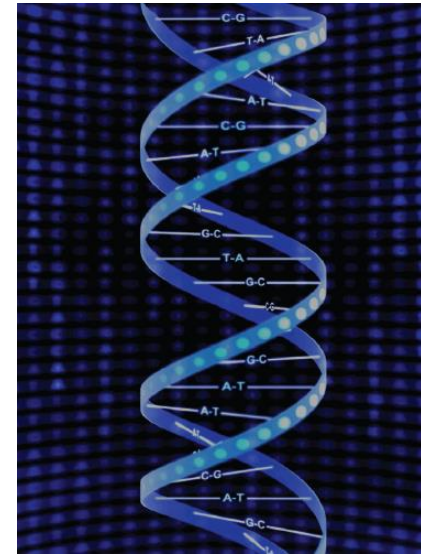


Using eNA to assess ecological impacts of pollution in freshwater ecosystems



Tamsyn Uren Webster

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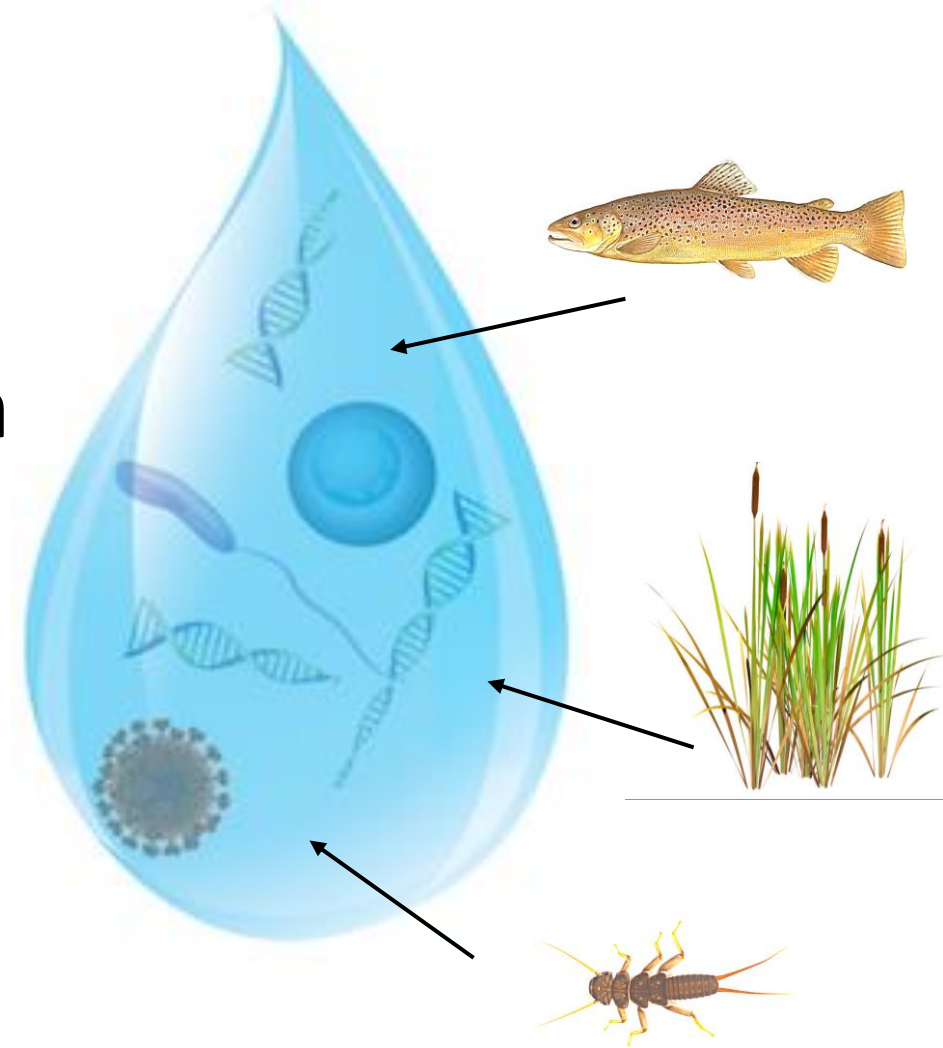
What is eNA?

*DNA and RNA obtained from environmental samples
(e.g. water, soil, sediment, air)*

Rare, small & cryptic species detection

Non-destructive & highly applicable

Whole community approach



Huge potential for pollution biomonitoring




Marine Pollution Bulletin
Volume 191, June 2023, 114896




eDNA metabarcoding reveals shifts in sediment eukaryote communities in a metal contaminated estuary










[Alessandra L. Suzzi](#)^a  , [Megan J. Huggett](#)^a, [Troy F. Gaston](#)^a, [Geoff R. MacFarlane](#)^a, [Md Rushna Alam](#)^{a b}, [Jodie Gibb](#)^a, [Michael Stat](#)^a



Chemosphere
Volume 298, July 2022, 134239




Environmental RNA outperforms eDNA metabarcoding in assessing impact of marine pollution: A chromium-spiked mesocosm test

[Mattia Greco](#)^a  , [Franck Lejzerowicz](#)^b , [Emanuela Reo](#)^c , [Antonio Caruso](#)^d , [Antonella Maccotta](#)^h , [Rodolfo Coccioni](#)^e , [Jan Pawlowski](#)^{a c f} , [Fabrizio Frontalini](#)^g 











Environment International
Volume 172, February 2023, 107738



Full length article

Encapsulated in sediments: eDNA deciphers the ecosystem history of one of the most polluted European marine sites

[Ines Barrenechea Angeles](#)^{a b}  , [Maria Lorena Romero-Martínez](#)^c , [Marco Cavaliere](#)^d , [Stefano Varrella](#)^e , [Fabio Francescangeli](#)^f , [Roberta Piredda](#)^g , [Maria Grazia Mazzocchi](#)^c , [Marina Montresor](#)^c , [Antonio Schirone](#)^h , [Ivana Delbono](#)^h , [Francesca Margiotta](#)^c , [Cinzia Corinaldesi](#)^e , [Salvatore Chiavarini](#)ⁱ , [Maria Rita Montereali](#)ⁱ , [Juri Rimauro](#)^j , [Luisa Parrella](#)^j , [Luigi Musco](#)^{c k} , [Antonio Dell'Anno](#)^l , [Michael Tangherlini](#)^c , [Jan Pawlowski](#)^{b m n} , [Fabrizio Frontalini](#)^d 

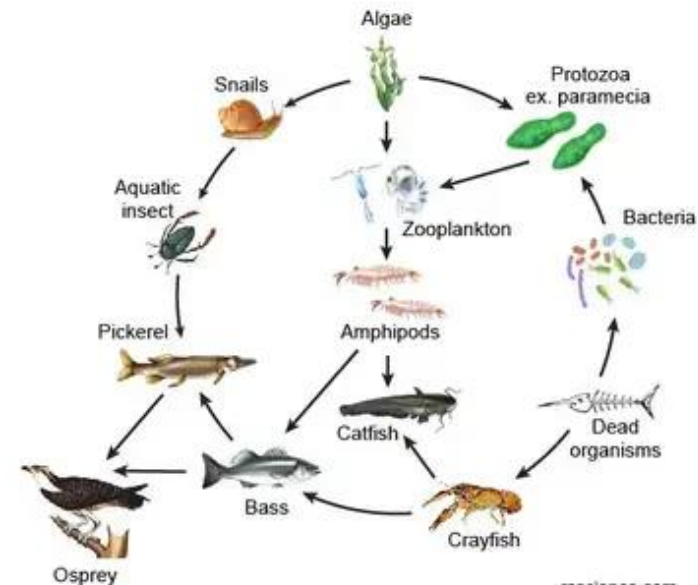
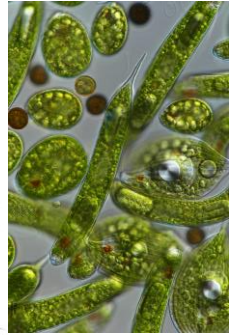
Biological impacts of heavy metals

Abandoned mines remain a key source of pollution

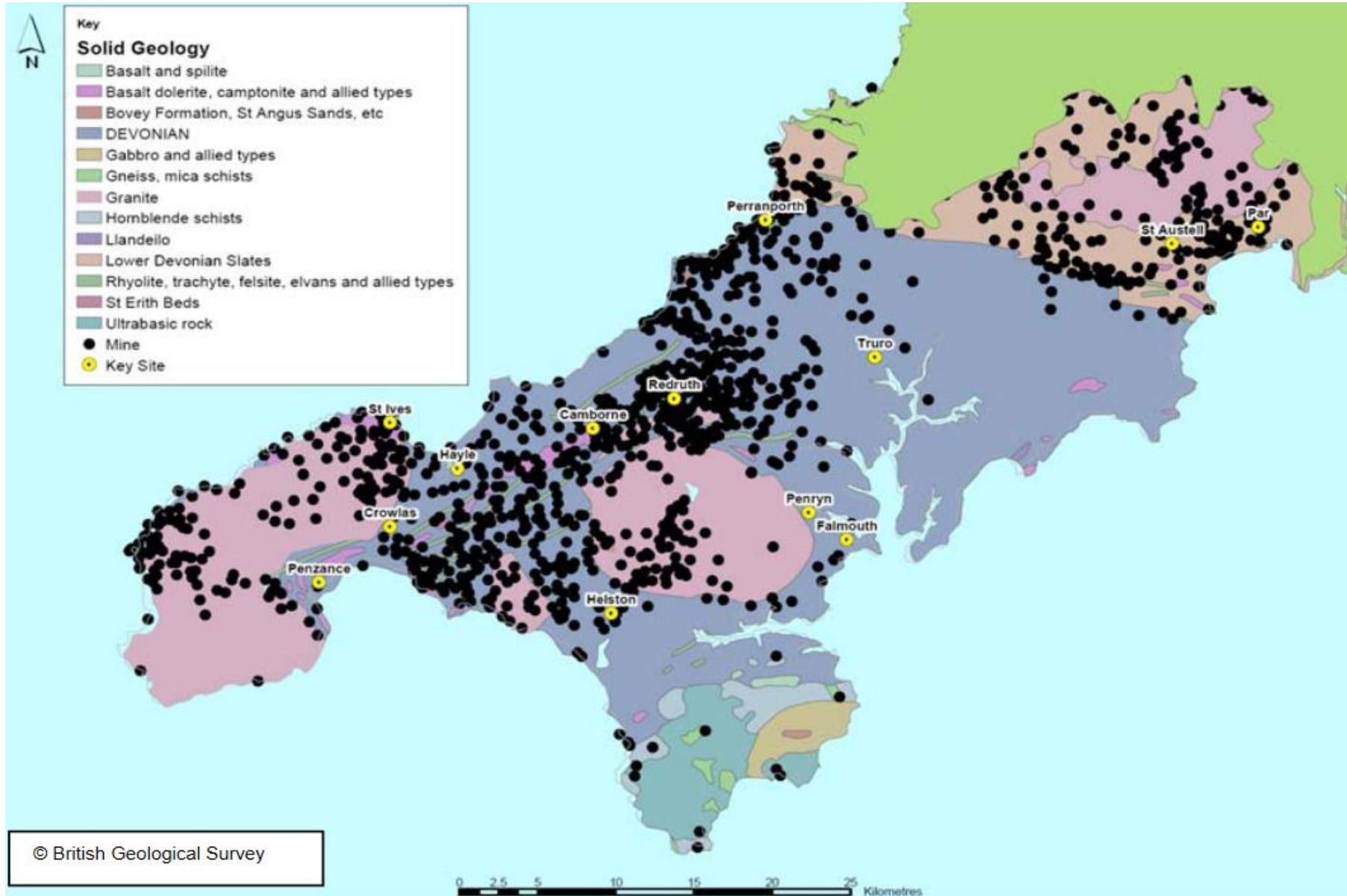
Well characterised mechanisms of toxicity in *some* species

Ecological dead zones > sublethal impacts

Impacts on entire, multi-trophic food webs are not well known

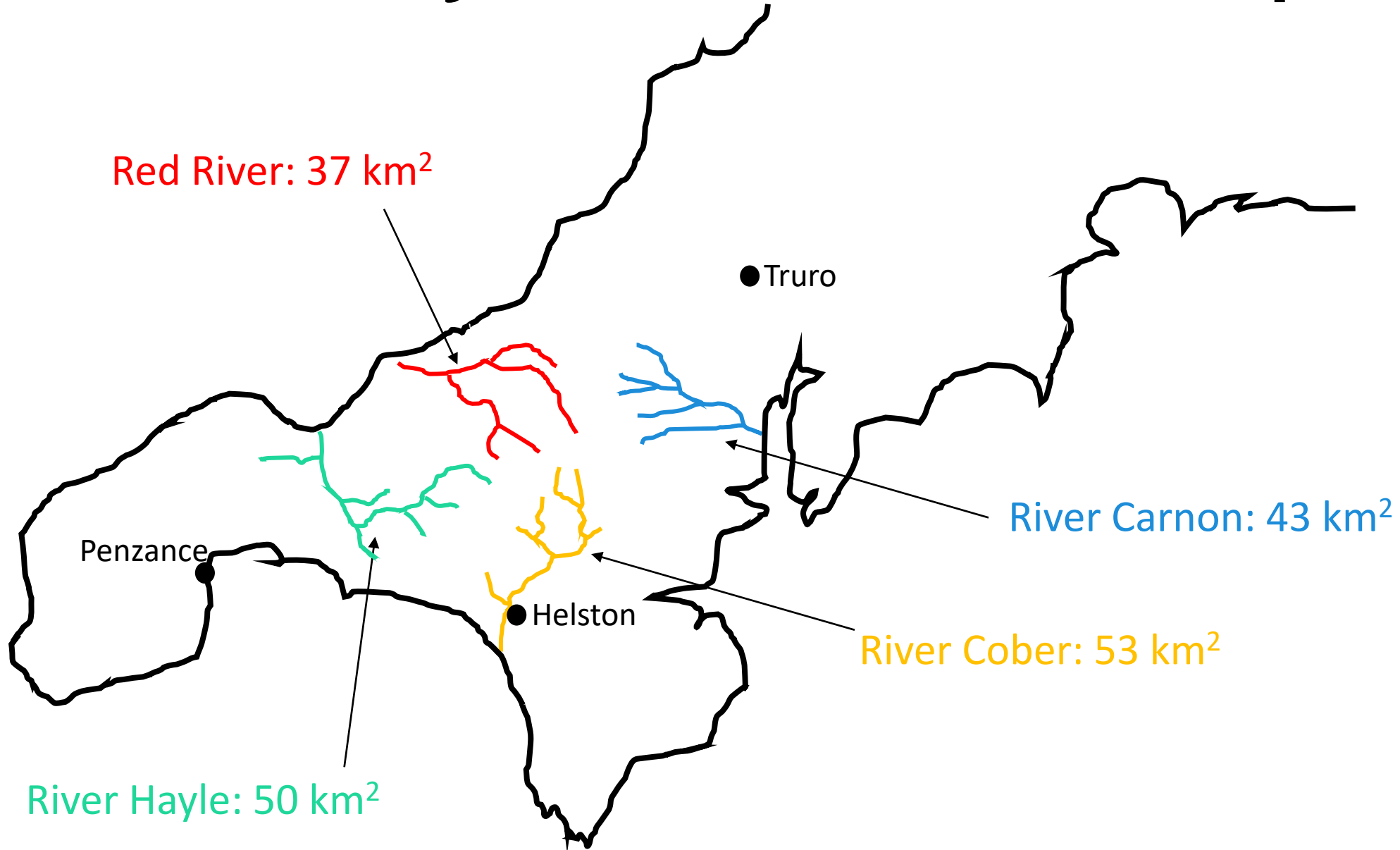


Community-level effects of metal pollution

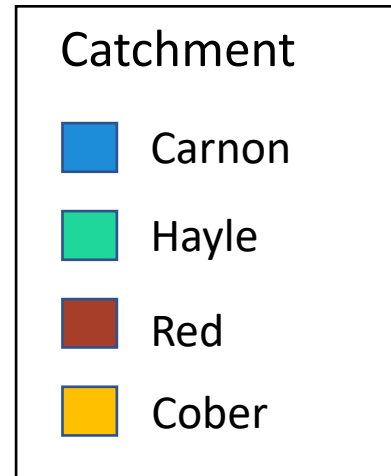
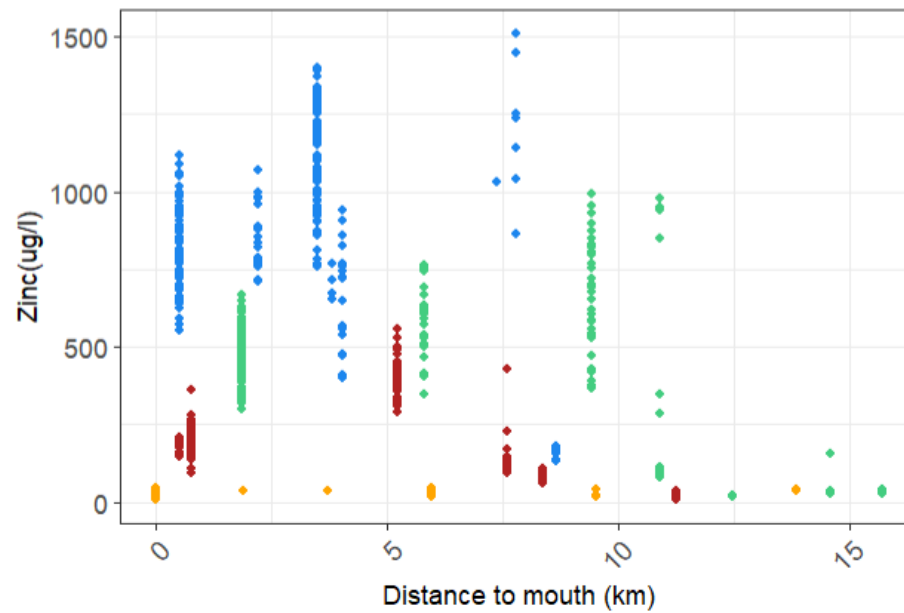
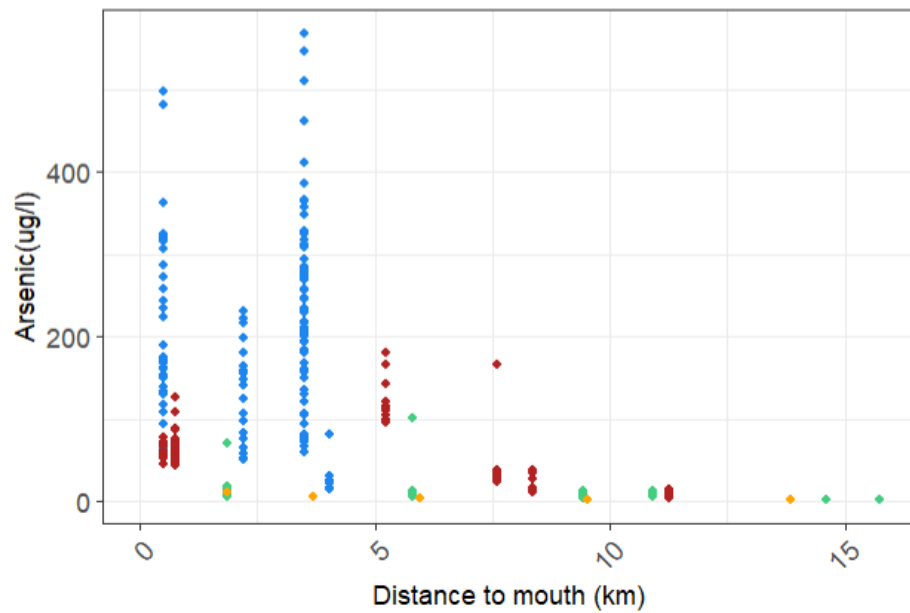
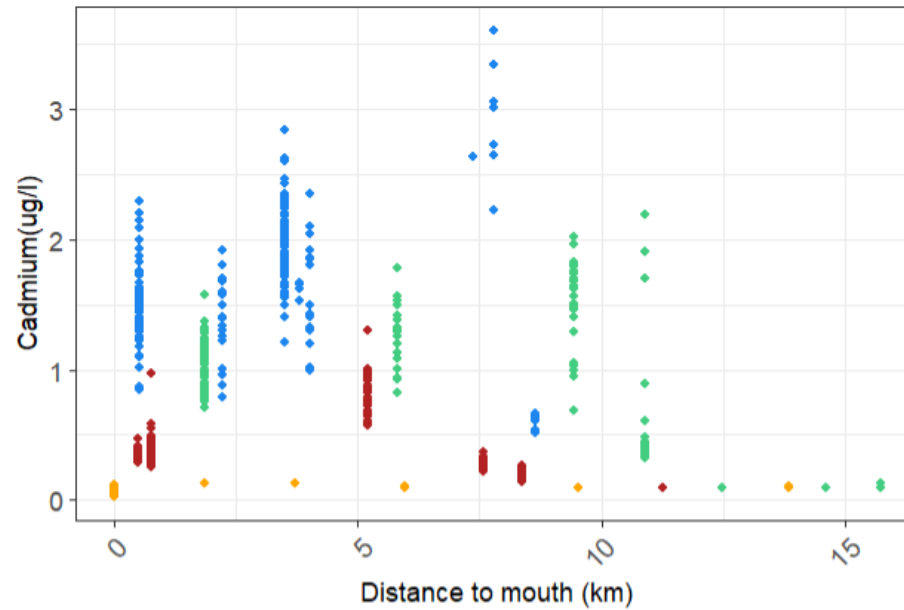
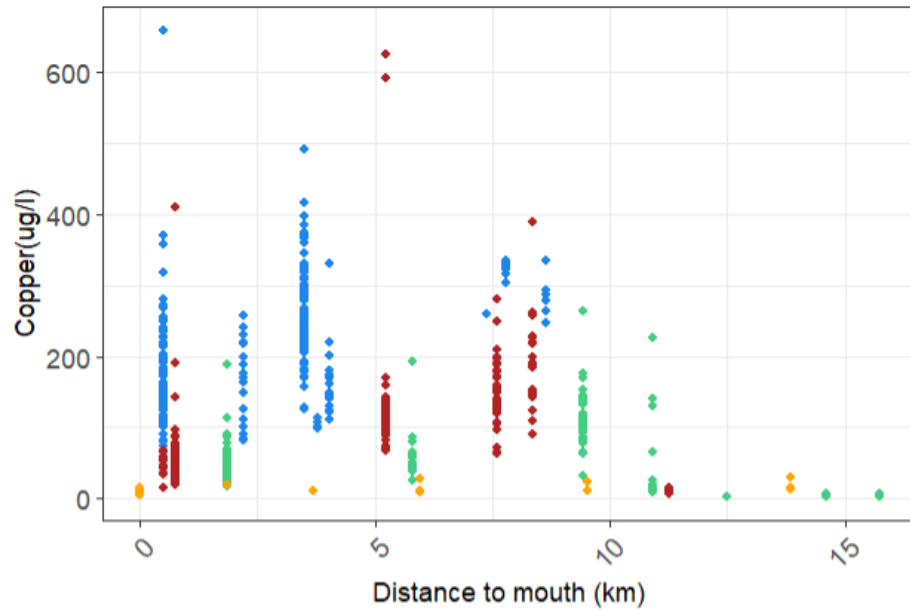


*Case study:
West Cornwall*

Community-level effects of metal pollution



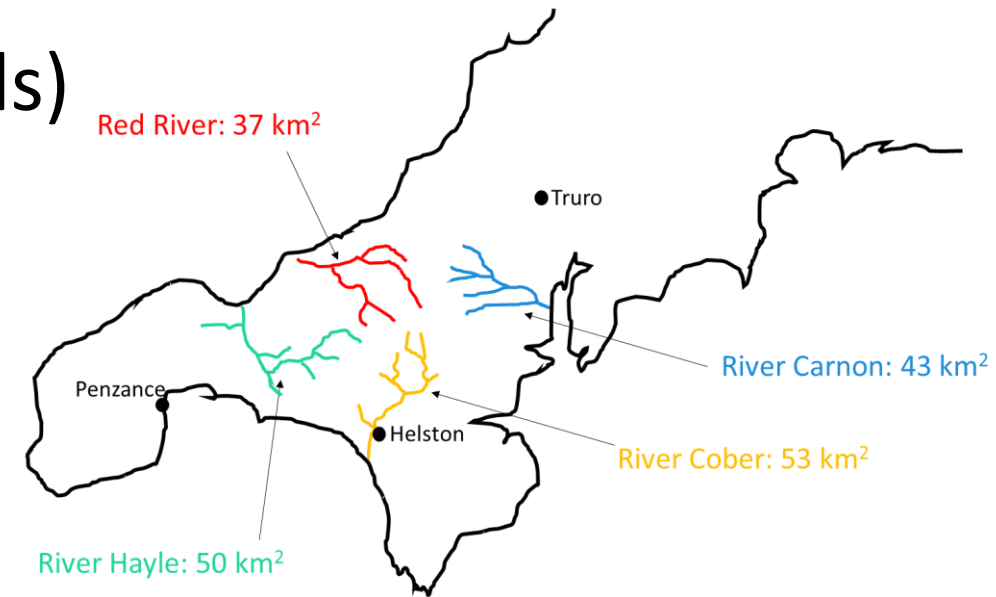
Community-level effects of metal pollution



Environment Agency
monitoring data
2011-2022

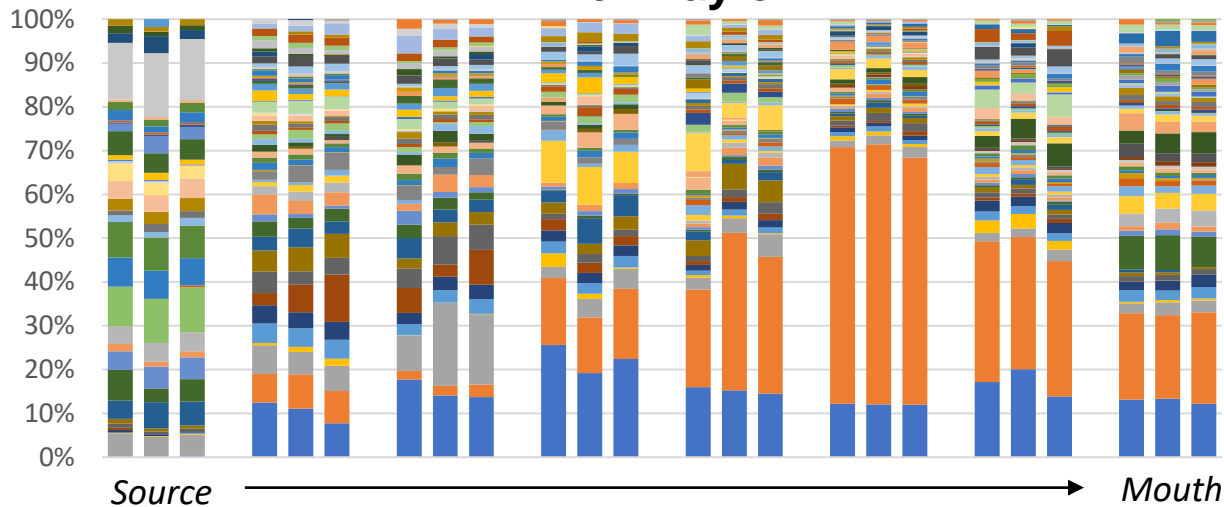
Community-level effects of metal pollution

- 12 sites per catchment (20 m alt. intervals)
- Repeated, seasonal timepoints
- pH/temp, flow, water metal analysis
- Triplicate water samples (500 ml) filtered (0.2 μm) > DNA extraction
- High-throughput DNA sequencing (bacteria, fungi, plants & metazoa)

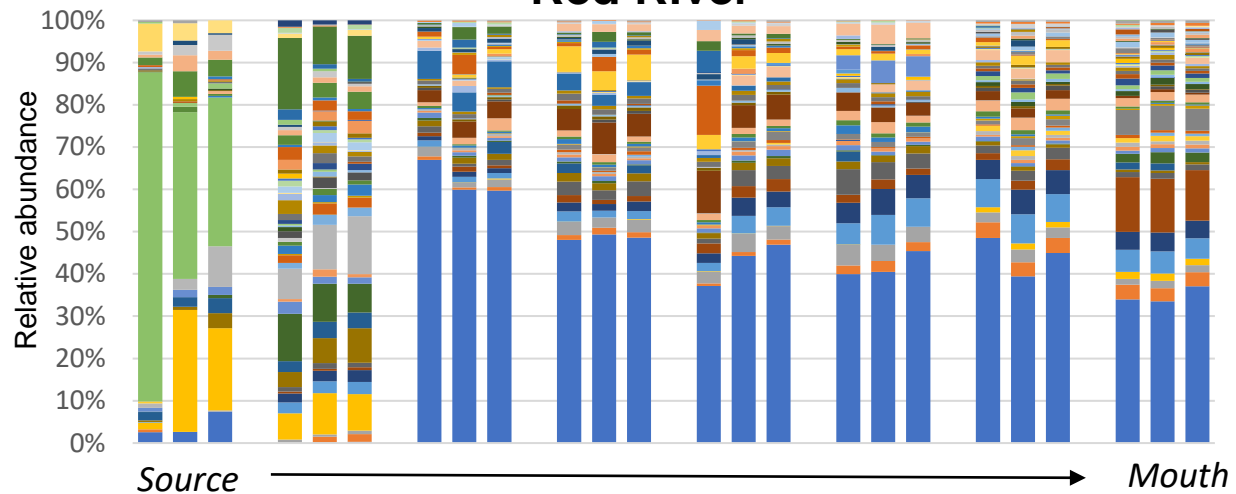


Community-level effects of metal pollution

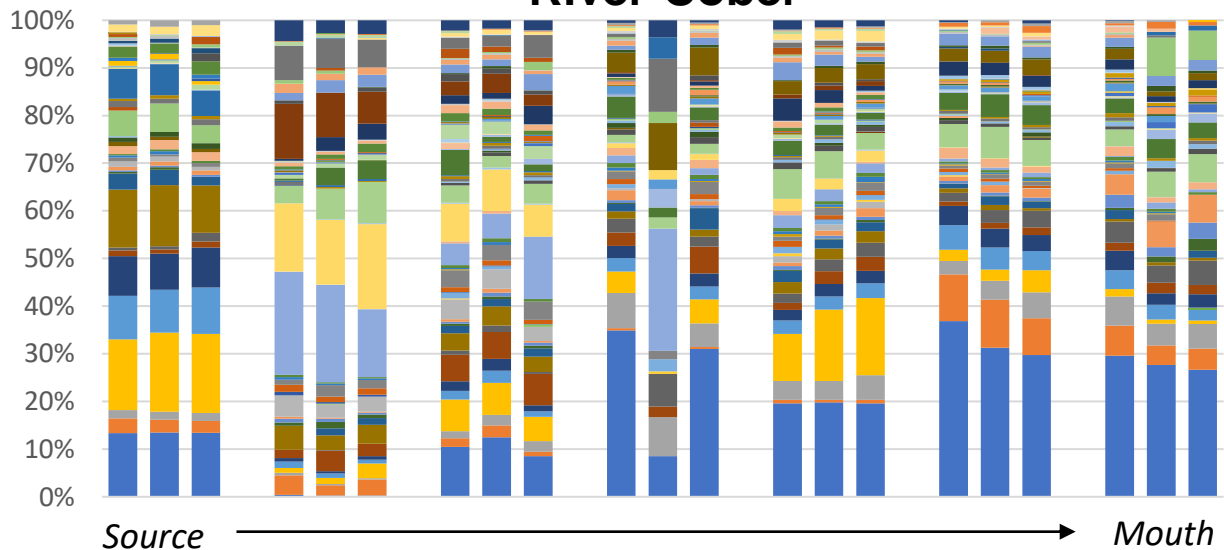
River Hayle



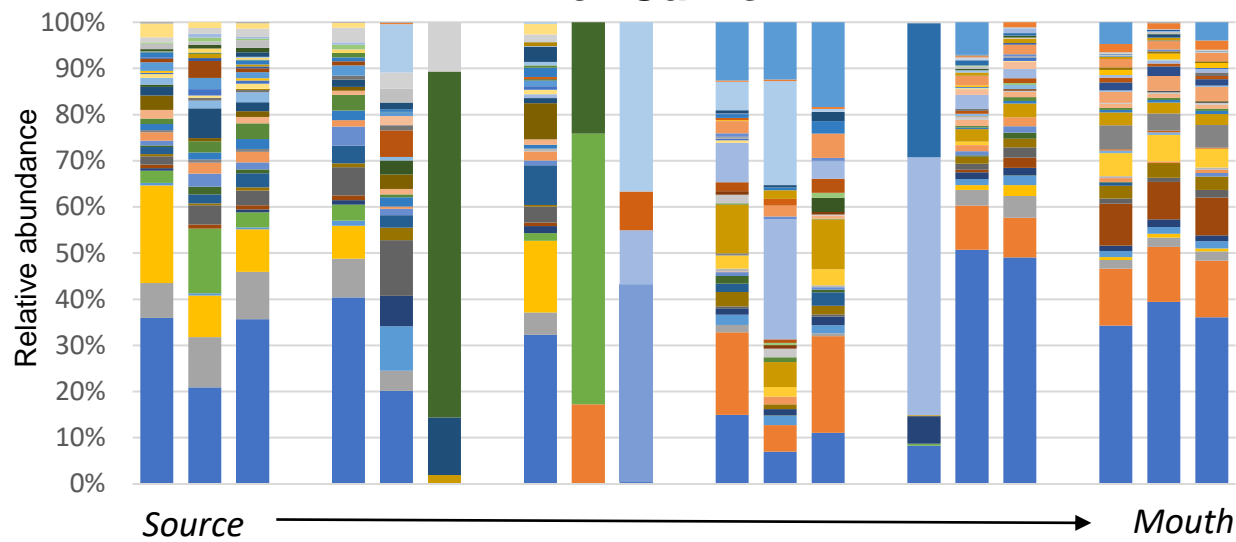
Red River



River Cober



River Carnon

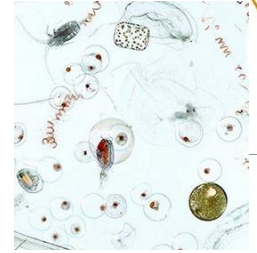


Community-level effects of metal pollution

Continued seasonal samplings

Impacts on biodiversity and food web ecology?

Which species are more sensitive and more tolerant?



Matched study in South Wales

Wider application in biomonitoring

Please get
in touch

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Huan Yi Yap, Myriam Tsuda, Katherine Uren

The Environment Agency

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