

## Yellowhead disease

(Also known as infection with yellowhead virus)

Yellowhead disease in giant black tiger prawn (*Penaeus monodon*); note yellow heads of infected prawns on the left. Prawns on the right are normal.



Source: DV Lightner

### 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.

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

- aggregation of moribund prawns near the surface at pond edges
- abnormally high feeding rate of infected 5–15-gram prawns for several days and then cessation of feeding
- mass mortality (up to 100%) 2–4 days after cessation of feeding.

#### Gross pathological signs are:

- yellowing of the cephalothorax and general bleaching of the body
- white, yellow or brown gills
- exceptionally soft digestive gland compared with normal
- yellow, swollen digestive gland, making the head appear yellow.

#### Microscopic pathological signs are:

- moderate to large numbers of deeply basophilic, evenly stained, spherical, cytoplasmic inclusions within tissues of ectodermal and mesodermal origin.

Disease agent

The causative agent of yellowhead disease is yellowhead virus, a corona-like RNA virus in the genus *okavirus*, family *Roniviridae* and order *Nidovirales*. Yellowhead virus (genotype 1) is one of six known genotypes in the yellowhead complex of viruses and is the only known agent of yellowhead disease. Gill-associated virus is designated as genotype 2 (covered separately within the field guide). Four other known genotypes in the complex (genotypes 3–6) occur commonly in black tiger prawn (*Penaeus monodon*) in East Africa, Asia and Australia, and are rarely or never associated with disease.

Host range

Yellowhead disease is highly infectious for most known species of cultivated penaeid prawns. Natural and/or experimental infections have been reported to occur in the following species of penaeid and palaemonid shrimps, prawns and krill.

| Common name                     | Scientific name                  |
|---------------------------------|----------------------------------|
| Giant freshwater prawn <b>a</b> | <i>Macrobrachium rosenbergii</i> |
| Barred estuarine shrimp         | <i>Palaemon serrifer</i>         |
| Black tiger prawn <b>a</b>      | <i>Penaeus monodon</i>           |
| Brown tiger prawn               | <i>Penaeus esculentus</i>        |
| Greentail prawn                 | <i>Metapenaeus bennettiae</i>    |
| Kuruma prawn <b>a</b>           | <i>Metapenaeus japonicus</i>     |
| Mysid shrimp <b>a</b>           | <i>Palaemon styliferus</i>       |
| Northern brown shrimp           | <i>Farfantepenaeus aztecus</i>   |
| Northern pink shrimp            | <i>Farfantepenaeus duorarum</i>  |
| Northern white shrimp <b>a</b>  | <i>Litopenaeus setiferus</i>     |
| Pacific blue shrimp             | <i>Litopenaeus stylirostris</i>  |
| Pacific white shrimp            | <i>Litopenaeus vannamei</i>      |
| Paste prawn <b>a</b>            | <i>Ascetes</i> spp.              |
| Red endeavour prawn <b>a</b>    | <i>Metapenaeus ensis</i>         |
| Sunda river prawn               | <i>Macrobrachium sintangene</i>  |
| White banana prawn <b>a</b>     | <i>Fenneropenaeus merguensis</i> |

**a** Naturally susceptible (other species have been shown to be experimentally susceptible)

There are variations in the susceptibility of different species to disease. Laboratory trials have shown that yellowhead virus can cause high mortality in black tiger prawns, Pacific white shrimp, Pacific blue shrimp, northern brown shrimp, northern pink shrimp, Sunda river prawns, mysid shrimp and barred estuarine shrimp. Until proven otherwise, it should be assumed that most penaeid prawns worldwide are susceptible to infection with yellowhead virus.

Presence in Australia

EXOTIC DISEASE—not present in Australia.

## Epidemiology

- The tiger prawn suffers acute epidemics, with mortality reaching 100% within 3–5 days of the first appearance of the gross signs.
- Yellowhead virus can be transmitted horizontally by injection, ingestion of infected tissue, immersion in membrane-filtered tissue extracts or cohabitation with infected shrimp. Transmission has also been demonstrated by injection of extracts of paste prawns (*Ascaris* sp.) collected from infected ponds.
- Vertical transmission occurs from both male and female parents, possibly via surface infection or contamination of tissue surrounding fertilised eggs.
- Tiger prawns younger than 15 days postlarvae are resistant to yellowhead virus in comparison with those from postlarval days 20–25 to subadult, which are highly susceptible.
- Mortalities usually occur during the early to late juvenile stages in rearing ponds.
- There appear to be at least four genotypes of virus in the yellowhead virus group. Genotype 1 is the causative agent of yellowhead disease.

## 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

Necrotising hepatopancreatitis, Taura syndrome, white spot disease

## Sample collection

Due to the uncertainty associated with 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 state or territory 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.

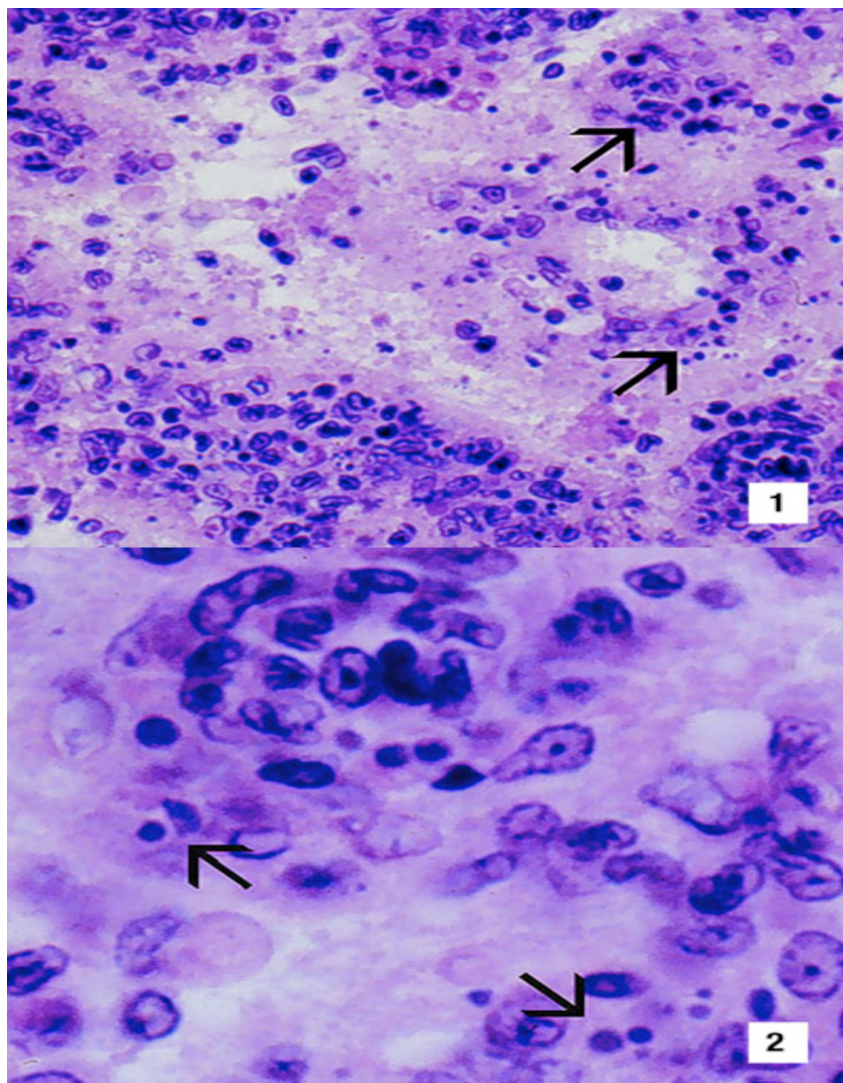
## Further reading

The accepted procedures for a conclusive diagnosis of yellowhead disease 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).

This hyperlink was correct and functioning at the time of publication.

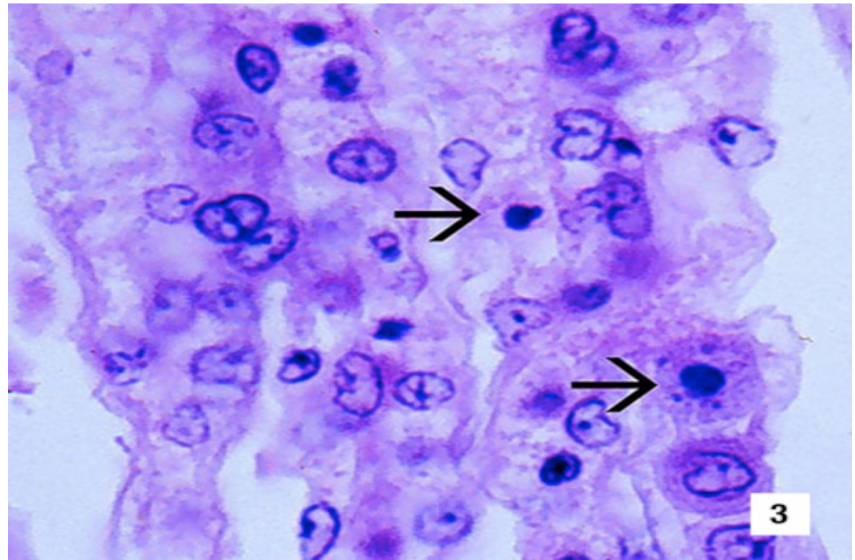
## Further images

(1 & 2) Histological section of the lymphoid organ (LO) of a juvenile giant black tiger prawn (*Penaeus monodon*) with severe acute yellowhead disease at low (525×, Figure 1) and high (1700×, Figure 2) magnification. A generalised, diffuse necrosis of LO cells is shown. Affected cells display pyknotic and karyorrhectic nuclei. Single or multiple perinuclear inclusion bodies, ranging from pale to darkly basophilic, are apparent in some affected cells (arrows). This marked necrosis in acute yellowhead disease distinguishes it from infection due to Taura syndrome virus, which produces similar cytopathology in other target tissues, but not in the LO.



Source: DV Lightner

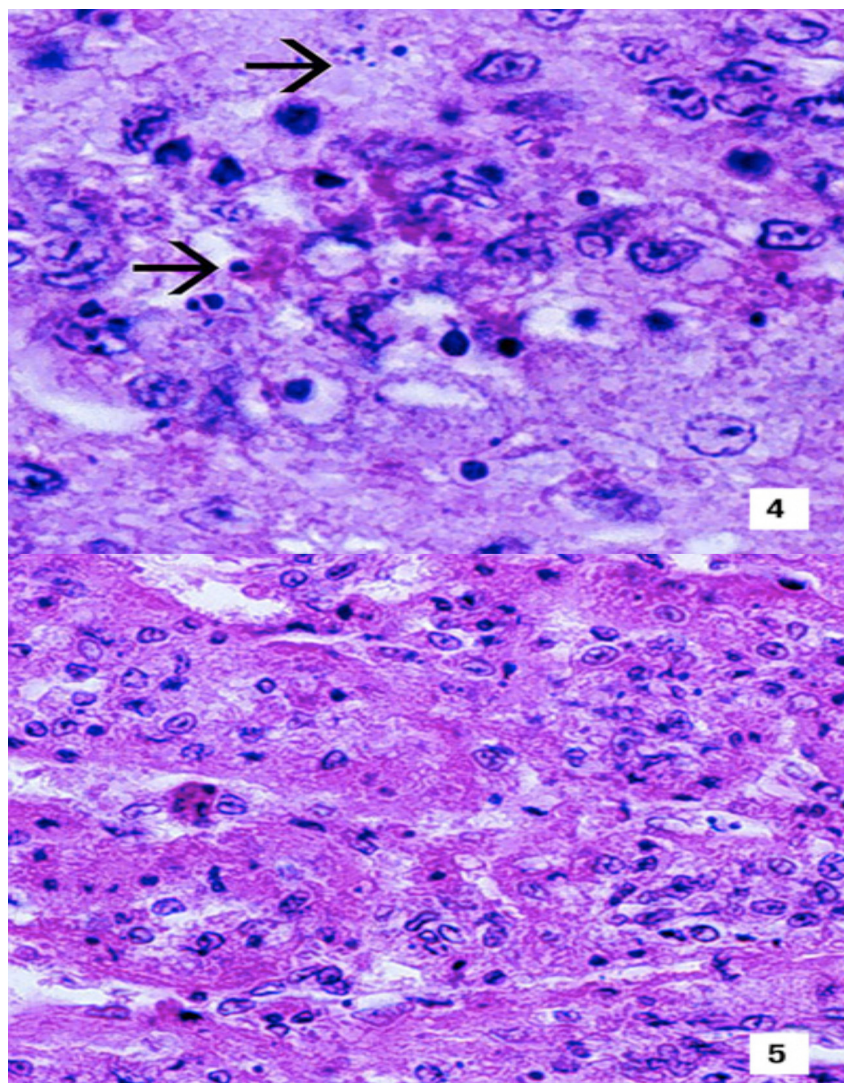
(3) Histological section (1000×) of the gills from a juvenile black tiger prawn (*Penaeus monodon*) with yellowhead disease. A generalised, diffuse necrosis of cells in the gill lamellae is shown, and affected cells display pyknotic and karyorrhectic nuclei (arrows). A few large, conspicuous, generally spherical cells with basophilic cytoplasm are present in the section. These cells may be immature haemocytes, released prematurely in response to a yellowhead virus-induced haemocytopaenia.



Source: DV Lightner

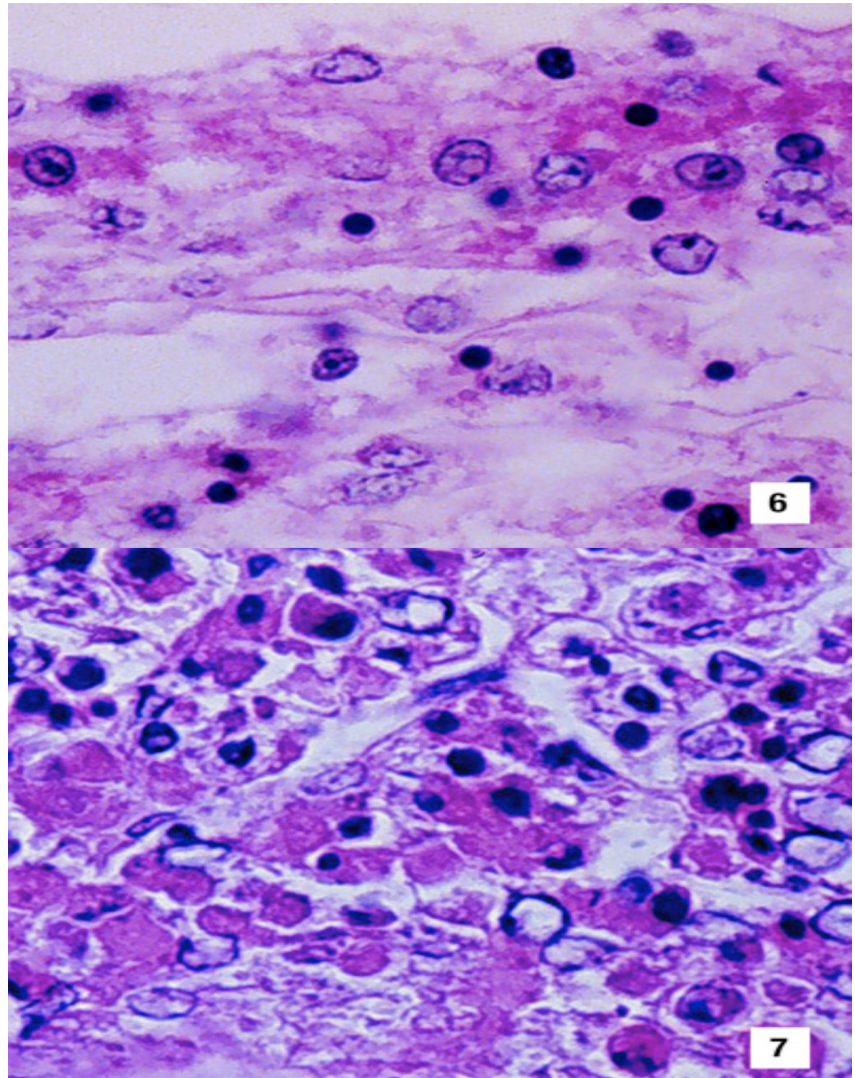


(4 & 5) Histological sections of the lymphoid organ (LO) of juvenile Pacific white shrimp (*Litopenaeus vannamei*) (Figure 4, 1000×) and northern brown shrimp (*Farfantepenaeus aztecus*) (Figure 5, 525×) experimentally infected with yellowhead virus. Severe (grade 3–4) diffuse to multifocal necrosis, characterised by cells with increased eosinophilic cytoplasm, pyknotic or karyorrhectic nuclei (arrows) and pale to densely basophilic perinuclear inclusions, is present.



Source: DV Lightner

(6 & 7) Histological sections (1000×) of the gills of a juvenile northern pink shrimp (*Farfantepenaeus duorarum*) (Figure 6) and the oesophagus of a Pacific white shrimp (*Litopenaeus vannamei*) (Figure 7) experimentally infected with yellowhead virus. Severe (grade 4) diffuse to multifocal necrosis, characterised by cells with increased eosinophilic cytoplasm, pyknotic or karyorrhectic nuclei, and pale to densely basophilic perinuclear inclusions, is present.



Source: DV Lightner