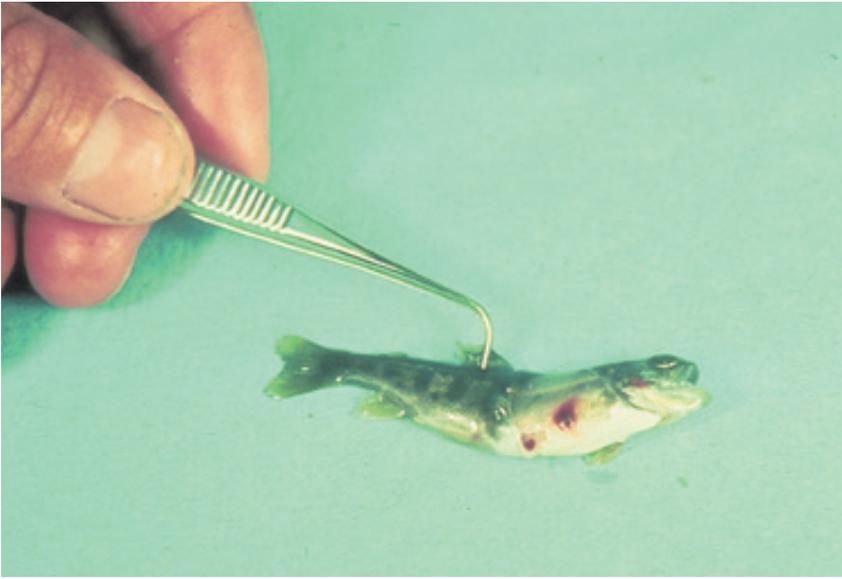


## Infectious haematopoietic necrosis (IHN)

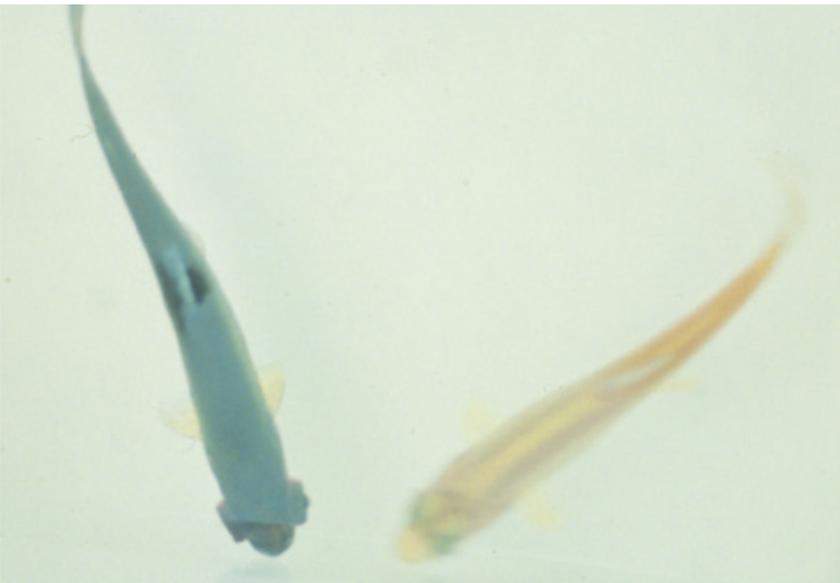
Exotic disease

Chinook salmon fry (*Oncorhynchus tshawytscha*) with IHN; note characteristic darkening from the tail region, swollen stomach and haemorrhaging at base of the fins



Source: J Fryer

Rainbow trout fry (*Oncorhynchus mykiss*) with (left) and without (right) IHN; note the darker colour of the infected fish



Source: G Kurath

## Signs of disease

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

The disease signs described below are seen only in young salmonids; infection in adults is subclinical.

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

- mass mortality
- lethargic swimming with intermittent bouts of frenzied, abnormal activity (spiral swimming and flashing).

### **Gross pathological signs are:**

- numerous yolk sac haemorrhages in the fry of rainbow trout and salmon
- darkening of the skin and pale gills
- haemorrhages on the abdomen and around the pupil of the eye
- exophthalmos (popeye) and a swollen abdomen
- trailing white faecal cast
- bleeding at the base of the fins
- stomach empty of food but distended with a gelatinous substance
- pale internal organs
- petechial (pinpoint) haemorrhages in the fatty tissue and muscle surrounding the organs and stomach wall
- spinal deformities in surviving fish.

### **Microscopic pathological signs are:**

- necrosis of eosinophilic granular cells in the intestinal wall
- degenerative necrosis in haematopoietic tissues.

## Disease agent

IHN is caused by infectious haematopoietic necrosis virus (IHNV), a virus in the family *Rhabdoviridae* and genus *Novirhabdovirus* that is related to viral haemorrhagic septicaemia virus.

## Host range

Species known to be susceptible are listed below.

Common name <sup>a</sup>	Scientific name
Amago salmon <sup>a</sup>	<i>Oncorhynchus rhodurus</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>
Ayu	<i>Plecoglossus altivelis</i>
Brook trout <sup>a</sup>	<i>Salvelinus fontinalis</i>
Brown trout <sup>a</sup>	<i>Salmo trutta</i>
Chinook salmon <sup>a</sup>	<i>Oncorhynchus tshawytscha</i>
Chum salmon <sup>a</sup>	<i>Oncorhynchus keta</i>
Coho salmon <sup>a</sup>	<i>Oncorhynchus kisutch</i>
Cutthroat trout <sup>a</sup>	<i>Oncorhynchus clarkii</i>
Gilt-head sea bream	<i>Sparus aurata</i>
Grayling	<i>Thymallus thymallus</i>
Lake trout	<i>Salvelinus namaycush</i>
Masu salmon <sup>a</sup>	<i>Oncorhynchus masou</i>
Pacific herring	<i>Clupea pallasii</i>
Pacific salmon <sup>a</sup>	<i>Oncorhynchus</i> spp.
Pike	<i>Esox lucius</i>
Pile perch	<i>Damalichthys vacca</i>
Pink salmon <sup>a</sup>	<i>Oncorhynchus gorbuscha</i>
Rainbow trout <sup>a</sup>	<i>Oncorhynchus mykiss</i>
Shiner perch	<i>Cymatogaster aggregata</i>
Sockeye salmon <sup>a</sup>	<i>Oncorhynchus nerka</i>
Tubesnout	<i>Aulorhynchus flavidus</i>
Turbot	<i>Scophthalmus maximus</i>
Whitespotted char	<i>Salvelinus leucomaenis</i>
White sturgeon	<i>Acipenser transmontanus</i>

<sup>a</sup> Naturally susceptible (other species have been shown to be experimentally susceptible).

Non-fish carriers include the species listed below.

Common name	Scientific name
Gill lice	<i>Salminicola</i> spp.
Leeches	<i>Piscicola</i> spp.
Mayfly	<i>Callibaetis</i> spp.

## Presence in Australia

**EXOTIC DISEASE**—not present in Australia.

## Epidemiology

- IHN is typically found in young, farmed trout and salmon fry or fingerlings, and in adults during or just following spawning.
- Mass mortalities can occur in hatcheries, typically with 100% of the population infected and mortality as great as 90%.
- Mortality also occurs in wild populations of Pacific salmon infected with IHNV, and survivors can be the source of infection of farmed stock.
- Susceptibility to infection varies between individuals of the same species and appears to be largely age dependent, with younger individuals being more susceptible.
- Fish that survive IHN are potential carriers of the virus for a period that depends on environmental conditions (e.g. temperature).
- The virus is shed into the water from infected fish through faeces, urine, spawning fluids and external mucous.
- Transmission is generally horizontal, with the virus entering fish through the gills and skin, although some blood-sucking parasites may serve as vectors.
- Virus can be transferred to new areas via the movement of infected fish or eggs, and by other sources such as contaminated equipment, water or birds.
- Outbreaks are most likely to occur around the time of spawning, with increased levels of virus released into the environment with spawning fluids.
- IHN is a cold-water disease. Clinical signs typically occur at temperatures between 8 °C and 15 °C. Outbreaks rarely occur once water temperatures reach more than 15 °C.
- It is believed that the spread of IHNV from the west coast of North America to Asia and Europe has been principally via the shipment of infected fish and eggs, suggesting some degree of vertical transmission. Although the risk of such egg-associated transmission is significantly reduced by the common practice of egg surface disinfection, it is not eliminated.

## Differential diagnosis

The list of similar diseases below refers only to the diseases covered by this field guide. Gross pathological signs may be representative of a number of diseases not included in this guide, which therefore should not be used to provide a definitive diagnosis, but rather as a tool to help identify the listed diseases that most closely account for the gross signs.

## Similar diseases

Enteric red mouth disease, epizootic haematopoietic necrosis, furunculosis, infectious pancreatic necrosis, infectious salmon anaemia, viral haemorrhagic septicaemia, whirling disease

## Sample collection

Due to the uncertainty in differentiating diseases using only gross pathological signs, and because some aquatic animal disease agents might pose a risk to humans, only trained personnel should collect samples. You should phone your state or territory hotline number and report your observations if you are not appropriately trained. If samples have to be collected, the agency taking your call will provide advice on the appropriate course of action. Local or district fisheries or veterinary authorities may also provide advice regarding sampling.

### **Emergency disease hotline**

The national disease hotline number is 1800 675 888. This number will put you in contact with the appropriate state or territory agency.

### **Further reading**

The accepted procedures for a conclusive diagnosis of IHN are summarised in the World Organisation for Animal Health Manual of diagnostic tests for aquatic animals 2011, available at [www.oie.int/en/international-standard-setting/aquatic-manual/access-online](http://www.oie.int/en/international-standard-setting/aquatic-manual/access-online).

Further information can be found on the Centre for Environment, Fisheries and Aquaculture Science (Cefas) International Database on Aquatic Animal Disease (IDAAD) website at [www.cefas.defra.gov.uk/idaad/disocclist.aspx](http://www.cefas.defra.gov.uk/idaad/disocclist.aspx).

These hyperlinks were correct and functioning at the time of publication.