

Abstract

My Ph.D. thesis deals with various aspects of research of the crayfish plague pathogen, *Aphanomyces astaci* (Oomycetes). Crayfish plague decimates whole populations of European crayfish; therefore, it is one of the main problems for conservation of these species endangered from other reasons as well. The infection is transmitted by invasive North American crayfish, which are much less susceptible to the disease and are apparently original hosts of *A. astaci*.

The core of this thesis consists of six studies. Four of them have been already published, the remaining two are manuscripts under review. The main linking motive among the presented studies is not only the crayfish plague pathogen itself, but also the use, development and verification of the reliability of molecular detection methods of *A. astaci* and its genotypes.

This core of the thesis is further divided into two parts. The first one contains four studies that deal with the distribution of *A. astaci* in North American crayfish populations in the Czech Republic (**Chapter 1**) and Hungary (**Chapter 2**), and factors influencing this distribution. Two North American crayfish species can be found in the wild in these countries, the spiny-cheek crayfish (*Orconectes limosus*) and the signal crayfish (*Pacifastacus leniusculus*). The first two chapters show that the prevalence of infection in North American crayfish populations varies and may be associated with population density and history, and habitat type. It seems that the spiny-cheek crayfish is more problematic as a carrier of *A. astaci* in the studied regions. Knowledge on the infection reservoirs is needed for efficient planning of conservational efforts. The first part of the thesis also shows that the prevalence of the parasite or at least its detectability by molecular methods may vary not only in space but also in time (**Chapter 3**). Finally, the results of the pathogen detection may be partly influenced by the used detection method as documented in **Chapter 4**. Therefore, it is necessary to interpret the results of the used molecular detection methods with caution and verify them using more approaches.

The second part of the thesis is dedicated to study of intraspecific diversity and phylogeny of *A. astaci*. **Chapter 5** documents that the spiny-cheek crayfish carries a novel *A. astaci* genotype. Comparison of genotypes from American crayfish and dying indigenous crayfish may assist uncovering sources of infection. **Chapter 6** brings a detailed phylogenetic study of the genus *Aphanomyces* based on the gene for ITS (internal transcribed spacers) of the ribosomal nuclear DNA. The study shows three clearly distinct lineages reflecting life strategies of oomycetes (plant parasites, animal parasites, and saprobionts). Furthermore, this study summarises most of the known ITS sequences of *Aphanomyces* spp. and provides a framework for further development of molecular detection methods for parasitic species.

As appendices to my thesis, I present additional three studies related to crayfish plague research, which were conducted during my study years. **Chapter 7** focuses on the recent crayfish plague outbreaks in Czechia. **Chapter 8** deals with the long-term coexistence of *A. astaci* and indigenous narrow-clawed crayfish (*Astacus leptodactylus*) in Turkey. And finally, in **chapter 9**, I describe diversity of oomycetes that can be found on crayfish and complicate isolation of *A. astaci*.