SCHOOL OF ENVIRONMENT AND NATURAL RESOURCES

Graduate Defense Seminar

Consequences of Landscape Change on Riverine Food Webs and Aquatic–Terrestrial Linkages

Adam Kautza

PhD Candidate, Fisheries and Wildlife Science

Food webs relate important information about species diversity, community composition, and ecosystem function. However, environmental determinants of food-web structure remain unresolved, particularly in fluvial systems that are highly variable over space and time and characterized by both longitudinal (i.e., upstream-downstream) and lateral (i.e., aquatic-terrestrial) connectivity. In particular, anthropogenic impacts relating to river regulation and land-cover change might be expected to strongly influence river-riparian food webs via modification of natural environmental gradients that are thought to structure ecosystem processes and biotic communities in rivers. To this end, we investigated the relative influence of anthropogenic and natural gradients on riverine landscape food-web dynamics including energetic linkages via reciprocal (i.e., aquatic-terrestrial) invertebrate fluxes, food-chain length (FCL) of fish food webs, and the contribution of aquatically-derived energy [e.g., carbon (C)] to terrestrial food webs. In general, river food webs were associated with both anthropogenic (urbanization, dams, and ßwater quality) and natural environmental gradients (river size, forest and grassland land cover) but aquatic and terrestrial components of the food web were influenced by distinct factors. For example, reciprocal invertebrate fluxes were related to gradients of anthropogenic land cover and water quality; whereas fish FCL was associated with dams and river size. Riparian landscape composition, dams, and river size all influenced the relative importance of aquatic C, which represented a considerable contribution (65%) to a suite of terrestrial consumers that forage across different spatial scales; tetragnathid spiders (shoreline; 76% aquatic C), damselflies (0-50 m; 72%), riparian swallows (0-400 m; 67%), and raccoons (0-1000+ m; 59%). Collectively, my results contribute to a growing understanding of the environmental determinants on riverine food webs, challenge the notion that terrestrially-derived energy drives river food webs, and have considerable application to river management and conservation.

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