A comparative analysis of organic and conventional agriculture's impact on aquatic biodiversity

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Background

- **Agriculture** is one of the most pervasive human activities on earth
- Ongoing **debate on the choice of agricultural practices** in terms of their impact on food security, ecosystem functioning and biodiversity
- Impact of **organic farming** is expected to differ from that of conventional farming because of:
    - ✓ the use of **organic fertilisers**
    - ✓ the restricted use of a **limited set of pesticides**
    - ✓ the implementation of **larger buffer zones** around natural elements (e.g. ponds)

    → Highly promoted under the current **EU Common Agricultural Policy** (2014-2020) as part of the 'greening' pillar: **An increase in the area and quality of High Nature Value Farmland**

- **Ponds** in agricultural settings:
    - ✓ harbour majority of regional biodiversity
    - ✓ are key providers of ecosystem services
    - ✓ are among the most threatened ecosystems on earth
    - ✓ are excellent **sentinels of human impact**, because they respond to contamination and disturbances at a very local scale
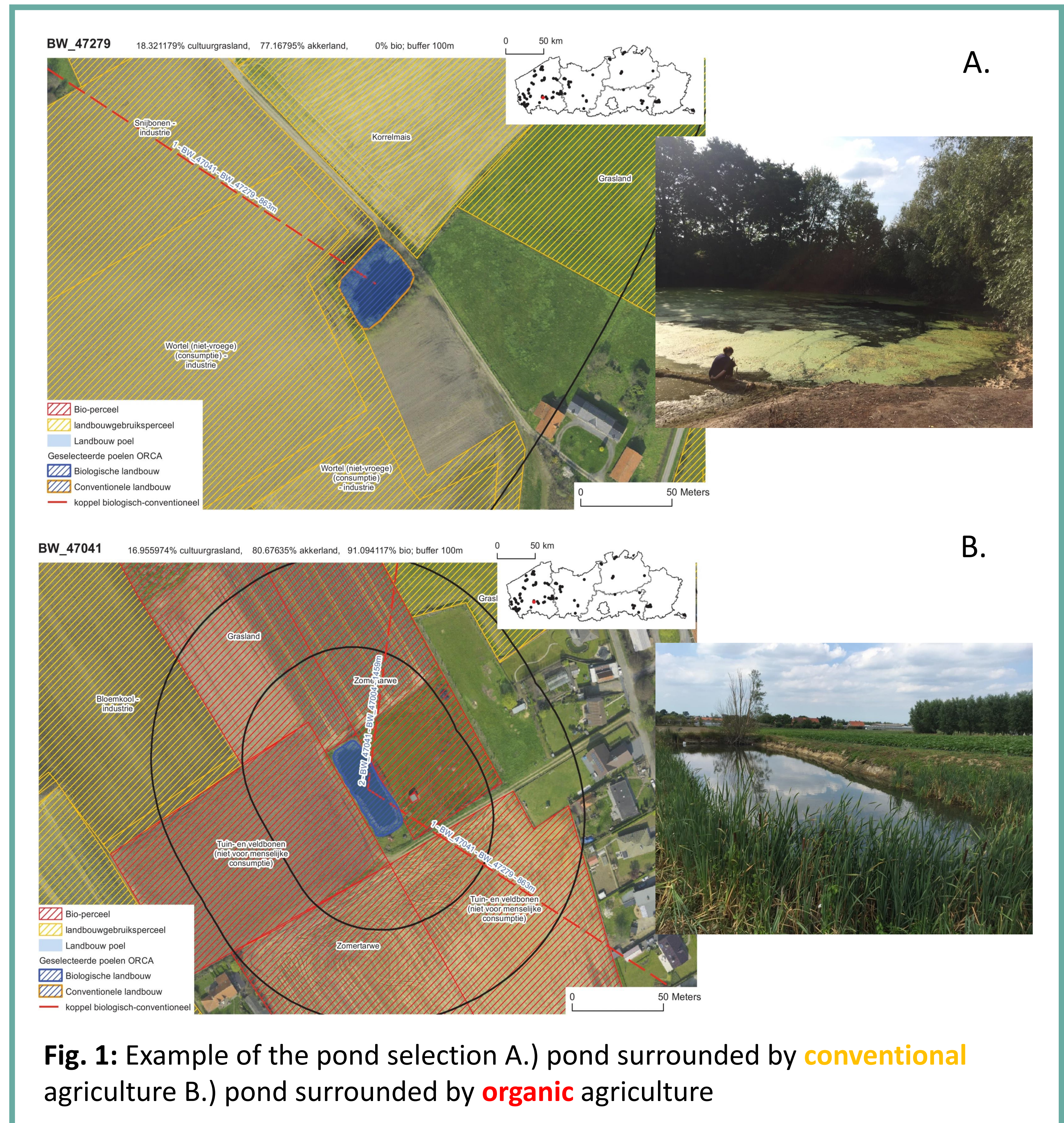
Sampling campaign summer 2017

- Pond selection
    - ➢ Using the blue layer (INBO) for pond locations and data from 2016 on the agriculture type and land use intensity (Department of Agriculture and Fisheries) (**Fig. 1**)
    - ➢ Land owners informed by letter supported by the Department of Agriculture and Fisheries

- 48 ponds sampled in Flanders (**Fig. 2**)
    - ➢ Biodiversity characterisation of:
        - – Ostracods
        - – Zooplankton
        - – Phytoplankton
        - – Macro-invertebrates
        - – Macrophytes

    - ➢ Water chemistry
        - – DOC, DON, DOP (dissolved organic carbon/nitrogen/phosphorus)
        - – Nutrients
        - – Sulphates
        - – Chlorides
        - – Hardness
        - – Alkalinity
        - – Suspended matter
        - – Conductivity
        - – pH
        - – Chlorophyll a
        - – Phycocyanine
        - – Oxygen

    - ➢ General pond information
        - – Surrounding land use
        - – Management and use
        - – Soil structure
        - – Pond morphology
        - – Turbidity
        - – Temperature

Overall aim

- Investigate effects of **agriculture type** (organic *versus* conventional) and **land use intensity** (extensive *versus* intensive) on aquatic biodiversity

    → Taxonomic, functional and intraspecific genetic diversity of multiple aquatic organisms: macro-invertebrates, macrophytes, zooplankton, ostracods, phytoplankton, amphibians and fish

Fig. 1: Example of the pond selection A.) pond surrounded by **conventional** agriculture B.) pond surrounded by **organic** agriculture

Fig. 2: Part of the sampling team with equipment

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