Seasonal changes in aquatic plant communities in rivers: the case of functional traits involved in plant - flow interactions

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Abstract

River hydrology can affect key processes of aquatic plant communities as dispersion by flow, or mechanical damages leading to loss of biomass during peaks of discharges. Responses of aquatic plant communities to hydrological events depend on the characteristics of the events (e.g., flood intensity) and on the plant functional traits involved in plant interactions with flow (e.g., mechanical resistance). Both (hydrology and functional traits) have a strong seasonal component but the seasonal changes of the functional composition of aquatic plant communities in different hydrological regimes remains largely unknown. The aim of the present study is to investigate changes in the functional composition of aquatic plant communities along a seasonal cycle in different hydrological regimes. For that purpose, four aquatic plant stands (400 to 1000m long, 1 to 18 species depending on stands and seasons) were selected, two stands being located in a bypassed section of the Rhône River (BS) characterized by fixed minimum flows over several months and occasional lowered peak flows, while the other two being located in the main Rhône channel (RC) where the flow magnitude and variability are not regulated. For each stand, aquatic plant species were collected along a seasonal cycle in _˜ 20 transects. For each species, a maximum of 5 individual plants were selected to measure the aboveground height and traits related to plant mechanical resistance. In addition, the plant density was measured in a quadrat (35 x 50cm) on each transect. Our results show that plant height and mechanical resistance are higher in stands located in the RC compared to those located in the BS, but with patterns differing greatly between species. For instance, while some species remained high throughout the seasonal cycle, other species were tall but only present in summer. In addition, density decreases sharply from autumn onwards in stands located in the BS, whereas it remains stable for those located in the RC. In winter, density decreases in all stands, but remains higher in the RC. The

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measured seasonal changes in the functional traits of the plant communities could be useful for modelling processes related to plant – flow interactions (e.g. plant uprooting) and for predicting community dynamics at large scales.

Keywords: aquatic plant communities, functional traits, hydrological conditions, plant, flow interactions, Rhône River, seasonal cycle