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DIVERSITY OF AMPHIBIANS AND REPTILES ON THE BALKAN PENINSULA

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The Balkan amphibians and reptiles are diversified in many respects. First of all, there is an enormous species-richness in the Balkan Peninsula. Approximately 100 species of these vertebrates live in this part of Europe, with also the realistic possibility of the existence of a number of morphologically cryptic taxa.

Secondly, batrachofauna (amphibians) and herpetofauna (reptiles) of this part of Europe has diverse biogeographical origins and connections with other regions. Namely, the Balkans appear to have been centre of intensive speciation within some taxa. There is evidence that new species emerged during Tertiary (mostly Miocene and Pliocene), whilst subspecies origin was confined to the Pleistocene. Furthermore, there were intense migrations of amphibians and reptiles from other zoogeographical areas via two main migration routes (the Pontic Bridge and mostly the Morava River Corridor). In the first place, there is a large front of contact with steppes to the east and northeast, whilst the Aegean Islands constituted a connection with the African and Asian fauna. In addition, in contrast to the Iberian and Apennine peninsulas, the Balkan Peninsula is not separated by a mountain barrier from the European mainland, and thus is widely connected with central Europe and therefore, the rest of continent. This has crucial importance for the European batracho- and herpetofauna, because it has been shown that central and northern Europe were populated by expansions from a Balkan refugium in the Holocene. Also, some groups have withdrawn from northern and mid European latitudes, some of them now being restricted to southern refugial areas.

On zoogeographical grounds, the Balkan Peninsula is also characterised by numerous discontinuities; *i.e.* the zoogeographical map is very complex with elaborate subdivisions, as well as with a wealth of preglacial faunal elements. Also, this area is the strongest centre of reptile and amphibian endemnicity in Europe, with the more than 45 endemic species, and many relict taxa. Due to these facts, some parts of the Balkans, in particular the Adriatic triangle (broadly speaking Prokletije Mt. area), are recognised as being one of Europe's main biogenetic reserves. As these isolated populations are mostly at species' range limits, there are numerous cases of range shrinking in the Balkan area. Of all species living in Balkans, 53% have range limits there. Although most of these peripheral populations are not going to evolve into distinct entities, there is still an astonishing potential for further evolutionary diversification.

In terms of general biological phenomena, Balkan amphibians and reptiles usually have much more inter- and intrapopulation genetic variability (in terms of allelic variation and a number of distinct genomes) when compared with other European areas. Diverse types of hybridisation and intergradation zones, which are differently spatially orientated (N-S, NW-SE directions, vertical distribution), are common on the Balkan Peninsula. Interspecific and intraspecific heterochronic phenomena expressed as a retention of ancestral larval features by a reproductively mature adult descendent (paedomorphosis and paedogenesis, respectively) are common among Balkan tailed amphibians. Paedomorphosis characterises the only European real cryptobiont *(Proteus anguinus),* while the existence of alternative life-history pathways among individuals of the same population (paedogenesis) is extremely high in Balkan newts *(Triturus),* especially along the Dinaric Alps. Also, it seems that hybridogenesis occurs in a number of green frog complexes *(Rana* kleptons), more than elsewhere. Finally, as in other places in Europe, there are more reproductive modes (oviparity *vs.* viviparity) within a single species *(Lacerta vivipara).*

In general, genesis of the present day diversities of the Balkan amphibians and reptiles was influenced by numerous factors, e.g. habitat heterogeneity, topographic diversity (mostly influenced by Pleistocene glaciations), great variation in climate, differences in rates of immigration, evolutionary and ecological time, *etc.* It should be stressed that geological history and palaeogeography of the Balkan Peninsula has undergone complex perturbations, especially during the Tertiary. Also, there is a correspondence of zoogeographical boundaries with the distribution of deep lithospheric breakages (crustal megablocks), so that these geological events might profoundly effect the evolutionary history at least of some Balkan amphibians *(e.g. Triturus cristatus* superspecies).

However, for a more comprehensive picture of Balkan amphibians and reptiles we still lack many relevant data on longstanding taxonomic problems, population structure, distributional characteristics of some taxa (size, shape, boundaries, overlaps and locations of geographic ranges), especially those which can be considered as a "zoogeographic paradoxes" (occurrence of isolated populations in "unexpected places"). Also, historical biogeographical patterns remains almost unexplored thus far, including the phylogenetic relationships of species and, especially, taxon-area cladograms.

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