

Lake Maggiore: analysis of contamination



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Aims

- Analysis of **contamination in Lake Maggiore**: historical and emerging contaminants
- Identification of the **main sources**: contamination hotspots and inputs from tributaries
- Potential **risks** for the ecosystems
- Analysis of: **trace elements (total Hg, methylmercury, As, Ni, Cd, Cu, Pb), DDT, PCBs, PAHs, flame retardants (PBDEs, DBDPE, HBCD), synthetic fragrances (Galaxolide, Galaxolidone, Tonalide, Celestolide, Phantolide), PFASs**
- Environmental compartments analyzed: **sediments and biota**
- **Spatial and temporal trends** (data series)

Diffuse contamination

Local anthropogenic activities

Toxicants in the water column and in sediments

phytoplankton

zooplankton

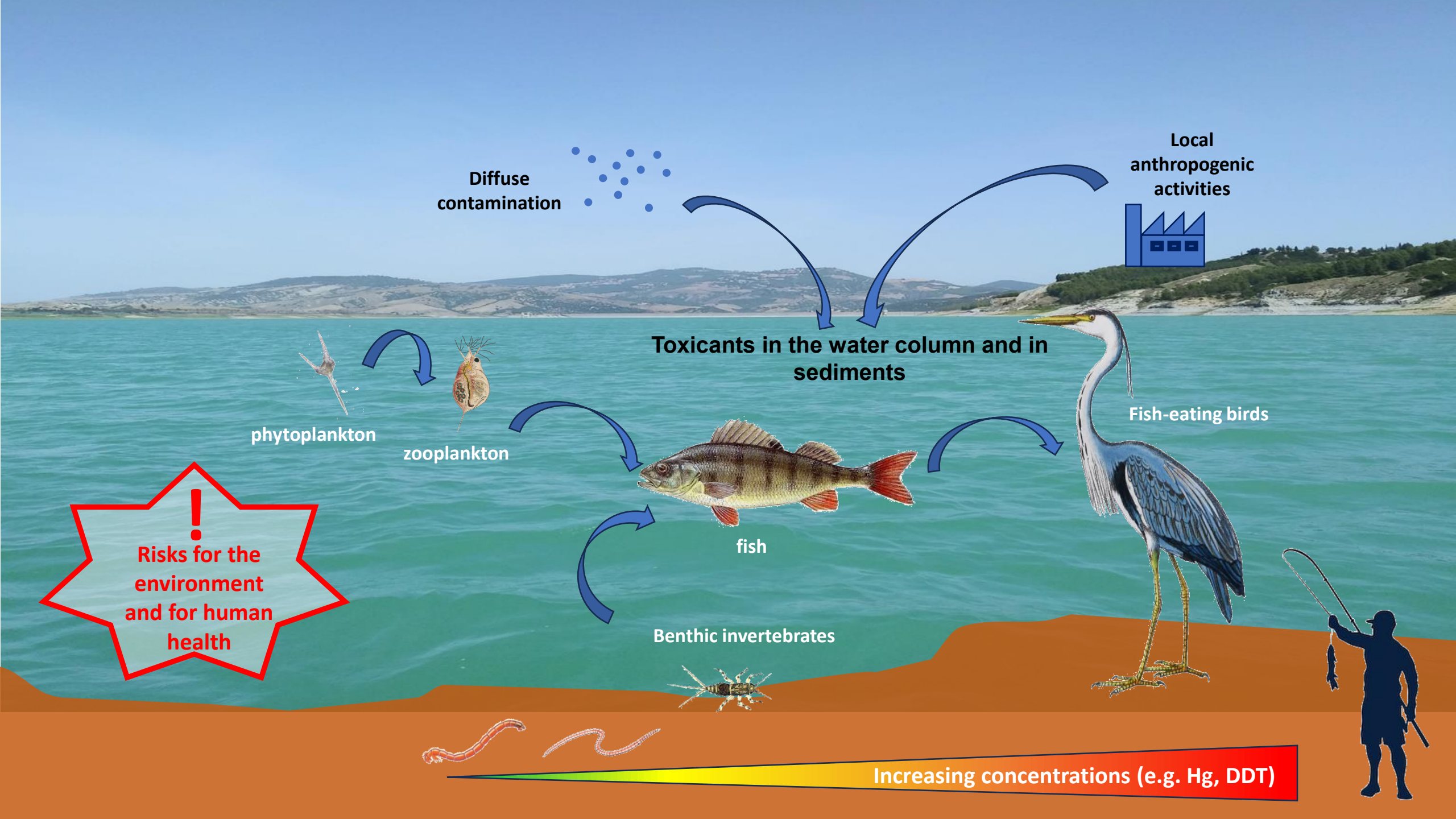
fish

Fish-eating birds

Benthic invertebrates

! Risks for the environment and for human health

Increasing concentrations (e.g. Hg, DDT)

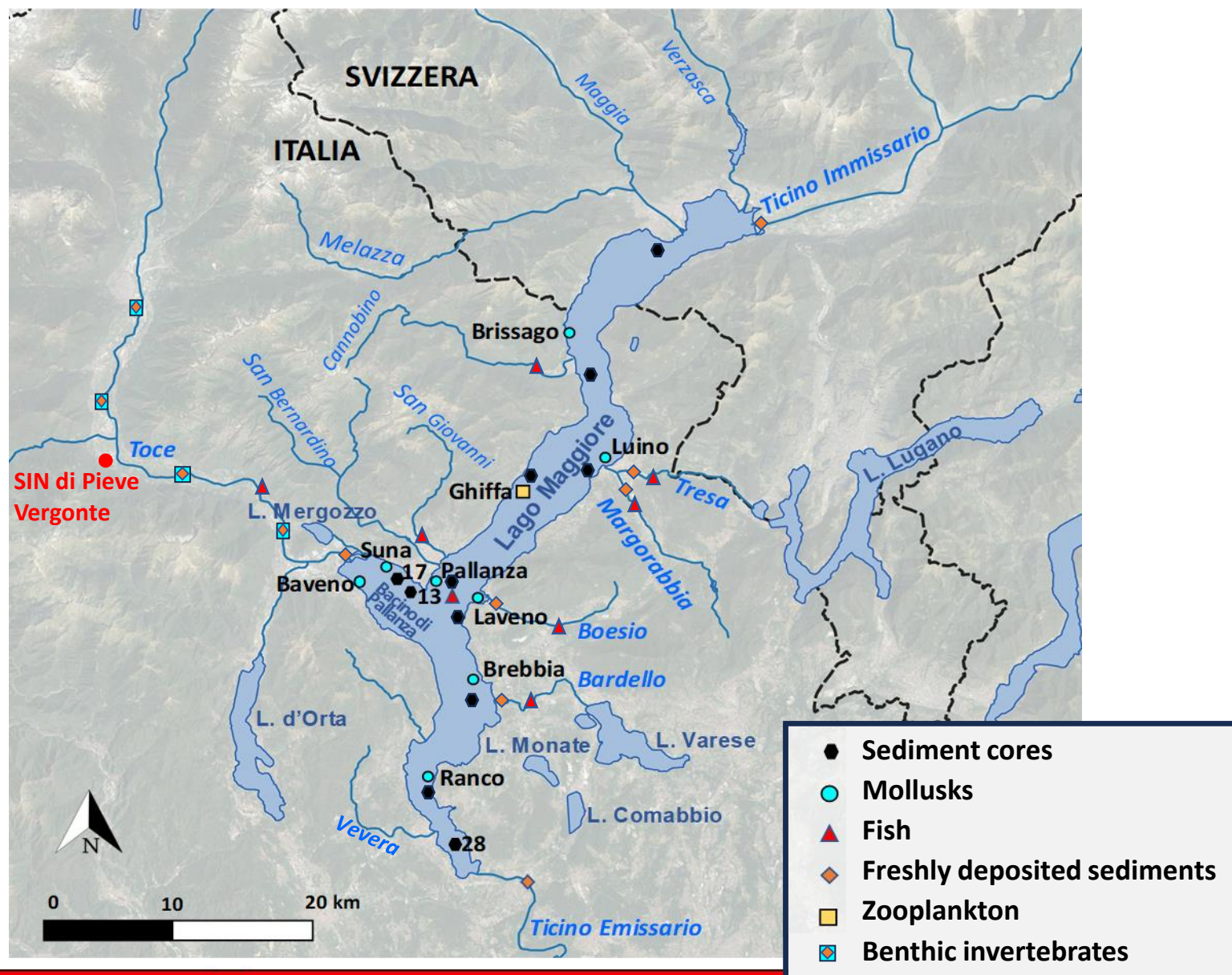


Sampling sites in the lake

- North-south axis of the lake
- Pallanza Basin
- Ticino emissary

Sampling sites in the main tributaries

- Ticino immissary
- Tresa
- Margorabbia
- Boesio
- Bardello
- Toce

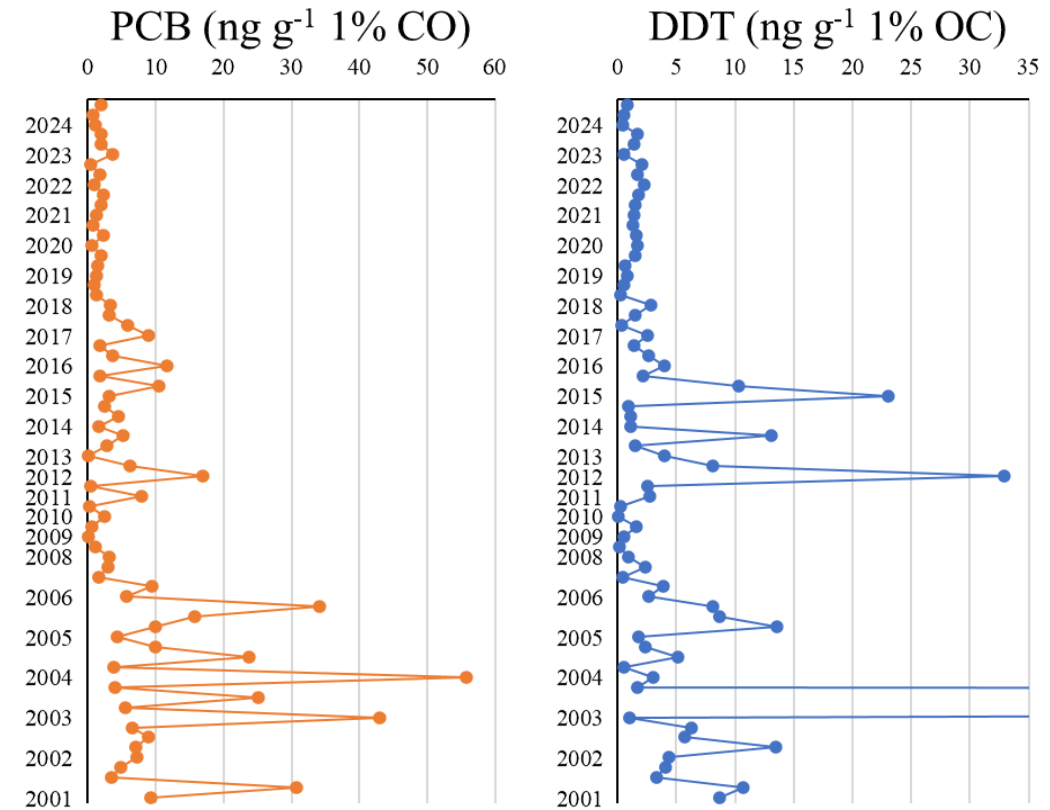
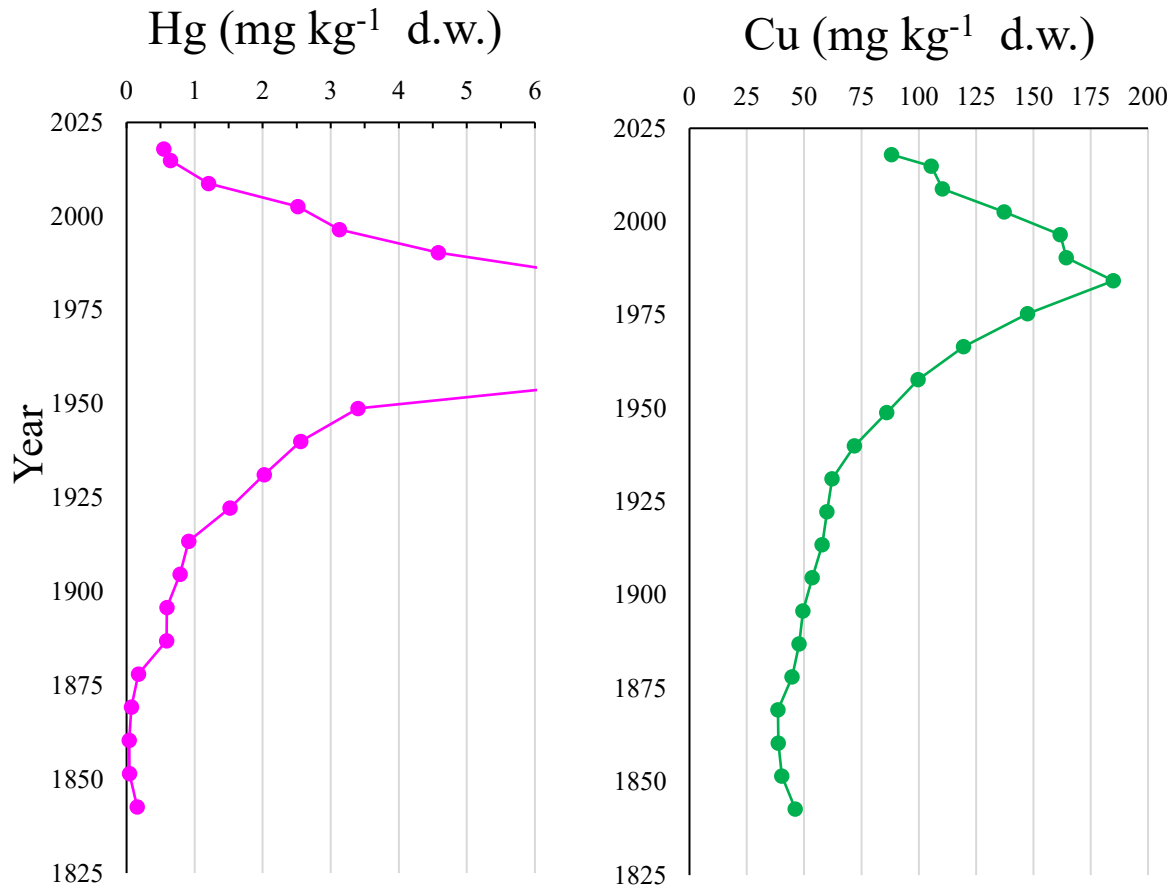




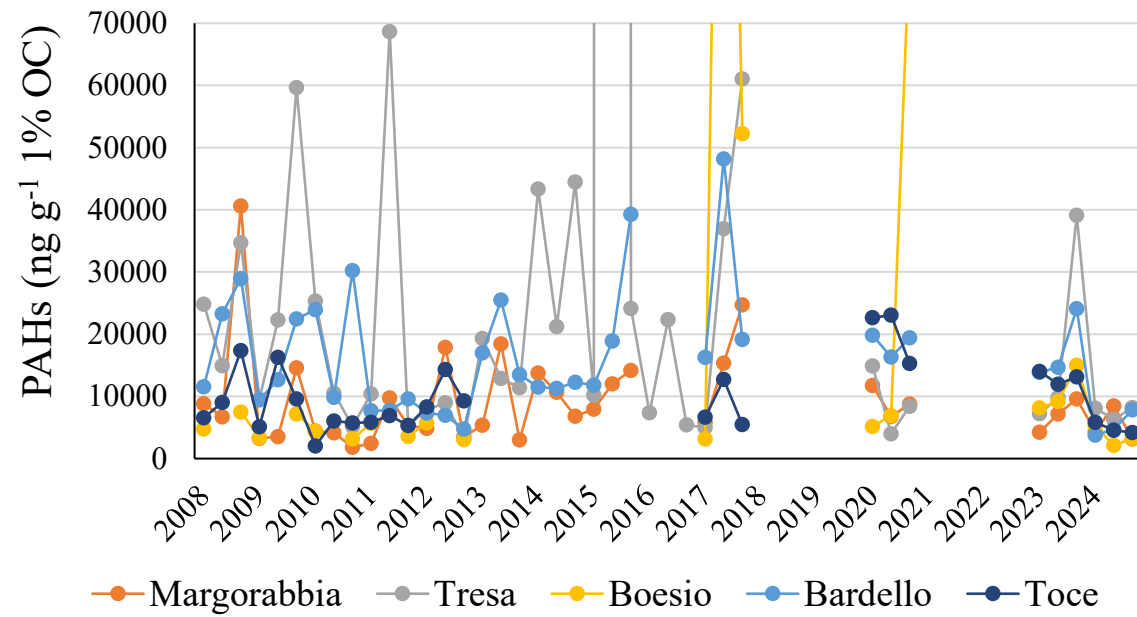
Historical contamination is decreasing over time in sediments

Lake sediment cores (Arona)

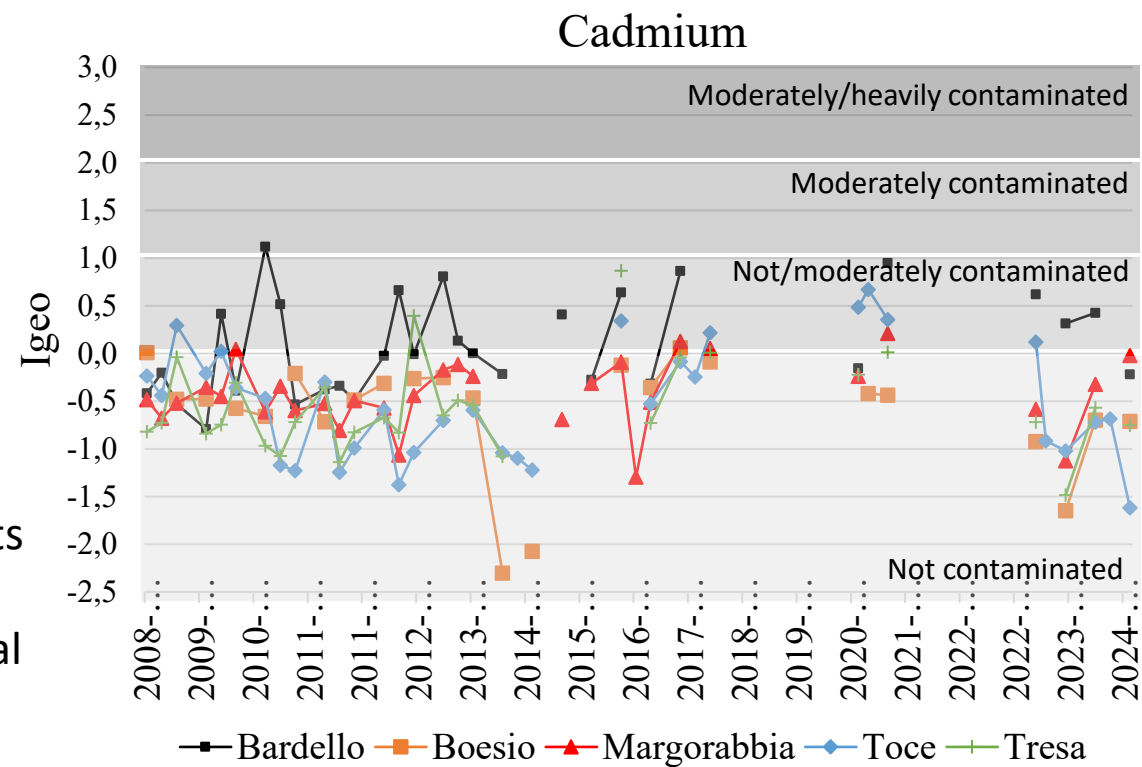
Sediments in Ticino emissary



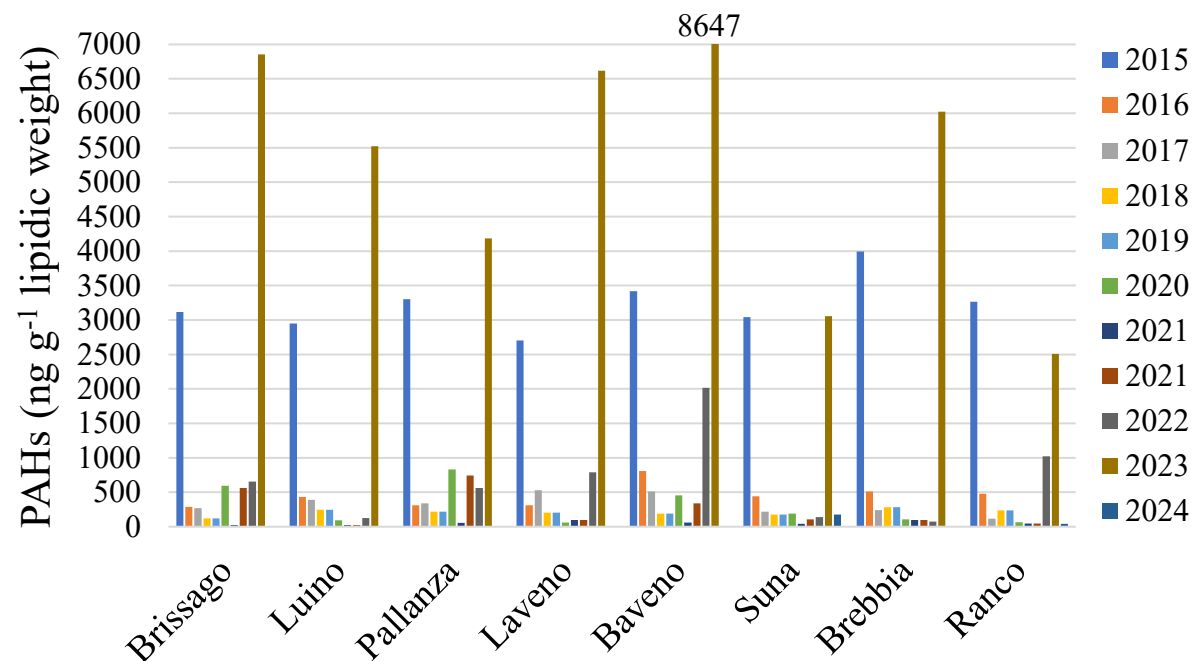
Sources of contaminants: sediments of tributaries



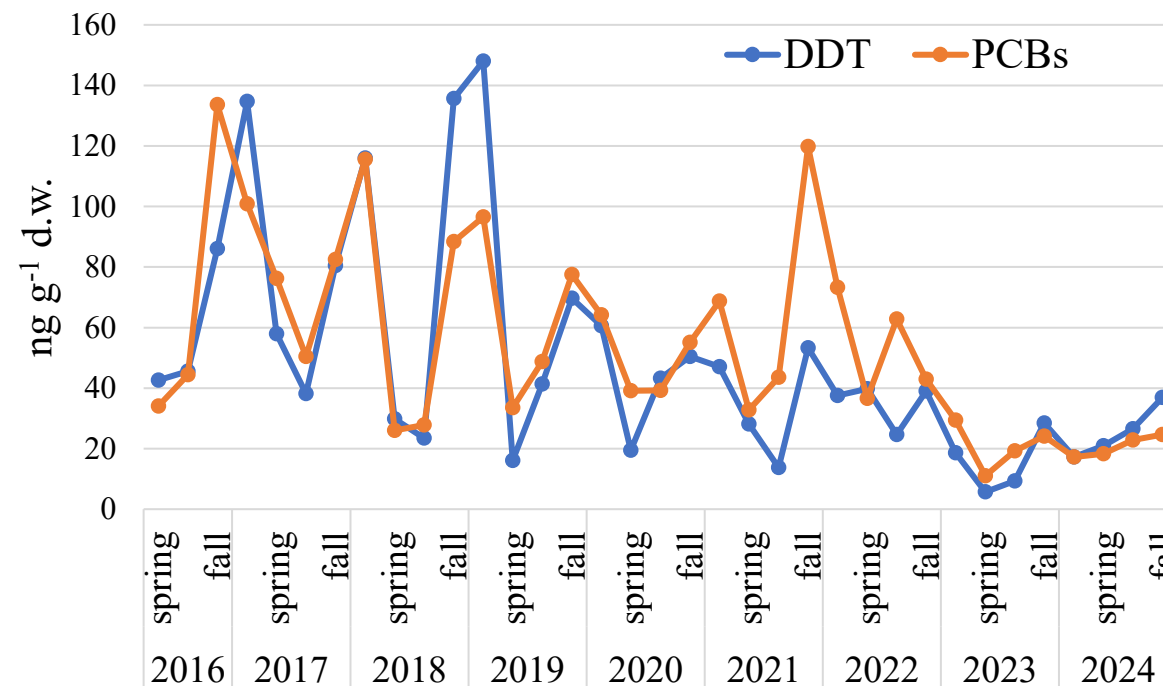
- Toce, Boesio and Bardello are the main sources of contaminants
- Concentration peaks are generally linked to intense hydrological events



Contamination persists in biota



Zooplankton



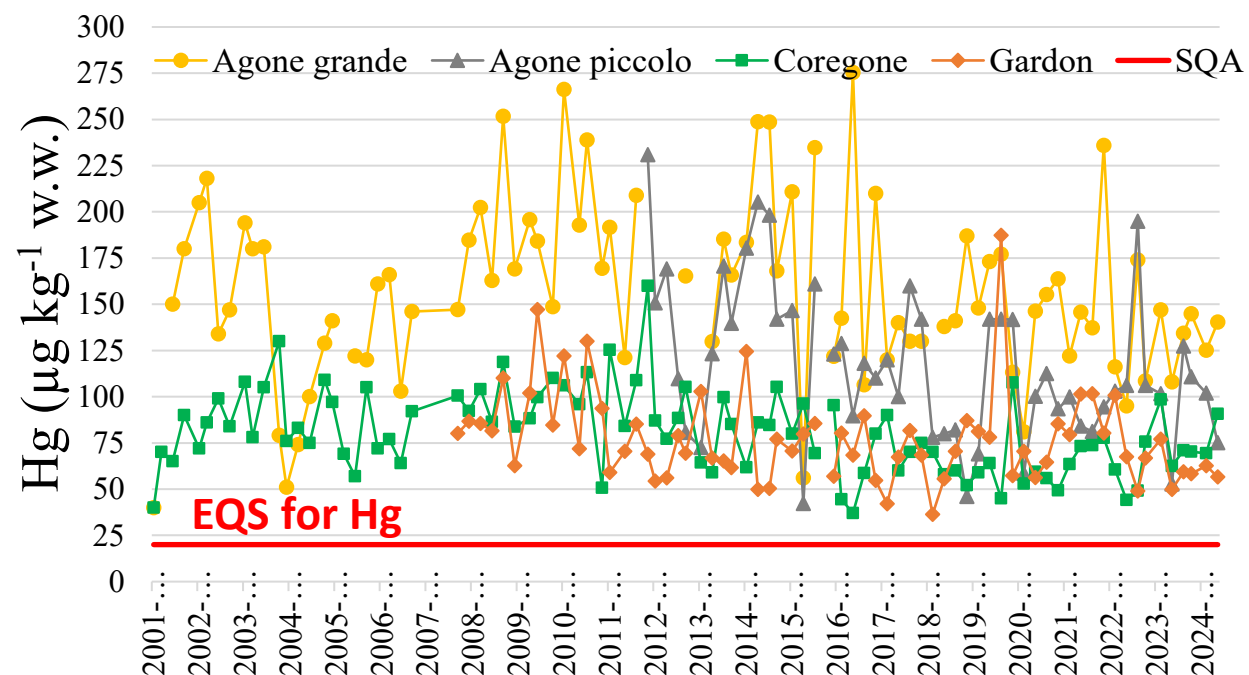
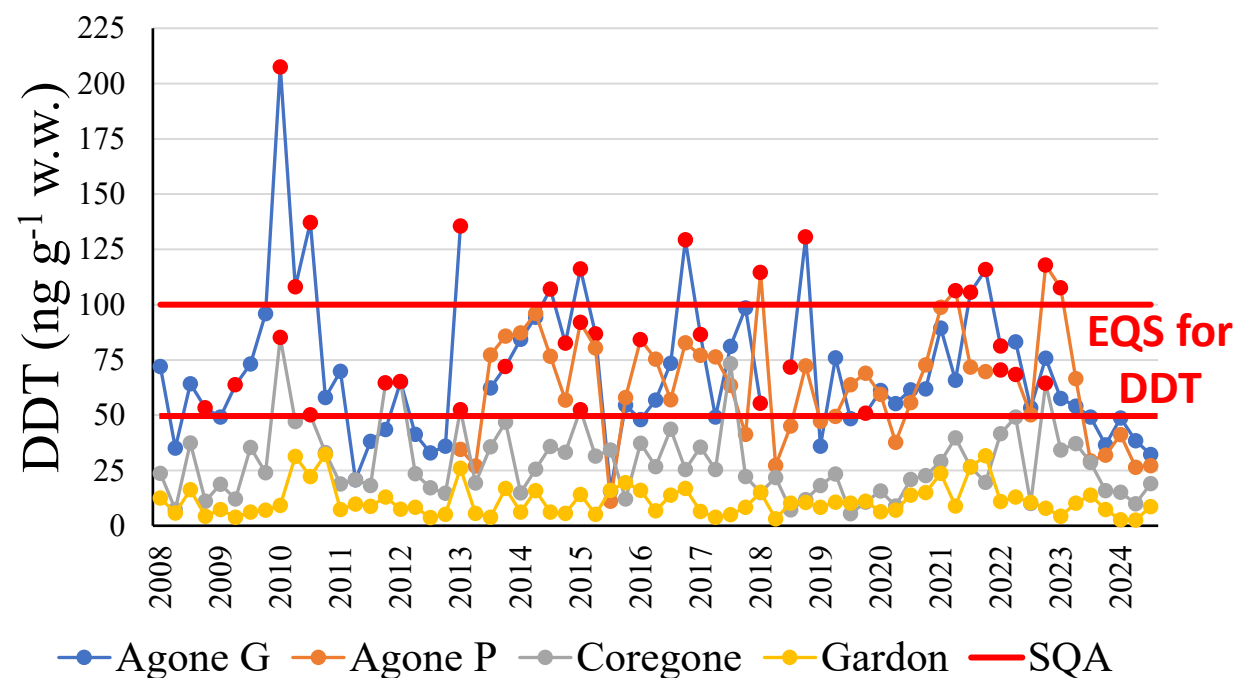
Lacustrine mollusks



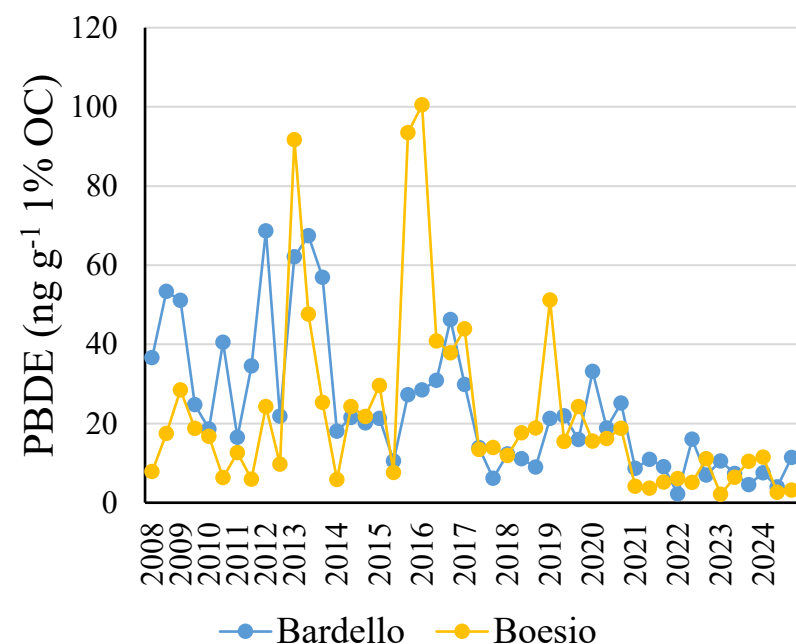
...and in some cases concentrations exceed the Environmental Quality Standards (EQS) for biota



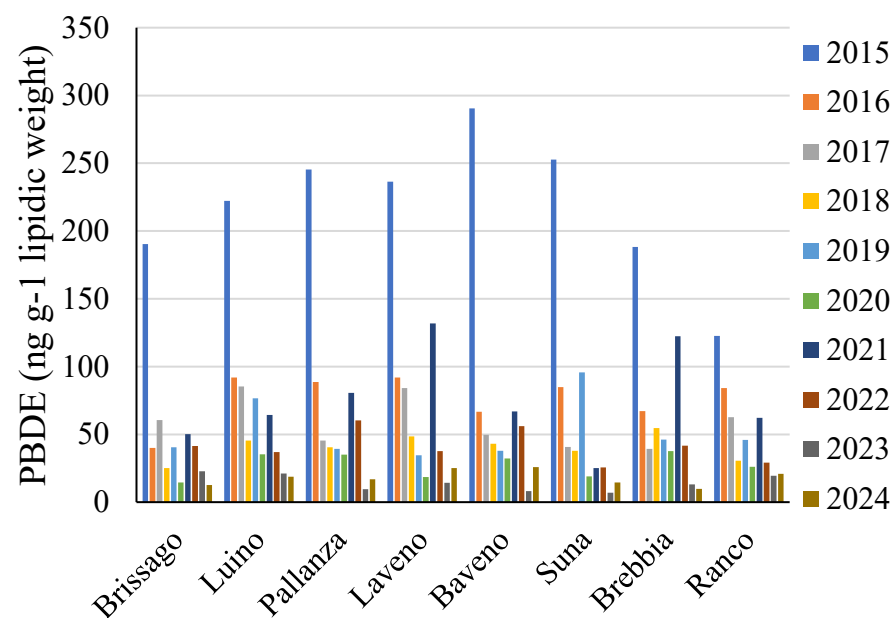
Concentrations in lacustrine fish



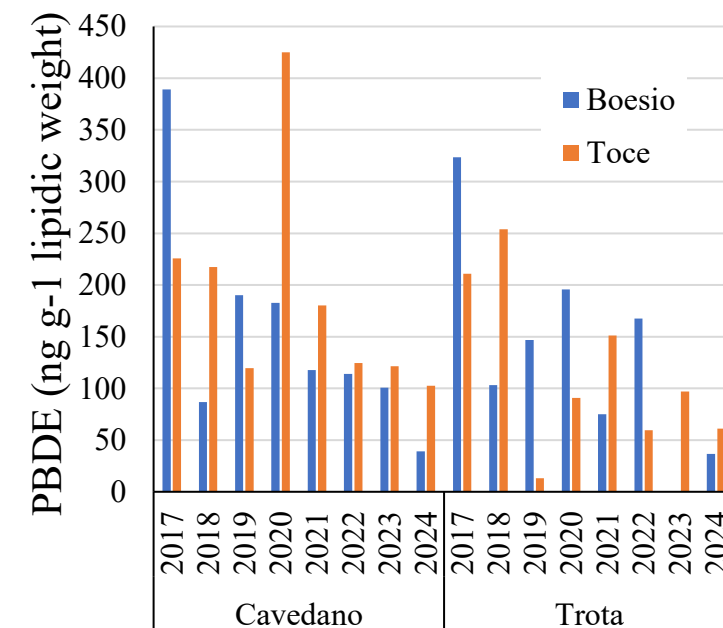
Flame retardants PBDEs: decontamination trend



In sediments.....



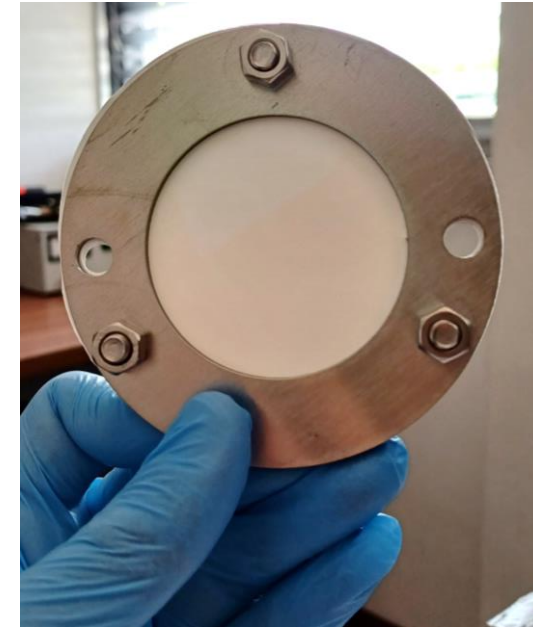
....in filter-feeding mollusks



.....in fish

Ongoing analysis: emerging contaminants

- Suspect, untargeted and targeted analysis of contaminants in lake sediments with high-resolution instruments (LC-HRMS/MS, GC-MS/MS, ICP-MS), comprising harmful substances of priority lists deriving from D.M. 172/2015 and European Watch Lists
- Analysis of bioaccumulation of a wide set of contaminants in fish of the tributaries to identify potential sources
- As regards PFASs, analysis in fish on the tributaries to identify sources, also with the use of passive samplers
- Analysis of synthetic fragrances (Personal Care Products) as potential toxicants and as tracers of inputs from wastewater treatment plants
- Analysis of biomarkers in lacustrine mollusks as effect-based tools and early warnings for potential adverse effects in the ecosystem



Working group

- **Water Research Institute (CNR-IRSA):**
 - **Unit of Brugherio (VB):** *Licia Guzzella, Laura Marziali, Michelangelo Morganti, Stefano Tasselli, Lucia Valsecchi*
 - **Unit of Verbania, Pallanza:** *Laura Fantozzi, Nicoletta Guerrieri, Andrea Lami, Aldo Marchetto, Simona Musazzi, Roberta Piscia, Pietro Volta*
 - **Unit of Bari:** *Giuseppe Mascolo*
- **University of Milan:** *Andrea Binelli, Camilla della Torre*
- **University of Insubria:** *Roberta Bettinetti*
- **Section 2 CIP AIS:** *Rosa di Piazza, Antonietta Fiorenza, Vincenzo Pellegrino, Nicola Solcà*

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