

## A Systematic List of Amphibians from the Alpides of the Caucasus and Middle Asia, with Comments on Their Taxonomy

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**РЕЗЮМЕ:** Систематический список земноводных из альпид Кавказа и Средней Азии, с комментариями по их таксономии. Б.С. Туниев. Приведен полный список земноводных гор альпийской складчатости Кавказа и Средней Азии и известные синонимы форм, описанных отсюда. Даются карты типовых локалитетов всех перечисленных форм. Обсуждается таксономическое положение видов, указаны существующие взгляды систематиков и данные автора. Отдельно отмечаются уклоняющиеся популяции, а также ошибочные или сомнительные указания и определения, несоответствия в синонимике и т.п. Внесены коррективы в указания типовых территорий некоторых форм.

**ABSTRACT:** In the given work a complete list of amphibians of the mountainous Alpine fold belt of the Caucasus and Middle Asia, and known synonyms of the forms described from there, with maps of the type localities of all listed forms is given. The taxonomic position of species is discussed, for which the existing views of taxonomists and the author's materials are specified. Deviating populations are marked separately, as well as erroneous or doubtful indications and definitions, discrepancies in synonymy, etc. Corrective amendments to the indications of type localities of some forms are brought in.

Alpine orogenesis, beginning from the Palaeogene/Neogene margin, has embraced vast areas from North Africa and Southern Europe in the west to the Himalayas in the east. The formation of large mountains has resulted from tectonic movements. These mountains now represent a barrier for the interchange of faunistic elements from tropical Africa, temperate – warm Europe, subtropical South East and East Asia, as well as arid – continental Middle and Central Asia. The suggested data indicate that the Alpine region extending from the Pyrenees to Pamir manifested a single rhythm of the Cainozoic tectonic process which was reflected in the specific sedimentation and deformation properties of Cainozoic strata (Scherba, 1993). According to Scherba, the mountains of this belt may be referred to as alpides. The Caucasus and the Armenian Highlands occupy a central position in the alpides of Eurasia. To the east, these alpides are represented by Balkhans, Kopet-Dagh, Badkhyz, Karabil and Western Pamir with the adjacent mountainous region of Kukhistan (Gvozdetskii, 1954, 1958).

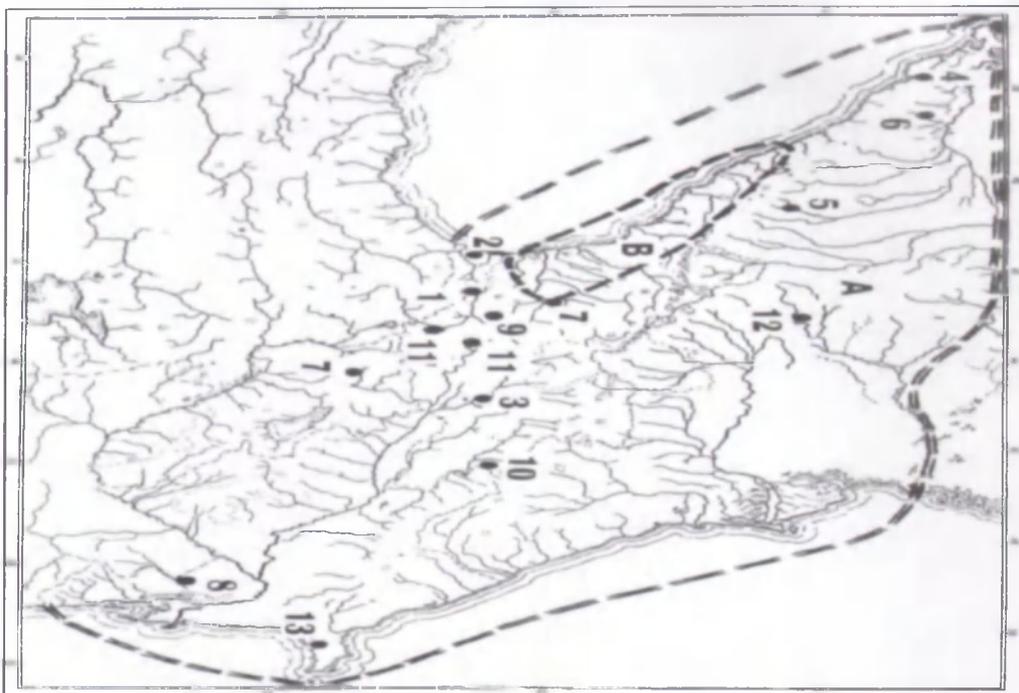


Fig. 1. Type localities of Caucasian amphibian taxa. A – taxa with type localities depicted as Caucasus (without details): *Rana verrucosissima* Pallas, [1814] [= *Bufo verrucosissimus* (Pallas, [1814])]; *Rana caucasica* Pallas, [1814] [= *Rana ridibunda* Pallas, 1771]; B – *Bufo colchicus* Eichwald, 1831 [= *Bufo verrucosissimus* (Pallas, [1814])]; Colchis; 1 – *Exaeretus caucasicus* Waga, 1876 [= *Mertensiella caucasica* (Waga, 1876)]; Mtirala Mountain Pass, Georgia; 2 – *Mertensiella caucasica djanaschvilii* Tartarshvili et Bakradze, 1989; Mtirala Mountain, vicinity of Batumi Town; 3 – *Triton ophryticus* Berthold, 1846 [= *Triturus vittatus ophryticus* (Berthold, 1846)]; Tiflis (=Tbilisi) City, Georgia; 4 – *Triton vulgaris* subsp. *typica* f. *lantzi* Wolterstorff, 1914 [= *Triturus vulgaris lantzi* (Wolterstorff, 1914)]; Novorossiisk, Western Caucasus; 5 – *Bufo bufo turowi* Krasovskiy, 1933 [= *Bufo verrucosissimus turowi* Krasovskiy, 1933]; Chernorechie Cordon (confluence of the rivers Urushten and Malaya Laba), Caucasian State Biosphere Reserve; 6 – *Bufo verrucosissimus circassicus* Orlova et Tuniyev, 1989; Krepostnaya Settlement, Krasnodar Region; 7 – *Hyla arborea schelkownikowi* Cernov, 1921; Stepanavan, Armenia; 7' – (*Hyla arborea schelkownikowi* Cernov, 1926): Kutaisi, Georgia; 8 – *Pelobates syriacus boettgeri* Mertens, 1923 [= *Pelobates syriacus syriacus* Boettger, 1889]; Belyasuvar, Azerbaijan; 9 – *Pelodytes caucasicus* Boulenger, 1896; Lomis-Mta Mountain, vicinity of Borzhomi Town, Eastern Georgia; 10 – *Pelodytes caucasicus* Nikolsky, 1896 [= *Pelodytes caucasicus* Boulenger, 1896]; Lagodekhi, Georgia; 11 – *Rana camerani* Boulenger, 1886; Tabitskhuri Lake, Georgia; 11' – (*Rana camerani* Boulenger, 1886): Akhalkalaki Settlement, Georgia; 12 – *Rana dentex* Krynicki, 1837 [= *Rana ridibunda* Pallas, 1771]; *Rana tigrina* Eichwald, 1843 [= *R. ridibunda* Pallas, 1771]; Pyatigorsk Town, North Caucasus; 13 – *Bufo caucasicus* Menetries, 1832 [= *R. ridibunda* Pallas, 1771]; Baku City, Azerbaijan.

Note. – According to the International Code of Zoological Nomenclature (1985), the taxa described from more than one locality have a Type locality of the site of the selected type specimen (holotype, lectotype, etc.). We kept all sites, but none-type localities are given in brackets.

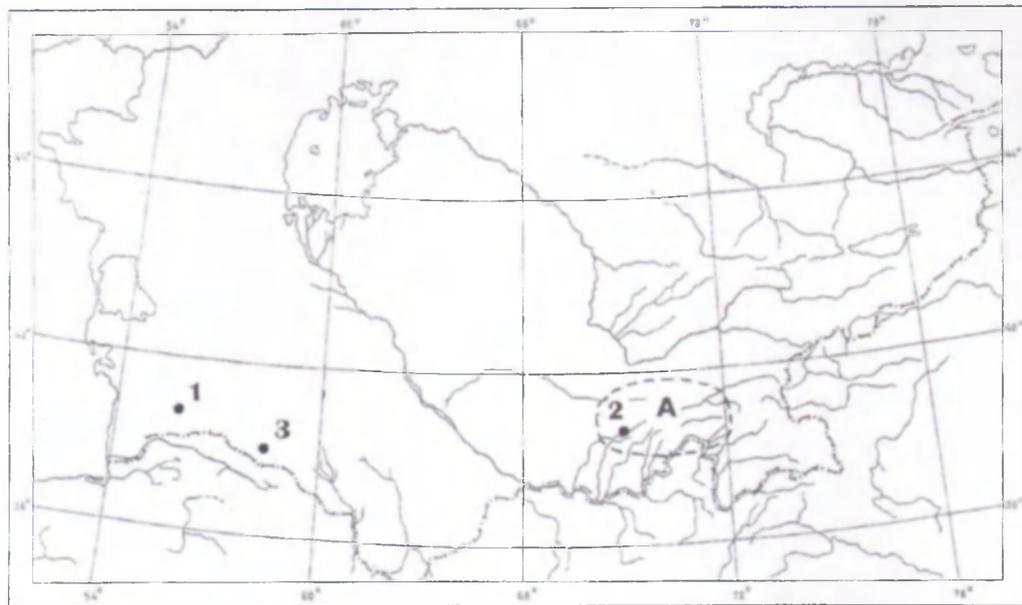


Fig. 2. Type localities of amphibian taxa described from the alpides of Middle Asia.  
 A – *Hynobius turkestanicus* Nikolsky, 1909: between Samarkand and Pamir; 1 – *Bufo danatensis* Pisanetz, 1978: Danata Village, Kyuren-Dagh Ridge; 2 – *Bufo viridis turanensis* Hemmer, Schmidtler et Bohme, 1978: vicinity of Dushanbe City, Gissar Valley, Tajikistan; 3 – *Rana temporaria warezowii* Terentjev, 1923 [= *Rana macrocnemis* Boulenger, 1885]: vicinity of Ashkhabad City, Turkmenia.

More than twenty forms of amphibians (Figs. 1 and 2) were described from these regions of the Caucasus and Middle Asia within the boundaries of the former Soviet Union. Many of them were synonymized with the currently recognised 16 species of batrachofauna from the territory under consideration (Tables 1 and 2). As the facts have been accumulated and modern methods have been introduced in taxonomy, the knowledge on structure of the families Salamandridae and Pelobatidae, as well as the genera *Bufo*, *Rana*, etc. has been changed considerably. However, many problems of systematics and nomenclature remain unresolved.

Below I present a full list of amphibians from the alpides of the Caucasus and Middle Asia, as well as synonyms of the forms known to us from that territory. The lowland of Precaucasia has not been considered.

Table 1. Amphibians of the alpides of the Caucasian Isthmus.

Taxa	Geographical districts of Caucasus						
	I	II	III	IV	V	VI	VII
Class AMPHIBIA							
Order Caudata							
Family Salamandridae							
1. <i>Mertensiella caucasica caucasica</i>	-	-	-	+	-	-	-
<i>M. caucasica djanaschvilii</i>	-	-	-	+	-	-	-
2. <i>Triturus (cristatus) karelinii</i>	+	-	+	+	-	+	-
3. <i>Triturus vittatus ophryticus</i>	+	-	+	+	-	-	-
4. <i>Triturus vulgaris lantzi</i>	+	+	-	+	-	+?	-
Order Anura							
Family Bufonidae							
5. <i>Bufo verrucosissimus verrucosissimus</i>	+	?	+?	+	-	+?	-
<i>B. verrucosissimus turowi</i>	+	-	-	-	-	-	-
<i>B. verrucosissimus circassicus</i>	+	-	-	-	-	-	-
6. <i>Bufo viridis</i>	+	+	+	+	+	+	+
Family Hylidae							
7. <i>Hyla arborea schelkownikowi</i>	+	+	+	+	-	+	-
8. <i>Hyla savignyi</i>	-	-	-	+	+	+	-
Family Pelobatidae							
9. <i>Pelobates syriacus</i>	-	-	+	+	+	+	?
Family Pelodytidae							
10. <i>Pelodytes caucasicus</i>	+	+	+	+	-	-	-
Family Ranidae							
11. <i>Rana camerani</i>	-	?	+	+	+	-	-
12. <i>Rana macrocnemis</i>	+	+	+	+	+	+	-
13. <i>Rana lessonae</i>	+	-	-	-	-	-	-
14. <i>Rana ridibunda</i>							

Note. – I Western Caucasus; II Central Caucasus; III Eastern Caucasus; IV Lesser Caucasus; V Armenian Highland; VI Talysh; VII Zuvand; + known presence; – absence; ? questionable presence; +? uncertain taxonomic status.

Table 2. Amphibians of the alpides of Middle Asia.

Taxa	Geographical subdivisions										
	1	2	3	4	5	6	7	8	9	10	11
Class AMPHIBIA											
Order Caudata											
Family Hynobiidae											
1. <i>Hynobius turkestanicus</i>	-	-	-	-	-	-	-	-	-	?	?
Order Anura											
Family Bufonidae											
2. <i>Bufo danatensis</i>	-	-	+	+	+	+	?	?	+	+	-
3. <i>Bufo viridis asiomontanus</i>	-	-	-	-	-	-	-	-	+	+	+
<i>B. viridis turanensis</i>	+	+	?'	+	+	+	+?	+?	+	-	-
<i>B. viridis oblongus</i>	-	-	-	-	-	-	?	-	-	-	-
Family Ranidae											
4. <i>Rana macrocnemis</i>	-	-	-	?	-	-	-	-	-	-	-
5. <i>Rana ridibunda</i>	-	-	-	+	+	+	-	-	+	-	-

Note. - I Bolshoi Balkhan Ridge; II Malyi Balkhan Ridge; III Kyuren-Dagh Ridge; IV West Kopet-Dagh; V Central Kopet-Dagh; VI East Kopet-Dagh; VIII Karabil Highland; IX Afghano-Tajikian Depression; X Gissaro-Darvaz Mountains; XI West Pamir. See Table 1 for other legend.

**AMPHIBIA**

**ORDER CAUDATA SCOPOLI, 1777**

About 340 species, 54 genera, and 8 families, two of which are represented in the Caucasian and Middle Asian fauna.

**Family Hynobiidae Cope, 1860**

Among 7 currently known genera, two live in Middle Asia, including *Ranodon* Kessler, 1866, which is distributed beyond the alpides.

**Genus *Hynobius* Tschudi, 1838**

Includes about 20 species, one of which, evidently, lives in Middle Asia.

*Hynobius turkestanicus* Nikolsky, 1909 – Trudy Kharkovskogo Obshchestva Ispytatelei Prirody 43: 73, 76. Terra typica: between Samarkand City and Pamir Mountains.

P.V. Terentjev (in Terentjev and Chernov, 1949) considered this species as doubtful on the basis of a lack of modern collecting. Moreover, he synonymized it with *Turanomolge menzbieri* Nikolsky, 1918. Detailed analysis of the preserved materials has led Andrushko (1973) to a conclusion on the validity of these two species. This opinion was generally accepted (Bannikov et al., 1977) and later another combination

was proposed for the larva remaining in the collection of the Zoological Institute of the USSR Academy of Sciences, *Turanomolge turkestanicus* (Borkin and Darevsky, 1987). This was also accepted in a recent overview (Dunaev and Orlova, 1994). However, a critical study conducted by Kuzmin et al. (1995) has led to the conclusion that the two larvae of "*Hynobius turkestanicus*" and "*Turanomolge mensbieri*" remaining up to the present time, really belong to the family Salamandridae, most probably the *Triturus cristatus* superspecies. In this relationship, preliminary synonymization of *Turanomolge mensbieri* with *Triturus cristatus* was proposed, as well as recognition of the validity of *Hynobius turkestanicus*, by the original description.

### **Family Salamandridae Gray, 1825**

The family includes 15 genera, two of which live in the Caucasus.

#### **Genus *Mertensiella* Wolterstorff, 1925**

A doubt in the reality of the genus *Mertensiella* was expressed on the basis of similarity in structure of the skull bones and the transient pattern of this and other characters (tail length, etc.) in the row *Mertensiella caucasica* – *Mertensiella luschani* – *Salamandra salamandra* (Özeti, 1967). According to N. Özeti, *Mertensiella* is no more than a subgenus within the genus *Salamandra*. This view has not become widespread (Bannikov et al., 1977; Obst and Rotter, 1962; Atatür and Budak, 1982; Borkin, 1986; Borkin and Darevsky, 1987; Klewen, 1988). Thus, the genus *Mertensiella* is now considered as including 2 species, one of which lives in the Caucasus.

#### ***Mertensiella caucasica* (Waga, 1876)**

*Exaeretus causicus* Waga, 1876 – Rev. Mag. Zool. Ser. 3: 326-328. Terra typica: Zekari Pass, Georgia.

*Mertensiella caucasica djanaschvilii* Tartarashvili et Bakradze, 1989. – Soobshcheniya Akademii Nauk GSSR 133 (1): 177-178. Terra typica: Mtirala Mountain, environs of Batumi Town, Adjara, Georgia.

A description of this subspecies, distinguished mainly by peculiarities of coloration, has caused doubts about the type locality (which is positioned within the range of the nominative subspecies) and the lack of indication on the specificity of animals from the Mtirala Mountain by Obst and Rotter (1962), who have also studied salamanders from that place. However, my work in Adjara revealed that all the individuals from Mtirala Mountain are characterised by the different modifications of brown-orange coloration described by Tartarashvili and Bakradze (1989). The animals are more subtle as compared to the black-coloured, large individuals of the nominative subspecies. Moreover, this form is distributed over the whole of the basin of the lower flow of the rivers Chorokh and Korolitskhali in Adjara. It is interesting to note in this relationship that only individuals with typical coloration for the nominative subspecies have been recorded in the Anatolian part of the salamanders' range (Atatür and Budak, 1982). However, these authors did not analyse materials from the lower parts of Chorokh River and the adja-

cent Lazistianian shore (Atatür and Budak, 1982: map 1, p.296), whereas the closest locality from Shavshet is actually within the range of the nominative subspecies.

My field studies in Turkey: in the surroundings of Borchkha, Murgul, and Artwin did not confirm the presence of the nominative subspecies on the east of the Pontic (Lazistianian) Ridge. There, as in coastal Adjaria, red-brown, sometimes with a clear dove-coloured taint, individuals of *M. c. djanaschvilii* occur (Fig. 3).

### Genus *Triturus* Rafinesque, 1815

Among 12 known species, 3 live in the Caucasus. Intraspecific groups are simply understood. According to Lantz (1947), *Triturus cristatus* is distinct from the “*vulgaris* group”, which includes *T. vulgaris* and *T. vittatus*. Analysis of secondary sexual characters and sexual behaviour allowed Belyaev (1981a, b) to combine *T. vittatus* and *T. cristatus* in one group and to allocate *T. vulgaris* to another group. Finally, the inclusion of *T. vittatus* in the “*alpestris* group” was proposed (Ragghianti et al., 1978).

#### *Triturus (cristatus) karelinii* (Strauch, 1870)

*Triton Karelinii* Strauch, 1870. – Mem. Acad. Sci. St. Petersburg 7 (16): 42. Terra typica: southern shore of the Caspian Sea in Persia (=Iran).

*Triton longipes* Strauch, 1870. – Mem. Acad. Sci. St. Petersburg 7 (16): 44. Terra typica: surroundings of Astrabad (Caspian shore in Iran)

?*Turanomolge menzbieri* Nikolsky, 1918. – Zernovodnye. Fauna Rossii i Sopredelnykh Stran. Petrograd: 257. Terra typica: Turkestan.

Views on taxonomic position of this form living on the Balkan and Crimean peninsulas in Asia Minor, on the Caucasian Isthmus and in Talysh – Elburz, are quite contradictory. Described by Strauch as a separate species, it has been considered later as a subspecies of the polytopic species, *Triturus cristatus*. Nikolsky (1918) considered that the Western Caucasus is inhabited by the subspecies *Molge cristata carnifex* (= *T. cristatus carnifex* Laurenti, 1768), whereas Dinnik (1902) indicated the nominative subspecies of *T. cristatus*, from the same locality (Psebai). Krasovsky (1933) repeated the opinions of these authors. Bartenev and Reznikova (1935) indicated the existence of *T. cristatus cristatus* also in West Transcaucasia (Achishkho Mountain). *Molge cristata* var. *karelinii* has been indicated for South-Western Transcaucasia (environs of Artwin Town, Turkey) by Nesterov (1911). He thought, however, that this form occurs in Dalmatia and Spain, in addition to Transcaucasia and North-Eastern Persia.

According to Borkin (1986), recent karyological studies and protein electrophoretic analysis indicate divergence of the geographic forms of *T. cristatus* above the level of subspecies. The same idea has been expressed in recent overviews (Borkin and Darevsky, 1987). However, the problem of the taxonomic status of different subspecies of the “*cristatus* – complex”, including the “*karelinii* – group”, seems not to be definitely resolved as yet. In this respect, the work of Yugoslavian scientists (Crnobrnja et al., 1989) is important. They used an electrophoretic method for the elucidation of genetic divergence of all four subspecies of *T. cristatus* living in the territory of the former Yugoslavia. These authors came to the conclusion that mean genetic distance does not

characterise the spatial proximity of populations and that their main divergence took place from one to three millions years ago. The presence of hybrid zones and, first of all, between the forms *karelinii* and *dobrogicus* require additional, more complex analysis, which would be capable of demonstration of the internal hierarchy of subspecies or sister species within “*cristatus* – complex”, although, according to recent data (Litvinchuk et al., 1994), the presence of hybrid zones is placed in doubt.

***Triturus vittatus ophryticus* (Berthold, 1846) (Fig. 4)**

*Triton ophryticus* Berthold, 1846. – Nachr. Königl. Ges. Wiss. Göttingen 12: 189. Terra typica: Tiflis (= Tbilisi) City, Georgia

This form has been described as a separate species and then combined with some other subspecies under the rank *Triturus vittatus* (Gray, 1835). After the analysis made by Steinitz (1965), the view of the presence of only two subspecies, the nominative, distributed from Israel to Southern Turkey, and *T. vittatus ophryticus*, which lives in Anatolia and the Caucasus, has become generally accepted. The equal width of stripes on the male dorsal crest is considered as the main difference of *T. vittatus ophryticus* from the nominative form (Bannikov et al., 1977). In spite of significant differences in body size and proportions noted by me in *T. vittatus ophryticus* in the Western Caucasus (Tuniyev, 1994), in general, a single coloration type and pattern was recorded in representatives of West-Caucasian populations and individuals from Eastern Transcaucasia. At the same time, the presence of dark-coloured forms on the left bank of the Chorokh River (Charnali Gorge) and of similar forms in the province of Marash, Turkey (Leviton et al., 1992: pl. 31g), provides evidence for the necessity of additional studies on intraspecific systematics of *T. vittatus*. In addition, sharp differences in the biology and ecology of the two subspecies may indicate their specific status. A photograph of *T. vittatus* from Elbasy, Turkey, in the book of Leviton et al. (1992: plate 31f) is also characterised by the presence of stripes of equal width on the male dorsal crest, but habitus and “stream-like”, two-striped pattern of the flanks have neither commonness with the pattern of *T. vittatus ophryticus* from the major part of the Caucasian range, nor with dark-coloured individuals recorded in the Adjaro-Lazistianian part of the range. At the extreme north-west of the Caucasian range, in the surroundings of Gelendzhik and Tuapse towns, the animals are coloured with golden-brown tints with slightly visible pattern elements. The taxonomic status of these populations also requires elucidation.

***Triturus vulgaris lantzi* (Wolterstorff, 1914) (Fig. 5)**

*Triton vulgaris* L. subsp. *typica* f. *Lantzi* Wolterstorff, 1914. – Abh. Ber. Mus. Naturk. Magdeburg 2 (4): 5. Terra typica: Novorossiisk City, North-Western Caucasus.

Infrasubspecific name given by W. Wolterstorff, has been kept as a subspecific name for Caucasian representatives of *Triturus vulgaris*. In addition to morphological differences, studies by Belyaev (1978) revealed some differences in elements of the sexual behaviour of *T. vulgaris vulgaris* and *T. vulgaris lantzi*. At the same time, it is interesting to note the opinion of Bartenev and Reznikova (1935) who considered *T. vulgaris lantzi* to inhabit only the Black Sea shore of the Caucasus and some foothill localities of

the Northern Caucasus, whereás towards the highland of the Western Caucasus this form is replaced with the nominative subspecies, through some transitory variants. Analysis of the external morphological characters of *T. vulgaris lantzi* revealed the presence of individuals deviating from *T. vulgaris lantzi* in some populations (Tuniyev, 1994). In addition, the origin and taxonomic status of the newts from Lenkoran District, Azerbaijan, which are traditionally considered as *T. vulgaris lantzi*, remains unclear. Records of *T. vulgaris* in the surroundings of Lenkoran Town is interesting also in relation to the fact that this species has not been found in Elburz and on the Caspian shore of Iran (S. Anderson, in litt.).

## ORDER ANURA RAFINESQUE, 1815

About 2,900 species from 237 genera compose 19 families of this order.

### Family Bufonidae Gray, 1825

The family includes 305 species from 21 genera. Members of 1 genus live in the territory of the alpidés of the Caucasus and Middle Asia.

#### Genus *Bufo* Laurenti, 1768

More than 250 species of this genus are known; among them, 3 - 4 are distributed in the Caucasus and Middle Asia.

#### *Bufo verrucosissimus* (Pallas, [1814])

*Rana verrucosissima* Pallas, [1814]. – Zoographia Rosso-Asiat. 3: 15. Terra typica: Caucasus.

*Bufo colchicus* Eichwald, 1831. – Zoologia Specialis Ross., Polon. 3: 167. Terra typica: Colchis.

The Caucasian Common Toad was described under the name *Rana verrucosissima* by Pallas [1814]. Later, Eichwald (1831) described *Bufo colchicus* from the Black Sea shore of the Caucasus. In 1832, I. Dwigubsky proposed the new combination *Bufo verrucosissima* for this toad, confirming the priority of P.S. Pallas. Further researchers (Kessler, 1878; Boettger, 1892b; Radde, 1899; Silantiev, 1903; Nikolsky, 1913; etc.) combined Caucasian and European common toads in one species, *Bufo vulgaris*. Later, A.M. Nikolsky combined Caucasian and European common toads in the nominative subspecies. However, he recognised the taxonomic validity of the Far Eastern common toads.

In the list of synonyms of *Bufo bufo bufo*, Nikolsky (1918) noted *Rana caucasica* Pallas (?) and *Bufo causicus* Menétriés. Menétriés (1832) provided *Rana caucasica* Pallas in the list of synonyms of *Bufo causicus* and indicated this species for Baku City, Azerbaijan. At the same time, he keeps the name *Bufo variabilis* Pallas for the Green Toad (*Bufo viridis*). We can conclude that *Rana ridibunda* was considered there, because common toads are absent from Baku and from an area of hundreds of kilometres around. They are known only from Talysh and Zakataly in Azerbaijan

(Alekperov, 1978). The closest localities of *Rana macrocnemis* are known from the slopes of the Great Caucasian Ridge.

It is very indicative that Mertens and Wermuth (1960: p.57) in the list of synonyms of *Bufo bufo verrucosissimus* kept *Rana verrucosissima* Pallas, *Bufo colchicus* Eichwald, *Bufo bufo verrucosissima* by Terentjev and Chernov (1949), but indicated *Rana caucasica* Pallas and *Bufo causicus* Menétriès, considering them as junior synonyms of *R. ridibunda*.

In 1993, D.V. Krasovsky described the subspecies *Bufo bufo turowi* from northern part of the Caucasian State Reserve. He thought that the Black Sea coast is inhabited by the nominative subspecies. In 1936, P.V. Terentjev and S.A. Chernov considered all the common toads from the Caucasus as a separate subspecies, *B. b. verrucosissima*. This view has become generally accepted later (Terentjev and Chernov, 1949; Bannikov et al., 1977; Mertens and Wermuth, 1960; Engelmann et al., 1985).

In the last years, comparative analysis of all the forms of common toads living in the former USSR, has been conducted using different methods of studies: morphometrics, karyology and electrophoresis (Pisanetz, 1978b; Borkin and Roshchin, 1981; Birstein and Mazin, 1982; Borkin, 1984; Matsui et al., 1985; Pryalkina, 1985). The majority of these authors tend to consider the Caucasian Common Toad as a separate species. Chkhikvadze (1984: p.8), without concretising the materials, admits that "significant differences in external morphology, ecology, osteology (of *Bufo verrucosissima*) indicate that, in this case, we deal with a separate species having its independent evolutionary fate and tendencies". At the same time, Pisanetz (1978b), in spite of serious differences between the Caucasian Common Toad and the nominative subspecies noted by him, considers it as subspecies but not a species. Such an approach, as correctly noted by Borkin and Roshchin (1981), is usually a matter of tradition. The Caucasian Common Toad should probably be considered as a separate species (Borkin, 1986; Borkin and Darevsky, 1987). The Caucasian or Colchic Toad, considered by us as a separate species, *Bufo verrucosissimus* (Pallas [1814]) (Orlova and Tuniyev, 1989), produces several forms within the species' range.

The nominative subspecies (Fig. 6 and 7) differs from *B. verrucosissimus turowi* by a larger body and its segments, a well-developed cervical interception, and peculiarities of the skin and coloration. It differs from *B. bufo* by a larger body and its segments, except for head length, which is relatively large in *B. bufo*. In addition, this form is distinguished by the shape of the tongue, structure of the skin (extent of tubercle development), the nuptial coloration of males and juvenile coloration: *B. bufo* juveniles are brownish-reddish with dark parotoids, whereas juvenile *B. verrucosissimus* are orange, with lighter and bright-yellow parotoids. The sexual differences are most prominent in the length of body and its segments, in comparison with *B. bufo* and *B. verrucosissimus turowi*. The differences in nuptial coloration are weak or absent, in difference to *B. bufo*.

The range of the nominate subspecies embraces the southern macroslope of the Main Caucasian Ridge from the surroundings of Tuapse Town in the west to the Settlement of Akhaldaba in the Kura River valley in the east. The Main Caucasian Ridge serves as the northern range margin. Along the Black Sea slope of the Pontic (Lazistanian) Ridge, the range is composed of a narrow band into Trabzon in Turkey. It is difficult to identify the specific position of common toads distributed westward from Trabzon as is revealed by recently published data (Yilmaz and Kumlutas, 1995). In the area of the so-called Colchic Gates, the subspecific range reaches the northern slope of the Main Caucasian Ridge by the valley of the Belaya River to the settlements of Mezmai, Guzeripl and Sakhray in the north. Toads from the districts of Lagodekhi - Zakataly possibly belong to the same subspecies because new localities have been found along the southern slope of the Great Caucasus. These localities form a practically indistinct chain from Colchis to Lagodekhi (D.N. Tarkhnishvili, pers. comm.).

*Bufo verrucosissimus turowi* (Krasovsky, 1933) (Fig. 8)

*Bufo bufo turowi* Krasovsky, 1933. – *Izvestiya Vtorogo Severo-Kavkazskogo Pedagogicheskogo Instituta (Ordzhonikidze)*: 90-91. Terra typica: Chernorechenskii Cordon, confluence of the rivers Urushten and Malaya Laba, Caucasian State Biosphere Reserve, Krasnodar Region, Russia.

Differences from the nominative subspecies are indicated above. According to Krasovsky (1933: p.90), this form differs from *B. bufo bufo* in the following characters: “Distance between nostrils  $3/4$  of the interocular width, eyelid width always equal to interocular interval, tympanum quite clear, its diameter is  $2/3$  of the eye diameter; web at the both sides of the fourth toe reaches only the third articulation (from the end) of this toe, its cut reaches half of the length of fourth (from the end) phalanx of this toe. Second finger is somewhat longer than fourth but slightly shorter than the first. Tibial length is 2.5 - 2.75, but no more, in the body length from the anus”. According to our data, this subspecies differs also in larger sizes of the body and its segments, except for head length, which is relatively larger than in *B. b. bufo*, tongue shape, and peculiarities of coloration (Orlova and Tuniyev, 1989). As for the tympanum, we found this character to vary widely in all toad species. Therefore, it can not serve as a systematic character. The sexual differences are most prominent in the length of body and its segments. The sexual differences in *B. verrucosissimus turowi* coloration are slight, and the females are somewhat brighter than the males.

In addition to the type locality, this toad has been found by me in the canyon of the Bolshaya Laba River.

*Bufo verrucosissimus circassicus* Orlova et Tuniyev, 1989. – *Byulleten Moskovskogo Obshchestva Ispytatelej Prirody* 94 (3): 20-21. Terra typica: Krepostnaya Village, Krasnodar Region, Russia.

It differs from the nominative subspecies by a longer body and wider head, as well as a higher value for the index head width/distance from the nostril to anterior edge of eye. In addition, *B. verrucosissimus circassicus* is well distinguishable from the previous

subspecies by the lack of a crest on the rostrum, smooth skin, peculiarities of coloration and tongue shape (Fig. 9 and 10). The sexual differences are expressed only in the length of the body and its segments.

The subspecific range covers extreme north-western edge of the Great Caucasus (Orlova and Tuniyev, 1989).

*Bufo verrucosissimus* ssp. (Fig. 11)

This form of the Caucasian Common Toad occurs in Talysh and on the Caspian slope of Elburz mountains. In Soviet literature it is traditionally combined with *B. bufo verrucosissimus* (Terentjev and Chernov, 1949; Bannikov et al., 1977; Alekperov, 1978). However, S. Anderson (Anderson, 1985) indicated that it is not yet known to which particular species the Iranian Common Toads belong, but they may be *B. bufo verrucosissimus*, which is distributed in Caucasus.

My materials (Tuniev, 1995a) indicated a high level of differences in morphometric characters between males of the common toads from Talysh and from all other Caucasian common toads. The level of differences between females is insignificant. In general for the Talysh individuals, the maximum values of the body length and limb proportions in males, as well as numerous qualitative differences (pattern, character of spines, etc.) were recorded. This form is similar to *B. verrucosissimus verrucosissimus* in having the narrow, spindle-like form of the tongue. However, a final decision on the taxonomic position of this form requires examination of additional materials.

***Bufo* “viridis – complex”**

Current knowledge of the toads from the “viridis – complex” seems to be a most complex and knotty situation in the systematics and nomenclature of Palearctic amphibian species. The number of species and forms described from the vast territory from the eastern shore of the Mediterranean Sea and Arabia to Kashgaria and adjacent mountain areas of China, and from Middle Asia to south of Iran is so large, and the understanding of their taxonomic position so contradictory, that the situation in general is unclear up to the present. It is even impossible to indicate the number of species, not to mention the infrastructure of taxa. Almost all modern works contain discussions on these difficulties (Anderson and Leviton, 1969; Pisanetz, 1977, 1991; Eiselt and Schmidtler, 1973; Hemmer et al., 1978; Pisanetz and Szczerbak, 1979; Borkin et al., 1986; Leviton et al., 1992; Zhao and Adler, 1993; etc.). For example, Anderson and Leviton (1969), discussing the “viridis – complex” from Afghanistan, noted that the status of different nominal forms attributed to *Bufo viridis* is quite unclear. Probably, all of them: *B. andersonii*, *B. oblongus*, *B. olivaceus*, *B. pentoni*, *B. persicus* and *B. surdus* represent a late Pleistocene isolation of the same, more widespread species, *B. viridis*. At the same time, these authors indicated *B. andersonii* for Afghanistan, in addition to *B. viridis*. They synonymized *B. oblongus* with *B. andersonii*. *Bufo oblongus*, described by Nikolsky (1896a) from Northern Iran, was considered also as a subspecies *Bufo viridis oblongus* (Eiselt and Schmidtler, 1973; Pisanetz and Szczerbak, 1979), or a subspecies *Bufo latastii oblongus* (Andersen, 1985), or a form close to *Bufo danatensis* (Borkin et al., 1986).

Since the time of separation of three populational groups of *Bufo viridis* in the USSR (Pisanetz, 1977), two subspecies have been described: *B. viridis turanensis* from the type territory of Dushanbe, Tajikistan (Hemmer et al., 1978) and *B. viridis asiamentanus* from the type territory of Arslanbob, Fergansky Ridge, Kirgizia (Pisanetz and Szczerbak, 1979). In addition, the presence of another 22-chromosome form was noted in Shaartuz, Tajikistan. This form was distinguished by its external morphological characters and advertisement calls from other diploid toads of Middle Asia (Pisanetz, 1991). Pisanetz and Szczerbak (1979) considered East Transcaucasia as a contact zone between the nominative subspecies and *B. viridis turanensis*, and south-eastern Turkmenia as the zone of intergradation of the latter with *B. viridis oblongus*. Anderson (1985) believed that North-Western Iran is inhabited by the nominative subspecies, whereas the south-west is inhabited by *B. viridis arabicus*, and the mountains of Kerman by *B. viridis kermanensis*. S. Anderson thought that the Green Toad is replaced in the mountains of Khorasan with *B. latastii oblongus*. He also admitted *Bufo cavirensis*, described by Andren and Nilson (1979) from the Deshte-Kevir Desert, as well as some other species: *B. luristanicus*, *B. olivaceus*, *B. surdus surdus*, *B. s. annulatus*, and *B. stomaticus*. Some of these species were recently combined (Leviton et al., 1992).

Small green toads from the southern regions of Tajikistan and Uzbekistan were attributed to *Bufo latastii* (Hemmer et al., 1978), which was later discounted by Pisanetz and Szczerbak (1979). The opinion of the latter authors was generally accepted (Borkin et al., 1986), but the problem of the systematic position of eastern forms described by Bedriaga (1898) from Central Asia remains unresolved. Zhao and Adler (1993) have put the forms *B. viridis* var. *pewzowi*, *B. viridis* var. *strauchi*, and *B. viridis* var. *Grum-Grzimaloi* in synonyms of *Bufo viridis* Laurenti, 1768, whereas *Bufo nonettei* Mocquard, 1910 was synonymized by them with *Bufo raddei* Strauch, 1876. At the same time, these authors noted that a part of individuals of *B. viridis* from the territory of China may belong to the sister species, *Bufo danatensis*.

As the problem of taxonomic attribution of diploid members of the "viridis - complex" is not yet resolved, I attribute, conventionally, the forms from the alpidés of the Caucasus and Middle Asia to the species *Bufo viridis* with three subspecies:

***Bufo viridis* Laurenti, 1768**

*Bufo viridis asiamentanus* Pisanetz et Szczerbak, 1979

*Bufo viridis turanensis* Hemmer, Schmidtler et Böhme, 1978. – Zool. Abh. Mus. Tierk. Dresden 34 (24): 349-384. Terra typica: Dushanbe City, Tajikistan

*Bufo viridis oblongus* Nikolsky, 1896

***Bufo danatensis* Pisanetz, 1978.** – Doklady Akademii Nauk UkrSSR, Ser. B, 3: 280-284. Terra typica: Danata Settlement, Kyuren-Dagh Ridge, Turkmenia.

This polyploid species ( $4n = 44$ , instead of  $2n = 22$  common for *Bufo*) has been described from the Western Turkmenia (Pisanetz, 1978a), although the first polyploid toads were discovered in the mountains of Kirgizia (Mazik et al., 1976). Later, the range of the species was clarified. It was revealed to include the territory of Southern Turkmenia,

Uzbekistan, Tajikistan (Pisanetz and Szczerbak, 1979), Kirgizia, Southern and Eastern Kazakhstan to the lakes Balkhash and Zaissan in the north, as well as Western Mongolia (Borkin et al., 1986) and Western China (Pisanetz, 1991; Zhao and Adler, 1993). According to Pisanetz (1987), in addition to the external morphological differences and the number of chromosomes, *Bufo danatensis* differs from *B. viridis* by the arrangement and size of the eggs in the spawn string. This was not confirmed by my observations in nature.

The nominative subspecies is distributed within mountains of the Alpien folding of the Middle Asia and *Bufo danatensis pseudoraddei* Mertens, 1971 lives eastwards, in the highlands of Alai and Tien-Shan (Pisanetz and Szczerbak, 1979).

The taxonomic position of toads inhabiting the lowlands of Kazakhstan, Mongolia, and China is unclear (Orlova and Uteshev, 1986; Borkin et al., 1986). The tetraploid toads from the lowland of Kazakhstan have been conventionally called *B. danatensis* (Borkin et al., 1995), although the comments by Borkin et al. (1986) on species nomenclature and volume are right. The problem of the synonymization of *B. danatensis* with *B. viridis pseudoraddei* would be resolved if Pisanetz and Szczerbak (1979) would propose another name for the highland polyploid toads of Tien-Shan, because such possibility has taken place due to the mixed composition of *B. viridis pseudoraddei* Mertens, 1971<sup>1</sup>. However, in this case, full resolution of the problem might be done by studies on the ploidy and taxonomic relationships of numerous forms of the *viridis* – complex described from Iran, Middle Asia, China, and Mongolia (Borkin et al., 1986).

### **Family Hylidae Gray, 1825**

The family contains about 40 genera and 2 subfamilies, one of which lives in the Caucasus.

#### **Genus *Hyla* Laurenti, 1768**

About 450 species are distributed on all the available continents, except for tropical Africa and South Asia. Two species live in the Caucasus.

*Hyla arborea schelkownikowi* Černov, 1926. – Byulleten Severo-Kavkazskogo Instituta (Vladikavkaz) 1: 70. Terra typica: the cities of Stpanavan, Armenia and Kutaisi, Georgia.

The taxonomic status of this form has been considered doubtful (Terentjev, 1960), due to clinal variation in the body proportions of this and the nominate subspecies. However, Shelkovnikov's Tree Frog is geographically isolated, as noted earlier by Borkin (1986). Currently, it is considered as a subspecies of the Common Tree Frog (*Hyla arborea*), which was promoted also by osteological peculiarities as compared with *H. arborea arborea* (Gutieva, 1989) (Fig. 12).

#### ***Hyla savignyi* Audoin, 1812**

This form was considered as a subspecies of *Hyla arborea* (Linné, 1758) for a long time. As materials on the ecology (Aleksperov, 1978), vocalisation (Danielian and Egiazarian,

<sup>1</sup> Pisanetz and Szczerbak indicated partial (part.) synonymization with the latter subspecies.

1973) and morphology have accumulated, the basic difference of the two forms in all the parameters studied has become evident. The situation was especially complex due to the sympatry of both forms in some districts of Armenia and Azerbaijan. In the most recent overviews (Engelmann et al., 1985; Borkin and Darevsky, 1987), *H. savignyi* has been considered as a separate species. Gutieva (1989) came to the same conclusion after her study on morphological peculiarities in the tree frogs. It should be especially noted that indications of the existence this species in different areas of the Western Caucasus and Western Transcaucasia (Nikolsky, 1918; Krasovsky, 1933; Bartenev and Reznikova, 1935; Tuniyev, 1985) are erroneous. They should be attributed to *H. arborea*.

### Family Pelobatidae Bonaparte, 1850

The family includes 9 – 11 genera. One of them is distributed in the Caucasus.

#### Genus *Pelobates* Wagler, 1830

One of the four known species inhabits the Caucasus and one another, *P. fuscus* (Laurenti, 1768), lives in lowland Precaucasia.

#### *Pelobates syriacus* Boettger, 1889 (Fig. 13)

*Pelobates syriacus boettgeri* Mertens, 1923. – Senckenbergiana Biol. 5: 122. Terra typica: Belyasuvar Settlement, Azerbaijan.

Mertens (1923) has described the form *P. syriacus boettgeri* by narrow-skull specimens from South-Eastern Azerbaijan. Later this name was considered as a synonym of the nominative species (Terentjev and Chernov, 1949). Anderson (1978a, 1985) indicated the distribution of the nominative subspecies in the areas of Northern Iran bordering with Azerbaijan.

### Family Pelodytidae Bonaparte, 1850

*Pelodytes caucasicus*, formerly considered as a member of the family Pelobatidae, takes an intermediate position between *Pelobates* and *Scaphiopus* by the DNA content (Aleksandrovskaya et al., 1979). The fact that the genome size in *Pelobates* is about twice as large as in *Pelodytes* (Aleksandrovskaya et al., 1979), as well as the morphological differences in the adult and larval stages (Lynch, 1973; Borkin and Anisimova, 1986) promoted the rooting of the opinion on the distinctiveness of the family Pelodytidae. This is a monotypic family.

#### Genus *Pelodytes* Bonaparte, 1850

Includes 2 species, one of which is distributed in the Caucasus.

*Pelodytes caucasicus* Boulenger, 1896. – Ann. Mag. Nat. Hist. 6 (17): 406. Terra typica: Lomis-Mta Mountain, Adjaro-Imeretian Ridge, Georgia.

*Pelodytopsis caucasica* Nikolsky, 1896. – Ezhegodnik Zoologicheskogo Muzeya Imperatorskoi Akademii Nauk 1 (1-2): 137-140. Terra typica: Lagodekhi, Georgia.

Currently, *Pelodytes caucasicus* (Fig. 14) is combined with the West European species, *Pelodytes punctatus* in one genus, in spite of the opinion on the possibility of separation of the Caucasian species in a separate genus, *Pelodytopsis* (Nikolsky, 1896).

On the basis of the lack of differences in morphometrics, Terentjev (1949) considered *Pelodytes caucasicus* as no more than a subspecies of *P. punctatus*. According to Borkin (1986), such opinion can not be recognised as seriously substantiated, because the similarity in morphometric indices in such forms is not always evidence for a low level of divergence. Materials collected during recent years, including morphometrics, confirmed this opinion. *Pelodytes caucasicus* is larger than *P. punctatus*, the coloration of upper body part in breeding males is darker, nuptial coloration of throat is absent, the green tints are less developed in coloration and the cross is better expressed (Golubev, 1985). The skin relief in *P. caucasicus* is better developed and includes elements lacking in *P. punctatus*: central dorsal lines, additional pads on legs, etc. In difference to *P. punctatus*, in *P. caucasicus* the fronto-parietal bones are in close contact. In general, a higher extent of skull bone reduction is typical for *P. punctatus* (Golubev, 1985). Aleksandrovskaia et al. (1979) noted some differences in the karyotypes of both forms. The group of large chromosomes in *P. punctatus* consists of 4 pairs of submetacentric and 3 pairs of subtelocentric homologues, whereas in *P. caucasicus* of 3 and 4 pairs, respectively. Secondary interception in *P. punctatus* is localised in the 7th and 9th pairs of chromosomes, whereas in *P. caucasicus* this is found only in the 2nd pair of large chromosomes. There are also many differences in the biology and ecology of these species, including habitats, spawning, vocalisation, etc.

In the guide by Bannikov et al. (1977), Lomis Mountain (surroundings of Bakuriani Town, Georgia) was indicated as the type territory. The surroundings of Bakuriani were indicated for Boulenger's (1896) type specimen also in the review by Golubev (1980). However, the peak of Lomis-Mta is positioned not in the surroundings of Bakuriani on the right bank of the Kura River, but on its left bank in surroundings of Borzhomi, in the territory of the contemporary Borzhomskii Nature Reserve. The correct name of the mountain, Lomis-Mta, has been noted also by Chanturishvili (1940). Therefore, the terra typica of *Pelodytes caucasicus* is Lomis-Mta Mountain, surroundings of Borzhomi, Eastern Georgia.

### **Family Ranidae Gray, 1825**

A large family subdivided into 6 subfamilies and 45 genera. The Caucasus and Middle Asia are inhabited by representatives of the same genus from the subfamily Raninae.

#### **Genus *Rana* Linnaeus, 1758**

The genus consists of more than 200 species, four of which are known from the Caucasus and Middle Asia (not including introductions).

***Rana camerani* Boulenger, 1886.** – Bull. Soc. Zool. France 11: 597. Terra typica: Tabistskhuri Lake and Akhalkalaki Settlement, Georgia.

This form is considered as a separate species in the literature (e.g., Nesterov, 1911; Terentjev and Chernov, 1949; Terentjev, 1950; Ushakov, 1959; Dal, 1954; Papanian, 1961; Eiselt and Schmidtler, 1973; Bischoff and Engelmann, 1976; Logvinenko and Pryalkina, 1987), or as a subspecies of *Rana macrocnemis* (Lantz and Cyren, 1913;



Fig. 14. *Pelodytes caucasicus*. Adult male from the Yew-Box grove of the Caucasian State Biosphere Reserve, Russia.



A

Fig. 15. *Rana macrocnemis*. A – adult female from the subalpine belt of the Caucasian State Biosphere Reserve, Russia; B – rare striped morph from the subalpine belt of Uglovoi Ridge, Caucasian State Biosphere Reserve, Russia; C – adult male from limestone Fisht Mountain, Caucasian State Biosphere Reserve (photo: C. Andren); D – adult female from the subalpine belt of Gizeldere Gorge, Turkey.



Fig. 15. Continued.

B



Fig. 15. Continued.

C



Fig. 15. Continued.

D

Ishchenko and Pyastolova, 1973; Bannikov et al., 1977), or synonymized with the latter species (Borkin, 1977; Ishchenko, 1978, 1987).

Without introducing an analysis of the existing views on this problem, which was done by Borkin (1977, 1986), I shall note that I follow those authors which consider *R. camerani* as a separate species. Ishchenko (1978) considered the facts of the overlapping of morphological characters in brown frogs from Precaucasia and Transcaucasia, as well as a high similarity of individuals from the canyon of the Baksan River in the Northern Caucasus and Vokhchabert Village in Armenia, as evidence for the combining of *R. camerani* and *R. macrocnemis* into one species or subspecies. For me, such a conclusion is not well substantiated. Terentjev (1950) suspected the existence of *R. camerani* in southern Dagestan. I have found both species in Transcaucasia and on the northern slope of the Great Caucasus, excluding its western part. *Rana macrocnemis* is always a more mesophilous species and, for example, in South Armenia it was encountered in the densest parts of gallery forests in the valleys of the rivers Khosrov, Shvanidzor, etc., where they lived in streams jointly with *R. ridibunda*.

On the other hand, *R. camerani* in the Northern Caucasus exclusively inhabits semi-arid hollows at middle elevations. A chain of such hollows extends from Dagestan to Kabardino - Balkaria (Tuniyev, 1995b). In other words, the samples treated by Ishchenko (1987) might include representatives of both species. At the same time, the solution of problems of the taxonomic status of such complicated groups as Caucasian and Minor Asian brown frogs should include modern methods of biochemical analysis. It is also necessary to analyse the whole complex of problems of the original speciation and evolution of batrachocomplexes under mountain conditions of the Caucasus and the Armenian Highlands.

***Rana macrocnemis* Boulenger, 1885 (Fig. 15)**

The species is fairly variable within the Western Caucasus and Western Transcaucasia. Small individuals with very long limbs and an unusual greenish coloration of the flanks of the body and thigh bases are typical for Adjara.

*Rana macrocnemis pseudodalmatina* Eiselt et Schmidtler, 1971

*Rana temporaria warezowi* Terentjev, 1923. – Trudy Pervogo Vserossiiskogo Siezda Zoologov, Anatomov i Gistologov v Petrograde. Petrograd: 33-35. Terra typica: surroundings of Ashkhabad City, Turkmenia

I included this form in the list only by means of a doubtful record in Arpaklen, south-west of the Kopet-Dagh Ridge (Borkin, 1977). A mistake in labelling can not be excluded: my multiyear special searches for this species in the Kopet-Dagh gave no results.

***Rana lessonae* Camerano, 1882**

The only certain record of this species, in the basin of the Mzymta River, surroundings of Sochi Town (Bartenev and Reznikova, 1935), is hard to explain because the species is absent not only through the Caucasus but also for hundreds kilometres northwards.

*Rana ridibunda* Pallas, 1771

*Rana caucasica* Pallas, [1814]. – Zoographia Rosso - Asiat. 3: 15. Terra typica: Caucasus

*Bufo causicus* Menetriés, 1832. – Catalogue Raison. Objects Zool. Cauc. Terra typica: Baku City, Azerbaijan.

*Rana dentex* Krynicki, 1837. – Bull. Soc. Imp. Nat. Moscou 3: 63. Terra typica restricta: Podkumok River near Pyatigorst Town, Russia

*Rana tigrina* Eichwald, 1842. – Bull. Soc. Imp. Nat. Moscou 7: 157. Terra typica: surroundings of Pyatigorsk Town, Russia, and Mazanderan Province, Iran.

## Other Species

Concluding the list of species living in the alpides of the Caucasus and Middle Asia, it is necessary to note species introduced there relatively recently, as well as the species living in close proximity to the region under consideration.

In lowland Precaucasia this is, first of all, *Bombina bombina* (Linné, 1761), inhabiting the area southwards to the Kuban River and the surroundings of Krasnodar City, as well as *Pelobates fuscus* (Laurenti, 1768) occurring in the Nogaiskaya Steppe to Budary Lake in the south-west. *Rana nigromaculata* Hallowell, 1861, is dispersed over the Kara-Kum Channel in Turkmenia. It has been introduced there occasionally with fish fry. Finally, *Ranodon sibiricus* Kessler, 1866, *Rana arvalis altaica* Kastschenko, 1899 (Fig. 16), *R. amurensis* Boulenger, 1886 and *R. asiatica* Bedriaga, 1898 occur in the eastern sector of the Middle Asian mountains from Tien-Shan to the Zaissan Hollow.

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Fig. 3. *Mertensiella caucasica djanaschvilii*. Adult male from the vicinity of Maden, Pontic Ridge, Turkey.



Fig. 4. *Triturus vittatus ophryticus*. Adult male from the Yew-Box grove of the Caucasian State Biosphere Reserve, vicinity of Sochi Town, Russia.



Fig. 5. *Triturus vulgaris lantzi*. Adult male in reproductive period. Sergei-Pole Village, vicinity of Sochi Town, Russia.

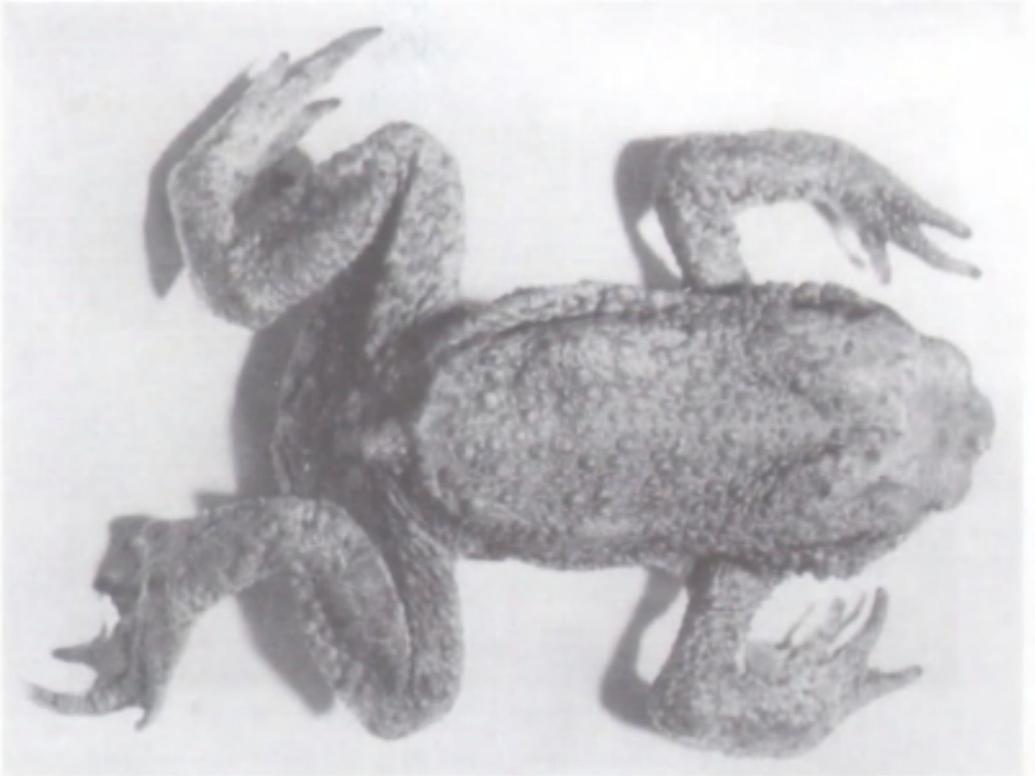
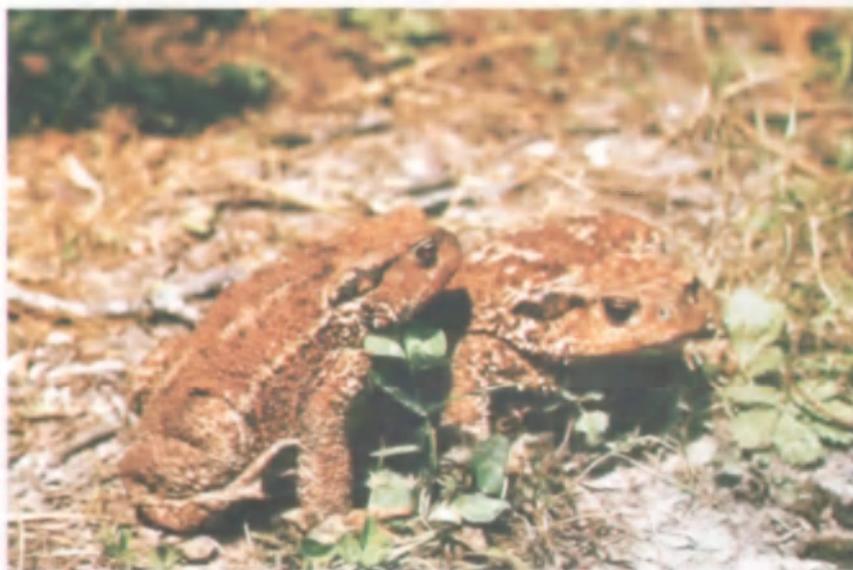


Fig. 6. *Bufo verrucosissimus verrucosissimus*. Type locality: Colchis, vicinity of Sochi Town, Russia.



Fig. 7. *Bufo verrucosissimus verrucosissimus*. Adult female from Charnali Gorge, vicinity of Batumi Town, Adjara, Georgia.



8A

Fig. 8. *Bufo verrucosissimus turowi*. A – from type locality: Chernorechye Cordon, Malaya Laba River, Caucasian State Biosphere Reserve, Krasnodar Region, Russia; B – from new locality: gorge of Bolshaya Laba River, Karachaevo-Cherkessia, Western Caucasus, Russia.



8B

Fig. 8. Continued

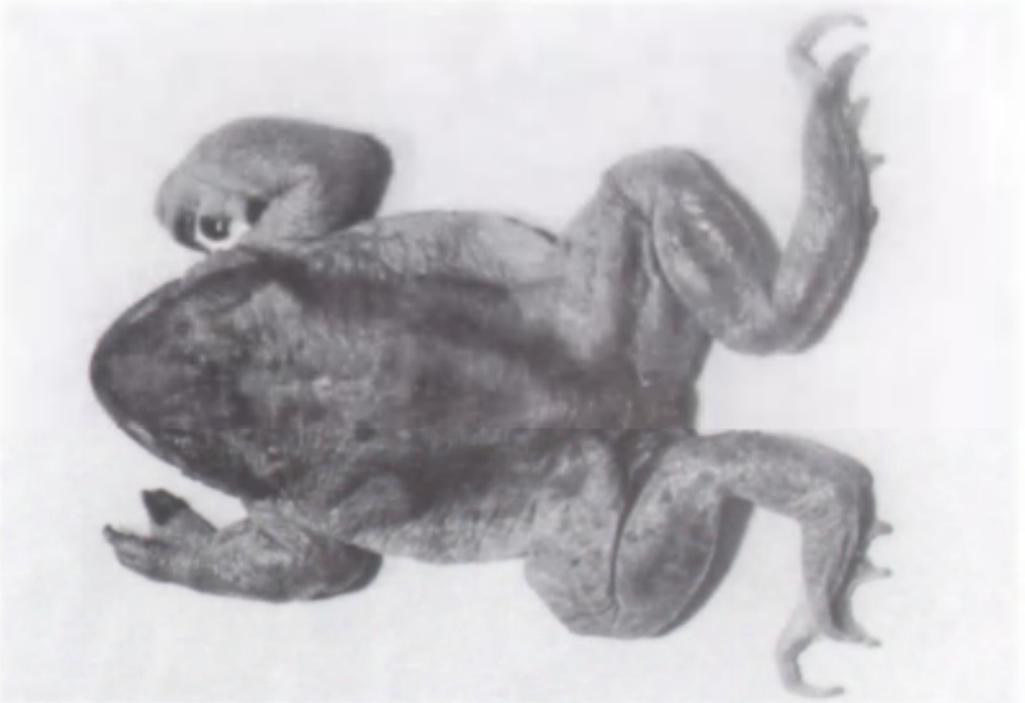


Fig. 9. *Bufo verrucosissimus circassicus*. Holotype, Zoological Museum of Moscow State University no. 2267, adult male from village Krepostnaya Settlement, Krasnodar Region, Russia.



Fig. 10. *Bufo verrucosissimus circassicus*. Adult male from Papai Mountain, Russia, not far from the type locality.



Fig. 11. *Bufo verrucosissimus ssp.* Adult female from Talysh Mountains, Azerbaijan.



Fig. 12. *Hyla arborea schelkownikowi*. Adult male from vicinity of Sochi Town, Russia (photo: G. Dusej).



Fig. 13. *Pelobates syriacus*. Adult from vicinity of Sisian, Armenia.



Fig. 14. *Pelodytes caucasicus*. Adult male from the Yew-Box grove of the Caucasian State Biosphere Reserve, Russia.



A

Fig. 15. *Rana macrocnemis*. A – adult female from the subalpine belt of the Caucasian State Biosphere Reserve, Russia; B – rare striped morph from the subalpine belt of Uglovoi Ridge, Caucasian State Biosphere Reserve, Russia; C – adult male from limestone Fisht Mountain, Caucasian State Biosphere Reserve (photo: C. Andren); D – adult female from the subalpine belt of Gizeldere Gorge, Turkey.



Fig. 15. Continued.

B



Fig. 15. Continued.

C



Fig. 15. Continued.

D



Fig. 16. *Rana arvalis altaica* (extralimital). Adult from Markakol Lake, Southern Altai, Kazakhstan.  
Erratum: Fig. 16 on page 75 is the map to Fig. 1 on page 44

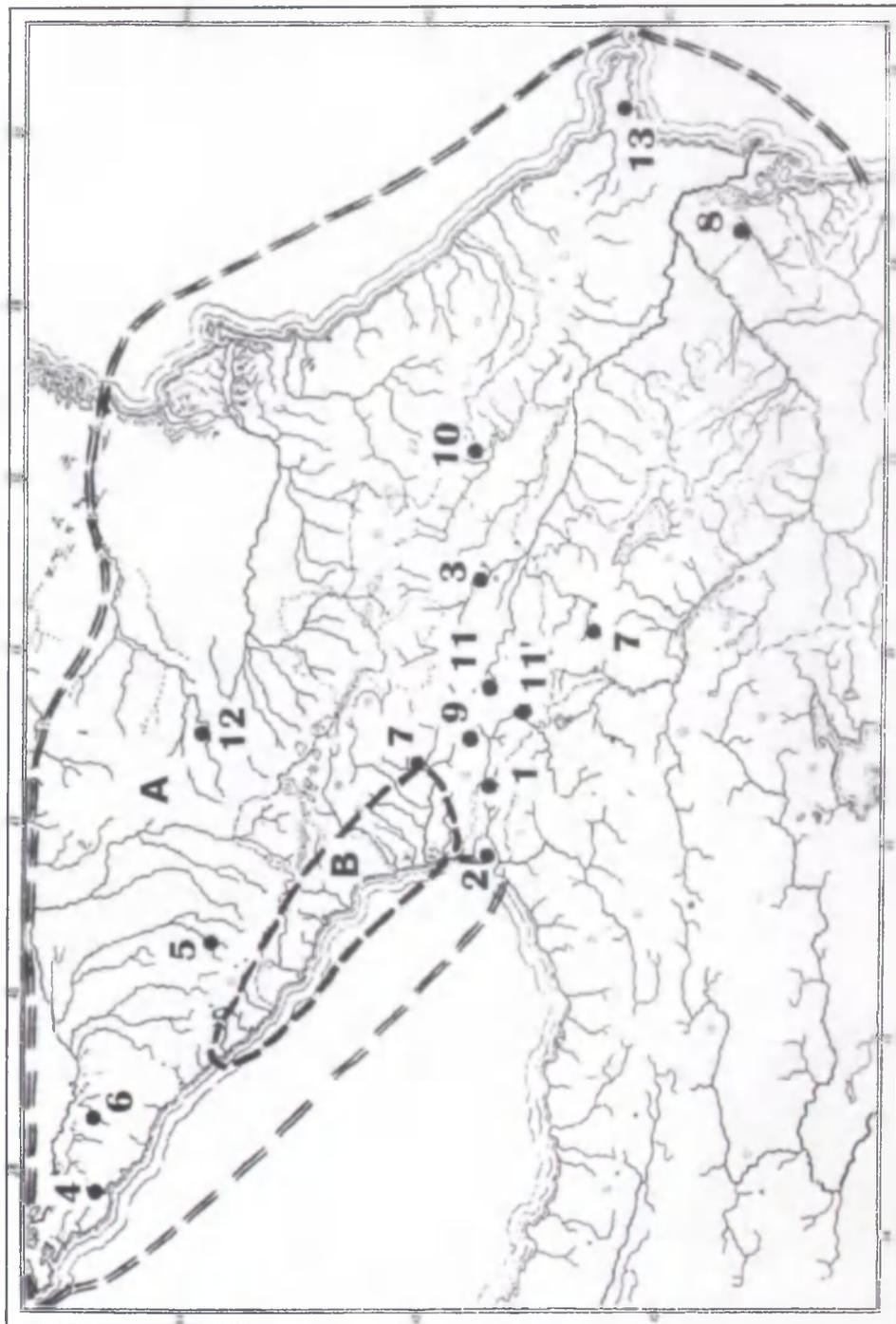


Fig. 16. *Rana arvalis altaica* (extralimital). Adult from Markakol Lake, Southern Altai, Kazakhstan.