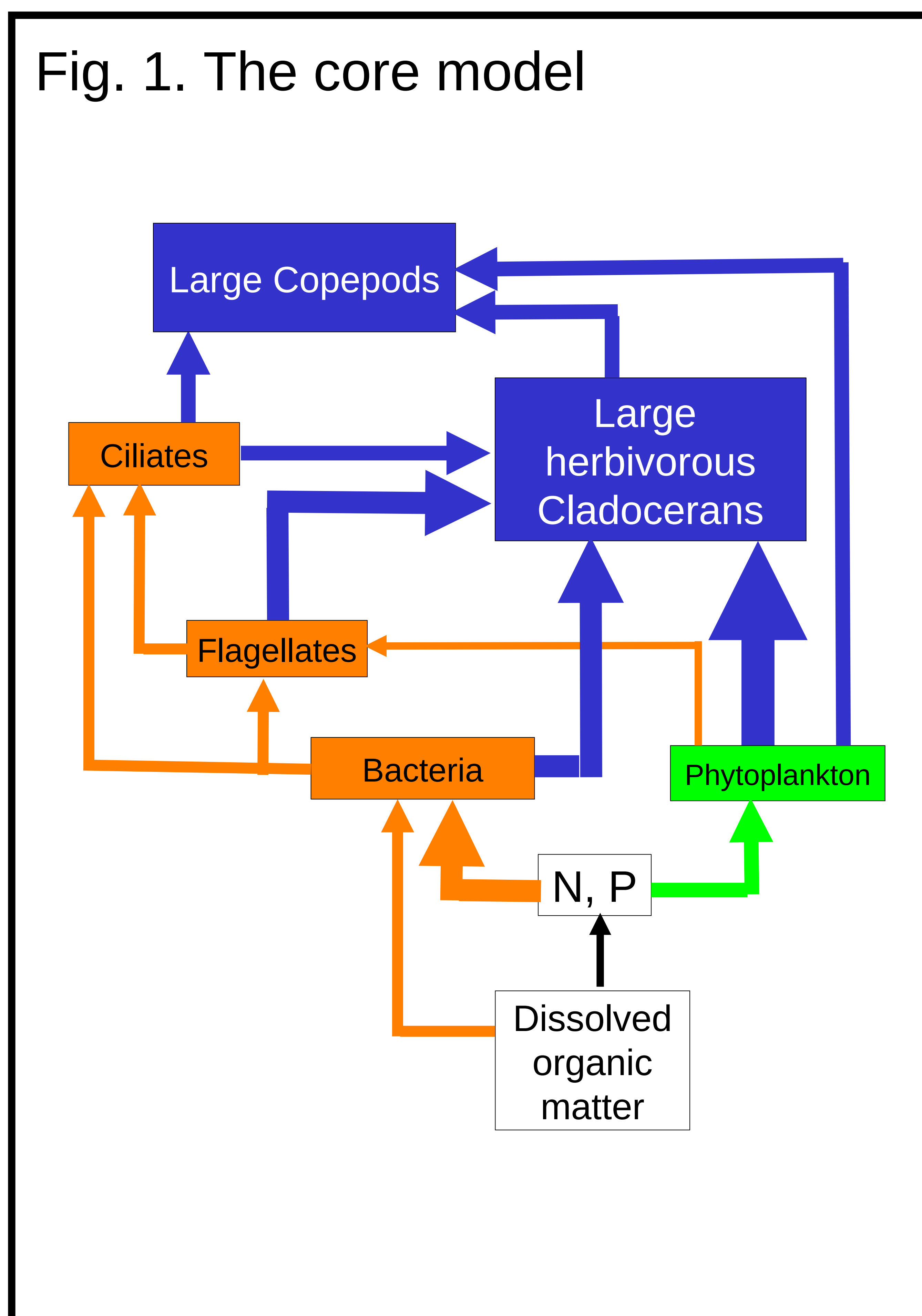


# How do fish and allochthonous subsidies simultaneously control food-webs?

(Eric EDELINE and Gérard LACROIX)

## 1. Introduction

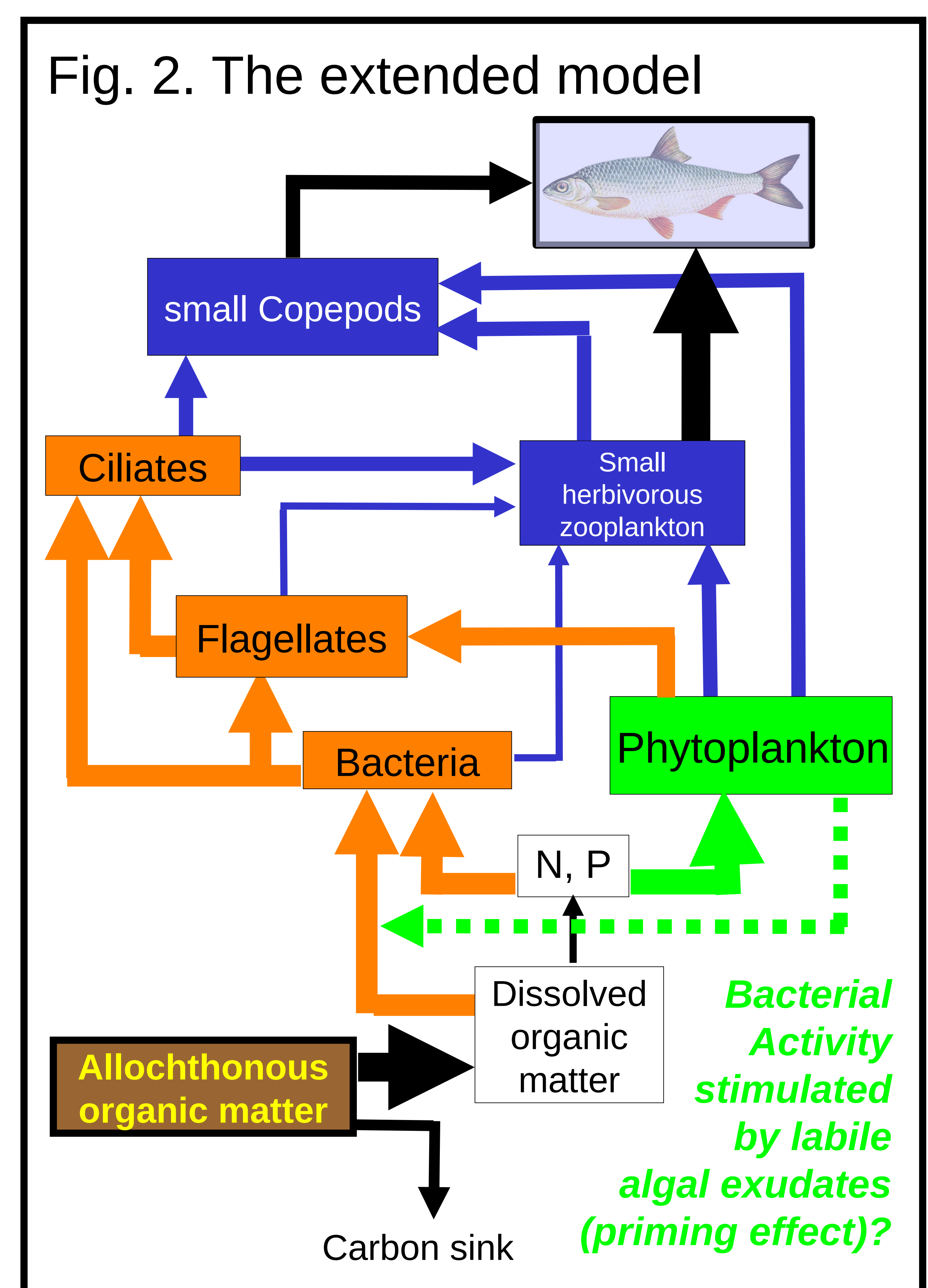
Fish strongly influence the structure and function of aquatic ecosystems (see figs 1 & 2). Recent works further highlight the potential influence of allochthonous subsidies on ecosystem autotrophy / heterotrophy ratio (Cole Ref.), energy transfer efficiency to higher trophic levels (Thorp & Delong, *Oikos* 96, 2002), and on the strength of trophic cascades (Leroux & Loreau, *Ecol. Let.* 11, 2008). (For a synthesis, see Jansson *et al.*, *Tree* 22, 2007). However, the interaction of fish and allochthonous subsidies have not been experimentally investigated).



### Autotrophic and heterotrophic pathways for energy transfer in aquatic food webs

(1) *Autotrophic, short-length pathways dominate. Phytoplankton and large Cladocerans are the main energy mobilizers, and energy transfer efficiency to higher trophic levels is high.*

(2) *Planktivorous fish favour the microbial loop, and longer food chains dominate. Energy transfer efficiency to higher trophic levels is low.*



## 2. Predictions to be tested

- Allochthonous organic matter and fish both favour longer, heterotrophic pathways.
- These longer heterotrophic pathways lower energy transfer efficiency to higher trophic levels.
- Labile exudates from primary producers favour the mineralization of recalcitrant organic matter by bacteria.
- For a given nutrient load, this priming effect is greater in presence of fish due to higher algal biomass and exudate production (allochthonous inputs x fish synergistic effect).
- The strength of trophic cascades is lower in presence of high allochthonous inputs, due to asymmetric competition between bacteria and phytoplankton for nutrients.

## 3. The experimental setup

4 treatments in triplicates during one year :

- 1: no fish, no allochthonous input
- 2: no fish, allochthonous input
- 3: fish, no allochthonous input
- 4: fish, allochthonous input



12 experimental tanks located at the biological station of Foljuif (CEREAP)

Variables to be measured:

- ▶ Water physics (temperature, pH, and chemistry (N, P concentrations))
- ▶ Chemical nature of allochthonous, dissolved and sedimented organic matter (lipid component analysis, degradability; etc.)
- ▶ Abundance of bacteria, ciliates, flagellates, phyto- and zooplankton, periphyton and macroinvertebrates
- ▶ Fish survival, somatic growth and fecundity

## 4. Main collaborations

**Loïc HARRAULT & Béatrice ALLARD (Bioemco):**

Chemical characterisation of organic matter

**Jean-François CARRIAS (LBP, UMR 6023 - Clermont-Ferrand):**

Microbial loop analysis

**Antoine THOUVENOT (LBP, ATHOS Environment - Clermont-Ferrand):**

Analysis of zooplanktonic communities

**Sébastien BAROT (Bioemco):**

Modelisation of food-web responses to inputs of allochthonous OM

