

Crayfish plague



Wetlands supporting
groups of susceptible
animals

Wildlife ✓
Aquaculture ✓
Humans ✗



Synonyms: Crayfish aphanomyiasis, Kraftpest, Krebspest, la peste

KEY FACTS

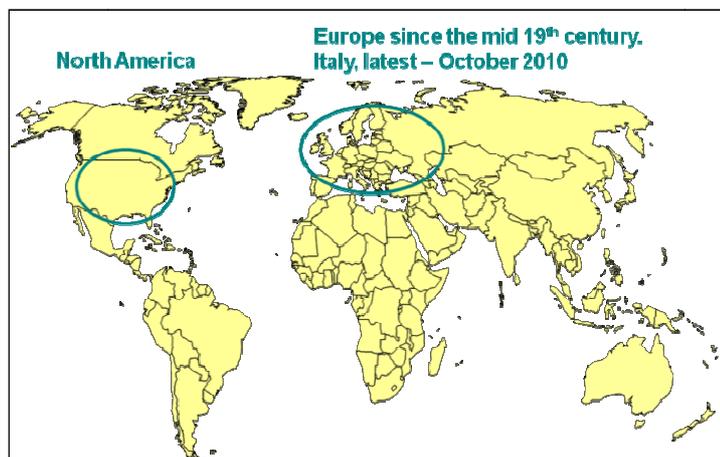
What is Crayfish Plague? Crayfish plague is a disease caused by an oomycete (water mould) that affects wild and farmed freshwater crayfish. The disease can cause large scale mortality.

Causal agent The oomycete *Aphanomyces astaci*. This is a close relative of *A. invadans* which is a species associated with epizootic ulcerative syndrome (EUS).

Species affected All species of freshwater crayfish are currently considered susceptible to crayfish plague. The outcome of infection varies depending on species:

- All stages of European crayfish species are considered highly susceptible.
- Laboratory challenges have shown that Australian crayfish species are also highly susceptible.
- North American crayfish do not usually present with clinical disease when infected with *A. astaci*.

Geographic distribution The native range of *A. astaci* infection is throughout North America. Crayfish plague spread to Europe in the 19th century and is now considered widespread throughout this continent.



Geographic distribution of crayfish plague.

Environment *A. astaci* is an obligate parasite of freshwater crayfish and does not survive well for long periods without a host. Crayfish plague is therefore found in the same freshwater, aquatic environments as its host.

TRANSMISSION AND SPREAD

Vector(s) Anthropogenic activity is often the most important vector of *A. astaci* as the disease is often spread by the translocation of animals (crayfish, fish, etc.) and *via* the movement of contaminated water and equipment (*i.e.* ropes, nets, traps, boots, fishing gear).

How is the disease transmitted to animals?

Transmission of the disease is primarily *via* the motile zoospores of *A. astaci* which have been shown to actively swim towards crayfish. Zoospores are also spread *via* flowing water, infected crayfish and less commonly by migratory and/or translocated fish.

How does the disease spread between groups of animals?

Introductions of North American crayfish (directly into the wild or into fish farms, from which escapes occurred) are believed to have initially spread crayfish plague to Europe.

The disease is spread to naïve crayfish populations by:

- the expansion of invasive, plague-carrying crayfish (*e.g.* signal crayfish *Pacifastacus leniusculus*)
- accidental releases of North American crayfish
- transmission from infected native crayfish
- viable zoospores (in water, on fish skin, or on contaminated equipment).

Other wildlife (*e.g.* otter, mink and heron) that can spread Infected crayfish to uncontaminated water bodies.

How is the disease transmitted to humans?

A. astaci does not have any human health implications.

IDENTIFICATION AND RESPONSE

Field signs

When the infection first reaches a naïve population of highly susceptible crayfish species, high levels of mortality are usually observed within a short space of time.

Initial field signs of crayfish plague include:

- presence of a number of crayfish during daytime (they are normally nocturnal)
- crayfish in open water with unsteady, uncoordinated movements
- crayfish falling over and unable to right themselves
- weakened rapid tail escape response
- numerous dead or weak crayfish in water bodies and water courses at the time of initial outbreak.

Note that there is no other disease, or pollution effect, that can cause total mortality of crayfish but leave all other animals in the same water unharmed.

Clinical signs of crayfish plague are complicated. They depend on environmental conditions, number of zoospores and the density of susceptible crayfish in the area. Clinical signs can include:

- fungal growth on the soft parts of the shell
- brown or black spots on the carapace
- white necrotic musculature in the tail
- black lines on the soft shell underneath the tail
- blackening of most of the shell in chronically infected individuals
- death (within weeks in susceptible species).

Recommended action if suspected

Contact and seek assistance from appropriate animal health professionals. Crayfish plague is a notifiable disease and must be reported to local and national authorities and the OIE.

If crayfish plague is suspected take note of simple observations such as:

- abnormal behaviour of crayfish
- date and time of observed outbreaks

- species of crayfish affected and estimate of mortalities
- pattern of mortality (small number of crayfish dying every day, large number of crayfish dying at one time, *etc.*)
- any unusual events.

Guidance should be sought before collecting any samples.

Diagnosis

A confirmation of crayfish plague can be attained by molecular diagnostic tests (PCR, DNA sequencing). Isolation, confirmed by PCR and sequence analysis or bioassay, can be attempted. Note that isolation is only successful before or within 12 hours of the death of infected crayfish.

PREVENTION AND CONTROL IN WETLANDS

Environment

There is presently no practical way of eradicating crayfish plague or infected crayfish from a large or complex wetland system, although chemical eradication has proved an effective control mechanism in some smaller, closed water-bodies. Usually, the only effective way of preventing further spread and maintenance of crayfish plague is to control the spread of North American carrier crayfish. Emphasis should be placed on measures preventing future introductions of non-native or infected crayfish to unaffected water-bodies.

North American crayfish have been used in various European countries to replace the lost stocks of native crayfish. This is *not* recommended as restocking with North American crayfish can further the spread of *A. astaci*. Given the high reproductive rates and the tendency of several North American crayfish species to colonise new habitats, restocking with North American crayfish species would also largely prevent the re-establishment of native crayfish species.

Aquaculture

As above, actions should be directed at preventing the introduction of crayfish plague, as subsequent control can be very difficult.

- Movement of **water** or any **equipment** from affected to unaffected watersheds should be avoided or undertaken with disinfection precautions.
- Sodium hypochlorite and iodophores should be used to **disinfect equipment** and equipment should be dried thoroughly (>24 hours).

If a **new crayfish farm** for a highly susceptible species is being planned, investigate whether North American crayfish species are:

- in the **vicinity** of the planned site; or
- present **upstream** (if North American crayfish are present, it is highly likely that susceptible farmed crayfish will eventually become infected).

On an **established crayfish farm** (containing highly susceptible species), the following recommendations should be followed to avoid the introduction of *A. astaci* onto the site:

- Prevent movements of potentially infected live or dead crayfish.
- Prevent movements of potentially contaminated water, equipment or any other item that might carry *A. astaci* from an infected to an uninfected site.
- If fish transfers are to be undertaken, these must not come from streams or other waters that harbour potentially infected crayfish.
- Do not bring North American crayfish onto the site.

- Do not use fish obtained from unknown freshwater sources, sources where North American crayfish may be present, or from sources where a current outbreak of crayfish plague may be taking place.
- Do not use fish as bait or feed for crayfish, unless they have been subject to a temperature treatment that will kill *A. astaci*.
- Disinfect any equipment that is brought onto the site.
- Follow general biosecurity measures (*e.g.* controlled access to premises, disinfection of boots, investigation of mortalities if they occur).
- Conduct a risk analysis when making decisions to introduce live animals (crayfish, fish); introduce live animals only from sources known to be free of crayfish plague.

Wildlife

Contact between wildlife and aquaculture facilities should be minimised wherever possible.

Humans

Humans should make sure that they follow the guidelines described above to ensure that they do not move infectious agents or non-native crayfish to previously uninfected areas.

IMPORTANCE

Effect on wildlife

The spread of crayfish plague in Europe has resulted in the reduction of native European crayfish species. In the 125 years that crayfish plague has been recognised in Europe, no evidence of resistant populations of European crayfish has been found.

Although *A. astaci* does not directly affect biota other than the crayfish, the reduction of native crayfish species may indirectly affect the ecology of a wetland system.

Effect on aquaculture and fisheries

Large losses to fish farmers and fishermen through mortalities of crayfish.

Effect on humans

The agent causing crayfish plague has no direct human health implications.

Economic importance

Crayfish plague has caused significant financial damages to those who run crayfish farms and others who rely on catching in the natural water bodies for income.

FURTHER INFORMATION

Useful publications and websites

- ☐ World Organisation of Animal Health (OIE). **Chapter 2.2.01: Crayfish plague.** Manual of diagnostic tests for aquatic animals. http://www.oie.int/fileadmin/Home/eng/Health_standards/aahm/2010/2.2.01_CRAYFISH.pdf [Accessed March 2012].
- ☐ European Network On Invasive Alien Species (NOBANIS). **Invasive alien species fact sheet – *Aphanomyces astaci*.** http://www.nobanis.org/files/factsheets/aphanomyces_astaci.pdf [Accessed March 2012].
- ☐ Australian Government, Department of Agriculture, Fishery and Forestry. **Diseases of crustaceans; fungal diseases – crayfish plague.** <http://www.scribd.com/doc/59272549/Crayfish-Plague>. [Accessed March 2012].
- ☐ Food and Agriculture Organization (FAO) Fisheries technical paper. **Asia diagnostic guide to aquatic animal diseases.** <http://www.fao.org/docrep/005/y1679e/y1679e00.HTM> [Accessed March 2012].
- ☐ **Aquatic animal disease significant to Asia-Pacific; fungal diseases – crayfish plague.** <http://library.enaca.org/Health/FieldGuide/html/cp001cra.htm> [Accessed March 2012].

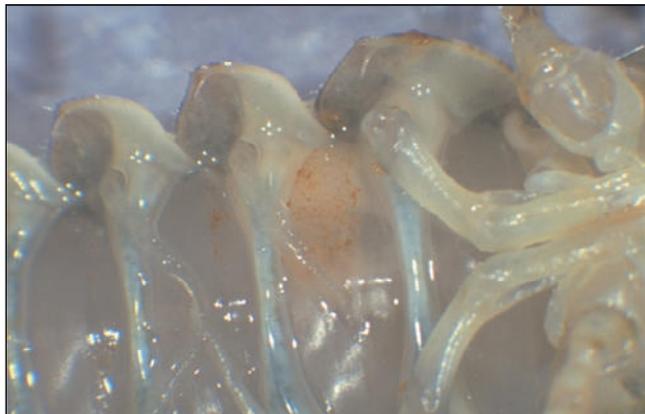
Contacts

- ☒ OIE reference laboratories and collaborating centres for diseases of amphibians, crustaceans, fish and molluscs: http://www.oie.int/fileadmin/Home/eng/Health_standards/aahm/2010/3_LIST_OF_LABS.pdf

Photos



Fresh microscopic mount of a piece of infected exoskeleton showing fungal spores (D. Alderman, UK & FAO).



Segment with brown markings shows signs of typical infection from fungus. (D. Alderman, UK & FAO).