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Diverse crayfish plague: an animal disease or an invasive alien species?

Crayfish plague is known in Finland as a serious animal disease that has in many places destroyed our original crayfish species, the noble crayfish. In its own environment in North America, however, the crayfish plague is a harmless oomycete, *Aphanomyces astaci*, a water mould that grows hyphae in the shell of crayfish, and very little is known about its incidence or effects on crayfish populations. The crayfish plague agent came to Europe by accident in the mid-1800s, most likely with imported host animals. European crayfish species could not effectively prevent hyphal growth and usually die within a few weeks of exposure. The water mould was capable of effective spreading among crayfish populations that were healthy at the time, and wide-spread mortality became known as crayfish plague. The water mould was not identified as the cause of crayfish plague until half a century later.

Signal crayfish, which was not susceptible to the disease, was imported from North America to replace the destroyed crayfish populations. However, signal crayfish carry the crayfish plague agent as a parasite in their shell, infecting noble crayfish with the disease. The crayfish plague agent carried by signal crayfish, which is of genotype Ps1, differs genetically from the pathogen that was originally found in Europe, which was of genotype As. Three other genotypes have been identified thus far which, to some extent, appear typical for their host species. They have different characteristics, and the difference between the virulence of the original As genotype and the Ps1 genotype of signal crayfish is particularly clear.

Crayfish plague is included on the list of 100 of the world's worst invasive alien species on account of destroying large numbers of crayfish in Europe. For the same reason, it has been justifiably classified as a serious animal disease subject to immediate notification. The normal presence of crayfish plague in the shell of another imported invasive alien species – the signal crayfish – without causing a disease makes controlling crayfish plague and defining outbreaks complicated.