



# Furunculosis

Also known as infection with *Aeromonas salmonicida* subsp. *salmonicida*  
From *Aquatic animal diseases significant to Australia: identification field guide*, 5th edition

Figure 1 Furunculosis in Atlantic salmon (*Salmo salar*)



Note: Large furuncle (boil) on side of fish.  
Source: T Håstein

Figure 2 Atlantic salmon (*Salmo salar*) with furunculosis boil exposed below the surface of the skin



Note: Furuncle has been cut away to show underlying necrotic tissue.  
Source: T Håstein

## Signs of disease

Important: Animals with this disease may show one or more of these signs, but the pathogen may still be present in the absence of any signs.

Disease signs at the farm, tank or pond level are:

- sudden death, perhaps with slight exophthalmos (popeye)
- often no clinical signs in young fish with peracute form of the disease
- death within days of initial clinical signs of disease in growing fish with acute furunculosis
- high mortality
- lethargic swimming or swimming just below the surface
- loss of appetite
- respiratory distress and jumping from the water immediately before an outbreak.

Gross pathological signs are:

- furuncles (boils) involving skin and/or muscle, progressing to crater lesions (usually restricted to the subacute or chronic phase in adult salmon)
- haemorrhages on the skin, mouth and fin bases (mainly of paired fins)
- darkening of body colour and pale gills
- bloody discharge from nares and/or vent
- exophthalmos (popeye)
- haemorrhages in muscle and internal organs
- enlarged spleen and focal necrosis of the liver
- stomach filled with mucus, blood and sloughed epithelial cells
- congested intestine
- death without any clinical signs other than darkening of the skin (occurs only in peracute infections in juvenile salmon).

Microscopic pathological signs are:

- fusion of gill lamellae, with necrosis of the epithelium
- eosinophilic inflammatory changes in gills
- bacterial colonies in many tissues
- sloughing of renal tubular cells into the renal tubular lumen
- sloughing of intestinal epithelial cells into the intestinal lumen.

## Disease agent

Furunculosis is caused by infection with the bacterium *Aeromonas salmonicida* subsp. *salmonicida*, a member of the family *Enterobacteriaceae*. The bacterium is intracellular and so may avoid some host immune defences after infection. During infection, the bacterium produces extracellular toxins that may play a significant role in the pathogenesis of the disease. There are four other subspecies of *A. salmonicida*; these 'atypical' strains are considered to cause a different disease syndrome, infection with *Aeromonas salmonicida*—atypical strains, which is also discussed in this guide.

## Host range

All salmonids and eels are believed to be susceptible to *A. salmonicida* subsp. *salmonicida*. Species known to be susceptible are listed in Table 1. The bacterium has also been isolated from sea lice infecting lesions on fish and can be spread by piscivorous birds.

**Table 1 Species known to be susceptible to *Aeromonas salmonicida* subsp. *salmonicida***

Common name	Scientific name
Amago salmon <sup>a</sup>	<i>Oncorhynchus rhodurus</i>
American eel <sup>a</sup>	<i>Anguilla rostrata</i>
Arctic char	<i>Salvelinus alpinus</i>
Atlantic cod <sup>a</sup>	<i>Gadus morhua</i>
Atlantic salmon <sup>a</sup>	<i>Salmo salar</i>
Atlantic wolfish <sup>a</sup>	<i>Anarhichas lupus</i>
Ayu	<i>Plecoglossus altivelis</i>
Black sea salmon	<i>Salmo labrax</i>
Brook trout <sup>a</sup>	<i>Salvelinus fontinalis</i>
Brown trout <sup>a</sup>	<i>Salmo trutta</i>
Bull trout	<i>Salvelinus confluentus</i>
Bullhead	<i>Cottus gobio</i>
Chinook salmon	<i>Oncorhynchus tshawytscha</i>
Chum salmon	<i>Oncorhynchus keta</i>
Cisco	<i>Coregonus artedii</i>
Coho salmon	<i>Oncorhynchus kisutch</i>
Common shiner	<i>Luxilus cornutus</i>
Cutthroat trout	<i>Oncorhynchus clarkii</i>
Danube salmon	<i>Hucho hucho</i>
Eels	<i>Anguillidae</i> all species
European eel	<i>Anguilla anguilla</i>
Galaxiids	<i>Galaxiidae</i> all species
Gila trout	<i>Oncorhynchus gilae</i>
Gilt-head sea bream	<i>Sparus aurata</i>
Golden trout	<i>Oncorhynchus aguabonita</i>
Grayling	<i>Thymallus thymallus</i>

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Common name	Scientific name
Hybrid (rainbow trout × coho salmon)	<i>Oncorhynchus mykiss</i> × <i>O. kisutch</i>
Japanese eel	<i>Anguilla japonica</i>
Lake trout	<i>Salvelinus namaycush</i>
Lake whitefish	<i>Coregonus clupeaformis</i>
Masu salmon	<i>Oncorhynchus masou</i>
Mountain whitefish	<i>Prosopium williamsoni</i>
Pacific halibut <sup>a</sup>	<i>Hippoglossus stenolepis</i>
Pacific salmon <sup>a</sup>	<i>Oncorhynchus</i> spp.
Pike	<i>Esox lucius</i>
Pike perch	<i>Sander lucioperca</i>
Pink salmon <sup>a</sup>	<i>Oncorhynchus gorbuscha</i>
Rainbow trout <sup>a</sup>	<i>Oncorhynchus mykiss</i>
Salmonids (all presumed susceptible) <sup>a</sup>	<i>Salmonidae</i> all species
Sea lamprey <sup>a</sup>	<i>Petromyzon marinus</i>
Shortfin eel	<i>Anguilla australis</i>
Sockeye salmon <sup>a</sup>	<i>Oncorhynchus nerka</i>
Splake (lake trout × brook trout)	<i>Salvelinus namaycush</i> × <i>S. fontinalis</i>
Turbot	<i>Scophthalmus maximus</i>
Whitefish (Muksun)	<i>Coregonus muksun</i>
Whitefish (Peled)	<i>Coregonus peled</i>
Whitespotted char	<i>Salvelinus leucomaenis</i>
Wrasses	<i>Labridae</i> all species

<sup>a</sup> Naturally susceptible. Note: Other species likely to be susceptible or shown to be experimentally susceptible.

**Table 2 Non-fish carriers**

Common name	Scientific name
Salmon louse A ( <i>Lepeophtheirus</i> spp.)	<i>Lepeophtheirus salmonis</i>
Salmon louse B ( <i>Caligus</i> spp.)	<i>Caligus elongatus</i>
Piscivorous birds	Various genera and species

## Presence in Australia

Exotic disease—not recorded in Australia.

The strain of *Aeromonas* causing furunculosis in salmonids overseas (typical strain) is not present in Australia. However, atypical strains are present (see Infection with *Aeromonas salmonicida*—atypical strains).

### Map 1 Presence of furunculosis, by jurisdiction



## Epidemiology

- Furunculosis is highly contagious and affects fish of all ages.
- The disease is one of the most commercially significant salmonid diseases, occurring in freshwater and marine salmonid aquaculture in all countries except Australia and New Zealand.
- Overseas, this disease must be controlled on farms by medication or vaccination.
- Outbreaks typically occur at temperatures above 10°C. However outbreaks can occur in very young fish and at temperatures as low as 2 to 4°C. Disease may be precipitated by endogenous stressors (such as smoltification or spawning) and exogenous stressors (such as temperature fluctuations or poor water quality).
- Australia's relatively warm water temperatures may favour the establishment of *A. salmonicida* subsp. *salmonicida*.
- Rainbow trout are relatively resistant to the disease, but are still considered susceptible.
- Horizontal transmission occurs via the water column, but also through direct fish-to-fish contact and animal vectors (birds and invertebrates such as sea lice).
- *Aeromonas salmonicida* subsp. *salmonicida* has been detected on the surface of fertilised eggs. Surface decontamination using iodine is effective in preventing vertical transmission (passage of infection from parent to offspring).
- *Aeromonas salmonicida* subsp. *salmonicida* can survive for months in some environments.

- Non-salmonids may become infected by ingesting tissue of infected salmonids. Transmission to non-salmonids can occur where fish caught for feed are taken from waters near an outbreak.
- Susceptibility to the disease increases with damaged mucous and skin, such as occurs when fish are handled with nets.
- Fish surviving disease outbreaks are recognised as carriers of the disease. Carriers may continue to infect the remaining population without themselves showing any outward signs of infection. Stress may precipitate disease in subclinical carriers.

### Differential diagnosis

The list of [similar diseases](#) in the next section refers only to the diseases covered by this field guide. Gross pathological signs may also be representative of diseases not included in this guide. Do not rely on gross signs to provide a definitive diagnosis. Use them as a tool to help identify the listed diseases that most closely account for the observed signs.

### Similar diseases

Epizootic haematopoietic necrosis (EHN), infection with *Aeromonas salmonicida*—atypical strains and infectious haematopoietic necrosis (IHN).

### Sample collection

Only trained personnel should collect samples. Using only gross pathological signs to differentiate between diseases is not reliable, and some aquatic animal disease agents pose a risk to humans. If you are not appropriately trained, phone your state or territory hotline number and report your observations. If you have to collect samples, the agency taking your call will advise you on the appropriate course of action. Local or district fisheries or veterinary authorities may also advise on sampling.

### Emergency disease hotline

See something you think is this disease? Report it. Even if you're not sure.

Call the Emergency Animal Disease Watch Hotline on **1800 675 888**. They will refer you to the right state or territory agency.

### Further reading

CEFAS International Database on Aquatic Animal Diseases [Furunculosis](#)

Department of Agriculture, Water and the Environment [AQUAVETPLAN disease strategy manual: Furunculosis](#)

These hyperlinks were correct at the time of publication.

## Contact details

Emergency Animal Disease Watch Hotline 1800 675 888

Email [AAH@agriculture.gov.au](mailto:AAH@agriculture.gov.au)

Website [agriculture.gov.au/pests-diseases-weeds/aquatic](http://agriculture.gov.au/pests-diseases-weeds/aquatic)

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