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## AN OVERVIEW OF THE HERPETOFAUNA OF SLOVENIA

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### INTRODUCTION

In Slovenia little scientific work has been carried out on reptiles and especially amphibians. Until now, very few herpetological articles have been published (Breljih 1954, Berlin 1962, Breljih, Džukić 1974). In this paper I would like to show our knowledge about Slovenian herpetofauna and I would also like to contribute some new information about amphibians and reptiles in Slovenia.

### GEOGRAPHY & CLIMATE

Slovenia is situated in central Europe, south of the Alps. The small country of about 20 000 km<sup>2</sup> contains four landscapes: the Alpine, Illyrian, Mediterranean and Pannonian regions. The Alpine region is restricted to the north-western part and encompasses no more than 12% of the most mountainous areas in the country. The sub-Alpine region is much larger, covering about 32% of the Slovenian territory. This is predominantly hilly terrain, ranging from about 200 to 500 m. Most characteristic of the Illyrian region are the Karst plateaus at an altitude above 400 m. Lowlands (sub-Pannonian area) represent about 22% of the surface of Slovenia. Here we find the three largest Slovene rivers: Drava, Sava and Mura. The Mediterranean region covers about 8% of Slovene territory in the west, mainly a littoral belt. Slovenia lies in the temperate climate zone and its climate is central European – a mixture of the three climates typical of this zone: Atlantic, Continental and Mediterranean.

From the phytogeographical point of view the Slovene territory can be divided into six regions: Alpine, sub-Alpine, Dinaric, pre-Dinaric, sub-Mediterranean and sub-Pannonian.

For amphibians the most important habitats are various standing water bodies suited for egg deposition. In the north-eastern part of Slovenia, especially along the Sava, Drava and Mura rivers, gravel-pits of different sizes have become increasingly important. In this, mainly lowland, part of country, intensive agriculture, regulation of streams and rivers and the drainage of wetlands has destroyed almost all natural habitats and turned the natural landscape into a cultural steppe. In this region, gravel-pits with standing water remain the only reproductive and wintering place for amphibians.

In the Karst region in the south-western part of Slovenia, water flows mainly underground and forms underground streams and caves (habitat for *Proteus anguinus*). Very characteristic of this region are so-called "kal" – a common watering place for livestock (in the shape of pools of different size).

In Slovenia there are also numerous ponds used for fish farming, which can also be important for *Bufo bufo*.

Slovenia is a country with an extraordinary floristic and faunistic diversity. We can find about 3200 species of higher plants, 60 of which are endemic, and more than 50,000 animal species, among them also many endemic ones. There are 430 species of vertebrates, including 69 species of mammals, 219 species of birds, 98 species of fresh and brackish water fishes, 25 species of reptiles and 20 species of amphibians (Vidic 1992).



Figure 1. Map of Slovenia showing main localities mentioned in the text.

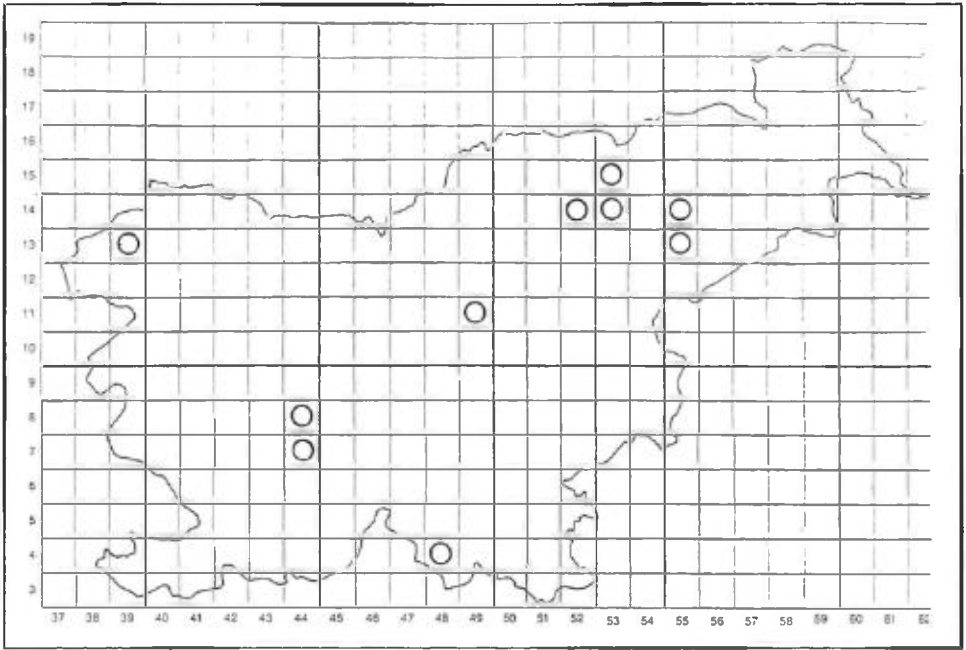
## THE HERPETOFAUNA

Species lists of the herpetofauna of Slovenia including IUCN Red List categories are presented in Table 1 and 2.

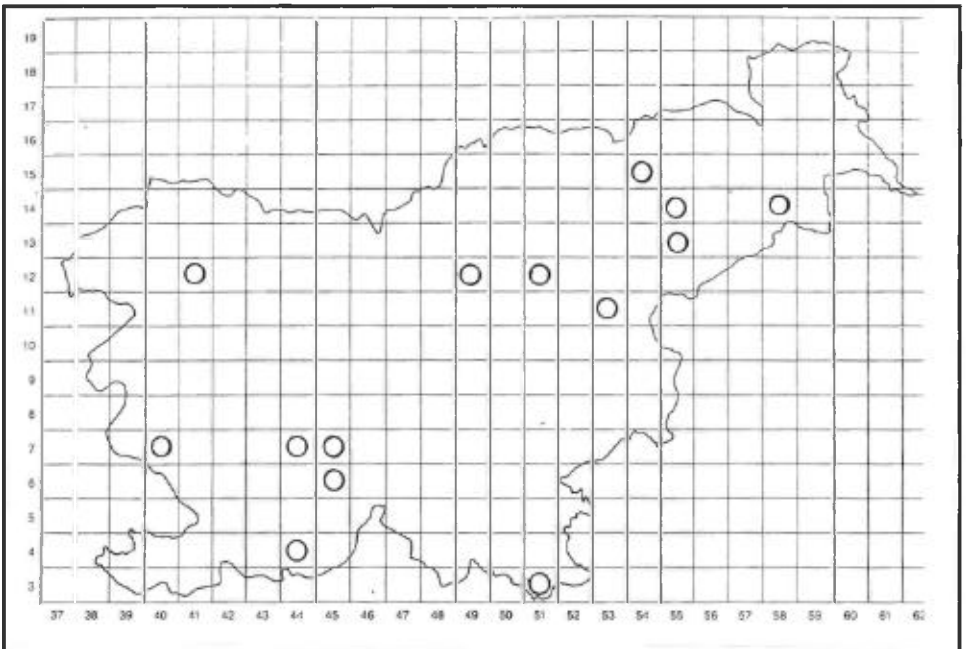
### Amphibians

In Slovenia, 20 species and three subspecies of Amphibia are known. Seventeen species and one subspecies are listed in the national Red List. The high proportion of species in the "intermediate" category of the Red List indicates the poor state of knowledge on the Slovene amphibians. The most endangered species in Slovenia is the Olm (*Proteus anguinus*). In 1986 the black Olm was found, the taxonomic status of which is still unclear.

Recent research, mostly by the author, suggests that more species must be in the highest category (Kropivšek 1995). For example: the Common Spadefoot (*Pelobates fuscus*) and the Fire-bellied Toad (*Bombina orientalis*) are found only in northeast Slovenia. But this region is also one of the most developed agricultural areas in Slovenia and both species are strongly affected by the regulation of streams and rivers and the loss of wetlands. They are also indirectly threatened by the intense use of fertilisers and pesticides. Only a few localities are known for both species, mostly along the river Mura.



**Figure 2.** Provisional UTM Atlas (10 x 10 square grid system) of the distribution of the Yellow-bellied Toad (*Bombina variegata*) in Slovenia



**Figure 3.** Provisional UTM Atlas (10 x 10 square grid system) of the distribution of the Green Lizard (*Lacerta viridis*) in Slovenia.

On the other hand, the Yellow-bellied Toad (*Bombina variegata*) is distributed all over Slovenia (Figure 2). We can find hybrids between the Fire-bellied toad and Yellow-bellied Toad in north-eastern Slovenia (Vogrin, unpublished). The exact range of the hybrid zone, however, is not known yet but researches are in progress. In the last few years numbers of Green Toads (*Bufo viridis*) have decreased. The reasons for this decline are not known. Green Toads can be found in gravel-pits, in the brackish lagoon near Koper, but also in some towns (Koper, Ljubljana, Žalec).

We have two subspecies of the Common Toad: *Bufo b. bufo* and *Bufo b. spinosus*. The latter is limited to the southern part of the country (Bressi, 1995, personal observation). The greatest threat to the Common Toad is road mortality. Many populations of this species have to cross roads on the spring migration and there is a site (Slivnica Lake) where tunnels for amphibians with temporary driftfences exist. The system was built in 1995 and was designed to preserve one of the biggest populations of Common Toads in Slovenia, numbering about 10,000 adults (Vogrin 1995).

On Mt. Pohorje (the most eastern part of Alps) the European Tree Frog (*Hyla arborea*) was found at an altitude of 1050 m. This is the highest known locality in Central Europe. Until now the highest known locality was in Austria at 800 m (Nöllert, Nöllert 1992). In the western part of Slovenia, near the border with Italy, additionally the newly described Italian Tree-Frog (*Hyla italica*) (Nascetti, Lanza, Bullini 1995) has been found.

The Moor Frog (*Rana arvalis wolterstorffi*) can be found in the eastern part of Slovenia, mainly near the border with Croatia, along the three biggest rivers Sava, Drava and Mura. Recently a new locality for the Moor Frog has been found on Dravsko polje (Drava field) (Vogrin, Vogrin 1995). The Moor Frog is also endangered for mostly the same reasons as are the Common Spadefoot and the Fire-bellied Toad.

The Grass Frog (*Rana temporaria*) and the Agile Frog (*Rana dalmatina*) are the common species. The Italian Agile Frog (*Rana latastei*) has been found near the border with Italy in the woods of Panovec. In the past few years no records of observations of these species could be found, but efforts will continue.

The distribution of the *Rana esculenta* complex including *R. lessonae*, *R. kl. esculenta* and *R. ridibunda* is still largely unknown.

The Smooth Newt (*Triturus vulgaris*) is represented in Slovenia by two subspecies. *Triturus v. vulgaris* seems to be distributed in north-eastern Slovenia, *Triturus v. meridionalis* can be found in the other parts of the country (Pozzi in Lapini, L., A. Dall'Asta, D. Scaravelli 1991, personal observation).

The Alpine Crested Newt (*Triturus carnifex*) is common in some gravel-pits in the north-eastern part of the country. At some of these sites it seems to be quite numerous, as up to 200 individuals could be found.

The Alpine Newt (*Triturus alpestris*) can be found from the lowlands to the high mountains. From the Črno jezero (Črno Lake) in Triglav National Park was described a subspecies, *Triturus alpestris lacusnigri*, that is extinct because of fish populations (Sket 1992).

On the mountain Pohorje were found large populations of the Alpine Newt, the Alpine Crested Newt and the Smooth Newt in only one pond at an altitude of 1150 m. The population of the Alpine Newt is estimated as at least 1500 individuals, the population of the Alpine Crested Newt is estimated as about 300 individuals and the population of the Smooth Newt about 1500 individuals. One other place – called Menina planina, also has all three species of newts, found at an altitude of 1360 m.

In the deciduous mountain forests the Fire Salamander (*Salamandra salamandra*) is common. It is rare in the pine forest. The Alpine Salamander (*Salamandra atra*) lives in the Alps and on some other mountains (i.e. the mountains Snežnik, Gorjanci).

**Table 1.**  
**Amphibians in Slovenia with IUCN categories of endangerment.**

Species	IUCN categories
<i>Proteus anguinus</i>	V
<i>Salamandra salamandra</i>	–
<i>Salamandra atra</i>	–
<i>Triturus alpestris alpestris</i>	(V) I
<i>Triturus alpestris lacusnigri</i>	Ex
<i>Triturus vulgaris vulgaris</i>	(V) I
<i>Triturus vulgaris meridionalis</i>	(V) I
<i>Triturus carnifex</i>	(V) I
<i>Bombina bombina</i>	(R) I
<i>Bombina variegata</i>	(V) I
<i>Pelobates fuscus</i>	(V) I
<i>Bufo bufo bufo</i>	(V) I
<i>Bufo bufo spinosus</i>	*
<i>Bufo viridis</i>	(V) I
<i>Hyla arborea</i>	(V) I
<i>Hyla italica</i>	*
<i>Rana arvalis wolterstorffi</i>	(V) I
<i>Rana dalmatina</i>	(V) I
<i>Rana latastei</i>	R
<i>Rana temporaria</i>	(V) I
<i>Rana kl. esculenta</i>	(V) I
<i>Rana lessonae</i>	(V) I
<i>Rana ridibunda</i>	(V) I

Legend: Ex – Extinct, V – Vulnerable, R – Rare, I – Intermediate

\* This sub-species or species is not mentioned in the Red List of Endangered Amphibia in Slovenia (Sket 1992).



**Plate 1.** The Alpine Crested Newt (*Triturus carnifex*) is numerous in some places in Slovenia

## Reptiles

Twenty-five species of reptiles are known for Slovenia. The occurrence of the following species has not been reliably determined yet: the Cat Snake (*Telescopus fallax*), the Turkish Gecko (*Hemidactylus turcicus*) and the European Glass Lizard (*Ophisaurus apodus*) (Mršić 1992). Three species of sea turtles come to the Slovenian sea only periodically – the Loggerhead Turtle (*Caretta caretta*), the Leathery Turtle (*Dermochelys coriacea*) and the Green Turtle (*Chelonia mydas*). One of the most endangered reptiles in Slovenia is the European Pond Turtle (*Emys orbicularis*). Because of habitat loss only a few localities, mainly in the southern part of the country (Bela krajina), have remained. The Viviparous Lizard (*Lacerta vivipara*) lives in various habitats, depending on altitude. In the mountains, it can be found on pastures, rocky areas and in bogs. In the lowlands it lives on swamp meadows and similar habitats. A similar distribution can be found for the Smooth Snake (*Coronella austriaca*), the range of which includes both mountain areas and lowland parts of the country.

The Horvath's Rock lizard (*Lacerta horvathi*), which is an endemic species for this part of Balkan peninsula, is distributed in the South-west part of the country, mainly in the Julijske Alpe (Julian Alps) (De Luca 1989).



**Plate 2.** The Green Lizard (*Lacerta viridis*)



**Plate 3.** The Bosnian Adder (*Vipera berus bosniensis*)

*All photographs by Nuša Vogrin*



In the coastal areas live the Italian Lizard (*Podarcis sicula campestris*) and the Dalmatian Alygroides (*Alygroides nigropunctatus*). The Dalmatian Wall Lizard (*Podarcis melisellensis fiumana*) is distributed in the south-western part of the country.

There are different subspecies of the Common Wall Lizard (*Podarcis muralis*) in Slovenia. In the coastal area lives *Podarcis muralis maculiventris*, in the other parts of the country *Podarcis muralis muralis*. We also have two subspecies of Common Viper, *Viper berus berus*, and *Vipera berus bosniensis*, which lives in the Southern part of the country, mainly on Mount Snežnik. The Bosnian adder reaches here the northern border of its range. Our most populous lizard is the Green Lizard (*Lacerta viridis*); it seems that it is distributed all over in country, except in the mountains (Figure 3). In some places it is still numerous.

The Slow Worm (*Anguis fragilis*) is a common species but is endangered on account of killing and the use of rotational mowers on the meadows.

The south-western part of Slovenia is of particular interest because it represents the northern border of the distribution of some snakes. These species include the Four-lined Snake (*Elaphe quatuorlineata*) (Škornik 1985), the Balkan Whip Snake (*Coluber gemonensis*), the Western Whip Snake (*Coluber viridiflavus carbonarius*) and the Montpellier Snake (*Malpolon monspessulanus insignitus*) (Mršič 1992). These snakes are among the most endangered reptiles in our country, the biggest threat being people killing every snake they see. Another threat arises from reforestation. About 120 years ago only 14% of the karst region was covered with woods. Due to planting of *Pinus niger*, today about 50% of this area is wooded, and still increasing. As a consequence of the loss of suitable habitat, the distribution areas of the mentioned snakes have continuously decreased.

The Aesculapian Snake (*Elaphe longissima*) is distributed in the whole country but the number of specimens has decreased (Mršič 1992).

The Grass Snake (*Natrix natrix*) is a common species. In some places (for example on Cerknica Lake (Cerkniško jezero)) it is very numerous in a small area. The distribution of the Diced Snake (*Natrix tessellata*) is unknown and its numbers in the known localities are low. It seems to be more endangered than the Grass Snake because of water pollution and a loss of suitable habitats.

The Asp Viper (*Vipera aspis*) lives (lived?) on the Slovenian border with Italy in an area called Goriško. In the past few years no specimens have been found, but efforts will continue.

In Slovenia we can probably find two subspecies of the Nose-horned Viper. One is *Vipera ammodytes ammodytes*, that is distributed in the south, and *Vipera ammodytes gregorwallneri*, which probably lives in the north, near the border with Austria.

**Table 2.**  
**Reptiles in Slovenia with IUCN categories of endangerment.**

Species	IUCN categories
<i>Caretta caretta</i>	E
<i>Chelonia mydas</i>	E
<i>Dermochelys coriacea</i>	E
<i>Emys orbicularis</i>	E
<i>Hemidactylus turcicus</i>	I
<i>Algyroides nigropunctatus</i>	V?
<i>Lacerta agilis</i>	V
<i>Lacerta viridis</i>	V?
<i>Lacerta horvathi</i>	R
<i>Lacerta vivipara</i>	*
<i>Podarcis melisellensis fiumana</i>	V?
<i>Podarcis muralis</i>	V?
<i>Podarcis sicula campestris</i>	V?
<i>Anguis fragilis fragilis</i>	*
<i>Ophisaurus apodus</i>	I
<i>Coluber gemonensis</i>	E
<i>Coluber viridiflavus carbonarius</i>	V
<i>Coronella austriaca</i>	*
<i>Elaphe longissima</i>	V
<i>Elaphe quatuorlineata</i>	E
<i>Malpolon monspessulanus insignitus</i>	E
<i>Telescopus fallax</i>	E
<i>Natrix natrix</i>	V?
<i>Natrix tessellata</i>	V?
<i>Vipera berus berus</i>	O
<i>Vipera berus bosniensis</i>	R
<i>Vipera ammodytes</i>	V?
<i>Vipera aspis</i>	Ex?

Legend: Ex? – Probably extinct, E – Endangered, V – Vulnerable, R – Rare, I – Indeterminate, O – Out of danger.

\* Species are not mentioned in the Red List of Endangered Reptilia in Slovenia (Mršič 1992).

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