
How human-altered hydrological conditions influence the structure of the food web in marshes?

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Résumé

Marsh ecosystems are essential habitats for diverse flora and fauna and provide a wide range of ecosystem services. In many marshes, however, hydrological conditions have been deeply disrupted by anthropic management, and the consequences on marshlands' ecological structure and function remain questionable. In particular, how human-altered hydrological conditions influence the structure and functioning of food webs, an important determinant of the stability, persistence and resilience of biodiversity to disturbance, remains unclear. To fill this knowledge gap, we conducted surveys of fish, amphibian and macroinvertebrate biodiversity across 55 ditches within eleven hydrological units submittted to different water regime management, in the Marais poitevin. Using trophic data from existing literature, we inferred the structure of food webs in each of the 55 ditches and characterized their structure by two metrics: i) maximum trophic level, which represents the breadth of the vertical dimension of the food webs, and ii) connectance, which reflects the level of generalism in the food webs. Our results show that food webs at sites exposed to greater hydrological disturbances, especially prolonged drought, had a lower maximum trophic level and higher connectance. This fits well with the disturbance hypothesis on food-chain length and with other studies suggesting that generalist predators are better adapted to disturbance regimes and that higher connectance should promote structural robustness of food webs to disturbance. Food web structure was also found to be related to habitat size (particularly canal width) and aquatic vegetation cover, with a positive relationship with maximum trophic level and a negative relationship with connectance, as expected. Indeed, habitat size and complexity have been shown to promote the occurrence of top predators or intermediate taxa and thus trophic diversity. Our results highlight that the food web structures are influenced by the management patterns of the water regime. They must therefore be taken into account in management strategies aimed at maintaining the integrity and resilience of these ecosystems.

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Mots-Clés: ditch, network ecology, trophic interactions, water level, water regulation