

An annual fossil record of production, planktivory and piscivory during whole-lake manipulations

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Abstract

Annual and subannual paleolimnological records of pigments and zooplankton were used to analyze three whole-lake manipulations. The relative abundance of cladoceran remains in recent seasonal laminae was significantly correlated with the relative abundance of species in the plankton ($r^2 = 0.59$, $P < 0.001$). Comparison of food-web structure after piscivore introduction showed that there are multiple outcomes of predation and that final food-web structure depended on the strength of interaction between piscivorous and planktivorous fish. Intense predation on cyprinids (*Phoxinus eos*, *P. neogaeus*, *Umbra limi*) by largemouth bass (*Micropterus salmoides*) allowed large herbivores (*Daphnia pulex*) and invertebrate predators (*Chaoborus punctipennis*) to dominate. Analysis of fossil invertebrate morphology suggested that small grazers (*Bosmina longirostris*, *Diaphanosoma birgei*) were eliminated by invertebrate predators. Under moderate predation by rainbow trout (*Oncorhynchus mykiss*), cyprinids remained, only intermediate-size herbivores (*D. rosea*) increased in abundance, and *Bosmina* persisted. In contrast to food-web manipulations, increased algal abundance resulting from watershed disturbance (road construction) did not alter the species composition or size-structure of fossil Cladocera.