

Wanderleistung und Orientierung von Amphibien: eine Übersicht

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Migration and orientation in amphibians: an overview

Migrations are a central component in the life of amphibians, and questions about migratory behaviour play an important role in applied amphibian conservation. A recent study has shown that amphibians are more mobile than previously thought: 45 % (anurans) and 16 % (urodeles) of 53 and 37 considered species, respectively, cover distances exceeding 1 km; 7 % and 2 % of these even migrate further than 10 km (SMITH & GREEN 2005). Field studies about dispersal rates are increasingly supplemented with genetic approaches, but a combination of findings from the field and the laboratory proves difficult, mainly due to the differing nature of the phenomena studied (migration vs. gene flow). Orientation between breeding ponds, summer habitats and hibernation sites is enabled through the use of a complex orientation system which integrates acoustic, visual, olfactorial, mechanic and magnetic information. In native amphibians, common mechanisms are beaconing along acoustic and olfactorial cues from the breeding site and piloting between fixed visual landmarks, whereas the integration of information from the outward migration only plays a minor role. A sun and star compass with time compensation and a light-dependent magnetic inclination compass are used alternatively or in combination to maintain the chosen direction of travel. Navigation, i.e. the ability for homing from an unknown region without information from an outward journey, was so far only shown for the North American salamander *Notophthalmus viridescens*. The consequences of the outlined findings for conservation measures are that previously used guidelines for maximum dispersal rates in native amphibians might be too low, and that adjacent breeding sites might be less decoupled than previously thought. Artificial structures which enable migration (e.g. tunnels under roads) should not obstruct the environmental information required for orientation.

Key words: Amphibia, dispersal, migration, gene flow, orientation system, pilotage, magnetic compass, navigation.

Zusammenfassung

Wanderungen sind ein zentraler Teil der Lebensweise von Amphibien. Erkenntnisse über Wanderverhalten spielen im Amphibienschutz eine große Rolle. Neue weltweite Forschungsergebnisse zeigen, dass Amphibien wesentlich mobiler sind als vielfach angenommen: 45 % (Froschlurche) und 16 % (Schwanzlurche) von 53 bzw. 37 weltweit untersuchten Arten überwinden Distanzen von mehr als 1 km, und 7 % bzw. 2 % dieser Arten wandern sogar weiter als 10 km (SMITH & GREEN 2005). Feldstudien über Ausbreitungsraten werden auch zunehmend durch genetische Methoden er-