Relationship between hydrology and cyprinid reproductive success in the Lower Rhône at Montélimar, France

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With 5 figures and 4 tables

Abstract: Young-of-the-Year (YOY) cyprinid recruitment success was investigated annually over a 16-year period (from 1983 to 1998) in relation with the annual hydrological regime in a large regulated river (the Rhône River, France). The annual discharge regime was divided among 3 seasons based on the biological cycle of fishes (wintering, reproduction, and growth periods), and characterised by descriptors of average, high and low flow conditions, and overall variability. Co-inertia analysis revealed two distinct effects of hydrology on YOY recruitment success. The first resulted in a sudden shift in the YOY community organization, and was the consequence of two unpredictable (of extremely high magnitude in regard with the long-term mean value in a given time interval) consecutive floods, in October 1993 (110-year return-flood) and January 1994 (50-year flood). The resulting scouring of the substratum seems to have had a favourable effect on recruitment. The second, weaker effect was only observed in the 5 years after the 1993 and 1994 floods. It revealed the role of seasonality in hydrological conditions, because it separated high and variable discharge during the spawning period (favourable for barbel and bleak) from low discharge during this season (favourable for roach, rudd and nase). The results were consistent with previous knowledge concerning these species, and functional interpretations confirmed general expectations. Our findings support habitat template theories that attribute a major role to environmental variability (including ‘disturbance history’) in determining community characteristics. Finally, these results provide the first steps for a rational management of seasonal discharge in large regulated streams.

Key words: Fish recruitment, discharge, habitat template, substrate scouring.

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