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Source: Mingo, V., Lötters, S. & Wagner, N. (2016). Risk of pesticide exposure for reptile species in the European Union. *Environmental Pollution*, 215: 164–169. DOI: 10.1016/j.envpol.2016.05.011.

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European Commission

Science for Environment Policy

One third of all reptile species in EU at high risk of pesticide exposure

Pesticide exposure can have negative impacts on many species and is a major threat to biodiversity. A new study is one of few to assess the risks specifically for European reptiles. The results suggest that at least one third of European reptile species are at high risk of exposure, with lizards showing the highest sensitivity to pesticides.

There are approximately 10,000 different species of reptile worldwide, across all continents except Antarctica. Around 150 of these are found in Europe, including snake, lizard, turtle and tortoise species.

Reptiles are one of many groups facing population decline. In the EU, 18% of reptile species on the IUCN Red List are considered threatened. The major cause of this is the loss and degradation of habitat, but a close second is the use of agricultural chemicals.

Pesticides can have negative effects on biodiversity[1]. Although studies have shown negative impacts on reptiles, data on their toxicity — especially in natural habitats — are scarce. Furthermore, current EU processes for pesticide admission[2] do not include any risk assessment for reptiles.

In order to protect reptiles, it is important to understand how pesticides affect them and which populations are most likely to be exposed. Although some studies have looked at reptile biodiversity in croplands, none has investigated pesticide exposure on a large scale. Before this, only one study had investigated the pesticide exposure risk of European reptiles, and only covered species listed under Annex II of the Habitats Directive.

Building on past work, this study performed a risk evaluation for as many reptile species as possible within the EU. The researchers used the same general method as the previous study, calculating exposure risk based on: occurrence in agricultural areas with regular pesticide application, physiological factors that increase pesticide uptake (such as body mass) and life-history traits that increase exposure (such as number of offspring).

The researchers conducted a risk assessment for 102 species in total. Based on their physiology and life history, the majority of species were categorised as high risk. This is because most species were relatively small, increasing pesticide exposure due to greater pesticide intake via food, and via a larger body surface area, (which increases pesticide uptake via the skin) relative to an individual's body mass. Populations with fewer offspring are also more threatened by pesticides. Species that produce fewer clutches (groups of eggs), and fewer descendants per year, for example, are more vulnerable to detrimental effects caused by pesticides than those with multiple clutches. The majority of high-risk species also showed a high degree of overlap between their habitat and agricultural areas with regular pesticide use (50% on average).

Overall, around half of all the species evaluated here — and thus at least a third of all European species — showed high exposure risk, two of which (the Greek tortoise, *Testudo graeca,* and Mediterranean turtle, *Mauremys leprosa*) are already threatened with extinction.

Lizards were the most sensitive group to pesticides — although this was not reflected in their overall risk because their European distribution ranges do not overlap with agriculture as much as other groups, such as snakes.

Continued on next page.

1. http://www.sciencedirect.com/science/article/pii/S1439179109001388

2. Regulation (EC) No 1107/2009 concerning the placing of plant protection products on the market: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:309:0001:0050:en:PDF

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One third of all reptile species in EU at high risk of pesticide exposure *(continued)*

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The researchers finally compared risk in the different areas where pesticides can be used ('pesticide admission zones') within EU Regulation[3]. The area with the highest number of species occurring in agricultural areas with regular pesticide applications was southern Europe, where most reptile species occur in arable land. Apart from arable land, vineyards and olive groves were also highly occupied. Vineyards are particularly important areas for contamination in the 'central admission zone', as they match the habitat preferences of Mediterranean reptile species, like the common wall lizard *Podarcis muralis* and the western green lizard *Lacerta bilineata*, which live in dry and rocky areas with low vegetation in their northern distribution ranges. Vineyards are also hives of chemical activity; grape plantations use the most pesticide by crop in the EU at over 20 kg of active substance per hectare per year (with most of the remainder substance being made up by surfactants, for which toxicological data is scarce).

As well as having more reptile species and greater overlap with agricultural areas, pesticide applications are more frequent in the south, where pests are more likely to thrive than in harsher northern climates and so pesticides may have to be re-applied more often. Areas with the highest pesticide application rates include France, Italy, Portugal and Spain. It is especially important to integrate pesticide assessments into conservation practice for southern European countries, say the authors, as protecting species in these countries could help to protect biodiversity across the EU.

This study identifies species that are at high risk of pesticide exposure and could inform conservation actions for reptiles in European landscapes. If action is not taken, the number of threatened reptile species could increase. There is, therefore, an urgent need to increase the focus on reptiles in pesticide risk assessments and conservation actions to avoid further biodiversity loss, conclude the researchers.

3. Ibid.