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Crayfish plague detection: new techniques tested

Crayfish plague, spread by invasive North American crayfish, is currently devastating native European populations. However, while the disease is commonly diagnosed on the basis of diseased animals, free-living infective spores can contaminate water bodies. In the first study to test detection techniques for this disease in natural waterways, researchers found that invasive signal crayfish release low levels of plague spores, allowing it to spread undetected.

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Native European crayfish are under threat from invasive North American crayfish that not only compete for food, but also carry a parasite, *Aphanomyces astaci,* which typically kills infected European crayfish within just a few weeks. This 'crayfish plague' has had a substantial impact on native populations and the most common native crayfish in Europe, noble crayfish (*Astacus astacus*), is now listed as vulnerable by the IUCN.

In this study, researchers investigated the techniques for detecting crayfish plague spores from the water itself rather than diseased animals. They used water samples from Finland, Norway and Sweden and studied five areas, each including several individual sites, between 2010 and 2011. Twelve sites were studied in total.

The water bodies studied were: a Finnish crayfish farm where signal crayfish (*Pacifastacus leniusculus,* the most common invasive crayfish) are produced commercially for food, lakes in Finland, Norway and Sweden that are known to contain invasive signal crayfish populations and, finally, a river in Finland in which the local population of noble crayfish have suffered an outbreak of crayfish plague. The researchers detected the disease in both samples of the water and in signal crayfish.

The water samples, between 5 and 100 litres each, were filtered using filtration methods which can sample large amounts of water to capture even low concentrations of plague spores. The filtered particles were then tested for the presence of plague spores using DNA techniques.

The results showed that the levels of infection ranged from 70% to 87% in the populations of signal crayfish. The number of water samples that tested positive for crayfish plague spores ranged from 17% to 92% for signal crayfish areas. However, spores were detected in all water samples from the Finnish river in which the epidemic of crayfish plague had occurred and numbers of spores in this area were 43 times higher than the average of the other sites.

Importantly, the researchers showed that there were typically low numbers of spores in signal crayfish areas, often less than one spore per litre of water. This is worrying because although concentrations are low, they still represent a significant risk to noble crayfish. This suggests that water bodies should be monitored for early signs of crayfish plague rather than the animals themselves. This is possible using filtration techniques, say the researchers. However, large quantities of water will need to be filtered to stand a good chance of detection.

Overall, this study provides a method that can be effectively used in monitoring, risk assessments and to improve conservation management. For example, this method can be used to evaluate habitats before reintroducing native crayfish or prior to moving commercial stock to prevent more widespread transmission of the disease.