A serological comparison of the populations of the *Lacerta laevis* complex in northern Cyprus and southern Turkey

by Murat Tosunoğlu, Bayram Göçmen, Ertan Taşkavak and Abidin Budak

Abstract: The present study compares the blood serum proteins of populations of the *Lacerta laevis* complex from northern Cyprus and southern Turkey (Adana) by polyacrylamide-disc electrophoresis. There are discernible differences between the electropherograms of blood serum proteins of the two populations. By considering these differences, it would be appropriate to accept the northern Cyprus population as a distinct species, *Lacerta troodica*, as suggested previously by BUDAK & GÖÇMEN (1995).

Kurzfassung: In dieser Untersuchung werden mit Hilfe der Polyacrylamid-Elektrophorese die Blutserumproteine der Populationen des *Lacerta laevis*-Komplexes im nördlichen Zypern mit denen aus der Süd-Türkei (Adana) verglichen. Zwischen beiden Populationen gibt es im Bandenmuster der Serumproteine klar erkennbare Unterschiede. In Anbetracht dieser Unterschiede erscheint es angemessen, die zypriotische Population als separate Art, nämlich *Lacerta troodica*, zu akzeptieren, wie es bereits vorher schon von BUDAK & GÖÇMEN (1995) vorgeschlagen worden war.

Key words: Lacertidae, *Lacerta laevis*, *Lacerta laevis troodica*, taxonomy, serology.

Introduction

The morphology of the *Lacerta laevis* Gray, 1838 (GRAY 1838) populations of northern Cyprus and Turkey was examined in detail by BUDAK (1976), BUDAK & GÖÇMEN (1995) and OSENEGG (1989). BUDAK & GÖÇMEN (1995) indicated that according to some morphological characters, the *L. laevis* population of northern Cyprus is significantly different from the nominate race, *L. laevis laevis* in the vicinities of Adana and Mersin. They also proved that it is not possible to distinguish the two populations with the diagnostic characters given by WERNER (1936) for the Cyprus population, which he described as *L. laevis troodica*. OSENEGG (1989) failed to find significant morphological differences, but she claimed that the colour pattern would be more suitable for separating the Cypriot population from that of the opposite mainland. On the other hand, SCHÄTTI & SIGG (1989) and BÖHME & WIEDL (1994) claimed that there was more variation of colour pattern in the Cyprus population than thought before, but GÖÇMEN at al. (1996) did not find any significant variation in the pattern of 103 specimens examined, except for the vertebral bands.

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BUDAK & GÖÇMEN (1995) suggested that the differences between the island population and the mainland population are at species level. According to them, the Cyprus population can be distinguished from the mainland population on the basis of the scale numbers in the median gular region and the presence of supratemporal (subocular) bands under the temporal bands. The present study aims to further examine the northern Cyprus population from a serological point of view in order to clarify whether it should be considered as a subspecies, *L. l. troodica*, or as a separate species, *L. troodica*, as suggested by BUDAK & GÖÇMEN (1995).

Material and methods

For electrophoresis, we used a total of 24 (12 ♂ and 12 ♀) *Lacerta laevis* specimens collected in northern Cyprus and southern Turkey, and deposited in the museum of the Zoology Department of Ege University (ZDEU). The material used for electrophoresis is as follows: From Cyprus (n = 12) ZDEU-43/1994; 1–12 (6 ♂ and 6 ♀), Lapta, Girne, northern Cyprus, 21.8.1994, leg. B. GÖÇMEN. From Turkey (n = 12) ZDEU-12/1995; 1–12 (6 ♂ and 6 ♀), Ceyhan, Adana-Turkey, 18.8.1995, leg. M. TOSUNOĞLU & U. KAYA.

Polyacrylamide-disc electrophoresis of blood serum proteins was carried out according to the methods used previously by ÖZETI & ATATÜR (1973) and ARIKAN (1983) for studies on he Turkish herpetofauna.

Results

All specimens examined were sexually mature and no obvious difference was recorded between the serum protein pherograms (in densitometric curves) of males and females within a sample. Consequently, the sexes of each population were pooled for further analyses.

In qualitative comparisons between the specimens from northern Cyprus and Turkey (Adana), the electropherograms clearly differed in both the albumin and globulin regions (Figs. 1 A and B). The number of protein fractions comprises 11 fractions or fraction groups in the northern Cyprus specimens but 13 in the Adana specimens. The postalbumin found after albumin in the Adana specimens does not occur in the northern Cyprus specimens. Furthermore, the albumin fraction is relatively denser in the Adana specimens than in the Cyprus ones.

While there is only a single fraction in the Cyprus specimens, two fractions are visible in Region A of the globulins of Adana specimens. Region B of the globulins comprises two dense fractions in the Cyprus specimens, whereas, this region has three fractions, and has low density in the Adana specimens. Although we could not see any difference between Region C of the two samples, the densities of their fractions are distinguishable. Finally, considering Region D of the globulins of both samples, it contains two dense fractions in the northern Cyprus specimens but only a single one in Adana.

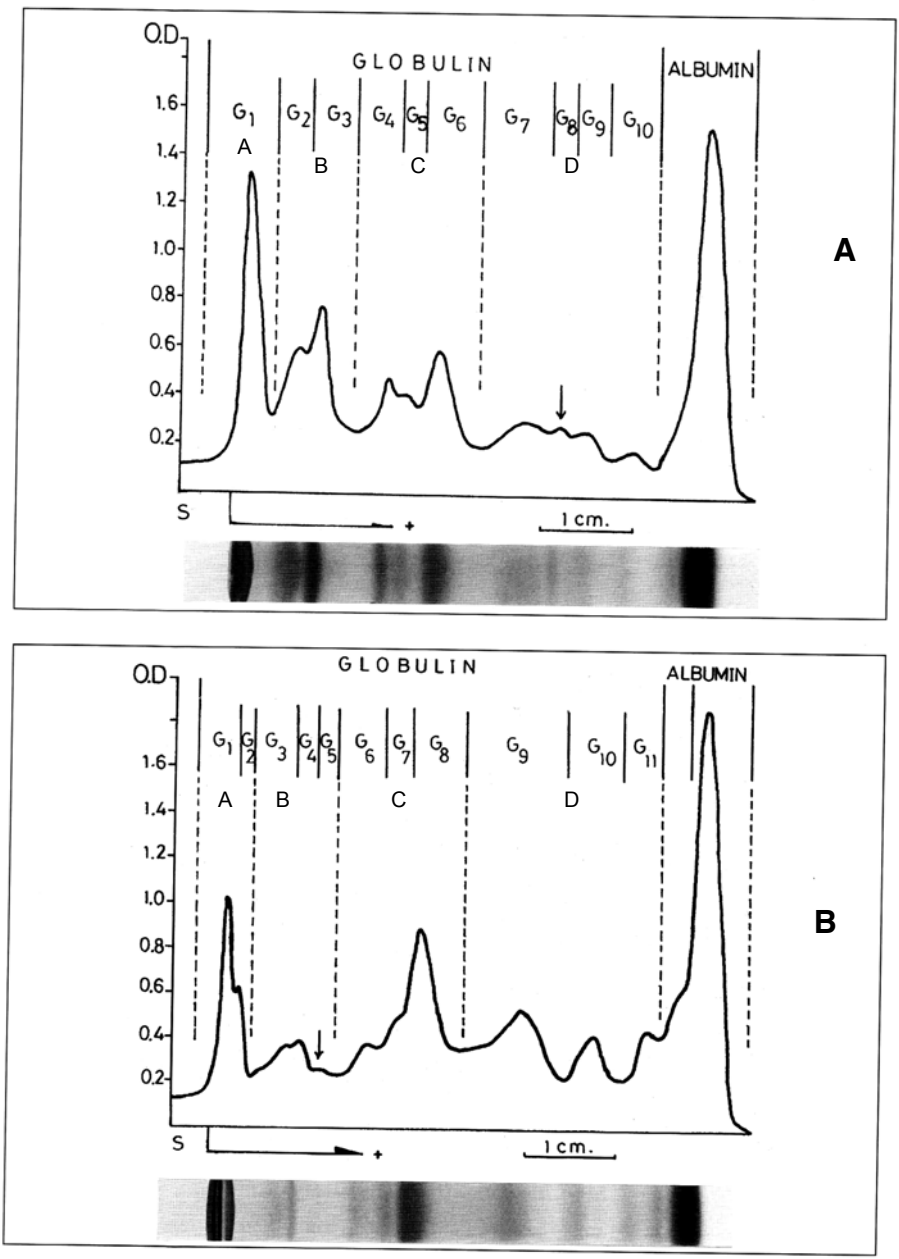

Fig. 1. Electropherograms (gel photographs) showing the electrophoretic separation of the bloodserum proteins of adult female specimens of the *Lacerta laevis* complex from northern Cyprus (A) and southern Turkey (B), together with their densiometric tracing curves. Designations G_1 to G_{11} indicate the globulin zone fractions or fraction groups.

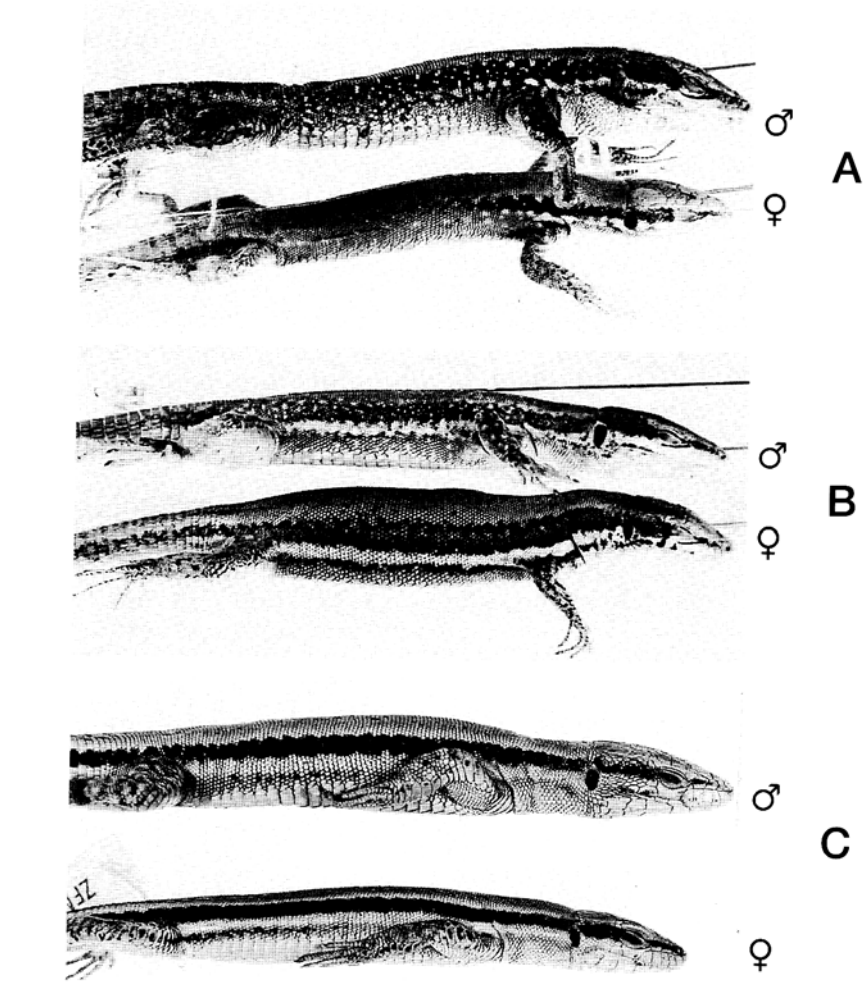

Fig. 2. Lateral view of various specimens of the *Lacerta laevis* complex from different localities: A: Turkey (*L. l. laevis*), ♂ ZDEU-111/1977-4, Sebil, Tarsus-Mersin and ♀ ZDEU-88/1968-7, Mezitli-Mersin; B: Cyprus (*L. troodica*), ♂ ZDEU-136/1993-3, Girne and ♀ ZDEU-93/1991-10, Çatalköy-Girne; C: Syria/Anti-Lebanon (*L. l. kulzeri*), ♂ ZFMK-57942, Rankus and ♀ ZFMK-57943, Rankus.

Discussion and conclusion

The conventional taxonomic treatment has resulted in uncertainty as to the taxonomic status of the genus *Lacerta* (Fig. 2). Studies carried out by HOOFIEN (1968) and HOOFIEN et al. (1990) in Israel and Jordan (Mount Hermon and Petra), and by EISELT & SCHMIDTLER (1986) and BISCHOFF & SCHMIDTLER (1994) in Syria, Lebanon and Anti-Lebanon indicated

the absence of *Lacerta danfordi*. *L. kulzeri* (Müller & Wettstein, 1932) in these areas, rather, the lizard previously described as *L. danfordi kulzeri* (Müller & Wettstein, 1933), was placed again on the scientific agenda. GÖÇMEN et al. (1996) indicated that the figures given by BISCHOFF & SCHMIDTLER (1994) for *L. kulzeri* were quite similar to the *L. laevis* specimens of Cyprus. Moreover, GÖÇMEN et al. (1996) claimed that this similarity was greater than those given for the specimens from Anatolia (Adana and Mersin). Although EISELT & SCHMIDTLER (1986) have seperated the southern Turkey's form from *Lacerta danfordi* and reassigned it to *L. laevis*, BISCHOFF & SCHMIDTLER (1994) claimed that this form was different form *L. l. laevis*, and indicated that its habitat preference was also distinct from that of the nominate race. Likewise, since BISCHOFF & SCHMIDTLER (1994) thought that *L. l. laevis* and *kulzeri* were simpatric, they considered the latter as *L.* (cf.) *kulzeri*.

In both the lateral colour pattern of the body and the fairly dark-coloured window of large scales in the lower eyelid, the Cyprus specimens closely resemble *L. l. kulzeri* (BUDAK & GÖÇMEN 1995, GÖÇMEN et al. 1996). However, they are also similar to Anatolian *L. l. laevis* specimens in general colouration, for example a strong orange-red color on the ventral side during breeding season. The Cyprus specimens also differ from *L. l. kulzeri* in ventral coloration and in some pholidosis characteristics, e.g., absent or small-sized massetericum (HOOFIEN et al. 1990). Habitats described by BISCHOFF & SCHMIDTLER (1994) for *L. l. kulzeri* and by BUDAK & GÖÇMEN (1995) for the Cyprus populations are somewhat different from each other. While *L. l. kulzeri* is an arid form, the Cyprus form likes relatively moist habitat, which is similar to the habitat of *L. l. laevis* (BUDAK 1976).

To this controversy we may now add our data from electrophoresis. In conclusion from these, the qualitative differences found in both albumin and globulin regions between the two samples examined mean that the northern Cyprus and Turkey populations are clearly distinct. According to these serological qualitative differences, we have here two populations, which are taxonomically distinct at the species level. Thus, the Cyprus population should be considered as *Lacerta troodica* stat. nov. rather than *L. laevis troodica* as previously suggested by BUDAK & GÖÇMEN (1995) and others. Consequently, we believe that certain other populations should also be examined morphologically, serologically and also karyologically in order to determine whether two other forms, *Lacerta l. laevis* and *L. l. kulzeri*, in the *L. laevis*-complex (BISCHOFF & SCHMIDTLER 1994, MÜLLER & BISCHOFF 1994) should similarly be elevated to species level.

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