

GEOGRAPHIC DISTRIBUTION AND STATUS OF SAND LIZARD (*LACERTA AGILIS*) AND COMMON LIZARD (*LACERTA (ZOOTOCA) VIVIPARA*) IN LITHUANIA

Giedrius TRAKIMAS

Center for Ecology and Environmental Research, Vilnius University, M. K. Čiurlionio 21/27, LT-03101 Vilnius, Lithuania. E-mail: giedrius.trakimas@gf.vu.lt

Abstract. During the reptile survey in Lithuania, a total of 116 localities of *Lacerta agilis* and 155 localities of *Lacerta (Zootoca) vivipara* were mapped. Frequency of occurrence was 40.6% and 54.2%, respectively. Values of Zielinski's index were considerably higher (53.2% and 69% respectively) if compared with the direct frequency of occurrence. These differences between the species, evident even after the evaluation of the survey effort degree, lead to the suggestion that in Lithuania *L. vivipara* is more common than *L. agilis*. However, a more detailed analysis showed that both species have the same status south of approximately 55°17'N, while to the north of this line *L. agilis* is less common, and its distribution is patchy. This latitudinal gradient in the distribution is probably caused by different tolerance of the species to the same environmental conditions.

Key words: biogeography, latitudinal distribution, Lacertidae, abundant centre, reptiles

The knowledge of the distribution of animal groups is important in estimating their abundance and in determining regional conservation priorities (Haila & Margules 1996; Strayer 1999). 'Presence-absence' data or national grid surveys, which are published as various regional or national atlases, are commonly used for studies of species distribution.

The 'Atlas of Amphibians and Reptiles in Europe' (Gasc *et al.* 1997) is the latest and the most comprehensive publication on the distribution of reptile species in Europe. According to this atlas, the common lizard (*Lacerta (Zootoca) vivipara*) is not found in Lithuania, but it occurs almost all over Latvia, Poland and Belarus. The same source indicates that the distribution of the sand lizard (*Lacerta agilis*) includes Lithuania. However, only a few localities of the species are recorded in the north and south of the country. Earlier and more recent publications, not widely available to the European scientific community, appear to contradict this. In the first half of the last century, *L. agilis* and *L. vivipara* were described as common species in the eastern (Fedorowicz 1918; Szeliga-Mierzeyewski 1924) as well as the remaining part of Lithuania (Ivanauskas & Vailionis 1922). Later, the same species were traditionally regarded as widespread and very common (Gaižauskienė 1981; Gruodis 1987). Recently, more accurate data, covering the entire territory of Lithuania and dealing with the distribution of *L. agilis* and *L. vivipara*, have been published (Balčiauskas *et al.*

1999). This publication, however, was restricted to maps and short comments and did not present a more detailed analysis. In this study, I review the current data on the distribution of *L. agilis* and *L. vivipara* and discuss their status in Lithuania.

The data on the distribution of the sand lizard *L. agilis* and the common lizard *L. vivipara*, presented in this study, cover the 1980–2003 period. The information was compiled from minor faunistic publications, reports, diploma theses, field expeditions and questionnaires. Localities were mapped on 10 × 10 km squares of the national grid 'LCS-94' (Figs 1, 2). Two or more localities found in the same square were treated as one. To evaluate distribution continuity and status, seven 40 km wide latitudinal zones were selected on 'LCS-94' grid wherein frequency of occurrence of the investigated species was established (Fig. 2). To determine frequency of occurrence in space (FOS) with reference to the degree of survey effort, Zielinski's (2001) index was calculated:

$$f = \frac{\sum_{i=1}^n k_i}{\sum_{i=1}^N s_i}$$

where

n – the number of squares with the given species recorded,

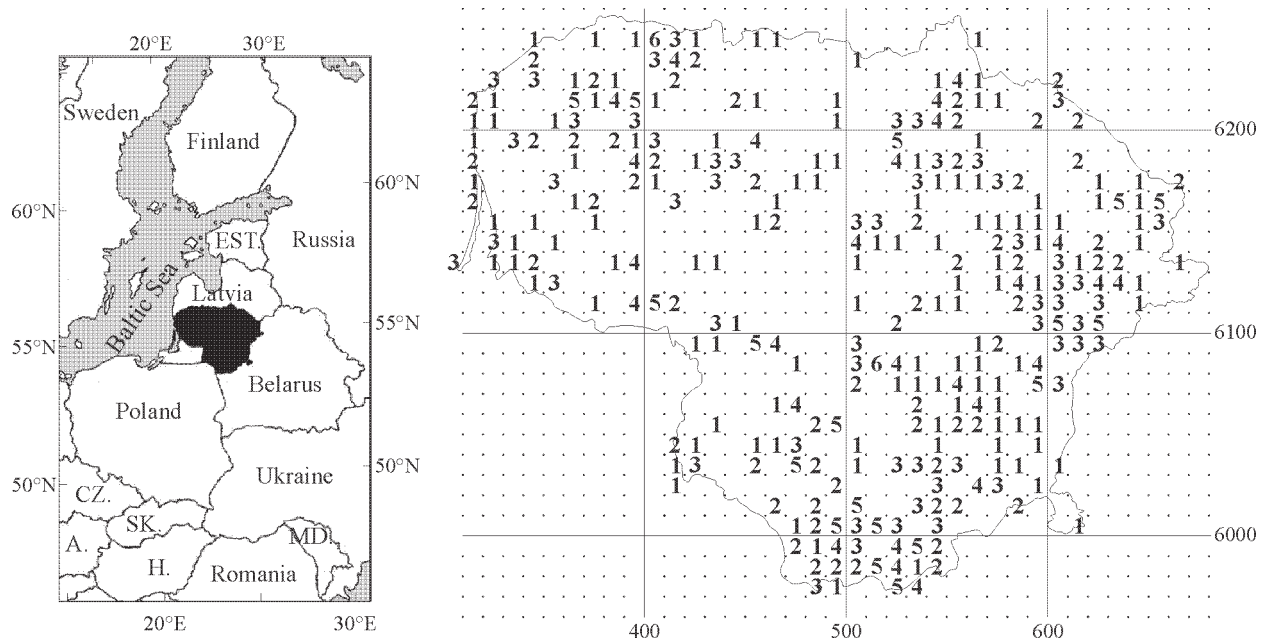


Figure 1. On the left: the geographic situation of Lithuania in Europe, where: EST – Estonia, CZ – Czech Republic, A – Austria, SK – Slovakia, H – Hungary, MD – Moldova. On the right: the number of reptile species mapped on 10 × 10 km squares.

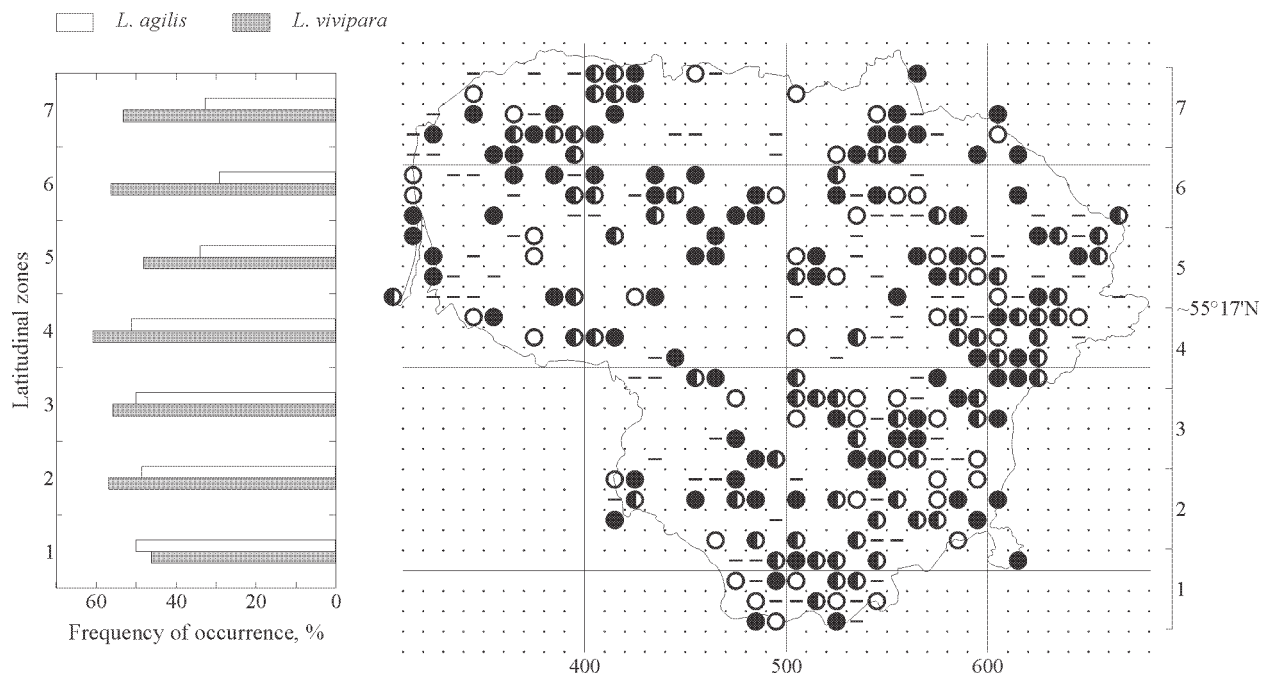


Figure 2. Distribution of *Lacerta agilis* and *L. vivipara* in Lithuania. On the left: frequency of occurrence of *L. agilis* and *L. vivipara* localities in surveyed squares in seven 40 km wide zones. On the right: *L. agilis* – open circles; *L. vivipara* – closed circles, half-open circles show squares wherein both species were found. Dashes show squares in which other species of reptiles were recorded.

k_i – the number of species recorded in the i -th square with the given species recorded,
 N – the total number of squares examined,
 s_i – the number of species recorded in the i -th square.

In total, the data on reptile species were obtained from 286 grid squares (Fig. 1), 71% (204 grid squares) of which were occupied by at least one of the two studied species: *L. agilis* or *L. vivipara*. 116 localities of

L. agilis and 155 localities of *L. vivipara* were mapped, which constitutes up to 40.6% and 54.2% of the survey area respectively (Fig. 2). Values of Zielinski's (2001) index assessing the general level of survey effort remained considerably high if compared with the direct frequency of distribution. The value of Zielinski's (2001) index for *L. agilis* was 53.2%, while that for *L. vivipara* was 69%. These differences between the species, observed even after the evaluation of the survey data, lead to the suggestion that in Lithuania *L. vivipara* is more common than *L. agilis*.

As a percentage of the total number of all investigated squares in all seven zones, localities of *L. vivipara* ranged from 46% to 61%, while those of *L. agilis* from 29% to 51% (Fig. 2). The frequency of occurrence recorded for both species in latitudinal zones 1–4 varied, that of *L. vivipara* averaging 55% and that of *L. agilis* 50%. However, to the north of approximately 55°17'N (from the fifth latitudinal zone) the number of localities of *L. agilis* decreased by an average of 32%, while that of *L. vivipara* remained static, i.e. 53% (Fig. 2). Therefore, in the central and southern parts of Lithuania both species have the same status, while in the northern part *L. agilis* is less common.

A continuous distribution of both species was recorded in Belarus at the border with Lithuania (Pikulik *et al.* 1988). It was similar to that reported in the present study. However, further to the north of Latvia, only *L. vivipara* was reported as widespread, and an uneven distribution was attributed to *L. agilis* (Čeirāns, unpubl. data). Most recordings of *L. agilis* in Latvia were from the south central region of the country near the Gauja River. *L. agilis* is included in the Latvian Red Data Book as intermediate (Ingelög *et al.* 1993), and further to the north, in Estonia, it is regarded as rare (Lilleleht 1998).

The fact that *L. agilis* is less common further to the north towards the limits of its range partly conforms to the general rule of the 'abundant centre' distribution in biogeographic ecology (Andrewartha & Birch 1954; Naumov 1972; Wittaker 1975; Rapoport 1982; Hengeveld 1990). The idea is that species reach their highest abundance in the centre of their distribution range and decline towards range edges. As *L. vivipara* is found up to 70°N, while *L. agilis* 60°N (according to Gasc *et al.* 1997), a shift in frequency of occurrence from the south to the north in Lithuania, as well as in other neighbouring countries seems clear with *L. agilis* becoming less common. It is reasonable to expect that in severe environments, viviparous populations of *L. vivipara* may have an advantage over oviparous *L. agilis*.

ACKNOWLEDGEMENTS

I would like to thank Rimvydas Juškaitis and Alius Ulevičius for useful comments on the early version of the manuscript, Linas Balčiauskas and Eduardas Budrys for their help in data collection, and David Snowden for improving English. Special thanks to Andris Čeirāns, who provided unpublished data.

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VIKRIOJO DRIEŽO (*LACERTA AGILIS*) IR GYVAVEDŽIO DRIEŽO (*LACERTA (ZOOTOCA) VIVIPARA*) GEOGRAFINIS PAPTITIMAS BEI STATUSAS LIETUVOJE

G. Trakimas

SANTRAUKA

Tyrimų apie roplių paplitimą Lietuvoje metu buvo užregistruota 116 *Lacerta agilis* ir 155 *Lacerta (Zootoca) vivipara* radimviečių. Šių rūšių aptikimo dažniai sudarė atitinkamai 40,6% ir 54,2%. Zielinski'o indekso vertės buvo žymiai aukštesnės (atitinkamai 53,2% ir 69%), palyginus su tiesioginiu aptikimo dažnumu. Tačiau tai, kad skirtumai tarp rūšių aptikimo dažnių išliko pakankamai dideli net ir po ištirtumo įvertinimo, leidžia apibendrinti, kad Lietuvoje *L. vivipara* yra dažnesnis už *L. agilis*. Vis dėlto, aptikimo dažnių platuminėse zonose palyginimas parodė, kad abi rūšys į pietus apytikriai nuo 55°17' paralelės yra panašaus statuso, tuo tarpu į šiaurę nuo šios linijos *L. agilis* yra retesnis, o jo paplitimas – labiau mozaikiškas. Tokio platuminio gradiento viena iš priežasčių gali būti skirtingas rūšių tolerantiškumas toms pačioms aplinkos sąlygoms.

Received: 22 June 2005

Accepted: 30 November 2005