University of Antwerp
Evolutionary Ecology Group

MP and IP subjects

https://www.uantwerpen.be/en/research-groups/eveco/education/masterproject-and-ipsubjects/

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Evolutionary Ecology Group

Who are we?

University of Antwerp
Evolutionary Ecology Group

- Six large research themes
  - Ecology of infections and host-parasite interactions
  - Spatial ecology
  - Ecological and evolutionary responses to global change
  - Morphological expressions of stress, fitness and quality
  - Understanding evolution using genomics
  - Applied population biology: conservation, pests, invasive species

5 professors, 4 guest professors

museum · AFRICA museum · RESEARCH INSTITUTE NATURE AND FOREST · ZOO SCIENCE · INSTITUTE OF TROPICAL MEDICINE ANTWERP


Hannes Svardal


Herwig Leirs


Erik Matthysen

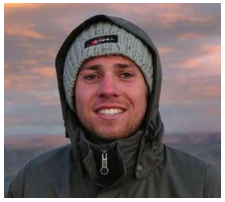

Stefan Van Dongen


Sophie Gryseels


Diana Erazo


Luc De Bruyn


Philippe Helsen


Joachim Mariën

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General information

- Listed topics are broad
- Final subjects decided after discussion with the student
- Suggestions for other topics are welcome!
- Open for all Master of Biology students, regardless of their orientation.
- Many topics possible for Master thesis as well as Individual project
- Applied methods vary widely between subjects, e.g.
  - Field work with live trapping of rodents, bats, birds, fishes
  - Statistical analysis of own or existing data (CMR, GIS, ...)
  - Mathematical modelling
  - Molecular genetics, DNA barcoding, immunology
  - Genomics, hybridization
  - Virus phylogenetics and epidemiological modelling
  - ...

Hannes Svardal and collaborators

University of Antwerp
Evolutionary Ecology Group

Hannes Svardal and collaborators

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- Topics for master thesis and Individual Projects
  October 2025

- Understanding evolution using mathematical models and genomic sequencing data

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Genomic basis of variation in Sailfin silversides

The Malili Lakes in Indonesia house an impressive adaptive radiation of Sailfin silversides which have rapidly diverged into ~17 species, with ongoing hybridisation and intermediate phenotypes. A lot is still unknown about the evolutionary history and speciation processes in these fish.

Master thesis project:

Genomic basis of morphometric traits in silversides

- **Geometric morphometrics**: X-ray scanning of specimen in Bonn (Germany) and morphometric analysis
- **Genomics**: GWA-like analysis to link morphological traits to genetic markers
- **Simulation-based validation:** forward simulations to model genetic and phenotypic variation under different evolutionary scenarios.

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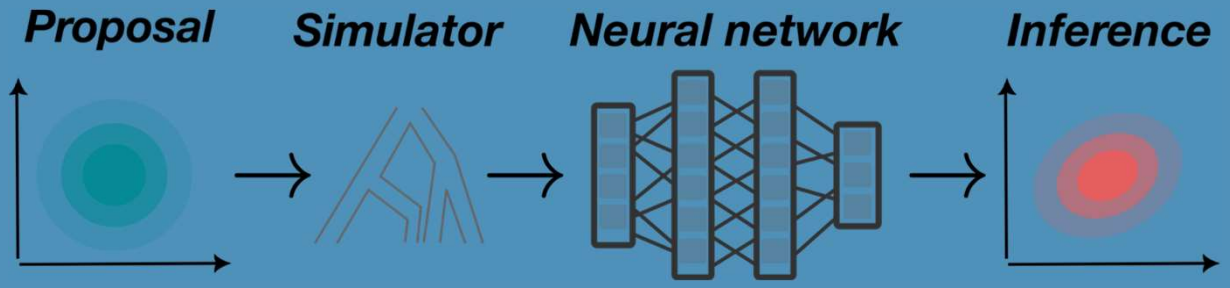
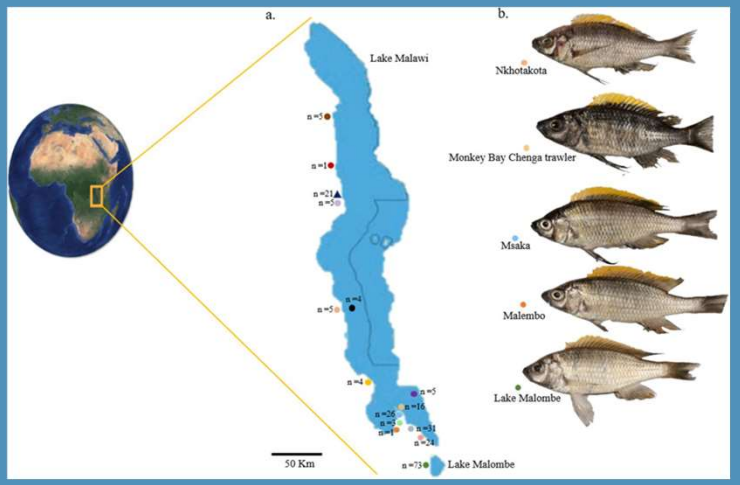
Inferring Selection and Demography from Genomes with AI

Simulation-based inference



PyTorch

Potential application: fishery-induced evolution in Lake Malombe



Contact us!
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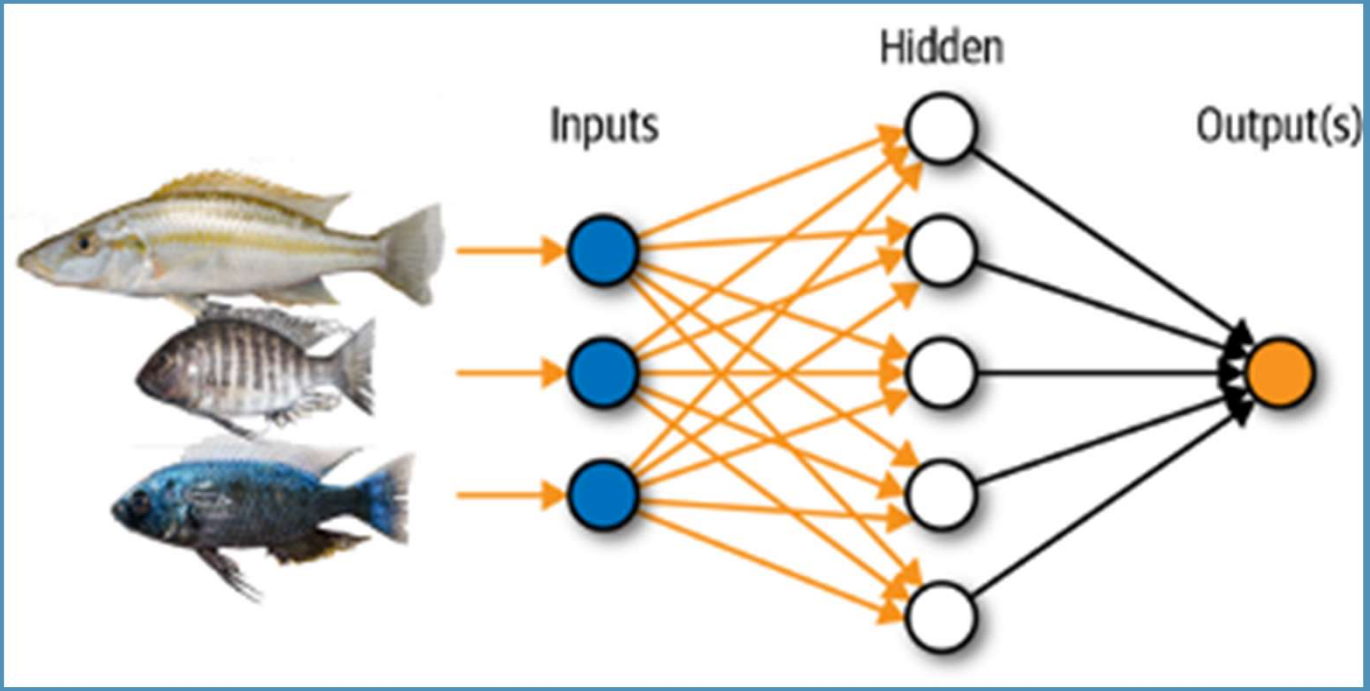
fishAI: A machine learning based tool to recognize individual fishes



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Inversions and reproductive behavior in Malawi Cichlids

Key words: behavior, mate choice, reproductive investment, aggression

- Populations of some Malawi cichlid species have long polymorphic inversions. It's also known that the inversions influence at least some types of reproductive behavior.
- Almost nothing is known about the direct effects of inversions on the reproductive success.

Your task: to set behavioral experiments with the fish of different inversion genotypes to study:

- Male-male aggression and domination
- Female reproductive investment
- Female aggression
- Female mate choice

Skills to be learned in process: Live fish handling, video analysis, statistics, programming (Python, R), wet lab work (DNA extraction, PCR typing, etc)

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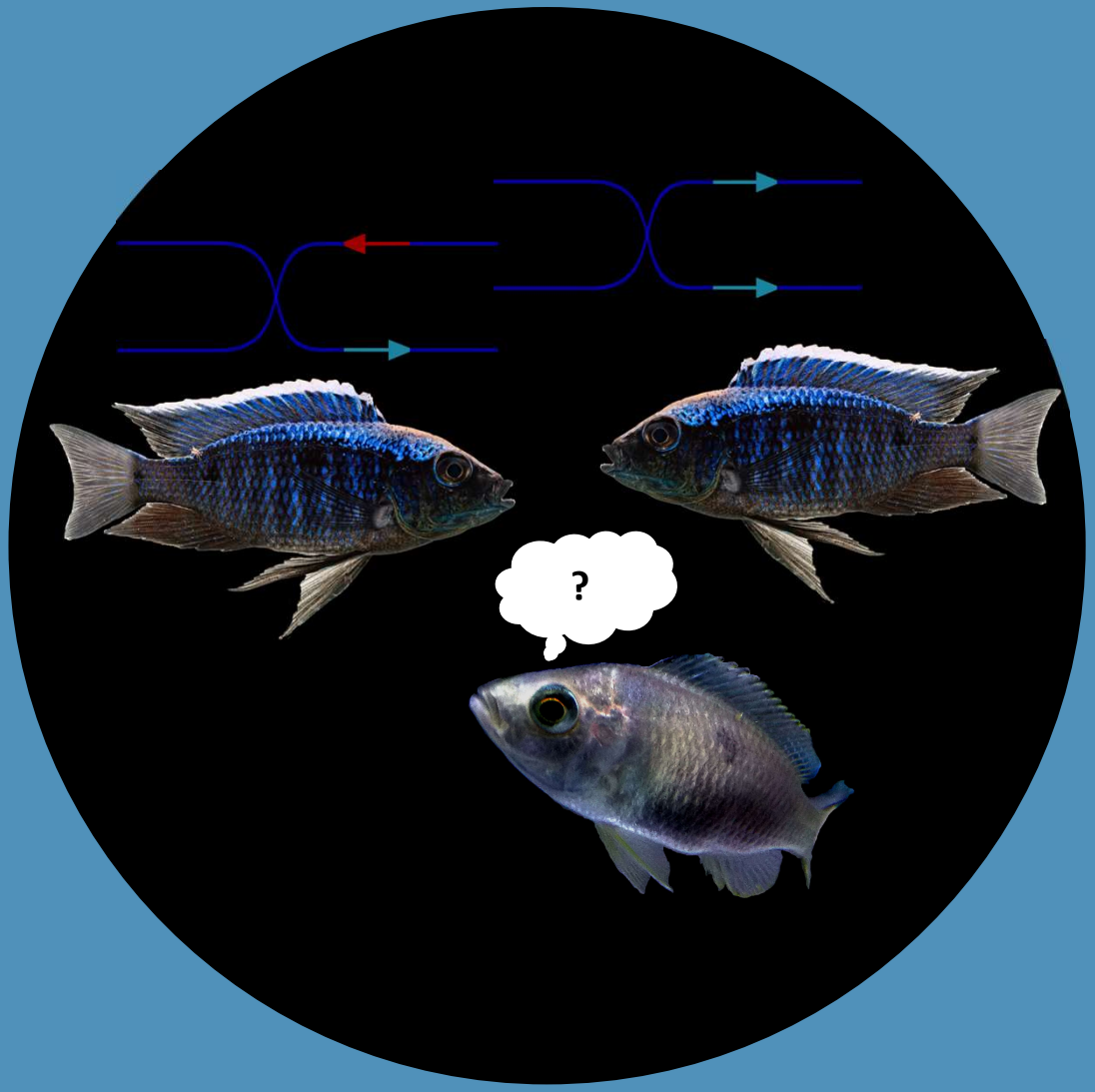
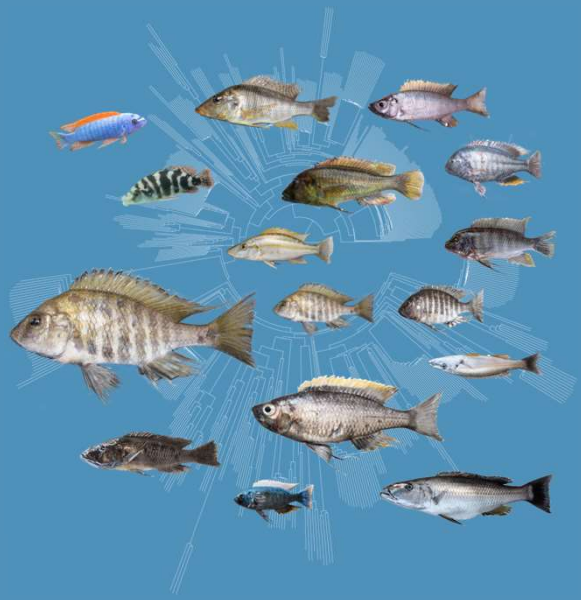
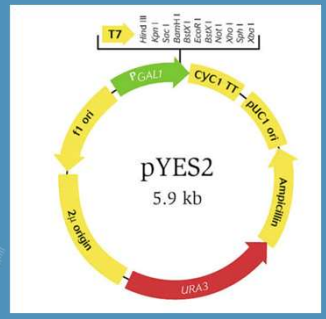


From sequence to function: Characterizing the fatty acid biosynthesis genes of Lake Malawi cichlids

The divergence of Malawi cichlids into distinct trophic niches likely involved changes in their fatty acid metabolism. Here, we want to find out if and how variation in their DNA also led to functional metabolic changes – using an innovative system of cloning and heterologous expression in yeast.





- Skills: Sequence analysis, molecular lab work, yeast experiments

- Previous molecular lab experience required

- ! Part of your thesis (2-3 months) will be conducted at the **Instituto de Acuicultura de Torre de la Sal in Spain**

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Diana Erazo (Africa Museum + EVECO)

University of Antwerp
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Reconstructing disease dynamics in Africa using historical museum collections and archives

Contact: Diana Erazo

- How vector-borne disease transmission varied across human groups during Belgian Congo?

→ Interest in vector-borne diseases and mathematical models

→ Involves using **archive data and coding** in R (differential equations)

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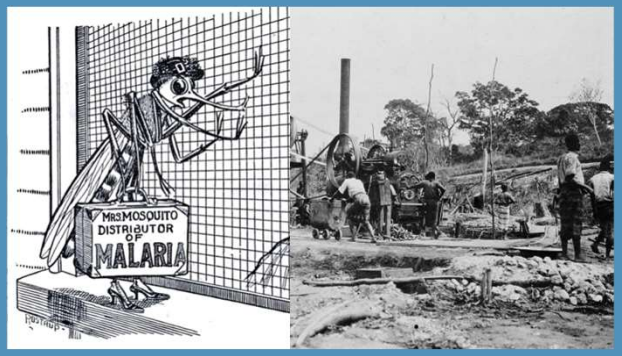


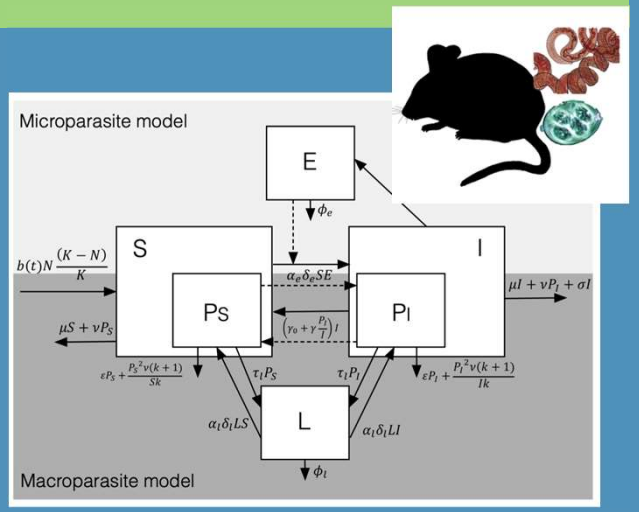
Assessing the impact of resources on parasite transmission in multi-parasite communities

- How resource increase (i.e. food) alter co-infection dynamics?

→ Interest in theoretical disease ecology and mathematical models

→ Involves coding in Mathematica and R (differential equations)

MP, IP



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Herwig Leirs/Vincent Sluydts
Sophie Gryseels

- Biodiversity and zoonotic disease emergence
- Evolution and diversity of viruses
- Field and lab work
- *More details: see EVECO website*

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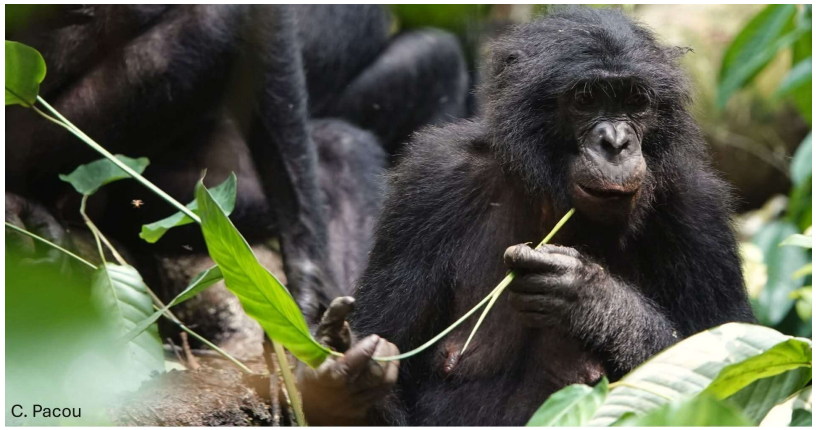
Virome in bonobo excrements

Bonobo project of Antwerp Zoo foundation in Lomako-Yokokala Nature reserve DR Congo



Field: Jef Dupain
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Lab: Sophie Gryseels (maternity leave until April ’26
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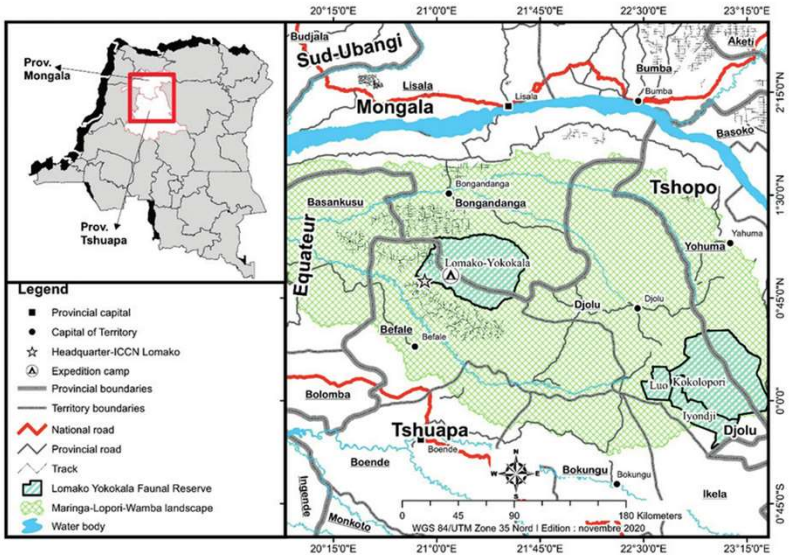

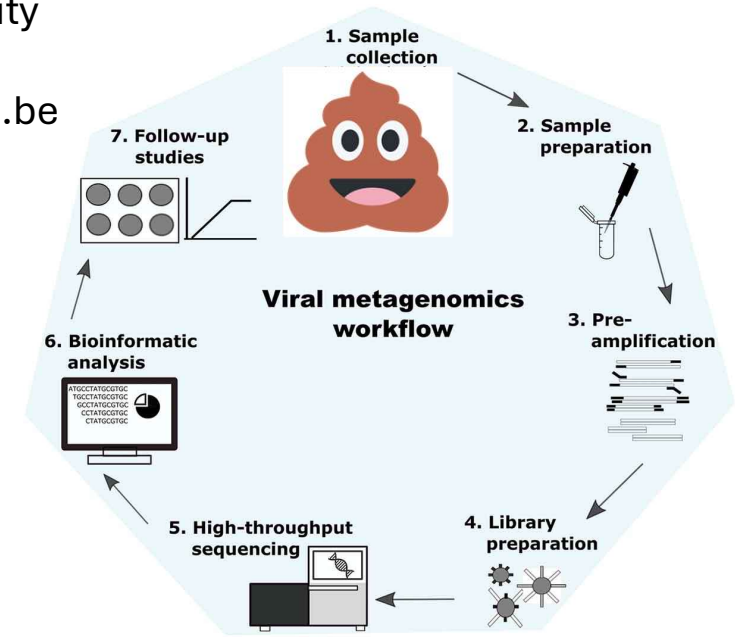

Philippe Helsen – CRC (Zoo) + EVECO

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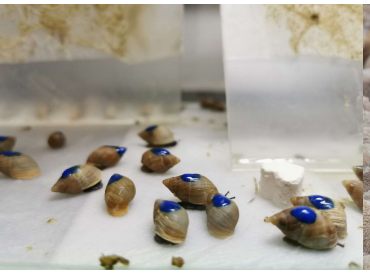
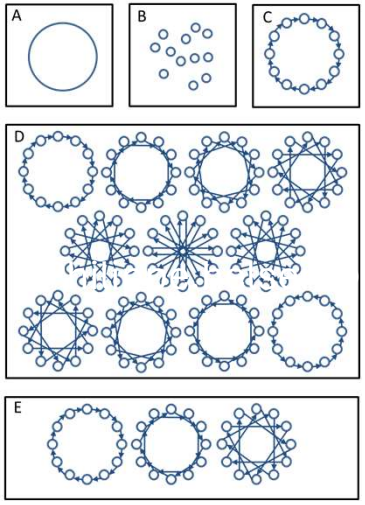




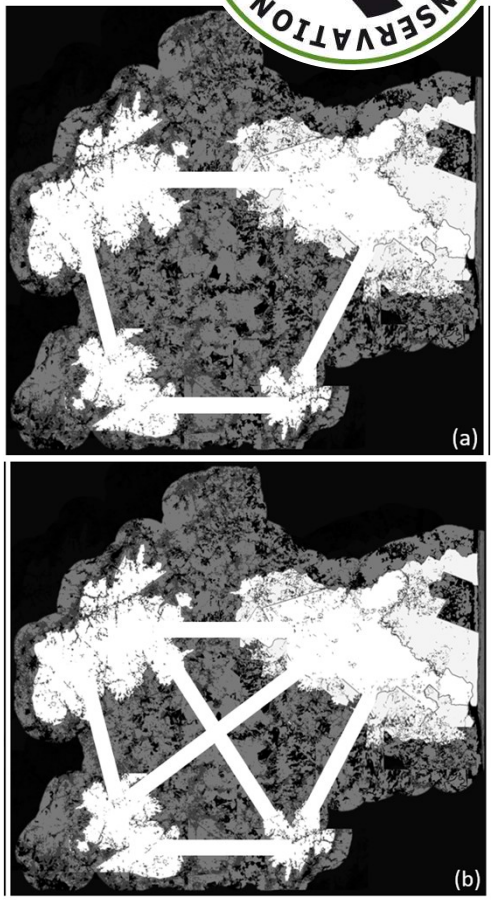
Topic 1: Group management

- mostly modelling – simulations (R – Vortex and SLiM)
- focus is to develop a framework to guide decision making on the best management style to safeguard demographically and genetically healthy populations
- an increasing number of species need this type of management



- can be any species, as long as it lives in (social) groups

- in-situ fragmented populations, or ex-situ breeding



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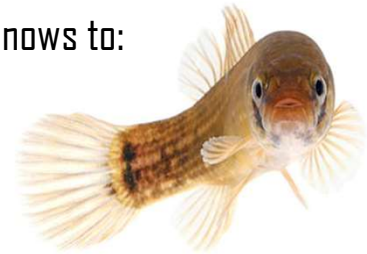
Topic II: Molecular diet analysis of the exotic and invasive Eastern mudminnow

- Focal area the Zegge
- Both lab work and bio-informatics
- Potential additions – population genomics of the mudminnows to:
  - Genomic make-up of the species
  - Study movement patterns



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Topic III: Conservation genomics projects

- Lab and bio-informatics
- Understand and preserve genetic diversity
- Relatedness within (ex-situ) populations and links with current or ancient levels of GD of natural populations

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Erik Matthysen and collaborators

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Individual-based ecology and bird tracking

Timing is everything

What drives variation in timing of breeding in (sub)urban and more natural habitats?

The question(s):

If spring temperature is the main cue for birds to start the breeding cycle, why are some locations consistently earlier than others, even at very short distances?

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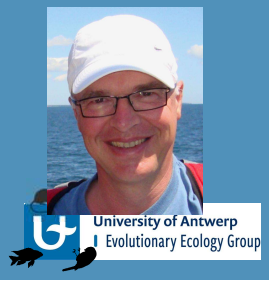
The approach:

Collecting budburst, temperature, nestbox data
Ambient variables (tree cover, light, noise…)
Use of Long-term breeding data from multiple populations



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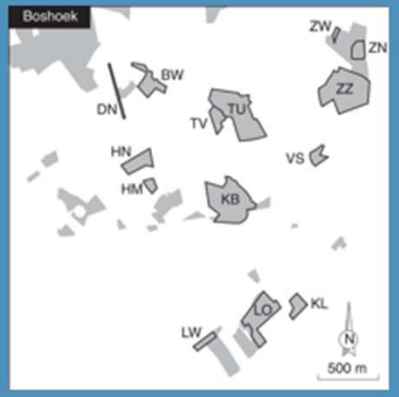
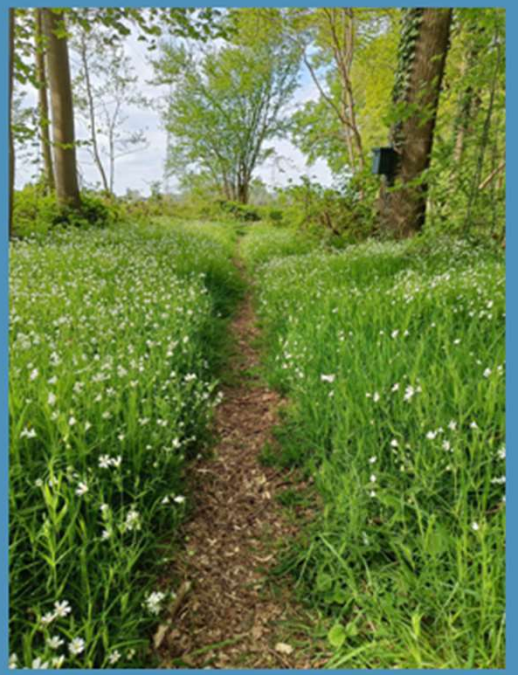
Individual-based ecology and bird tracking

Flying free or imprinted to move?

Using long-term individual data to uncover the drivers of dispersal and habitat selection in territorial birds





IF YOU ARE INTERESTED IN THE CORE CONCEPTS…

Individual vs. Environmental effects
Spatial ecology & Movement patterns
Natal imprinting & Habitat matching

IF YOU LIKE DOING FIELDWORK…

Mosaic landscape & Microclimates
Nest monitoring & Bird ringing

IF YOU WANT TO LEARN POWERFUL SKILLS IN STATS…

Analysis of long-term data since 1994 from pedigreed populations

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Individual-based ecology and bird tracking

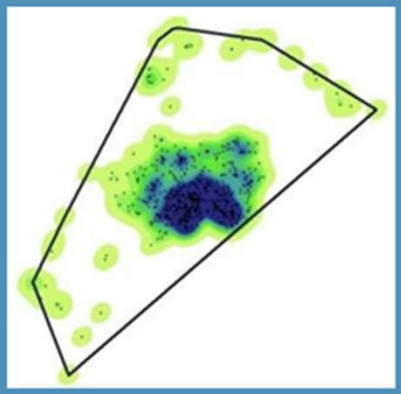
Tracking the parakeet invasion

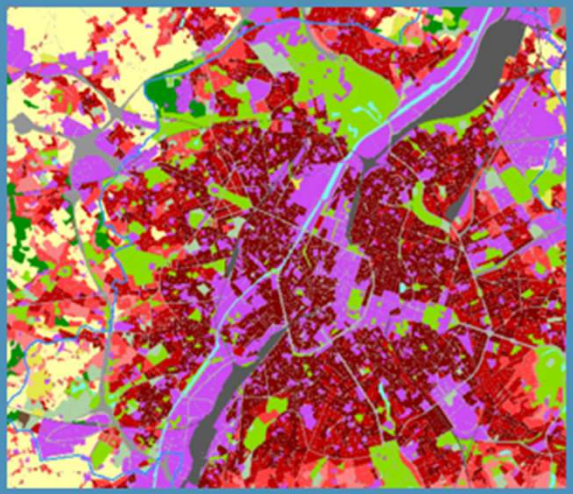
Home-range size, mobility and habitat selection in necked parakeets

- Capturing and tagging of parakeets (spring/summ
- Retrieve data from tagged individuals
- Data processing and analysis
- GIS datasets (NDVI, landcover, tree cover, …)

MP

In collaboration with U Gent and INBO (PhD student Frouke De Witte)





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Host-parasite interactions

Ecological drivers of tick abundanc

How do changes in forest management affect abundance, and what is the role of bird/mam hosts?

- Participate in 2nd year of data collection
- Tick collection (flagging)
- Bird counts, rodent trapping, camera data…
- 20 sites monitored in 2013-14 and 2025-26

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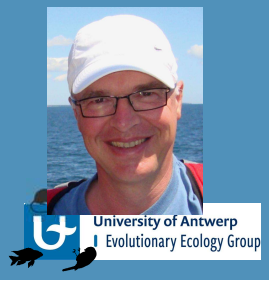
In collaboration with UC Louvain
(S. Vanwambeke)



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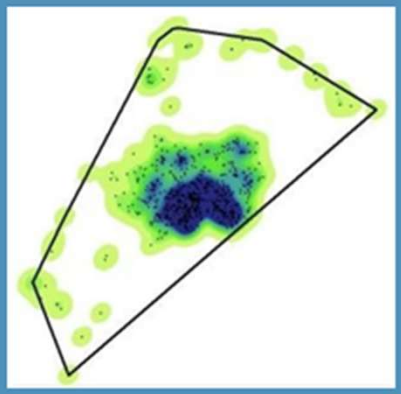
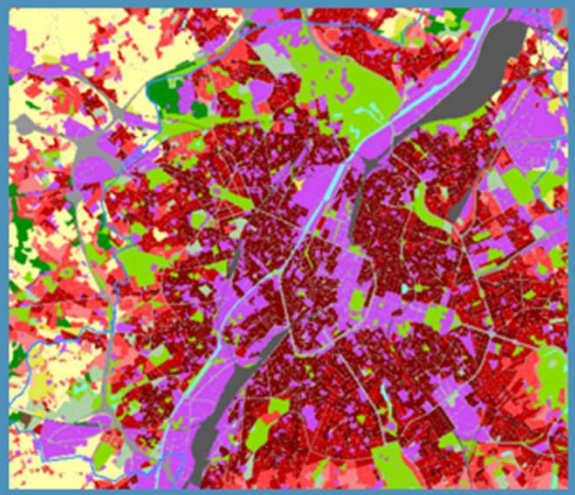
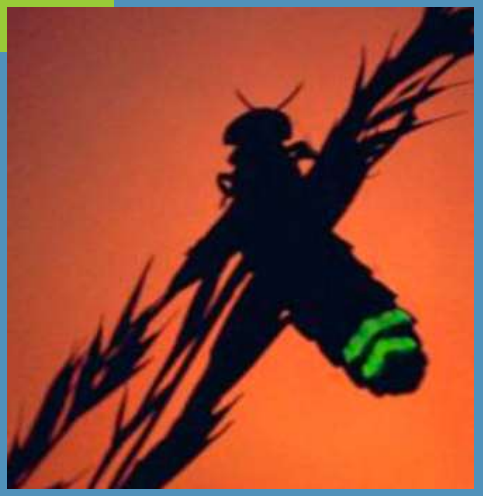
UCLouvain





Glowworms and artificial light at night (ALAN)



Background: red and blue light affects the males' ability to find glowing females in lab conditions.

Question: how does this translate into actual reproductive fitness?

Method: experimental matings in (semi-) field conditions (June-July 2026), monitoring egg and larvae production

Co-supervision by Raphael De Cock

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