

A very European tale – Britain still has only three snake species, but its grass snake is now assigned to another species (*Natrix helvetica*)

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Following several investigations of the phylogeography and systematics of grass snakes (Fritz et al., 2012; Kindler et al., 2013, 2014; Pokrant et al., 2016), we published a further detailed study on this topic in August (Kindler et al., 2017). Our new investigation revealed that only very limited gene flow occurs between western barred grass snakes and eastern common grass snakes. Consequently, we concluded that the barred grass snake (Fig. 1), previously a subspecies, should be elevated to a full species. August being the ‘silly season’ for news stories led the local media, including the highly respected BBC, to claim that Britain has now an additional snake species, i.e. four instead of three species – the northern viper (*Vipera berus*), the smooth snake (*Coronella austriaca*) as well as two species of grass snake, the common grass snake (*Natrix natrix*) and the newly recognised barred grass snake (*Natrix helvetica*).

This upheaval resulted from a complete misunderstanding of a press release by the Senckenberg Institution. The press release pointed out that Europe now has one more full snake species, which was misinterpreted as Britain gaining an additional snake species. In Brexit times, we have great sympathies with this approach. However, we have to face reality. Since the Kingdom of Hanover was lost from the United Kingdom in 1837, only one species of grass snake lives within UK borders (excluding a few introduced *N. natrix* and their offspring identified by our study). Until our paper was published (Kindler et al., 2017), the native British populations were assigned to the subspecies *Natrix natrix helvetica*, also widely distributed on the continent. Now, the strong evidence we presented indicates that this subspecies should be recognised as a full species, *Natrix helvetica*. Yet, this did not add another species to the British fauna, the British populations simply changed their identity label, as will all Britons when they leave the European Union. They will no longer be listed as EU citizens, but otherwise they will remain the same. Having now clarified this matter, we want to give a quick summary of the scientific situation.

As long ago as 1979, a thorough analysis of morphological characters demonstrated that there is a sharp break between western barred grass snakes and eastern common grass snakes (Thorpe, 1979). Geographically, this break approximates to the Rhine region in western Central Europe. Our genetic results (Kindler et al., 2013, 2017), based on analyses of mitochondrial DNA sequences and 13 microsatellite markers, largely corroborate Thorpe’s



Figure 1. Young *N. helvetica* showing the distinctive lateral bars from which the species common name the ‘barred grass snake’ is derived (photo: © Jason Steel)

findings. However, some southern populations identified by Thorpe with barred grass snakes, for instance from northern Italy, turned out to be distinct from *N. helvetica* sensu stricto, explaining Thorpe’s finding that in this region morphological divergence becomes fuzzy. These southern populations, distributed from the Padan Plain over the Apennine Peninsula, Sicily, Corsica, and Sardinia, are closely related to *N. helvetica*, but nevertheless are genetically and morphologically distinct and can be considered as subspecies of *N. helvetica* (Kindler et al., 2017).

For Central Europe, we found that the gene flow between *N. helvetica* and *N. natrix* is largely unidirectional from *N. helvetica* into *N. natrix* and restricted to a narrow belt less than 50 km wide in the Rhine region. In contrast, another contact zone in eastern Central Europe and south-eastern Europe is very wide (more than 650 km). In this eastern contact zone there are two genetic lineages of *N. natrix* involved, and nuclear genomic admixture is more or less complete (Kindler et al., 2017). The two contact zones correspond to two very different stages of the speciation process. With respect to the western contact zone in the Rhine region, we understand our findings as hard evidence for a widely advanced divergence process of *N. helvetica* and *N. natrix*. Therefore, we proposed to recognise the two taxa as distinct species. Our view is supported by morphological differences between *N. helvetica* and *N. natrix* and the considerable divergence time of 7.3-8.2 million years between the mitochondrial lineages of the two species (Fritz et al., 2012).

Europe now has three full species of grass snake, *Natrix astreptophora*, which is the recently recognised Ibero-Maghrebian species (Pokrant et al., 2016), *N. helvetica* and *N. natrix* (Kindler et al., 2017). However, Britain still has only one native species – the barred grass snake, *N. helvetica*. The only opportunity to have more would be to merge with the European Union.

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