

Flexibility of the movement patterns of two rheophilic cyprinids according to river characteristics

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In fragmented rivers, fish-passes are installed to increase the longitudinal continuity and improve fish movements between functional habitats. Continuous and multiannual monitoring of such devices allows to evaluate their effectiveness (biodiversity, biomass) but it can be also a scientific tool to better understand the fish mobility in rivers thanks to multispecific quantitative data's. As fish are supposed to adapt their behaviour in relation with their habitats, we test if the movement characteristics (biometry, periodicity or environmental determinants) of two rheophilic cyprinids, the barbel (*Barbus barbus*) and the chub (*Squalius cephalus*) are flexible and adaptive depending on the river typology (flow, T°, anthropisation, altitude). We used the capture data of three modern multispecies fish-passes that were monitored continuously during 3 consecutive years (2010 to 2012) in three different rivers: the Meuse (altitude: 52m ; average annual discharge: 400 m³.s⁻¹), the Ourthe (70m ; 67.4 m³.s⁻¹), a Meuse tributary and the Amblève (190m ; 19.3m³.s⁻¹), an Ourthe tributary. We observed different functional movements at different life stages (spawning migration, refuge or juvenile dispersion) for both species with specific periodicity and influence of environmental factors between each location. The spawning migration in spring of mature barbel was observed earlier (Q₅₀: 120th day of the year) and to lower temperature (Q₅₀: 14.5°C) in the lower rivers (Meuse and Ourthe) relative to the upper portion (Amblève) (Q₅₀:140th day of the year and 18°C). Moreover, we observed only in river Meuse, a second annual peak of capture in early fall. In contrast, the spawning migration of mature chub took place at the same temperature (Q₅₀: 16°C) but at different times between the three different locations (Meuse>Ourthe>Amblève). This study demonstrates that individuals of the same species are able to develop behavioural tactics allowing to optimize their space and time use depending on their environment.