



HUMAN PRESSURE DRIVE STRUCTURE AND FUNCTIONING OF FOOD WEBS ACROSS LARGE WETLANDS

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The structure and functioning of food webs are thought to be impacted by increasing human pressure. Yet, it remains unclear how human pressure alters the structure and functioning of wetland food webs through direct and indirect impacts mediated by changes in the coverage of natural environments. To address these issues, we used an extensive database of 73 lakes distributed across four major Neotropical wetlands in Brazil. Human pressure was quantified using the Human Footprint Index, whereas natural habitat coverage was measured as forest and wetland cover. At each lake, we constructed food webs with species-specific trophic links among 1,186 taxa, including fish, microcrustaceans, rotifers, ciliates, and phytoplankton, as well as fine and coarse particulate organic matter, plants, macroinvertebrates, and bacteria. Food web structure was analyzed using 13 network metrics, including the number of nodes and links, link density, connectance, generality, vulnerability, mean trophic level, maximum trophic level, mean omnivory, and the proportions of basal, intermediate, and top nodes. Food-web functioning was quantified from energy fluxes through the nodes of the network. We then used structural equation models to disentangle the direct and indirect pathways through which human pressure affects wetland food-web structure and functioning. We found that food webs became shorter and flatter, with total energy fluxes decreasing as human pressure increased. Human pressure reduced the coverage of natural environments, indirectly shortening and flattening food webs. This led to a net reduction in total energy fluxes through food webs. Our findings highlight that increasing human pressure is driving a simplification of wetland food webs, which leads to reduced energy fluxes, highlighting losses of key ecosystem functions such as herbivory, detritivory, and carnivory. In conclusion, this study underscores the importance of reducing the intensity of human pressures if we wish to safeguard the structure and functioning of wetland food webs.

Palavras-chave: *Biodiversity; Food web; Human pressure; Freshwater; Wetlands*

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