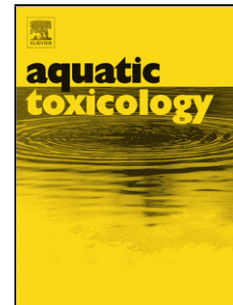


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Temporal variations in kidney metal concentrations and their implications for retinoid metabolism and oxidative stress response in wild yellow perch (*Perca flavescens*)

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### Highlights:

- Kidney concentrations of Cd, Cu and Zn varied seasonally in yellow perch from both clean and metal-contaminated lakes.
- Changes in the responses of hepatic retinoid metabolism biomarkers generally reflected changes in kidney Cd concentrations.
- Seasonal variations in tissue metal concentrations correlate with fish antioxidant capacities.
- The oxidative stress status of metal impacted fish was higher in the spring than in the fall.

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