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Ranid Frog Specimens Collected from the Vicinity of Erzurum, NE Anatolia

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Özet: ***Erzurum civarından (Kuzeydoğu Anadolu) toplanan ranid kurbağa örnekleri.*** Morfolojik analize (morfometrik-renk desen) bakılarak 40 örnek (11 ♂♂, 19 ♀♀, 10 juv.) incelenmiştir. Elde edilen veriler ilgili literatürlerle karşılaştırıldığında; ventral tarafın renklenme karakterleri nominat ırktan çok *Rana ridibunda* cf. *caralitana*'ya benzerlik göstermektedir.

Anahtar Kelimeler: Erzurum, *Rana ridibunda*, morphology

Abstract: A total of 40 specimens (11 ♂♂, 19 ♀♀, 10 juv.) were investigated in detail from the viewpoints of their morphological characteristics, the obtained data then compared with those in the relevant references. The coloration characteristics of the venters point to an affinity to *Rana ridibunda* cf. *caralitana*, rather than the nominate race.

Key Words: Erzurum, *Rana ridibunda*, morphology

Introduction

Until recently accepted as a monotypical species, *Rana ridibunda* was originally described by Pallas from Atyrau, western Kazakhstan (terra typica restricta). Its known range includes middle and southern Europe, northern Africa and western Asia. Its populations inhabiting Turkey were taken as the *Rana ridibunda* complex by Bodenheimer (1944), Baran (1969), Yılmaz (1984), Olgun and Baran (1988). Certain morphological, pattern and coloration characteristics of the Beyşehir population prompted Arıkan (1988) to name the same as *R. r. caralitana*. Later, the same race was reported from Eğirdir and Suğla lakes, from the tributaries of the Çarşamba creek, from Gölcük (Isparta) and Çivril (Denizli) in the west, foot of the Taurus Mts in the south and İvriz-Ereğli (Konya) in the east (Atatür *et al*., 1990; Arıkan *et al*., 1994; Arıkan *et al*.,1998; Budak *et al*., 2000). Arıkan *et al*. (1994) accepted the Sultan Mts as a natural barrier and stated that the population from Akşehir, Eber and Çavuşçu lakes differed from the typical *R. r. caralitana* inhabiting Beyşehir, Suğla, Eğirdir, Gölcük, Hotamış lakes and the Çumra, regarding the viewpoints of ventral pattern and coloration, concluding that it is an intermediate population between *R. r. ridibunda* and *R. r. caralitana.*

In (1992), Schneider *et al*., named the marsh frogs from the southwestern parts of Asia, including the western Turkey, as *Rana levantina*, utilizing voice analysis methods. The same was later changed to *R. bedriagae* Camerano, 1882 considering the priority rule (Beerli 1994, Dubois and Ohler 1994). Sinsch and Schneider (1999) and Schneider and Sinsch (1999) asserted that the temperate western and southern parts of Anatolia is inhabited by *R. bedriagae*, while the presence of the same in the mountainous regions of northern Anatolia is debatable, so the presence of *R. ridibunda* at these regions is a possibility. But according to Beerli (1994), Jdeidi *et al*. (1998) and Jdeidi *et al*. (2001); Anatolia is inhabited solely by *R. bedriagae*. Jdeidi *et al*. (2001), extended the range of the *caralitana* form to include Çardak-Denizli region and inserted this form under *R. bedriagae*, but also stressed the point that since the *caralitana* form and *R. bedriagae* were found sympatrically at Akşehir and Çardak, it is possible to regard *caralitana* as a distinct species.

Because of this taxonomical complexity of the Anatolian marsh or water frogs, we believe that, for the present, it would be more correct to accept them as a *Rana ridibunda* complex. The *caralitana* form, which was described within this complex, can be distinguished from the members of the other Anatolian populations especially by its ventral pattern and coloration characteristics. The aim of the present study is a detailed morphological investigation of the Erzurum population, members of which show some similarities to the *caralitana* form.

Material and Methods

The material (11 ♂♂, 19 ♀♀, 10 juv.) was collected from approximately 5 kms north of Erzurum and now is deposited to the ZDEU (Zool. Dept. Ege Univ.) collection. The pattern and coloration characteristics were recorded from live specimens, later the alcohol-formaldehyde fixed specimens (3 parts 40% formaldehyde + 7 parts 70% alcohol) were kept in 70% ethanol.

The morphometrical measurements were taken with a digital caliper of 0.01 mm sensitivity. To compare the two sexes morphometrically, LSD distribution tests were computed utilizing one-way variance analysis (ANOVA). P-values of less than 0.05 were accepted as statistically significant.

Material: ZDEU 12/2000.1-40; Erzurum province, 20.IX.2000, Leg.: C. V. Tok.

Results

The morphometric data of the sample is given in Table 1. The dorsum of the adult specimens was light to dark brown and greenish. Over this ground color, light to dark green maculations were present. When present, the vertebral stripe was light green, the dorsolateral folds were light brown. The venters were dirty white, overlaying it, at especially on throat and the anterior part of the venter down to the level of the forelimbs, yellow or brownish yellow vermiculate to roundish maculations were evident. The juveniles had dorsums similar to those of the adults, but their whitish venters were covered with fine yellow or yellowish brown maculations.

Table 1. Morphometrical measurements (in millimeters) and ratios of the Ranid material from Erzurum, together with their statistical data. *N*: number of specimens, *M*: means, *SD*: standard deviations and *SE*: standard errors of the means, *SVL*: Snout-Vent Length, *TL*: Tibia Length, *HL*: Head Length, *HW*: Head Width, *FTL*: First Toe Length, *MTL*: Metatarsal Tubercle Length, *HLL*: Hind Leg Length, *FL*: Femur Length.

Charactes	♂♂					♀♀					♂♂+♀♀				
	N	M	Range	SD	SE	N	M	Range	SD	SE	N	M	Range	SD	SE
SVL	11	62.79	47.64-85.08	10.30	3.11	19	62.47	40.90-90.74	15.89	3.65	30	62.59	40.90-90.74	13.91	2.54
TL	11	30.85	23.43-40.61	4.82	1.45	19	30.47	20.64-42.95	7.37	1.69	30	30.61	20.64-42.95	6.47	1.18
HL	11	21.35	16.69-27.00	2.98	0.90	19	20.93	14.37-30.30	4.90	1.12	30	21.08	14.37-30.30	4.24	0.77
HW	11	22.15	16.02-29.30	3.66	1.10	19	21.90	15.10-32.38	5.39	1.24	30	22.00	15.10-32.38	4.76	0.87
FTL	11	9.31	6.80-11.86	1.46	0.44	19	9.30	6.20-13.90	2.43	0.56	30	9.31	6.20-13.90	2.10	0.38
MTL	11	3.00	2.21-3.87	0.54	0.16	19	3.12	1.73-4.65	0.92	0.21	30	3.08	1.73-4.65	0.80	0.15
HLL	11	34.79	26.21-43.30	4.93	1.49	19	34.44	24.50-47.50	7.68	1.76	30	34.57	24.50-47.50	6.71	1.23
FL	11	28.88	22.28-37.79	4.72	1.42	19	28.75	18.78-41.70	7.58	1.74	30	28.80	18.78-41.70	6.58	1.20
SVL/TL	11	2.03	1.97-2.10	0.03	0.01	19	2.05	1.95-2.26	0.08	0.02	30	2.04	1.95-2.26	0.07	0.01
SVL/HW	11	2.84	2.66-3.02	0.11	0.03	19	2.85	2.70-3.04	0.10	0.02	30	2.84	2.66-3.04	0.10	0.02
SVL/FTL	11	6.75	6.25-7.17	0.29	0.09	19	6.73	6.33-7.21	0.25	0.06	30	6.74	6.25-7.21	0.26	0.05
SVL/MTL	11	21.03	17.94-23.16	1.32	0.40	19	20.35	17.44-23.64	1.80	0.41	30	20.60	17.44-23.64	1.65	0.30
HL/HW	11	0.97	0.90-1.06	0.05	0.02	19	0.96	0.91-1.08	0.04	0.01	30	0.96	0.90-1.08	0.04	0.01
TL/MTL	11	10.34	8.65-11.50	0.69	0.21	19	9.97	8.36-11.93	0.98	0.23	30	10.11	8.36-11.93	0.89	0.16
FTL/MTL	11	3.12	2.58-3.71	0.27	0.08	19	3.03	2.63-3.64	0.27	0.06	30	3.06	2.58-3.71	0.27	0.05
FL/TL	11	0.94	0.87-0.97	0.03	0.01	19	0.94	0.86-1.05	0.05	0.01	30	0.94	0.86-1.05	0.04	0.01
SVL/HL	11	2.94	2.73-3.15	0.14	0.04	19	2.97	2.80-3.13	0.10	0.02	30	2.96	2.73-3.15	0.11	0.02
SVL/FL	11	2.18	2.09-2.33	0.08	0.02	19	2.18	2.07-2.31	0.07	0.02	30	2.18	2.07-2.33	0.07	0.01

Pattern analyses were carried out separately on adults and juveniles. Six of the juveniles (60%) had a light greenish vertebral stripe. In two of the striped specimens the dorsal maculations were small and abundant, while in the other four they were bigger and more sparsely distributed. The two of the stripeless specimens had sparse, dark dorsal maculations, while in the other two the maculations were more abundant. In four of the juveniles (40%) the venters were covered with fine maculations, but in six (60%), only the anterior venters from the level of the forelimbs were maculated, also a few dark maculations at the inner parts of the femurs.

Seven of the adult males (63.64%) had vertebral stripes, while 4 males (36.36%) were stripeless (Figure 1). The stripe was present in 68.42% of the females (13) while in six it was absent. The dorsal patterns of the adults could be divided into 4 types (Figure 2):

A) A vertebral stripe is present. Two rows of maculations in contact with the stripe, the rest of the paravertebral maculations in different concentrations and are distributed randomly (seen in six males -54.55%- and ten females -52.63%-, males and females combined -53.33%-). B) Vertebral stripe is absent, vertebral and paravertebral maculations are randomly distributed in various concentrations (seen in three males 27.27% and four females 21.05% , males and females combined 23.33%). C) No stripe present, on both sides more or less distinct three longitudinal rows of maculations are present (seen in two female 10.53% , males and females combined 6.67%). D) A vertebral stripe is present, but the maculations adjacent to the stripe rarely in contact with it, and are randomly distributed (seen in two male 18.18% , and three females 15.79% , males and females combined 16.67%).

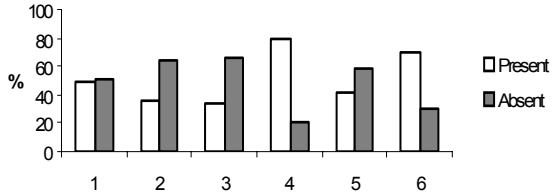

Figure 1. Presence-absence of vertebral stripe in *R. ridibunda* specimens 1: Arıkan (1988), 2: Atatür *et al*. (1990), 3: Arıkan *et al*. (1994), 4: Arıkan *et al*. (1998), 5: Budak *et al*. (2000), 6: The present study.

The adults could be divided into 3 types regarding their ventral patterns (Figure 3):

A) Overlaying the dirty white ground color, a more or less abundant vermiculate pattern is evident (seen in six males 54.55% , and nine females 47.37% , males and females combined 50%). B) Overlaying the dirty white ground color, sparsely and randomly distributed small to large roundish maculations present (seen in four males 36.36%,

and nine females 47.37% , males and females combined 43.33%). C) Only on the throat and down to the level of the forelimbs, a few roundish maculations are present, also a few insides of the femurs (seen in one male 9.09% , an done female 5.26% , males and females combined 6.67%).

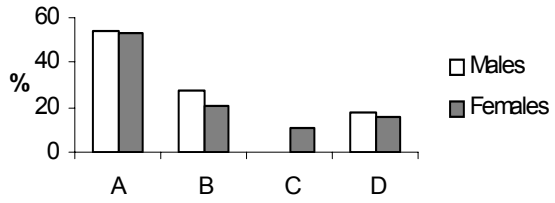

Figure 2. Dorsal pattern types (A to D) of the Erzurum material.

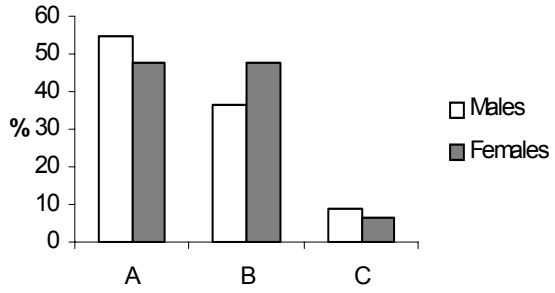

Figure 3. Ventral pattern types (A to C) of the Erzurum material.

Discussion

When the values given in Table 2 were compared, some of the values from the Erzurum material were seen to be similar or identical with those of *R. ridibunda, R. epeirotica* and hybrids from Greece, and *R. levantina* from Israel (*R. epeirotica*: SVL/HW, *R. levantina*: SVL/TL, SVL/HW; *R. ridibunda*: SVL/TL, FL/TL; hybrid form: SVL/TL, SVL/HW). Furthermore, the Erzurum sample was found to be closer to *R. ridibunda* populations of Dalaman, Datça and Greece from the viewpoint of FL/TL ratio. Regarding the *R. r. caralitana* populations, only similar values were those of the SVL/TL and HL/HW ratios compared with those of İvriz-Ereğli (Arıkan *et al*. 1998), Lakes District (Atatür *et al*. 1990) and Lakes District (Arıkan *et al*. 1994) populations, but our values were either higher or lower from those of the other *R. r. caralitana* populations. Arıkan *et al*. (1994) stated that, the SW of Sultan Mts are inhabited by *R. r. caralitana*, NE of the same (Akşehir, Eber and Çavuşçu lakes) by intermediate populations between *R. r. caralitana* and *R. r. ridibunda*, characterised by their venter colorations (brownish orange and gray-brown), i. e., The Sultan Mts form an isolation line for a probable new race. Considering the ventral pattern and coloration characteristics of the Anatolian *R. ridibunda* complex, Erzurum population exhibits a similarity to the *caralitana* form in two specimens which had venters with an orange colored pattern of partly wermiculate, partly randomly distributed small spots. However, in the majority of our specimens (93.75%), the ventral patterns were brownish orange or gray-brown, i. e., they are similar to those populations inhabiting the regions northeastern to Sultan Mts: Akşehir, Eber and Çavuşçu lakes (Arıkan *et al*. 1994). The same authors had accepted these populations as intermediate between the nominate race and the *caralitana* form. However, according to Jdeidi *et al*. (2001), of the two specimens collected from Akşehir, "one specimen was consistently classified as *caralitana* and the other as *bedriagae*"; the sympatric presence of both forms in Akşehir and Çardak (Denizli) "may be interpreted as evidence for the non-mixing of these forms, and may indicate separate species status for *caralitana*".

Table 2: Comparison of the morphometrical data of the Erzurum population with those given in literature. *Rana ridibunda* cf. *caralitana* from Erzurum=present study, *R. r. caralitana*-Beyşehir (Arıkan, 1988); *R. r. caralitana*-İvriz-Ereğli (Arıkan *et al*., 1998); *R. r. caralitana*-Çivril (Budak *et al*., 2000); *R. r. caralitana*-Lakes District (Atatür *et al*., 1990); *R. r. caralitana*-Lakes District-group A, Intermediate-Lakes District-group B (Arıkan *et al*., 1994); *R. r. ridibunda*-Dalaman (Tok *et al*., 2000); *R. r. ridibunda*-Datça (Tok, 1999); *R. r. ridibunda*-Black Sea (Kumlutaş *et al*., 1999); *R. ridibunda*-Greece, *R. levantina*-Israel (Schneider *et al*., 1992); *R. ridibunda*-Greece, *R. epeirotica*-Greece, Hybrid-Greece (Schneider *et al*., 1984). For abbreviations, see text.

	R. r.* cf. *caralitana **Karasu (Erzurum)**		***R. r. caralitana*** **Beyşehir (Konya)**		***R. r. caralitana*** **İvriz-Ereğli (Konya)**		***R. r. caralitana*** **Çivril (Denizli)**		***R. r. caralitana*** **Lakes District (Anatolia)**	
	M	SE	M	SE	M	SE	M	SE	M	SE
SVL/TL	2.04	0.01	1.96	0.006	2.070	0.024	2.141	0.019	2.00	0.007
SVL/HW	2.84	0.02	2.55	0.010	2.632	0.030	2.688	0.019	2.55	0.008
SVL/FTL	6.74	0.05	6.07	0.04	6.679	0.110	6.315	0.063	6.22	0.032
SVL/MTL	20.60	0.30			17.795	0.296	21.121	0.583	-	-
HL/HW	0.96	0.01	-	-	0.858	0.007	0.932	0.008	-	-
TL/MTL	10.11	0.16	-	-	8.602	0.137	9.405	0.271	-	-
FTL/MTL	3.06	0.05	2.83	0.04	2.673	0.059	3.195	0.107	2.77	0.022
SVL/FL	2.18	0.01	-	-	-	-	-	-	-	-
FL/TL	0.94	0.01	-	-	-	-	-	-	-	-

Table 2 (continued)

	R. r. Caralitana **Lakes District Group-A (Anatolia)**		**Intermediate Lakes District Group-B (Anatolia)**		**R. r. Ridibunda Dalaman (Muğla)**		**R. r. Ridibunda Datça (Muğla)**		***R. r. Ridibunda*** **Black Sea**	
	M	SE	M	SE	M	SE	M	SE	M	SE
SVL/TL	2.04	0.007	2.01	0.009	1.91	0.97	1.98	0.07	1.99	0.08

Table 2 continued

SVL/HW	2.58	0.008	2.91	0.015	2.74	0.09	2.84	0.12	2.70	0.10
SVL/FTL	6.30	0.031	6.19	0.052	6.48	0.04	6.97	0.41	6.88	0.52
SVL/MTL	17.94	0.144	17.75	0.222	19.11	1.69	-	-	19.24	0.20
HL/HW	0.87	0.004	0.87	0.005	1.01	0.04	-	-	0.84	0.04
TL/MTL	8.84	0.064	8.86	0.103	10.00	0.94	-	-	9.60	1.08
FTL/MTL	2.87	0.023	2.88	0.038	2.96	0.31	2.85	0.23	2.81	0.41
SVL/FL	-	-	-	-	2.11	0.12	2.04	0.09	2.00	0.09
FL/TL	-	-	-	-	0.91	0.04	0.98	0.03	0.99	0.04

Table 2 (continued)

	R. ridibunda Valtos (Thrace) Greece		*R. levantina* Israel		*R. ridibunda* Lake Ioannina Greece		*R. epeirotica* Greece		Hybrid Greece	
	M	SE	M	SE	M	SE	M	SE	M	SE
SVL/TL	2.03	0.01	2.05	0.02	1.92	0.06	2.16	0.07	2.02	0.10
SVL/HW	3.16	0.03	2.83	0.02	2.94	0.13	2.84	0.12	2.87	0.19
SVL/FTL	7.60	0.13	8.08	0.13	7.49	0.50	7.15	0.48	7.08	0.36
SVL/MTL	18.85	0.25	17.86	0.36	16.57	1.39	21.16	2.14	18.20	1.70
HL/HW	-	-	-	-	-	-	-	-	-	-
TL/MTL	9.25	0.12	8.71	0.17	8.58	0.65	9.78	1.04	9.01	0.83
FTL/MTL	2.49	0.06	2.23	0.06	2.21	0.21	2.96	0.25	2.59	0.25
SVL/FL	2.13	0.02	1.94	0.02	1.96	0.07	2.11	0.07	2.01	0.09
FL/TL	0.95	0.01	1.06	0.01	0.98	0.02	1.02	0.03	1.00	0.02

According to the present study, Erzurum specimens could be given as *Rana ridibunda* cf. *caralitana*, since no specimens with immaculate venters or very slightly maculated venters were observed (a characteristic of the nominate race), at least a few specimens were seen with an orange ventral pattern, while the venters of the majority of our specimens displayed a brown to gray-brown pattern of partly vermiculate and partly randomly distributed small spotty maculations (Fig. 4).

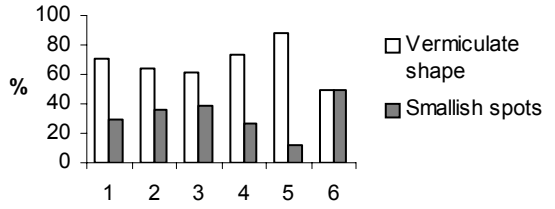

Figure 4. Ventral pattern percentages in; 1: Arıkan (1988), 2: Atatür *et al*. (1990), 3: Arıkan *et al*. (1994), 4: Arıkan *et al*. (1998), 5: Budak *et al*. (2000), 6: The present study.

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