



Abstract

Colonization and Succession of Fish Assemblages in a New River Section: A Size Structure Approach [†]

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Abstract: One of the severe impacts of rivers is the construction of new structures on the riverbed bringing about diversions and changes in the flow course. These new sections must then be colonized by the species present in the ecosystems. These colonizations are critical processes that regulate the communities' persistence and ecological resilience. Understanding these colonization and succession processes is essential for biodiversity conservation. However, studies that analyze these processes are rare for freshwater environments. This study explored the colonization and succession patterns of fish assemblages in a new channelized section of the Larraun River (Navarra, Spain) from its construction to the present (twenty-five year period). We also checked the usefulness of size-related variables as indicators of the changes in these processes for fish populations. Two sites (control and new section) were sampled by electrofishing from 1996 to 2020, physicochemical parameters were measured, and habitat was characterized. Our results show that constraining environmental features shape freshwater fish species' biological characteristics and distribution in the colonization processes. Initially, the mesohabitat of the new stream segment was simple and dominated by runs. Throughout the years, the complexity increased and mesohabitats became more diverse, with an increase in pools and higher width, depth and diversity of depths of the new section. The water temperature decreased due to the increased shade produced for the expansion of the riparian forest. Moreover, size-related variables of the fish community, such as size diversity, mean and maximum length, increased in the new section throughout the succession process, achieving values comparable to the control site. Regarding the slopes of the fish size spectra (i.e., the linear rate of decline of fish abundance as body size increases), it took twenty years for the new section to obtain values comparable to the control site, indicating a slow transition from a community dominated by small fish to a community where all sizes were well represented. This study suggests that habitat complexity (diversity of substrates, depths, water velocity, etc.) determines the structure of fish populations and that size-related variables can be effective ecological indicators when assessing the evolution of fish colonization and succession in temperate European rivers.

Keywords: ecological processes; temporal series; body size; habitat changes; biodiversity; human impacts; environmental management



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