

Individual Research Project Proposal

Candidate: Olga N. Petko

Proposed thesis title: “A comprehensive global meta-analysis of Crayfish Distribution: Informing Invasive species management and native fauna conservation”

1. Introduction of the Candidate

In 2012, I completed the Integrated Bi-National Master of International Nature Conservation, a double-degree programme at Georg-August-Universität in Germany and Lincoln University in New Zealand.

After graduation, I continued to gain experience as a field biologist, working on various research projects and being part of international teams in multiple countries, including Paraguay, Thailand, Japan, and Turkey. My work allowed me to gain knowledge of different localised nature conservation problems and solutions, examples of human-animal conflict, the spread of invasive species and their impact, and the workings of local environmental protection authorities. I also participated in educational programmes and camps for children and college students, organised museum exhibitions, took part in creation of educational books about nature and rare species, and worked as a science teacher in a middle school in Thailand.

Over the years, I developed an interest in a multidisciplinary approach to nature conservation and the use of modern technologies and innovations. This motivated me to resume my academic education in a new field, spatial ecology, to broaden my skill set and continue contributing to nature conservation as a professional with higher expertise.

2. Brief History and Context

Astacidae is a family of freshwater decapods colloquially known as crayfish. It is globally widespread, present on all continents except Africa and Antarctica. Crayfish are a popular biological crop, harvested both in the wild and raised in aquaculture. Due to their importance to humans as a food source and their popularity in aquaristics as pets, many species of crayfish have been introduced into new locations, and as a result, have become invasive species.

As of 2024, there are at least 10 invasive species in Europe alone, and the phenomenon is truly global. For example, the Red Swamp Crayfish

(*Procambarus clarkii*), a species native to the southern United States, can now be found in South America, several African countries, Japan, China, and Russia.

Invasive crayfish species possess several anatomical and behavioural advantages over local species, and they serve as a vector for the dangerous crayfish plague (*Aphanomyces astaci*). This makes them a threat to both native crayfish species and other freshwater organisms, while also disrupting local ecosystems.

To manage the already established populations of invasive species and curb their further expansion, as well as to ensure the survival of local species under the pressure of newcomers, the development of more informed and practical conservation programmes and policies is required.

3. Personal Contributions

In February 2024, I joined the team at the Crayfish Research Centre in Romania and contributed to the development of the geoportal *World of Crayfish* (WoC), an open-source global database of crayfish and crayfish pathogens' distribution, with data collected from scientific sources published in Russian. This information made it possible to expand the map's geographical coverage in several countries — Russia, Ukraine, Belarus, Kazakhstan, Georgia, and Mongolia — and add *Cambaroides dauricus*, *C. schrenckii*, *Pontastacus cubanicus*, *P. eichwaldi*, and *P. kessleri* to the list of covered species

4. Aims and Objectives

- a. Understand and decipher spatial distribution patterns of globally invasive crayfish species (*Procambarus clarkii*, *P. virginialis*, *Faxonius limosus*, *Pacifastacus leniusculus*, *Cherax quadricarinatus*) and endemic and threatened species using *World of Crayfish* and other sources.
- b. Identify the most relevant geospatial features that characterise the areas inhabited by the researched species.
- c. Identify the ecological optimum for the invasive and threatened species.
- d. Using data extracted from WoC and building mathematical models, identify the differences between the native range and recently invaded territories for the five invasive species.
- e. Make a comparison between the two groups of crayfish (invasive and local).

f. Determine if ecological plasticity is involved in crayfish invasions and whether invasive species need to alter their ecological optimums to successfully occupy new territories.

g. Using the results of the initial steps of the research, develop and test invasion scenarios under various conditions.

5. Contribution to Knowledge

The completion of the proposed thesis will deepen the understanding of selected crayfish species and offer new working models for predicting crayfish distribution. In turn, these models will help to formulate better sustainable conservation recommendations for native and endangered crayfish species, as well as identify optimal locations for establishing freshwater protected areas.

The experience gained and the methods and models developed for understanding spatial distribution patterns of a species using species distribution and global geospatial features databases could later be applied to other animal groups, thereby benefiting the conservation of species outside the Astacidae family.

Signature of the candidate: Olga N. Petko



Mentor's consent	
Professor, habilitated, Lucian Pârvulescu West University of Timișoara Str. Pestalozzi 16 A, 300115 Timișoara lucian.parvulescu@e-uvv.ro +4 0766 489 256	Agree with the individual research project proposed by the candidate Olga N. Petko Date: 16.09.2024 Signature: 