MSc project proposals

- Ecology of species interactions in the urban landscape (contact: Lorenzo Mari, Renato Casagrandi)
- The future of microplastics in the Mediterranean Sea (contacts: Lorenzo Mari, Renato Casagrandi)
- Ecohydrological modeling of liver fluke transmission (contacts: Lorenzo Mari, Marino Gatto)

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Urban biodiversity

Ecology of species interactions in the urban landscape

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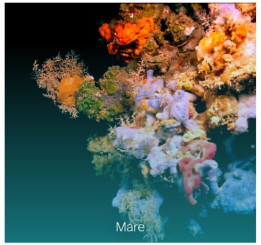

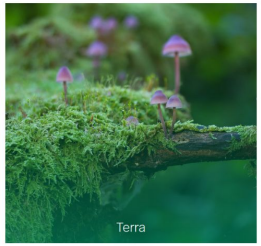

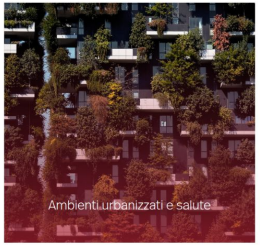

1. To quantify the structure of the **“vertical” interactions** (niche identification for predation, herbivory and pollination) and **“horizontal”** ones (competition for space and/or resources of native urban species with subdominant synanthropic or invasive species) among focal species.

2. To understand **how urbanization shapes** and likely impacts on such species interactions and consequent ecosystem services, considering especially the role played by green areas features (size, fragmentation), of Italian bioregions and within (center vs periphery) and between cities (small vs large, north vs south).

3. To assess if and how the connectivity of suitable patches for the **metacommunities** within the urbanized landscape affects the distribution and the abundance of the species involved in the interactions and their interactions*;

4. To develop **recommendations and indicators** to be used in urban planning and management to enhance those ecosystem services that are mediated by species interactions.

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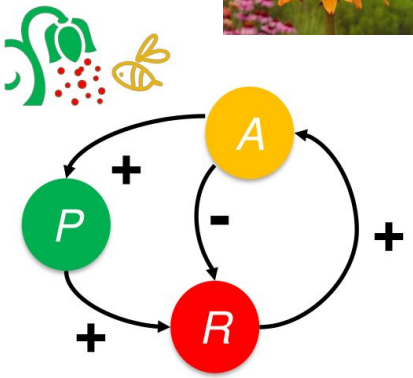
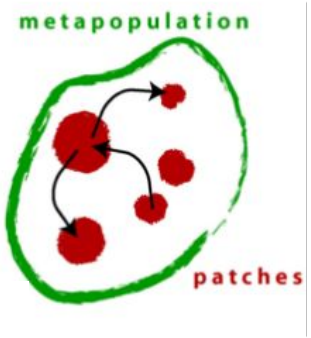


Urban pollination

$$\begin{cases} \dot{A} = A(cvbR - \mu_A) \\ \dot{R} = \beta P - \phi R - vbRA \\ \dot{P} = P[(1 - wP)gevA - \mu_P] \end{cases}$$



Ongoing work:

- **Andrea Coppola (PhD thesis, exp. 2027)**

Urban biodiversity

Ecology of species interactions in the urban landscape

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Oriental hornet
(*Vespa orientalis*)

Interactions of native urban species with invasive species

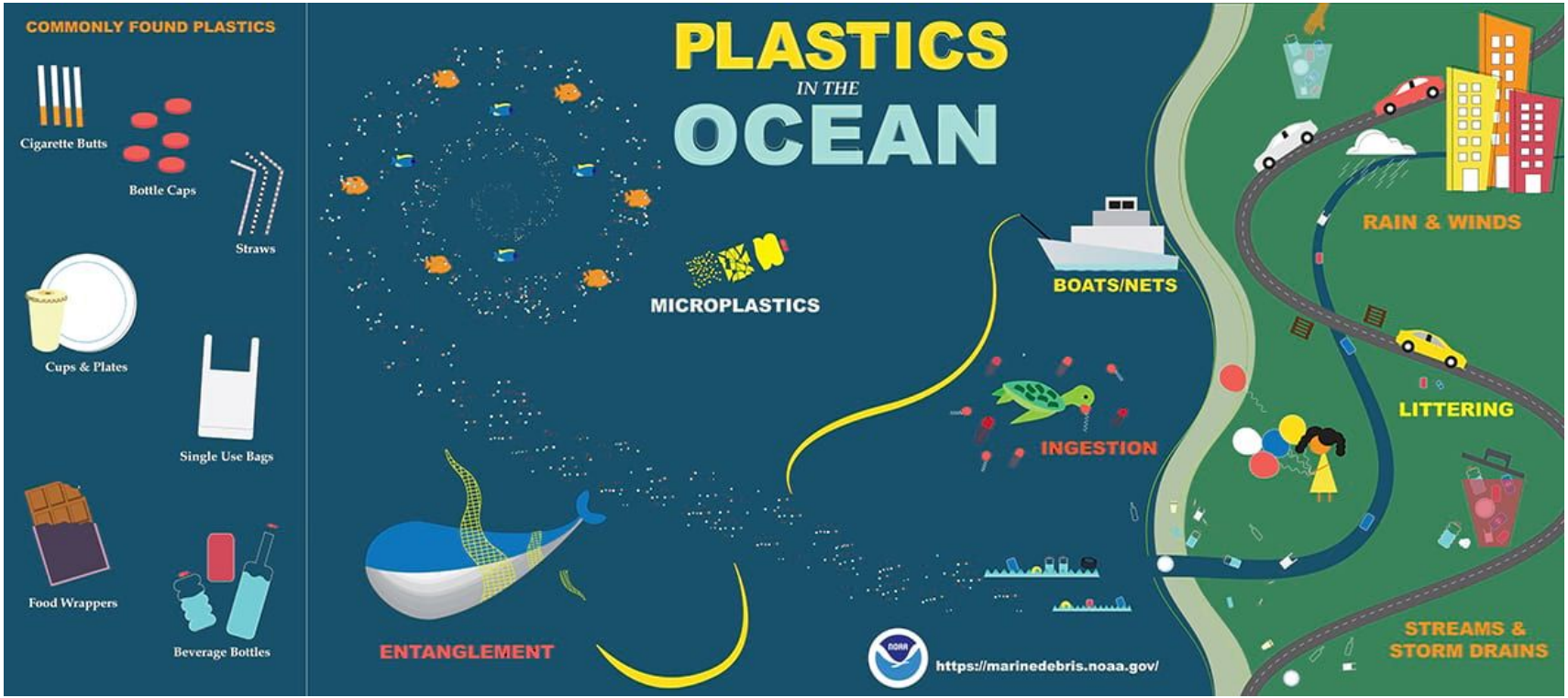
Honey bee
(*Apis mellifera*)

Noctule bat
(*Nyctalus noctula*)

Ring-necked parakeet
(*Psittacula krameri*)

Marine pollution

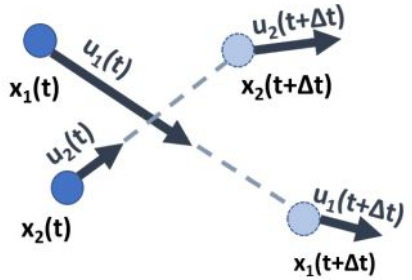
The future of microplastics in the Mediterranean Sea



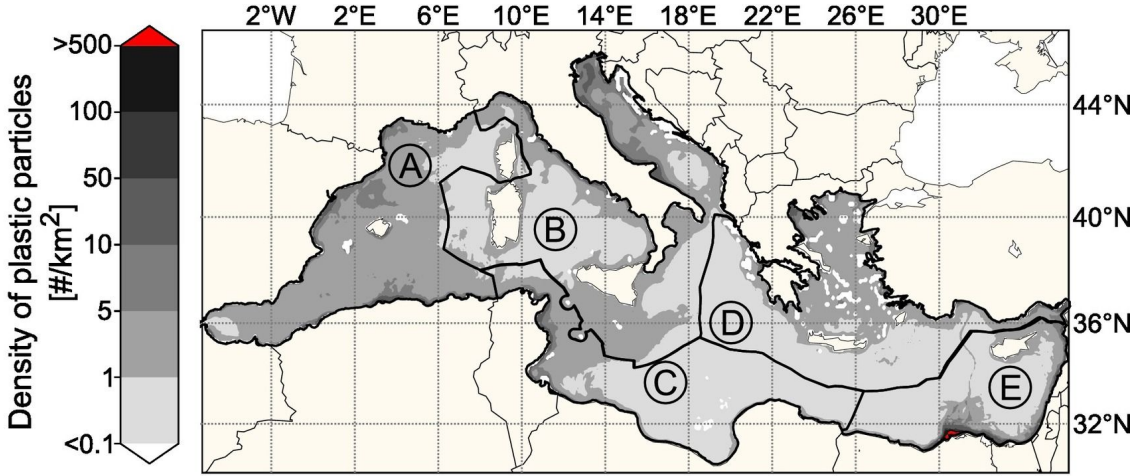
Marine pollution

The future of microplastics in the Mediterranean Sea

From reconstructions of past MP concentrations…

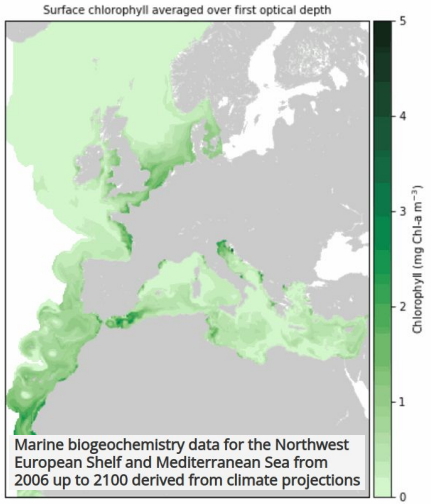


Guerrini, Mari & Casagrandi (2021)
STOTEN 777:145944

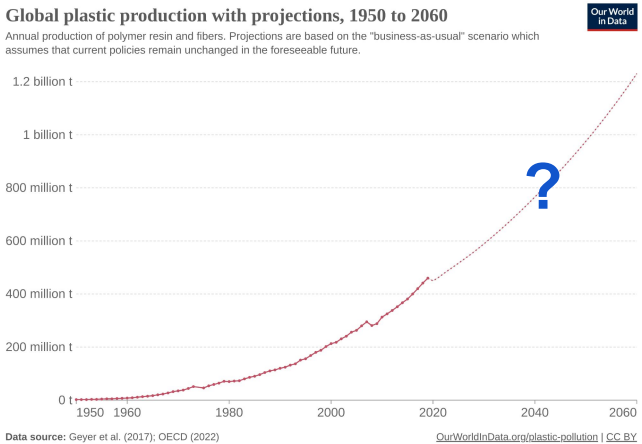


Marine pollution

The future of microplastics in the Mediterranean Sea

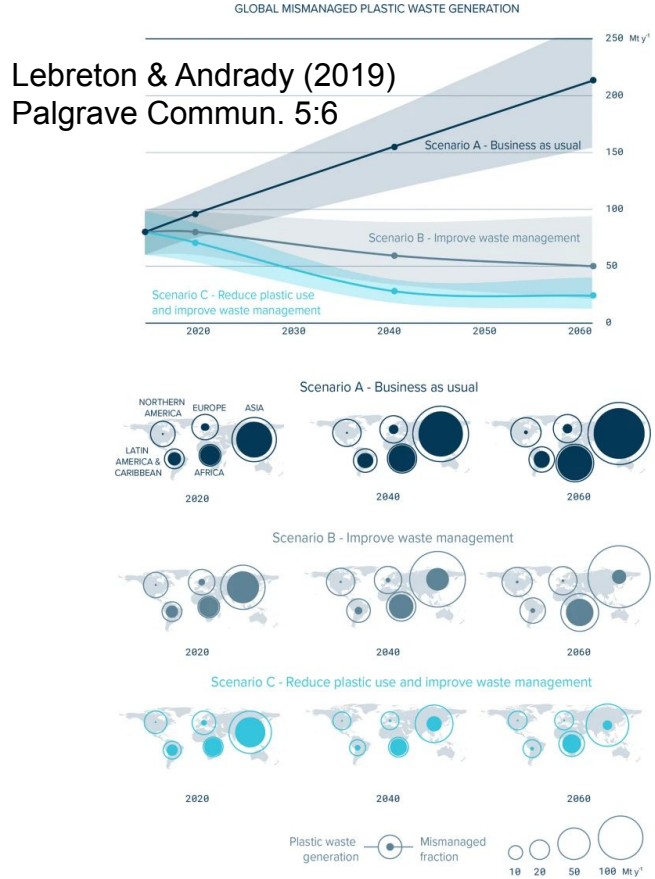


climate.copernicus.eu



… to projections of future MP concentrations in the Mediterranean Sea

Lebreton & Andrady (2019)
Palgrave Commun. 5:6

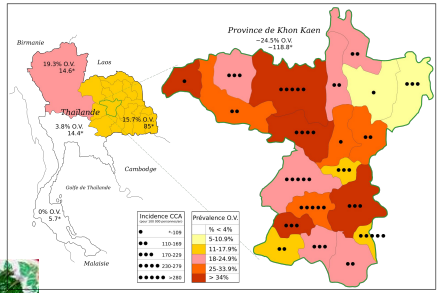


Ongoing work:

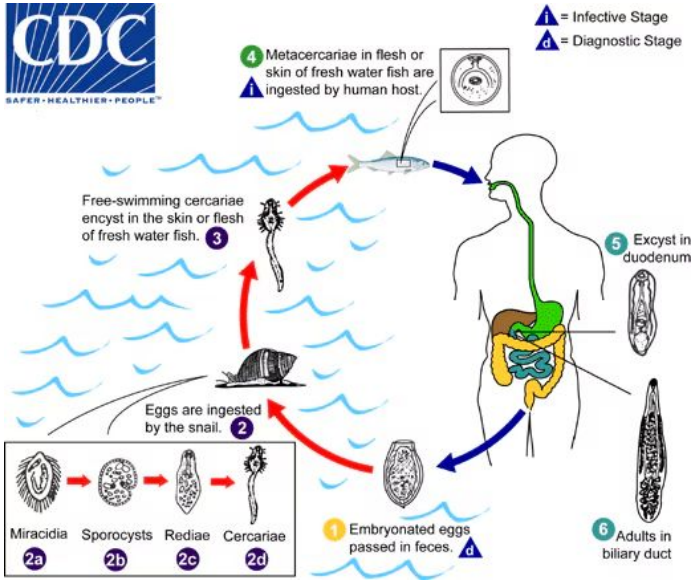
- **Teodora Sacco (MSc thesis, exp. 2025)**

Infectious disease

Ecohydrological modeling of liver fluke transmission



Southeast Asian liver fluke
(*Opisthorchis viverrini*)

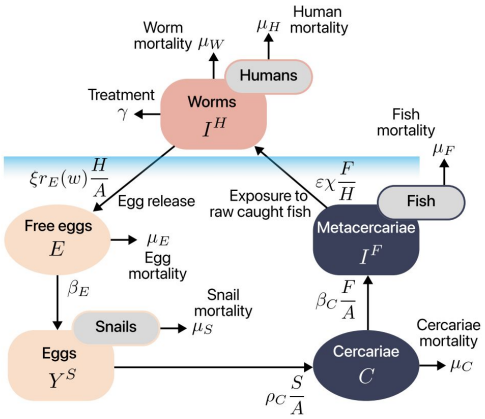


- experimental and epidemiological evidence strongly implicates *O. viverrini* infections in the etiology of cholangiocarcinoma, a malignant cancer of the bile ducts in humans
- *O. viverrini* is categorized by the International Agency for Research on Cancer (IARC) as a Group 1 carcinogen

Infectious disease

Ecohydrological modeling of liver fluke transmission

Trevisin et al. (2025)
Ecohydrology *in press*



$$\frac{dw}{dt} = \varepsilon\chi m - (\mu_W + \mu_H + \gamma)w$$

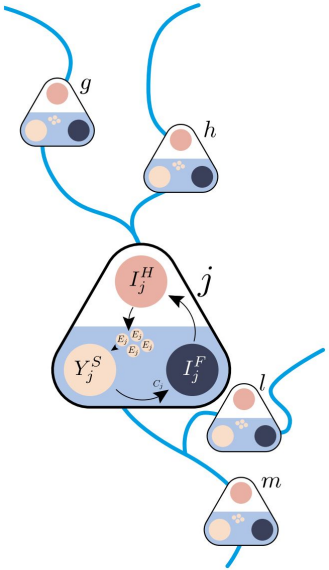
$$\frac{de}{dt} = \xi r_E(w)w - \left(\beta_E\frac{S}{A} + \mu_E\right)e$$

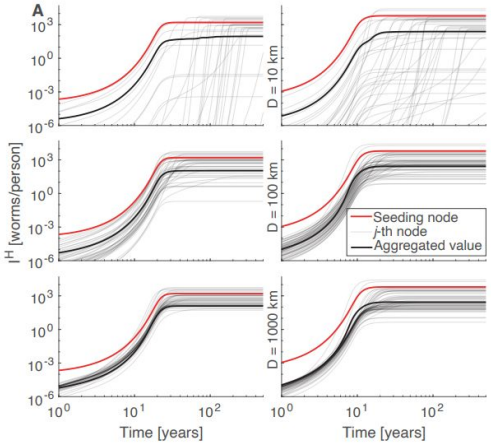
$$\frac{ds}{dt} = \beta_E(S - s)\frac{e}{A} - \mu_S s$$

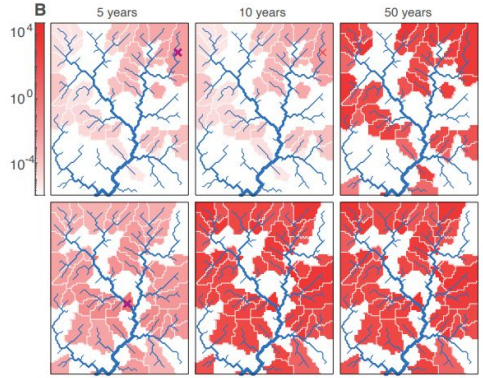
$$\frac{dc}{dt} = \rho_S s - \left(\beta_C\frac{F}{A} - \mu_C\right)c$$

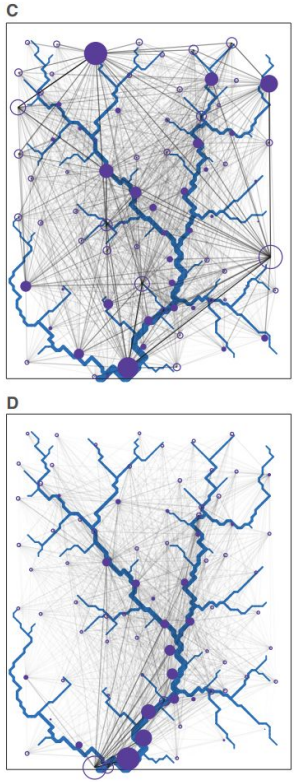
$$\frac{dm}{dt} = \beta_C\frac{c}{A}F - (\mu_F + \chi)m$$

Local-scale and spatially explicit modeling









Infectious disease

Ecohydrological modeling of liver fluke transmission

Photo credits:
Cristiano Trevisin

Development of a spatial model for a real case study: *O. viverrini* in Laos

Data:

- human population distribution
- fish population distribution
- access to sanitation
- land use
- raw fish consumption
- prevalence of infection
- intensity of infection