



Fakulta rybářství a ochrany vod Faculty of Fisheries and Protection of Waters

Jihočeská univerzita v Českých Budějovicích University of South Bohemia in České Budějovice Czech Republic

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Open-Minded

Combining metal and stable isotope analyses to disentangle contaminant transfer in a freshwater community dominated by alien species

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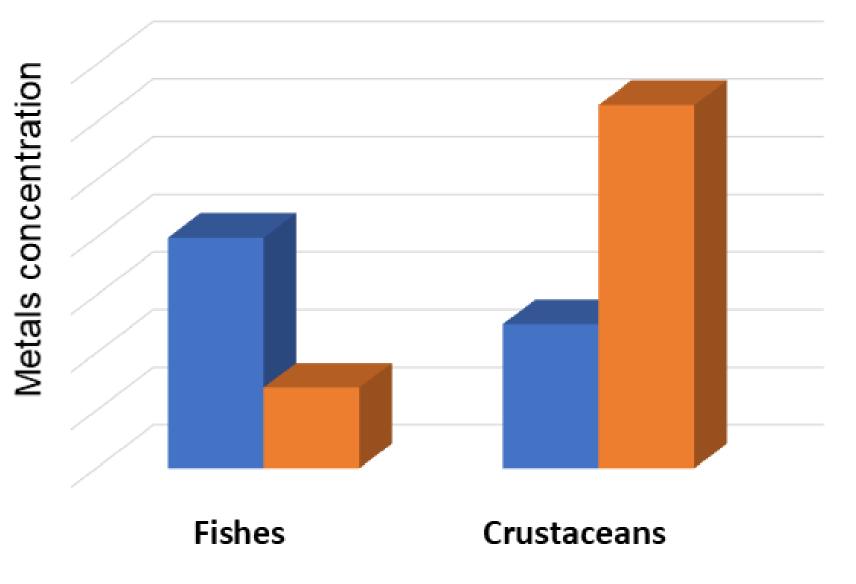


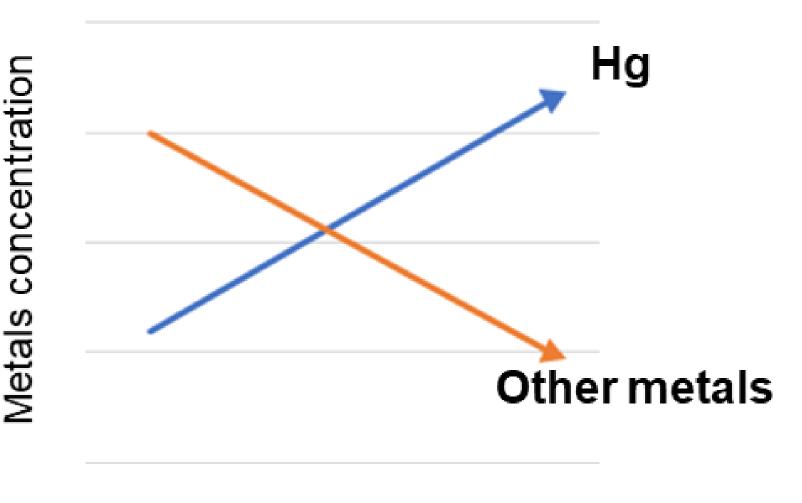
Freshwater alien species can bioaccumulate high metal concentrations (Gherardi et al. 2002), potentially transferring them along the food web. These species can modify the communities' trophic structure, leading to new interactions (Haubrock et al. 2019) with contaminants transfer following new pathways. Heavy metals transfer within highly invaded communities is scantly studied.

We analysed the concentration of 14 heavy metals of 11 species, mainly alien, present in the Arno River (Central Italy). To assess the pathway of contaminants within the community, metal and carbon/nitrogen stable isotope analyses were coupled. Using stable isotopes and Hg as a third diet tracer (Ballutaud et al. 2019), we estimated the diet and compared to that one reconstructed with stable isotope only.

RESULTS

showed higher metal Crustaceans concentration than fish, except for Cd, Hg and Se higher in fish (Fig. 1). A considerable biomagnification along the trophic chain was found for Hg, while other metals biodiluted (Fig. 2).



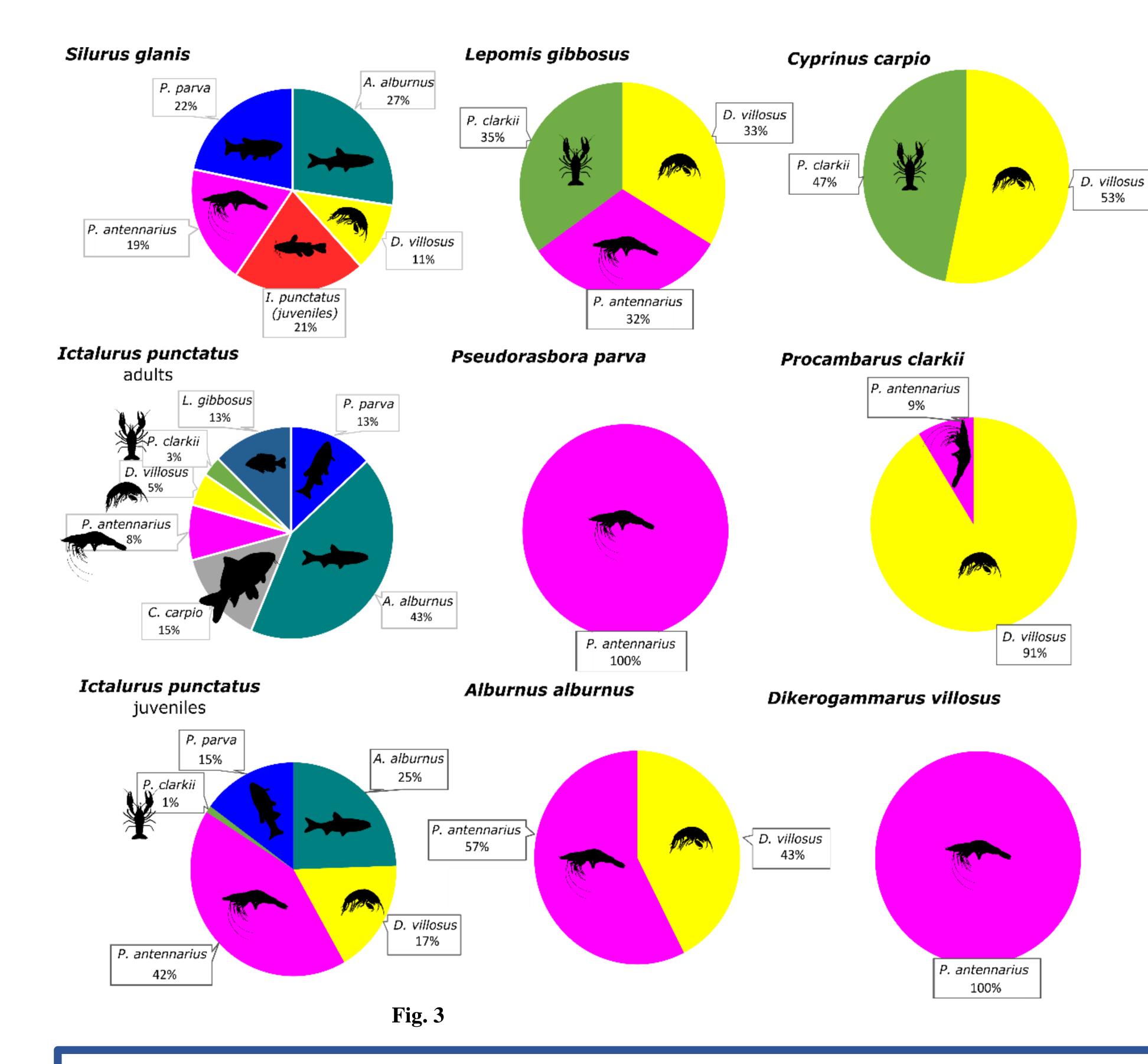




Cd, Hg, Se Other metals

Fig. 1

Fig. 2



Fish consumed crustaceans as a significant proportion of their diet but did not show higher metal concentration than crustaceans themselves (Fig. 1,3).

CONCLUSIONS

diet estimated combining both The stable isotopes and Hg concentrations (Fig. 3) provided finer results compared with that estimated with stable isotopes only. Metal accumulation in the Arno River community was relevant, even if biomagnification was found only for Hg. Environmental filtering and increased \bullet competition may contribute to the disappearance of native species with lower tolerances.

Literature: Gherardi et al. 2002. A comparison of trace metal accumulation in indigenous and alien freshwater macro-decapods. Mar. Freshw. Behav. Phy. 35(3), 179-188; Haubrock et al. 2019. Shared histories of coevolution may affect trophic interactions in a freshwater community dominated by alien species. Front. Ecol. Evol. 7, 355; Ballutaud et al. 2019. EStimating Contaminants tRansfers Over Complex food webs (ESCROC): An innovative Bayesian method for estimating POP's biomagnification in aquatic food webs. Sci. Total Environ. 658, 638-649.