Announcement

Project collaboration for a secondment of a young Chinese visiting scientists to the MARA- CABI European Laboratory in Switzerland

2024

PROJECT DESCRIPTIONS

1. The biological control of an invasive aquatic plant, parrot's feather, *Myriophyllum aquaticum*: investigation of the thermal physiology of potential biological control agents

Classical biological control of invasive plants uses host-specific natural enemies from the plant's area of origin to control the plant in the area where it has invaded. Ideally populations of the invasive plant will be reduced below an economic or ecological threshold. A narrow host range is the most important criteria to introduce a classical biological control agent against an invasive alien species. However, another important point to take into consideration is the capability of potential agents to adapt climatically to new niches. Too often, classical biological control omit this important factor and climate mismatch can occur, contributing to the inefficiency of the agent (Harms et al., 2021). Moreover, climate is changing which may influence niche expansion of the weed and its agents (Xian et al., 2023).

Myriophyllum aquaticum commonly known as parrot's feather, is an aquatic plant native to South America that has been introduced worldwide, including China, Europe, and North America where it became invasive. Chemical control options for *M. aquaticum* are limited because it is an aquatic macrophyte and grows in wetlands and water bodies. A biological control project was therefore initiated. As part of this project, several potential biological control agents were prioritized for further study: *Lysathia* sp., *Phytobius vestitus* and *Listronotus marginicollis*. Host range testing has been started in the CABI quarantine with *Lysathia* sp. and *P. vestitus*. Both insects originate from sub-tropical climates but are foreseen for releases in temperate climates. It is then essential to understand their thermal physiology to understand if those insects could be adapted to colder environments. Tests have been selected to establish their temperature profile:

- Super Cooling Point (SCP): temperature at which ice crystals form in insect tissues.
- Lower Lethal Temperature (LLT): coldest temperature which results in a prescribed rate of mortality (e.g., 50%=LT50, 100%=LT100).
- Critical Thermal Minimum (CTmin)/Chill Coma Induction Temperature (CCIT): temperature in a decreasing ramp, preceding loss of coordination (i.e., chill coma)
- Temperature-Dependent Development (TDD): rate of development along a temperature gradient.

Collaboration on this project will be a combination of data collection and modelling. The successful candidate will be involved in developing experiments and data collection with some of the tests mentioned above for the insects available in quarantine (e.g. *Lysathia* sp. and *P. vestitus*). The modelling aspect will be predicting

niches of the potential agents with the data collected from the thermal physiology tests and overlaying those models with that of parrot's feather (Xian et al., 2023).

Applicants for this project should have an interest and experience in entomology including insect and host plant rearing, and at least a theoretical background in biological control. The candidate will work as a collaborator in the biological control project at CABI Switzerland. CABI Switzerland offers a friendly multilingual (English, French, German) work environment with the possibility to exchange with students and researchers. The scientist will profit from learning different methods and approaches of biological control, as well as of risk assessments and biosafety. Project supervisors are experts in invasion ecology and biological weed control.

References

Goddard, M., Owen, C. A., Martin, G., & Coetzee, J. A. (2022). The thermal physiology of *Lysathia* sp. (Coleoptera: Chrysomelidae), a biocontrol agent of parrot's feather in South Africa, supports its success. *Biocontrol Science and Technology*, *32*(7), 837–846. https://doi.org/10.1080/09583157.2022.2054949

Harms, N. E., Knight, I. A., Pratt, P. D., Reddy, A. M., Mukherjee, A., Gong, P., Coetzee, J., Raghu, S., & Diaz, R. (2021). Climate Mismatch between Introduced Biological Control Agents and Their Invasive Host Plants: Improving Biological Control of Tropical Weeds in Temperate Regions. *Insects*, *12*(6), 549. https://doi.org/10.3390/insects12060549

Xian, X., Zhao, H., Humair, L., Yang, N., Li, J., Weyl, P., & Liu, W. (2023). Niche shifts undermine the prediction performance of species distribution models: Estimating potentially suitable areas for Myriophyllum aquaticum at the global scale. *Global Ecology and Conservation*, *48*, e02764. https://doi.org/10.1016/j.gecco.2023.e02764

CABI hosting team and project supervisors:

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CANDIDATE SELECTION CRITERIA

Interest

- Strong interest in the specific proposed subject of project
- Research areas conducted by the candidate in China fit to the proposed research area of the secondment.

Education & language skills

- MSc or above in a Life Science area ideally with entomology, invasive species, weed science, IPM and/or biological control as major subject(s);
- If part of education conducted in English speaking country, this would be regarded as an advantage;
- Fluent spoken English and good English writing skills.

Experience

- 2-3 years of post-graduate experience or equivalent working experience in relevant research area(s) as per announced project description;
- Experience in lab and field work, experimental design, data collection and handling, statistical analysis and reporting;
- Good scientific publication record;
- Proficiency in Microsoft Office Suite of packages.

Personal characteristics

- A team player with good interpersonal and communication skills;
- Self-motivated;
- Flexible;
- Ability to adapt to cultural differences.

Funding

- Funding is provided through the MARA – CABI Joint Laboratory of Biosafety`s European laboratory
- Some co-funding is needed by Chinese applicant`s sending institution.

Period of secondments

- Ideally up to 4 months between mid September to mid December 2024