Abstract

Aquatic ecosystem functioning in human-impacted environments is highly dependent of its uses; in consequence, the environment of biological communities is generally fluctuating. Studying the link between environment and organism in fluctuating environments is generally more complex compared to steady environments. The main objective of this work was to better understand how fish populations respond to environmental modifications in a reservoir affected with water level fluctuations (WLF), the Bariousses’s reservoir located on the Vézère River.

A multiscale approach was used with different biological (community and individual) and temporal (annual and daily cycles) scales. A special attention was given to the littoral zone as it plays a key role for lake fish communities and since it is strongly affected by WLF. This work is divided in 4 parts. The first part presents the characteristics of the study site and the second part describes the impact of WLF on the studied habitats using a mapping of the littoral zone. The consequences of hydrological stress through the changes in habitat conditions were also analyzed as well as the effects of water temperature and photoperiod. The third part shows the effect of the temporal variability of environmental conditions induced by WLF on the composition of the littoral fish community (sampled by electrofishing). The fourth part presents an innovative positioning system acoustic telemetry (Vemco Positioning System) that was used to study the impact of WLF at the individual scale by analyzing the behavior of 90 individuals from three different fish species (pikeperch, pike and perch) with a satisfactory accuracy (average error of 3.3 m after filtration).

The results of this work showed that WLF induced a temporal variability of the littoral zone surface and volume. In addition, a gradual decrease of the structural complexity of littoral habitats was associated with lower water level inducing a trend to homogenization (dominance of thinner substrates without vegetation). Despite these changes in habitats conditions induced by WLF, littoral fish community did not show any clear change in composition. High inter-individual variability of behavioral responses was observed in response to environmental fluctuations, but the temperature and photoperiod were the two major structural parameters controlling fish activity and spatial distribution. Water level affected a part of the fish population since more individuals attended the littoral zone and were less mobile when available habitats were more complex (with a high water level).

These results allowed us to suggest some ideas for the management of water levels in the studied reservoir focused on the fish population.

Keywords: reservoir, fish, littoral zone, water level fluctuations, temperature, photoperiod, individuals.