



## Correspondence

### *Batrachochytrium salamandrivorans* kills alpine newts (*Ichthyosaura alpestris*) in southernmost Germany

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The European amphibian fauna is threatened by several different pathogens. We currently know of mortalities linked to ranaviruses (KIK et al. 2011), and to two fungal pathogens, the widespread *Batrachochytrium dendrobatidis*, causing amphibian mortalities in several European countries (FISHER et al. 2009), and the invasive chytrid fungus *B. salamandrivorans* (*Bsal*), affecting especially urodeles (MARTEL et al. 2013, 2014). A modelling study suggests that currently much of the ecological niche of *Bsal* remains unoccupied in Europe (BEUKEMA et al. 2018). A further successful spread of this pathogen is therefore likely. In Europe, Germany has been counting about 50 known *Bsal*-positive sites (LÖTTTERS et al. 2020 in this issue) which makes it currently the most severely impacted country.

Several new observations of *Bsal*-related amphibian mortalities in the South of Germany have been made in recent years (LÖTTTERS et al. 2020 in this issue), including the first proof of *Bsal* in Bavaria in 2020 (THEIN et al. 2020 in this issue). Here we provide evidence of the first *Bsal* occurrence in the German region of Allgövia (northern Alps, Bavaria). Several mortality events of alpine newts (*Ichthyosaura alpestris*) have been observed in garden ponds in a small village north east of the town of Memmingen (Allgövia, Germany, N48.05883°, E10.32297°, Fig. 1) beginning of April 2020. Characteristic *Bsal*-lesions were observed on the skin of these specimens (N = 10, Fig. 2). We tested eight tissue samples of the specimens from one garden pond via qPCR analysis (standard protocol see BLOOI et al. 2013), detecting the presence of *Bsal* (mean GE = 36,145.5 ± 12436.8, GE range: 104–94,800). Histological analyses confirmed the presence of sporangia in typical ulcerative skin lesions in five specimens. In the close vicinity of the site of mortality events several additional dead alpine newts were observed, but neither collected nor analyzed.

Alpine newts have been demonstrated to be susceptible to *Bsal* infection (MARTEL et al. 2014) and identified as potential *Bsal* reservoirs (STEGEN et al. 2017). Our report confirms *Bsal*-induced field mortality in this species (SCHULZ et al. 2018, 2020 in this issue). The impact at the level of populations remains unclear since alpine newts are potentially able to cure themselves when affected by only a low load of *Bsal* zoospores (STEGEN et al. 2017).

Transmission pathways of batrachochytrids are poorly understood. *Bsal* was estimated to spread slowly under natural conditions due to the low migration ability of urodeles (TROCHET et al. 2014). Long-distance spread may mainly be anthropogenic (SPITZEN-VAN DER SLUIJS et al. 2018, MARTEL et al. 2020), especially given that the here reported mortalities were observed in a garden pond. The geographically closest known occurrence of *Bsal* is located at a distance of ca. 170 km of this outbreak in the Bavarian Steigerwald (THEIN et al. 2020 in this issue). These new observations of mortalities suggest that *Bsal* is spreading or is being spread by humans across large distances. Aquatic plants bought e.g. in garden centers may be possible vectors, as it is known that amphibians can hide in those plants and then are transported together with pathogens over longer distances and released in suitable habitats (a garden pond, pers. observ. DSS).

Our observation of mortalities in the very south of Germany, close to the German Alps give rise to concern that *Bsal* may now also threaten rare and emblematic species such as the alpine salamander, *Salamandra atra*, and its subspecies, and Lanza's alpine salamander, *S. lanzai*. A German and European threat abatement plan needs to be put in place urgently (THOMAS et al. 2019, LÖTTTERS et al. 2020 in this issue).

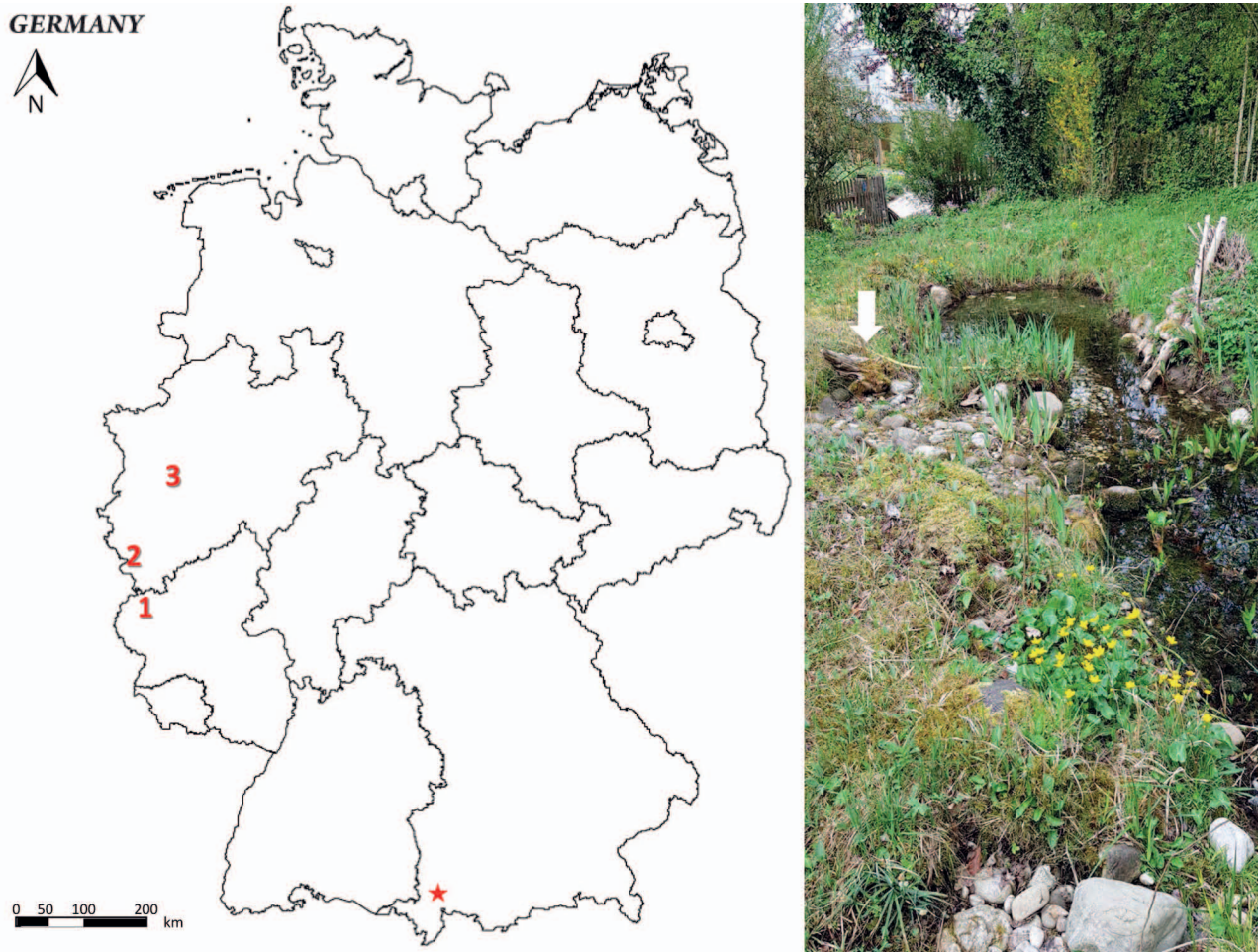


Figure 1. Location of the *Bsal* clusters known for Germany (1 = Southern Eifel cluster, 2 = Northern Eifel cluster, 3 = Ruhr District cluster, for details see LÖTTERS et al. 2020 in this issue). The red star shows the location of the alpine newt mortality site. The arrow in the photo depicting the garden pond shows the location where the dead alpine newts were found.

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Figure 2. Photographs of the observed lesions (white arrows) of alpine newts from a garden pond in Allgövia, southern Bavaria.

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