

## Diseases of crustaceans

### Viral diseases—**Infectious hypodermal and haematopoietic necrosis**

#### Signs of disease

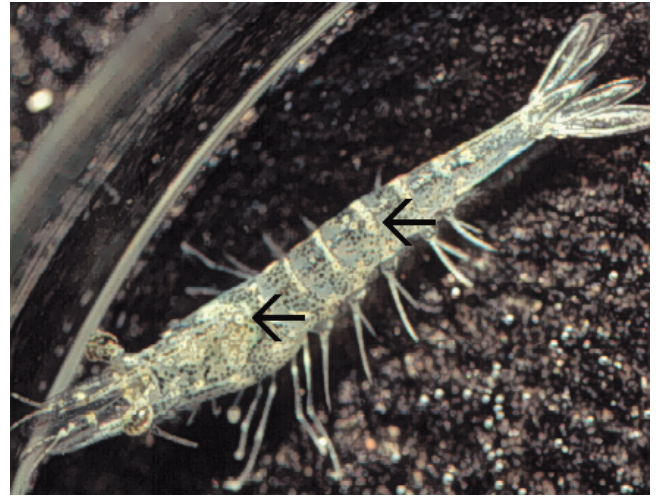
Important: animals with disease may show one or more of the signs below, but disease may still be present in the absence of any signs.

#### Disease signs at the tank and pond level

- reduced food consumption
- sometimes prawns repeatedly float slowly to water surface, roll over and then sink to bottom
- increasing morbidity/mortality

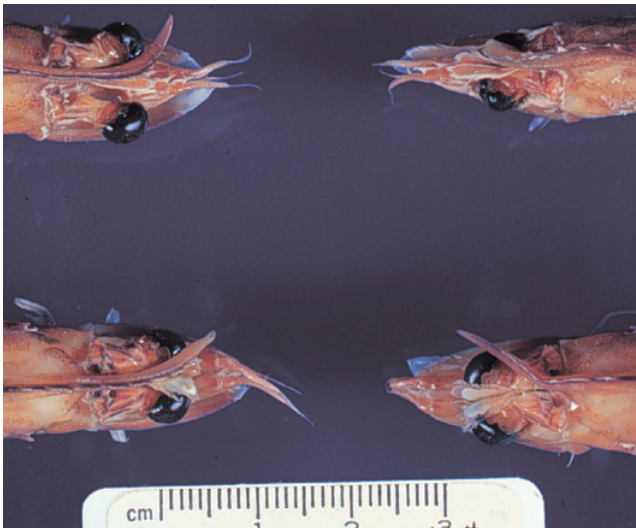
#### Clinical signs of disease in an infected animal

- reduced and irregular growth in juveniles and subadults (runt-deformity syndrome)
- white to buff mottling of shell, especially at the junction of shell plates of the abdomen
- giant black tiger prawn (*Penaeus monodon*) may appear blue
- deformed rostrums grow to one side



**Infectious hypodermal and haematopoietic necrosis in juvenile blue shrimp (*Penaeus stylirostrus*). Note white to buff lesions under shell (arrows)**

Source: DV Lightner



**IHHN in juvenile blue shrimp. Note classic rostrum deformation**

Source: DV Lightner



**IHHN in juvenile blue shrimp. Note deformed tail fan and sixth abdominal segment**

Source: DV Lightner



Australian Government  
Department of Agriculture,  
Fisheries and Forestry

Sourced from AGDAFF–NACA (2007) *Aquatic Animal Diseases Significant to Asia-Pacific: Identification Field Guide*. Australian Government Department of Agriculture, Fisheries and Forestry, Canberra.

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## Infectious hypodermal and haematopoietic necrosis continued

### Disease agent

Infectious hypodermal and haematopoietic necrosis (IHHN), or runt-deformity syndrome, is caused by a parvovirus.

### Host range

Crustaceans known to be susceptible to IHHN:

|                          |                                   |
|--------------------------|-----------------------------------|
| blue shrimp*             | ( <i>Penaeus stylirostris</i> )   |
| giant black tiger prawn* | ( <i>Penaeus monodon</i> )        |
| grooved tiger prawn*     | ( <i>Penaeus semisulcatus</i> )   |
| Kuruma prawn*            | ( <i>Penaeus japonicus</i> )      |
| Pacific white shrimp*    | ( <i>Penaeus vannamei</i> )       |
| southern white shrimp*   | ( <i>Penaeus schmitti</i> )       |
| western white shrimp*    | ( <i>Penaeus occidentalis</i> )   |
| yellow-leg shrimp*       | ( <i>Penaeus californiensis</i> ) |
| Chinese white shrimp     | ( <i>Penaeus chinensis</i> )      |
| Gulf banana prawn        | ( <i>Penaeus merguensis</i> )     |
| Indian banana prawn      | ( <i>Penaeus indicus</i> )        |
| northern brown shrimp    | ( <i>Penaeus aztecus</i> )        |
| northern pink shrimp     | ( <i>Penaeus duorarum</i> )       |
| northern white shrimp    | ( <i>Penaeus setiferus</i> )      |

### Presence in Asia–Pacific

IHHN virus has been officially reported from Australia, Burma (Myanmar), Indonesia, Iran, Malaysia, Thailand and Vietnam.



### Epidemiology

- Gross signs of disease in an infected animal (ie stunted or deformed rostrum) appear at about 35 days of postlarval development (PL-35). Earlier larval stages do not present gross signs but may still be carriers.
- The typical gross signs referred to as runt-deformity syndrome may be observed in juveniles and subadults.
- Infected adults seldom show mortalities or signs of the disease.
- IHHN virus-resistant prawns and early life stages carry the virus with them, transferring it to more susceptible species and life stages.

\* naturally susceptible (other species have been shown to be experimentally susceptible)



## Infectious hypodermal and haematopoietic necrosis continued

- This is a chronic condition that suppresses the prawns' defence system, allowing infection by other, more serious disease agents.
- IHHN virus in infected shrimp tissues remains infectious after five years of storage at  $-20^{\circ}\text{C}$  and after 10 years at  $-80^{\circ}\text{C}$ .
- Transmission is horizontal via water and ingestion, and can also be vertical, from parent to progeny.

### Differential diagnosis

The differential diagnostic table and the list of similar diseases appearing at the bottom of each disease page refer only to the diseases covered by this field guide. Gross signs observed might well be representative of a wider range of diseases not included here. Therefore, these diagnostic aids should not be read as a guide to a definitive diagnosis, but rather as a tool to help identify the listed diseases that most closely account for the gross signs.

### Similar diseases

White spot disease, yellowhead disease

### Sample collection

Because of uncertainty in differentiating diseases using only gross signs, and because some aquatic animal disease agents might pose a risk to humans, you should not try to collect samples unless you have been trained. Instead, you should phone your national hotline number and report your observations. If samples have to be collected, the agency taking the call will advise you on what you need to do. Local or district fisheries/veterinary authorities could advise you on sampling.

### Emergency disease hotline

For your national emergency disease hotline number, see Whom to contact if you suspect a disease.

### Further reading

[http://www.oie.int/aac/eng/cards/en\\_diseasecard.htm](http://www.oie.int/aac/eng/cards/en_diseasecard.htm)

The currently accepted procedures for a conclusive diagnosis of IHHN are summarised at [http://www.oie.int/eng/normes/fmanual/A\\_00053.htm](http://www.oie.int/eng/normes/fmanual/A_00053.htm)

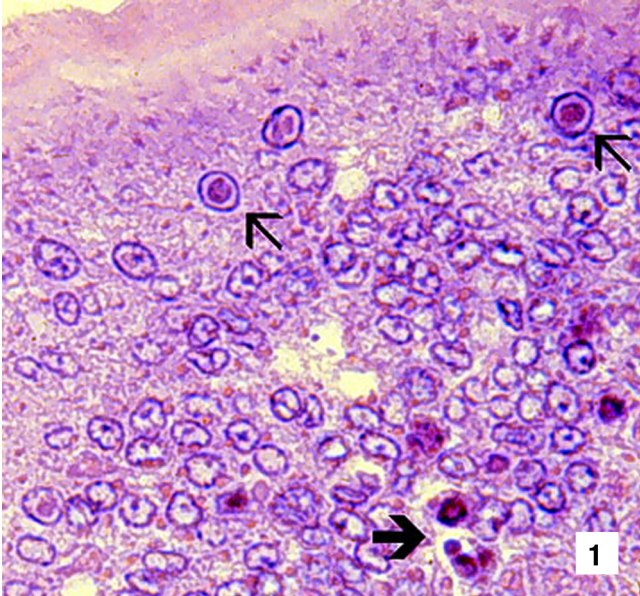
These hyperlinks were correct and functioning at the time of publication.





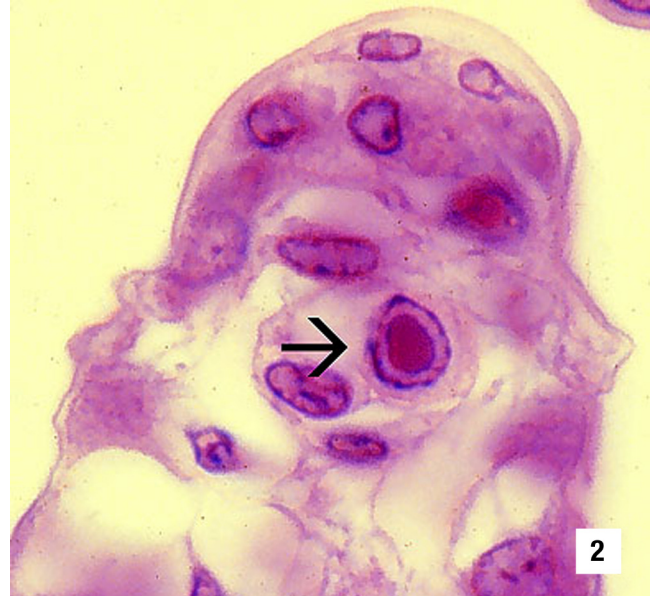
## Infectious hypodermal and haematopoietic necrosis continued

### Histological images



Low magnification (830x) photomicrograph (LM) of an H&E stained section of a juvenile blue shrimp (*Penaeus stylirostris*) with severe acute infectious hypodermal and haematopoietic necrosis (IHHN) disease. The section is through the cuticular epithelium and subcuticular connective tissues just dorsal and posterior to the heart. Numerous necrotic cells with pyknotic nuclei or with pathognomonic eosinophilic intranuclear inclusion bodies (Cowdry type A) are present (arrows)

Source: DV Lightner



High magnification (1800x) LM of gills showing eosinophilic intranuclear inclusions (Cowdry type A inclusions or CAIs) that are pathognomonic for IHHNV infections

Source: DV Lightner



A high magnification (1800x) LM of a gill lamella showing three adjacent cells with diagnostic IHHN CAIs in their hypertrophied nuclei

Source: DV Lightner



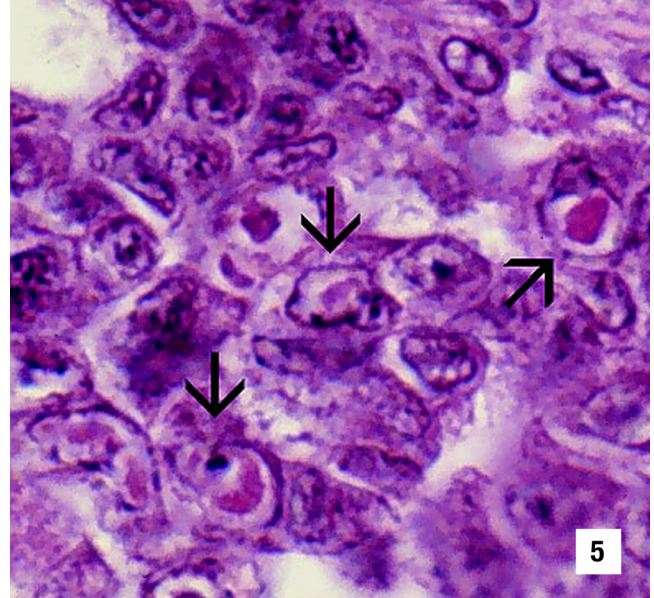
## Infectious hypodermal and haematopoietic necrosis continued

### Histological images



Another IHHNV CAI in the nucleus of a gill epithelial cell showing a chromatin process within the inclusion body (1800x)

Source: DV Lightner



Section through a haematopoietic nodule showing several cells with IHHNV CAIs (1800x)

Source: DV Lightner



Mid-sagittal section of the ventral nerve cord of a juvenile white shrimp (*Penaeus vannamei*) with runt-deformity syndrome. Note that CAIs take the shape of the host cell nucleus. Thus, in the nerve cord they often are elliptical and appear slightly different from CAIs in other tissues (1800x)

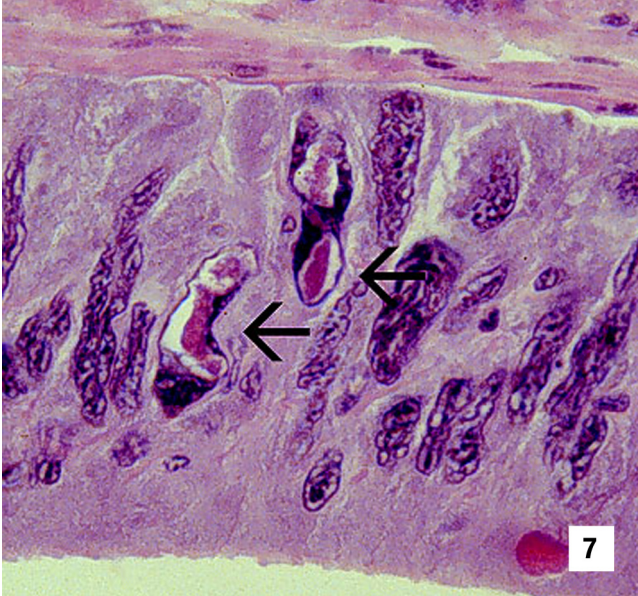
Source: DV Lightner





## Infectious hypodermal and haematopoietic necrosis continued

### Histological images



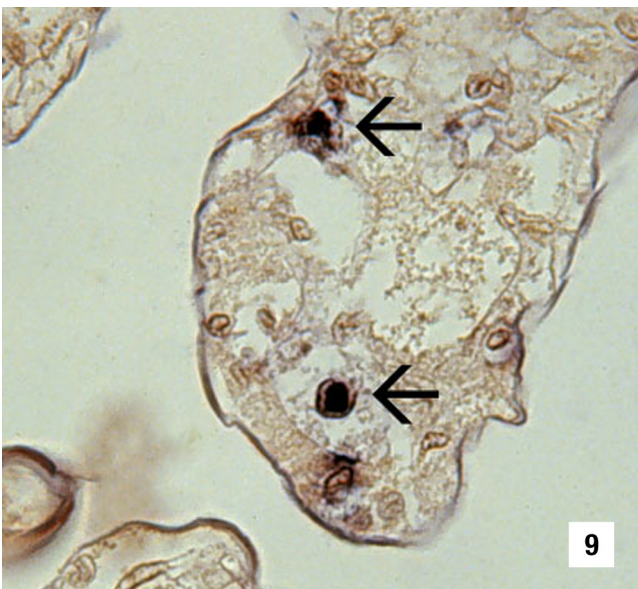
Section of the vas deferens of an adult *P. vannamei* with IHHN. Bizarrely shaped CAIs (which take the shape of the nuclei of this tissue) are illustrated (700x)

Source: DV Lightner



Section of the gills of a juvenile blue shrimp with G4 IHHN. While necrotic cells with pyknotic nuclei are numerous, no diagnostic CAIs are apparent (700x)

Source: DV Lightner



A section of gills has reacted with a DIG-labelled DNA gene probe for IHHNV. Several IHHNV-infected cell nuclei have reacted with the probe. Viral DNA is stained dark blue to black by the detection reaction for DIG-labelled probe. DIG-labelled probe and Bismarck Brown (700x)

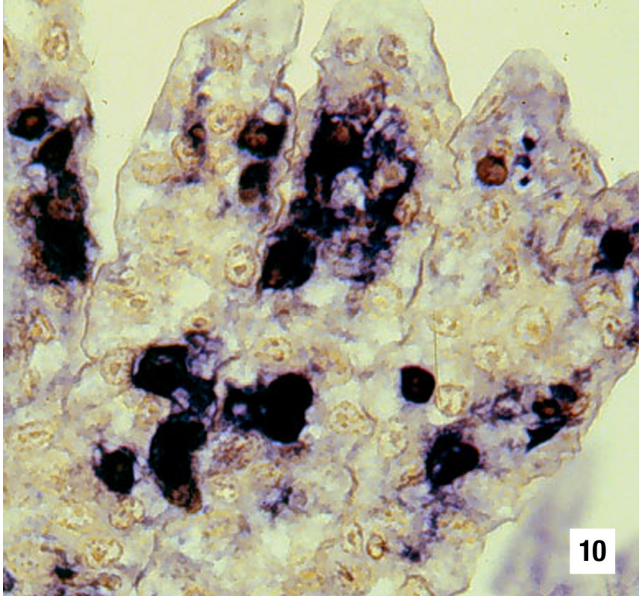
Source: DV Lightner





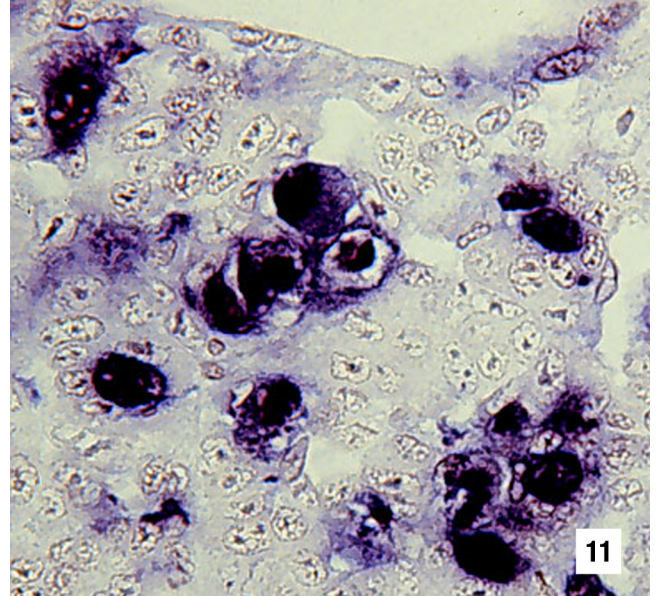
## Infectious hypodermal and haematopoietic necrosis continued

### Histological images



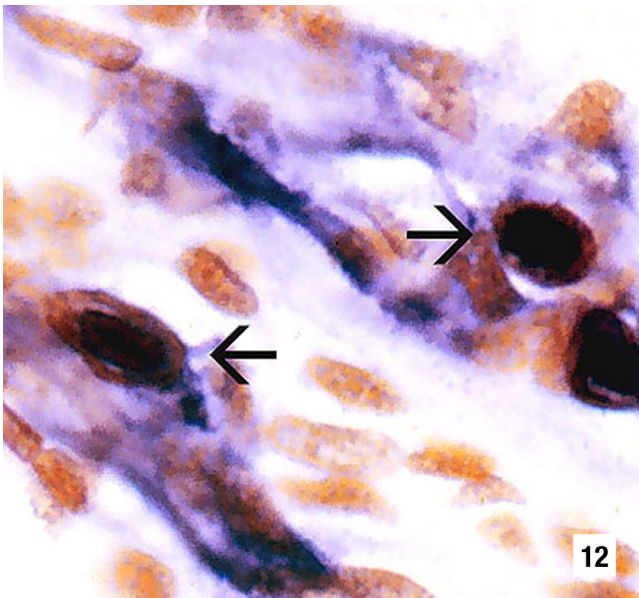
**Section of gills from a juvenile *P. stylirostris* with G4 IHHN. Probe positive IHHNV-infected cells are abundant. DIG-labelled probe and Bismarck Brown (700x)**

Source: DV Lightner



**Section of haematopoietic tissue from a juvenile blue shrimp with IHHN. Probe-positive cells are abundant. DIG-labelled probe and Bismarck Brown (700x)**

Source: DV Lightner



**Mid-sagittal section from a juvenile white shrimp with runt-deformity syndrome. The probe has reacted with several CAIs and with cellular debris or haemolymph with a high content of IHHNV. DIG-labelled probe and Bismarck Brown (600x)**

Source: DV Lightner

