, таксономічний статус.

Е. Писанец, О. Кукушкин, О. Мануилова

ПРЕДВАРИТЕЛЬНОЕ СРАВНЕНИЕ КРАНИАЛЬНОЙ И ВНЕШНЕЙ МОРФОЛОГИЧЕСКОЙ ИЗМЕНЧИВОСТИ ТРИТОНА КАРЕЛИНА (*TRITURUS KARELINII*) ИЗ КРИМА И КАВКАЗА

Группа *Triturus karelinii* гребенчатых тритонов включает восточную, центральную и западную ветвь, которые отличаются митохондриальной ДНК. Восточная ветвь в значительной мере сохраняет анцестральную форму черепной коробки и распространена по всему Крымскому полуострову, Кавказскому перешейку и южному побережью Каспийского моря в Иране. Проведено сравнение крымской и закавказской черепной формы *T. karelinii*, указано на отличия изменчивости размерных характеристик и окраски тела. Экземпляры *T. dobrogicus* из дельты Дуная были использованы для сравнения. Данные об отличиях между несколькими популяциями в пределах восточной ветви допускают, что они неоднородны, и *T. karelinii c* Крымского полуострова несколько отличаются.

Ключевые слова: тритон Карелина, *Triturus karelinii*, Крым, Кавказ, череп, внешняя морфология, таксономический статус.

Contact:

Yevgen Pysanets,
National Museum of Natural History NAS Ukraine,
15 B. Khmelnitsky Str., Kyiv, 01601 Ukraine.
E-mail: yevgen_pysanets@yahoo.com

Контакт:

Євген Писанець,
Національний науково-природничий музей НАН України,
вул. Б. Хмельницького, 15, Київ, 01601 Україна.