
Spotting and spreading of a fungal parasite on a globally invasive ladybird: explaining its global distribution and biocontrol potential

A Data Management Plan created using DMPonline.be

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Project abstract:

The harlequin ladybird, *Harmonia axyridis* (Coleoptera, Coccinellidae), is one of the worst invasive species in Europe. Originally from eastern Asia, it was introduced as biocontrol in North America, it has since spread over the rest of the world and has a negative effect on native insects as well as food production and human health. The ectoparasitic fungus *Hesperomyces harmoniae* nom. prov. (Ascomycota, Laboulbeniomycetes, Laboulbeniales) is found on *Ha. axyridis* worldwide. In laboratory settings infection of *He. harmoniae* affect *Ha. axyridis* mortality. However, much is still unclear about the spread and effects of *He. harmoniae* on *Ha. axyridis*. This project (1) explores the factors that determine *He. harmoniae* infections of *Ha. axyridis* through data analysis from experiments the lab, in the field, and gathered from citizen science. It (2) investigates the population genetics to determine how *He. harmoniae* has spread globally through DNA sequencing and statistical analysis. Lastly, the project (3) looks at the efficacy of *He. harmoniae* as a biocontrol agent through laboratory experiments and data from the field. It is necessary to create a greater understanding of how natural enemies infect, spread, and control the invasive alien *Ha. axyridis*, and the ubiquitous *He. harmoniae* makes a great target for investigation in this regard.

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Full DMP +

1. General Information

Name applicant

Michiel de Groot

FWO Project Number & Title

1142722N - Spotting and spreading of a fungal parasite on a globally invasive ladybird: explaining its worldwide distribution and biocontrol potential

Affiliation

- Universiteit Gent

INBO - Research Institute for Nature and Forest

2. Data description

Will you generate/collect new data and/or make use of existing data?

- Generate new data
- Reuse existing data

Describe the origin, type and format of the data (per dataset) and its (estimated) volume.

- DNA sequence data, genomic data, scripts, and assemblies from fungi (FASTA)
- Ladybird specimens, infected or not, of various species, caught in the wild (Several thousands)
- Laboulbeniales fungal specimens, extracted from ladybirds (Several hundreds)
- Results of infection experiments (Spreadsheets)
- A dataset regarding the metadata (specific locality, date, geographic coordinates, habitat description, etc.) of the ladybirds and Laboulbeniales specimens
- Biogeographical maps and (a few ARCGIS files and images)
- Phylogenetic trees (a few BEAST files and images)

3. Ethical and legal issues

Will you use personal data? If so, shortly describe the kind of personal data you will use AND add the reference to your file in your host institution's privacy register.

- No

Are there any ethical issues concerning the creation and/or use of the data (e.g. experiments on humans or animals, dual use)? If so, add the reference to the formal approval by the relevant ethical review committee(s).

- No

Does your work possibly result in research data with potential for tech transfer and valorisation? Will IP restrictions be claimed for the data you created? If so, for what data, and which restrictions will be asserted?

- No

Do existing 3rd party agreements restrict dissemination or exploitation of the data you (re)use? If so, to what data do they relate and what restrictions are in place?

- No

4. Documentation and metadata

What documentation will be provided to enable understanding and reuse of the data collected/generated in this project?

Data spreadsheets will be annotated with additional information, where necessary. Material and methods descriptions will explain where, when, and how the data was produced.

Will a metadata standard be used? If so, describe in detail which standard will be used. If not, state in detail which metadata will be created to make the data easy/easier to find and reuse.

- Yes

The metadata standard Darwin Core. Darwin core is a body of standards, including a glossary of terms (in other contexts these might be called properties, elements, fields, columns, attributes, or concepts) intended to facilitate the sharing of information about biological diversity by providing reference definitions, examples, and commentaries. In this case, it will be used to describe attributes of the data so it's easy to trace back from which specimen and where it was gained. Darwin Core is the standard used by GBIF, an international ecological information databank, which means that this way, the data generated by this project is easy to reuse.

5. Data storage & backup during the FWO project

Where will the data be stored?

Research Group Mycology has access to 20 TB of storage space. Co-promotor Haelewaters has access to all GU Tier2 clusters and also to the Tier1 cluster Hortense (project-based). Hortense has a RAM operating memory of 100 TB, storage capacity of 3 PB, where the data will be stored. Fungal specimens will be deposited at the Ghent University herbarium (GENT), vouchers of ladybird specimens will be deposited at the Royal Belgian Institute of Natural Sciences. Project metadata and images will be made available through Morphobank and GBIF, DNA sequence data through NCBI GenBank, alignments and phylogenetic trees submitted to figshare, scripts to GitHub, fungal metadata (images, locality, date, GenBank accession numbers, and other metadata) to MycoPortal.

How will the data be backed up?

The data will additionally be backed up on two hard drives by the PhD candidate, as well as online in Google Drive and OneDrive space.

Is there currently sufficient storage & backup capacity during the project? If yes, specify concisely. If no or insufficient storage or backup capacities are available, then explain how this will be taken care of.

- Yes

The existing storage detailed above is enough for the storage and backup of all generated data.

What are the expected costs for data storage and backup during the project? How will these costs be covered?

There are no additional costs for data storage, as the intended storage either is specifically intended for the purpose of scientific data/specimens or already private ownership.

Data security: how will you ensure that the data are securely stored and not accessed or modified by unauthorized persons?

The data on Ghent University computers can only be accessed by authorized personnel. Fungal specimens stored in the Mycological Herbarium at Ghent University and the ladybird specimens stored at the Royal Belgian Institute of Natural Sciences are well curated and not readily accessible to non-authorized personnel.

6. Data preservation after the end of the FWO project

Which data will be retained for the expected 5-year period after the end of the project? In case only a selection of the data can/will be preserved, clearly state the reasons for this (legal or contractual restrictions, physical preservation issues...).

All data will be preserved for the expected 5-year period.

Where will these data be archived (= stored for the long term)?

Fungal specimens will be deposited at the Ghent University herbarium (GENT), vouchers of ladybird specimens will be deposited at the Royal Belgian Institute of Natural Sciences. Project metadata and images will be made available through Morphobank and GBIF, DNA sequence data through NCBI GenBank, alignments and phylogenetic trees submitted to figshare, scripts to GitHub, fungal metadata (images, locality, date, GenBank accession numbers, and other metadata) to MycoPortal.

What are the expected costs for data preservation during these 5 years? How will the costs be covered?

There are close to no costs for the data preservation, as all the institutions and locations where data are either non-profit or created for the purpose of storing this data.

7. Data sharing and reuse

Are there any factors restricting or preventing the sharing of (some of) the data (e.g. as defined in an agreement with a 3rd party, legal restrictions)?

- No

Which data will be made available after the end of the project?

All data will be made available after publication of research results and will otherwise be available in open access repositories such as GBIF, MycoPortal, and GenBank.

Where/how will the data be made available for reuse?

- Upon request by mail
- In an Open Access repository

When will the data be made available?

- Upon publication of the research results

Who will be able to access the data and under what conditions?

In principle everyone, since the data will be made available in open-access repositories. The PhD candidate will be available for additional follow up questions regarding data curation, etc.

What are the expected costs for data sharing? How will these costs be covered?

None.

8. Responsibilities

Who will be responsible for the data documentation & metadata?

The PhD candidate, Michiel de Groot.

Who will be responsible for data storage & backup during the project?

The PhD candidate, Michiel de Groot.

Who will be responsible for ensuring data preservation and sharing?

The PhD candidate, Michiel de Groot.

Who bears the end responsibility for updating & implementing this DMP?

The PI bears the overall responsibility for updating & implementing this DMP.