

Biomarkers of metal exposure in acanthocephalans and fish intestine

THIRD PROJECT MEETING

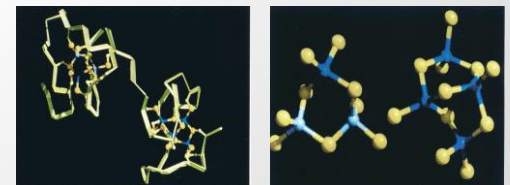
Integrated evaluation of aquatic organism responses to metal exposure:
gene expression, bioavailability, toxicity and biomarker responses
(BIOTOXMET)

Zagreb, 19th May 2023



METALLOTHIONEINE IN INTESTINE OF FISH FROM THE KARST ECOSYSTEM

- Metal-associated stress in the organism can be reflected as the induction of **metallothioneins (MTs)**, cytosolic proteins responsible for essential metal homeostasis (Cu, Zn) and detoxification of toxic metals (Ag, Cd, Hg).
- The aim of this study was to evaluate changes in MT levels in fish intestine, as a site of metal uptake, and acanthocephalans in the brown trout from the karst Krka River
- MT levels were compared among Krka River source (KRS, reference site), downstream of the industrial and municipal outlets (KRK, wastewater impact) and near Brijan Lake (KNP, location in the national park).

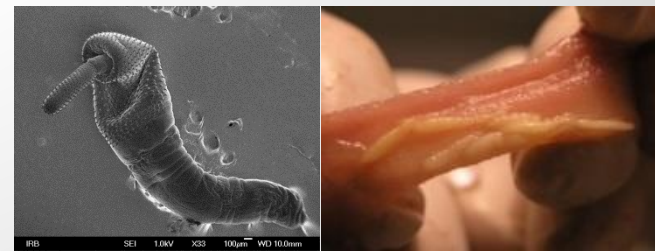


Robbins and Stout, 1992

MTs IN ENDOPARASITES OF FISH

Intestinal parasites *Acanthocephala* are common parasites in the intestine of fishes

- they lack digestive system (mouth and intestine) and rely on absorbing essential nutrients through their surface tegument, including essential metals as important micronutrients
- although being short living, four days after invading host they can accumulate metals
- metal accumulation, especially of toxic metals, is more efficient than in other free-living organisms, like fish, bivalves, crustaceans
- What about MTs in parasites?



STUDY AREA- KRKA RIVER

The aim of the research was to evaluate the anthropogenic influence on the Krka River in the watercourse near town of Knin, situated only 2 km upstream of the beginning of the Krka National Park.



April and October 2021

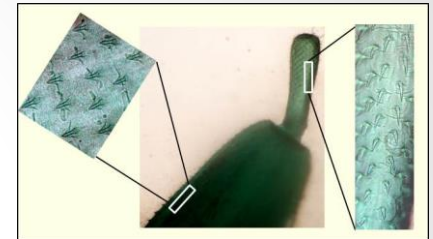
FIELD WORK

FISH SAMPLING – electro-fishing



Brown trout (*Salmo trutta*
Linnaeus, 1758)

BIOINDICATOR ORGANISMS



Dentitruncus truttae Sinzar, 1955

INTESTINE AND ACANTHOCEPHALAN ISOLATION – detached from the intestinal wall

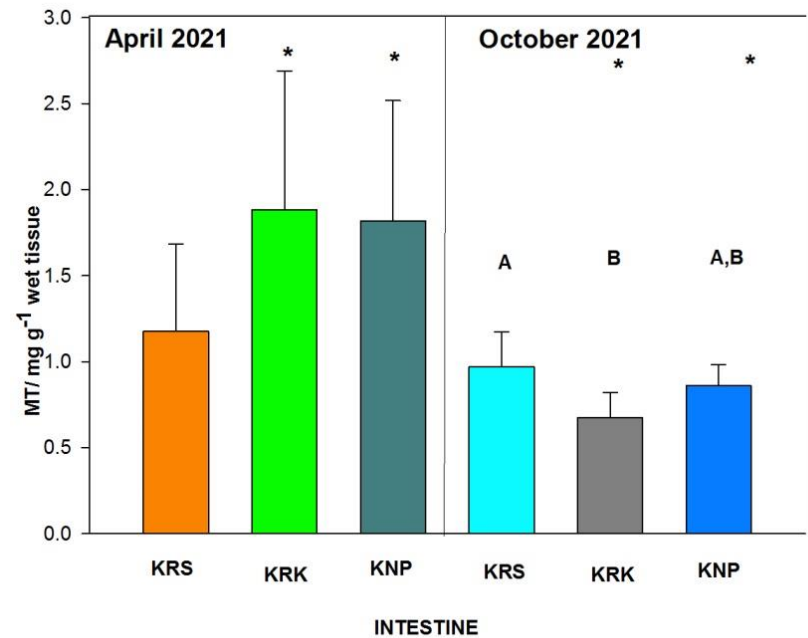
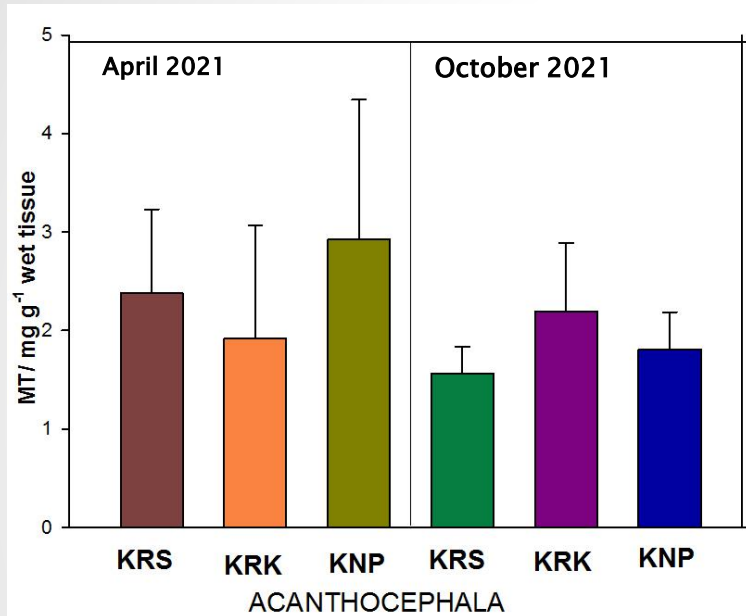


MT MEASUREMENT

Electrochemical method –
differential pulse voltammetry (DPV)



MTs in parasites and intestine of fish



- MT levels in Acanthocephala did not show significant differences between locations or seasons
- MT in brown trout intestines showed significant differences between the seasons at KRK and KNP locations (higher in spring), and also significant differences in autumn between the KRK and KRS locations, being higher at KRS.

MTs– CONCLUSIONS

- The presence of **MTs in Acanthocephala** was observed for the **first time**, being in range 0.7-5.2 mg g⁻¹ w.w.
- **MT levels in fish intestine (range 0.7-2.7 mg g⁻¹ w.w.)** showed higher levels at KRK and KNP than KRS in April, but higher levels at KRS in October (similar to previous field campaigns, possible influence of spawning activities, so further analyses are needed).
- **Impact** of anthropogenic activities in the Krka River indicates the need of continuous **biomonitoring** of the upper part of the Krka River, as well as **protection of the Krka National Park!**





**THANK YOU FOR
YOUR ATTENTION!**