



**NSW DEPARTMENT OF PRIMARY INDUSTRIES**

# **Oyster Disease**

## **Emergency Response Package**

**New South Wales**

**2004**

# CONTENTS

- ❖ **Emergency Contacts: phone & fax numbers** **1**
  
- ❖ **Guidelines:** **2**
  - Specimen packaging regulations
  - Formalin handling, hazards & precautions
  
- ❖ **Protocols:** **3**
  - Oyster mortality report forms
  - NSW DPI Fish-kill protocol
  
- ❖ **Aquatic Animal Disease Identification Guide** **4**
  - **Oyster Section.**
  - Australian Department of Agriculture, Fisheries and Forestry.*
  
- ❖ **Reporting Oyster Disease Outbreaks: Brochure & Poster** **5**



NSW DEPARTMENT OF  
PRIMARY INDUSTRIES

# Contacts

## NSW Department of Primary Industries, Fisheries Management Branch.

24 hour service

1800 043 536

### Office of Conservation Regional Offices

Northern Region ☎ 02 6686 2018 **Fax:** 02 6645 1326

Central (including Sydney) ☎ 02 4916 3931 **Fax:** 02 4982 1107

Southern Region ☎ 02 4441 8969 **Fax:** 02 4441 8961

### DPI (Fisheries) Aquatic Animal Health Unit

#### ❖ **Veterinary Service (Matthew Landos) 02 6626 1261**

**Fax:** 02 6626 1276 **Mobile:** 0428 698 112

Email: [matthew.landos@agric.nsw.gov.au](mailto:matthew.landos@agric.nsw.gov.au)

Postal address: Regional Veterinary Laboratories, Bruxner Hwy, Wollongbar  
NSW 2477.

#### ❖ **Biosecurity Manager (Jane Francis) 02 4982 1232**

**Fax:** 02 4981 1107 (for oyster mortality forms) **Mobile:** 0407 272 947

General enquiries:

Email: [jane.francis@fisheries.nsw.gov.au](mailto:jane.francis@fisheries.nsw.gov.au)

Postal Address: Port Stephens Fisheries Centre, Private Bag 1,  
Nelson Bay NSW 2315.

### NSW Department of Environment and Conservation

Pollution Line 24 hr service 13 15 55

(You will be transferred to the appropriate technical officer)

website: [www.dec.nsw.gov.au](http://www.dec.nsw.gov.au)

**For general information please visit: [www.dpi.nsw.gov.au](http://www.dpi.nsw.gov.au)**

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## NSW Department of Primary Industries

### Coastal Fisheries Office Contacts

	<u>Phone</u>	<u>Fax</u>
Batemans Bay	02 4772 4032	4472 7542
Central Coast (The Entrance)	02 4332 2147	4333 7164
Clarence (Maclean)	02 6645 0500	6645 3545
Far South Coast (Eden)	02 6496 1377	6496 1905
Hastings (Port Macquarie)	02 6581 4084	6581 4083
Hawksbury (Brooklyn)	02 9985 7256	9985 8357
Manning (Taree)	02 6552 6799	6552 4909
Merimbula	02 6495 2347	6495 2355
Montague (Narooma)	02 4476 2072	4476 1517
Newcastle	02 4927 6548	4927 6561
Port Stephens	02 4982 1311	4982 1014
Richmond (Ballina)	02 6686 2018	6686 8907
Shoalhaven	02 4441 8969	4441 8961
Sydney South	02 9529 6021	9529 6246
Tweed	02 5523 1822	5523 1835
Wallis Lake (Tuncurry)	02 6554 6078	6554 9552

## **IATA REGULATIONS FOR PACKAGING DIAGNOSTIC SPECIMENS**

On 1 May, 1993, the International Air Transport (IATA) Regulations were introduced Australia wide. These Regulations specify the way goods, including specimens, should be packaged for air transport. Even though you may consign goods by road/rail/post, they may spend some time on an aircraft before delivery and therefore should comply with IATA Regulations.

Almost all specimens which you send for laboratory testing are classed by IATA as "DIAGNOSTIC SPECIMENS" and must be packed in accordance with **IATA Packaging Instruction 650**.

This packing instruction may appear draconian but in most cases can be readily implemented. It simply enforces what most submitters do already.

IATA Packaging Instruction 650 can be summarised as follows:

- Leak-proof container (eg screw top plastic jar)
- Absorbent material (eg cotton wool, newspaper) wrapped around primary container(s) in sufficient quantity to absorb liquid contents
- Leak-proof secondary container (eg sealed plastic bag, larger sealable container)
- Ice bricks (not required for specimens in formalin) and tight packaging (to stop movement of specimens) between secondary and outer container. Ice bricks must be leak proof
- In a separate plastic bag included a list of contents, ie Specimen Advice
- Seal outer container, eg hard frame esky or 100 mm labmailer. (Minimum dimension of outer container must exceed 100 mm) or cardboard box.
- Label package with both Consignee's and Consignor's full address.
- Consignment note must state:  
  
Diagnostic specimens – NOT restricted, packed in compliance with IATA Packing Instruction 650

This is a guide only. Consult your courier to obtain their current requirement June 2003.

## **Packaging and labeling requirements for fish kill specimens.**

1. Label all containers with collection date, farm/site location, tank number/ part of river or lake, and contents (eg organs of one mullet) contact phone number of collector.
2. Fill out all the boxes on the history form and attach fish kill form.
3. It takes around 24 hours for the fixative to penetrate and preserve the specimen. Formalin will only penetrate to a depth of around 1 cm, so it is important to keep the size of the tissue specimens under that 1 cm thickness wherever possible.
4. Following the IATA 650 packaging guidelines presented below to prepare the specimens for the courier. Place the history forms in a zip-lock bag with the samples. If tissue has had a minimum of 24 hours since it was placed in the fixative then this tissue can be submitted wrapped in paper towel that has been dampened with the 10% formalin preservative solution and then placed in a sealed plastic screw top jar and triplicate packaging. Couriers do not like to carry around liquid formalin in case of leakage. Formalin is highly corrosive and potentially carcinogenic so minimising the amount of liquid formalin you send is helpful.
5. Send to:  
NSW Fisheries  
Aquatic Animal Health Unit  
Regional Veterinary Laboratory  
Bruxner Highway  
Wollongbar NSW 2477  
Labeled on consignment note and clearly on outside of package  
"Diagnostic Specimens packed in accordance with IATA 650"

HAZARDOUS ACCORDING TO WORKSAFE AUSTRALIA CRITERIA.

CAS RN: None                      NIOSH: None                      HAZCHEM: None  
UN NO: None                      DG Class: NONE                  Packing Group: None  
Poisons Schedule: S6              EPG: NONE                      IERG: NONE

CHEMWATCH HAZARD RATINGS



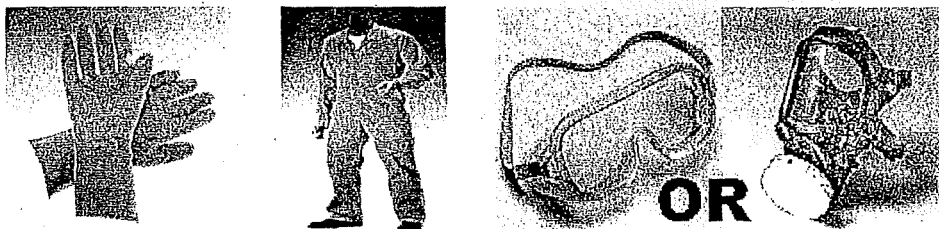
R Codes: R20/21/22 R36/37/38 R40(3) R43  
          R33 R42  
S Codes: S23 S25 S36 S51

- R Statements:
- Harmful by inhalation, in contact with skin and if swallowed
  - Irritating to eyes, respiratory system and skin.
  - Limited evidence of a carcinogenic effect.
  - May cause SENSITISATION by skin contact.
  - *Cumulative effects may result following exposure\*.*
  - *Possible respiratory sensitiser\*.*
  - *\*(limited evidence)*

- S Statements:
- Do not breathe gas/fumes/vapour/spray.
  - Avoid contact with eyes.
  - Wear suitable protective clothing.
  - Use only in well ventilated areas.



PERSONAL PROTECTIVE EQUIPMENT FOR INDUSTRIAL/COMMERCIAL ENVIRONMENTS



Issue Date: Fri 22-Dec-2000  
Print Date: Fri 23-May-2003

Copyright ChemWatch +613 9572 4700.

# FORMALIN SOLUTION

(ChemWatch name: FORMALDEHYDE AQUEOUS SOLUTION (10%))

ChemWatch Material Safety Data Sheet (REVIEW)

CHEMWATCH 62472

Issue Date: Fri 22-Dec-2000

CD 2003/2 Page 1 of 8

## IDENTIFICATION

### STATEMENT OF HAZARDOUS NATURE

HAZARDOUS ACCORDING TO WORKSAFE AUSTRALIA CRITERIA.

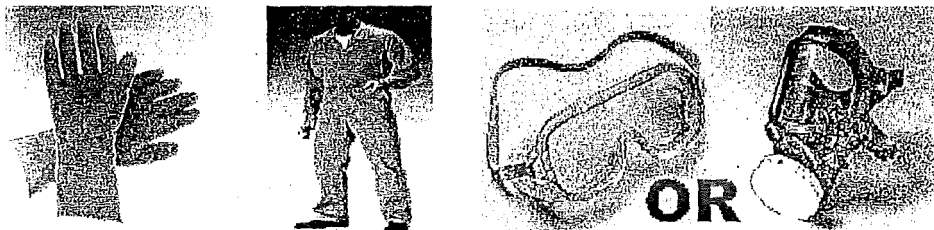
### SUPPLIER

Company:  
Vledvet Science P/L  
Address:  
20 Dalgleish St  
Thebarton  
SA, 5031  
AUS  
Telephone: (+61 8) 8222 3370  
Fax: (+61 8) 8222 3511

### CHEMWATCH HAZARD RATINGS



### PERSONAL PROTECTIVE EQUIPMENT FOR INDUSTRIAL/COMMERCIAL ENVIRONMENTS



Product Name: formalin solution

CAS RN No(s): None  
UN Number: None  
Packing Group: None  
Dangerous Goods Class: None  
Subsidiary Risk: None  
Hazchem Code: None  
Poisons Schedule Number: S6

continued...



# FORMALIN SOLUTION

(ChemWatch name: FORMALDEHYDE AQUEOUS SOLUTION (10%))

ChemWatch Material Safety Data Sheet (REVIEW)  
Issue Date: Fri 22-Dec-2000

CHEMWATCH 62472  
CD 2003/2 Page 2 of 8

## IDENTIFICATION ...

### USE

Used as disinfectant, germicide and fungicide.

## PHYSICAL DESCRIPTION/PROPERTIES

### APPEARANCE

Clear colourless liquid with pungent formaldehyde odour; mixes with water. Solution on standing may become cloudy if temperature is low; as at low temperatures a precipitate of trioxymethylene is formed. The formaldehyde vaporizes from solution and is flammable in air. Warming or heating solution increases formaldehyde generation.

Boiling Point (°C):	Not available.
Melting Point (°C):	Not available.
Vapour Pressure (kPa):	Not available.
Specific Gravity:	Not available
Flash Point (°C):	Not applicable
Lower Explosive Limit (%):	Not applicable
Upper Explosive Limit (%):	Not applicable
Solubility in Water (g/L):	Miscible

## INGREDIENTS

NAME	CAS RN	%
formaldehyde	50-00-0	10
stabiliser, as methanol	67-56-1	<2
water	7732-18-5	>88

## HEALTH HAZARD

### ACUTE HEALTH EFFECTS

#### SWALLOWED

Considered an unlikely route of entry in commercial/industrial environments  
The liquid is discomforting to the gastro-intestinal tract and may be harmful if swallowed  
Ingestion may cause abdominal pain, with vomiting, nausea, diarrhoea, anuria, dizziness.

#### EYE

The liquid is highly discomforting to the eyes and is capable of causing pain and severe conjunctivitis. Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated  
The vapour is discomforting to the eyes and may cause lachrymation (tears) and burning sensation

#### SKIN

The liquid is discomforting to the skin and is capable of causing skin sensitisation and allergic skin reactions which may lead to dermatitis  
Toxic effects may result from skin absorption

continued...

# FORMALIN SOLUTION

(ChemWatch name: FORMALDEHYDE AQUEOUS SOLUTION (10%))

ChemWatch Material Safety Data Sheet (REVIEW)

Issue Date: Fri 22-Dec-2000

CHEMWATCH 62472

CD 2003/2 Page 3 of 8

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## HEALTH HAZARD ...

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The material may accentuate any pre-existing skin condition  
Bare unprotected skin should not be exposed to this material

### INHALED

The vapour is highly discomforting to the upper respiratory tract and repeated exposure may cause sensitisation and/or allergic reactions

Inhalation hazard is increased at higher temperatures.

Respiratory sensitisation may result in allergic/asthma like responses; from coughing and minor breathing difficulties to bronchitis with wheezing, gasping. Sensitisation reactions may appear suddenly after repeated symptom free exposures

Inhalation of vapour may aggravate a pre-existing respiratory condition such as asthma, bronchitis, emphysema

### CHRONIC HEALTH EFFECTS

Principal routes of exposure are by accidental skin and eye contact and by inhalation of vapours especially at higher temperatures.

Prolonged or repeated skin contact may cause drying with cracking, irritation and possible dermatitis following.

Sensitisation may give severe responses to very low levels of exposure, i.e. hypersensitivity. Sensitised persons should not be allowed to work in situations where exposure may occur.

Minor but regular methanol exposures may effect the central nervous system, optic nerves and retinae. Symptoms may be delayed, with headache, fatigue, nausea, blurring of vision and double vision. Continued or severe exposures may cause damage to optic nerves, which may become severe with permanent visual impairment even blindness resulting.

**WARNING:** Methanol is only slowly eliminated from the body and should be regarded as a cumulative poison which cannot be made non-harmful [CCINFO]

### FIRST AID

#### SWALLOWED

Rinse mouth out with plenty of water.

If poisoning occurs, contact a doctor or Poisons Information Centre.

If swallowed do NOT induce vomiting.

If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.

Immediately give a glass of water.

#### EYE

If this product comes in contact with the eyes:

Immediately hold eyelids apart and flush the eye continuously with running water.

Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.

Continue flushing until advised to stop by the Poisons Information Centre or a doctor, or for at least 15 minutes.

Transport to hospital or doctor without delay.

Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

continued...

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(ChemWatch name: FORMALDEHYDE AQUEOUS SOLUTION (10%))

ChemWatch Material Safety Data Sheet (REVIEW)

Issue Date: Fri 22-Dec-2000

CHEMWATCH 62472

CD 2003/2 Page 4 of 8

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## HEALTH HAZARD ...

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### SKIN

If skin contact occurs:

Immediately remove all contaminated clothing, including footwear

Flush skin and hair with running water (and soap if available).

Seek medical attention in event of irritation.

### INHALED

If fumes or combustion products are inhaled remove from contaminated area.

Lay patient down. Keep warm and rested.

Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.

Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary.

Transport to hospital, or doctor.

### ADVICE TO DOCTOR

For acute or short-term repeated exposures to formaldehyde:

#### INGESTION:

Patients present early with severe corrosion of the gastro-intestinal tract and systemic effects.

Inflammation and ulceration may progress to strictures.

Severe acidosis results from rapid conversion of formaldehyde to formic acid.

Coma, hypotension, renal failure and apnoea complicate ingestion.

Decontaminate by dilution with milk or water containing ammonium acetate; vomiting should be induced. Follow with gastric lavage using a weak ammonia solution (converts formaldehyde to relatively inert pentamethylenetetramine)

Gastric lavage is warranted only in first 15 minutes following ingestion.

#### SKIN:

Formaldehyde can combine with epidermal protein to produce a hapten-protein couples capable of sensitising T-lymphocytes. Subsequent exposures cause a type IV hypersensitivity reaction (i.e allergic contact dermatitis). [Ellenhorn & Barceloux: Medical Toxicology]

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### PRECAUTIONS FOR USE

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### EXPOSURE STANDARDS

None assigned. Refer to individual constituents.

### ENGINEERING CONTROLS

Use in a well-ventilated area

Local exhaust ventilation usually required. If risk of overexposure exists, wear approved respirator. Correct fit is essential to obtain adequate protection.

Supplied-air type respirator may be required in special circumstances. Correct fit is essential to ensure adequate protection.

An approved self contained breathing apparatus (SCBA) may be required in some situations.

Provide adequate ventilation in warehouse or closed storage area. Air contaminants generated in the workplace possess varying "escape" velocities

continued...

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Issue Date: Fri 22-Dec-2000

CHEMWATCH 62472

CD 2003/2 Page 5 of 8

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## PRECAUTIONS FOR USE ...

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which, in turn, determine the "capture velocities" of fresh circulating air required to effectively remove the contaminant.

Type of Contaminant: solvent, vapours, degreasing etc., evaporating from tank (in still air).	Air Speed: 0.25-0.5 m/s (50-100 f/min.)
aerosols, fumes from pouring operations, intermittent container filling, low speed conveyer transfers, welding, spray drift, plating acid fumes, pickling (released at low velocity into zone of active generation)	0.5-1 m/s (100-200 f/min.)
direct spray, spray painting in shallow booths, drum filling, conveyer loading, crusher dusts, gas discharge (active generation into zone of rapid air motion)	1-2.5 m/s (200-500 f/min.)
grinding, abrasive blasting, tumbling, high speed wheel generated dusts (released at high initial velocity into zone of very high rapid air motion).	2.5-10 m/s (500-2000 f/min.)

Within each range the appropriate value depends on:

Lower end of the range	Upper end of the range
1: Room air currents minimal or favourable to capture	1: Disturbing room air currents
2: Contaminants of low toxicity or of nuisance value only.	2: Contaminants of high toxicity
3: Intermittent, low production.	3: High production, heavy use
4: Large hood or large air mass in motion	4: Small hood-local control only

Simple theory shows that air velocity falls rapidly with distance away from the opening of a simple extraction pipe. Velocity generally decreases with the square of distance from the extraction point (in simple cases). Therefore the air speed at the extraction point should be adjusted, accordingly, after reference to distance from the contaminating source. The air velocity at the extraction fan, for example, should be a minimum of 1-2 m/s (200-400 f/min) for extraction of solvents generated in a tank 2 meters distant from the extraction point. Other mechanical considerations, producing performance deficits within the extraction apparatus, make it essential that theoretical air velocities are multiplied by factors of 10 or more when extraction systems are installed or used.

## PERSONAL PROTECTION

### EYE

Safety glasses with side shields; or as required, Chemical goggles. Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

continued...

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(ChemWatch name: FORMALDEHYDE AQUEOUS SOLUTION (10%))

ChemWatch Material Safety Data Sheet (REVIEW)  
Issue Date: Fri 22-Dec-2000

CHEMWATCH 62472  
CD 2003/2 Page 6 of 8

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## PRECAUTIONS FOR USE ...

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### HANDS/FEET

Wear protective gloves, eg. PVC.

### OTHER

Overalls.  
Eyewash unit.

### RESPIRATOR

Respiratory protection is required when ANY "Worst Case" vapour-phase concentration is exceeded (see Computer Prediction in "Exposure Standards").

Protection Factor (Min) x ES	Half-Face Respirator	Full-Face Respirator
	BAX-AUS	-
	BAX-PAPR-AUS	-
50 x ES	-	BAX-AUS
	-	BAX-PAPR-AUS
100 x ES	-	BAX-2
	-	BAX-PAPR-2

^ - Full-face

The local concentration of material, quantity and conditions of use determine the type of personal protective equipment required. For further information consult site specific CHEMWATCH data (if available), or your Occupational Health and Safety Advisor.

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## SAFE HANDLING

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### STORAGE AND TRANSPORT

#### SUITABLE CONTAINER

Glass container  
Polyethylene or polypropylene container. Packing as recommended by manufacturer  
Check all containers are clearly labelled and free from leaks.

#### STORAGE INCOMPATIBILITY

Avoid storage with acids and strong oxidising agents.

#### STORAGE REQUIREMENTS

Store in original containers.  
Keep containers securely sealed.  
No smoking, naked lights or ignition sources.  
Store in a cool, dry, well-ventilated area.  
Store away from incompatible materials and foodstuff containers.  
Protect containers against physical damage and check regularly for leaks.  
Observe manufacturer's storing and handling recommendations.

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ChemWatch Material Safety Data Sheet (REVIEW)

Issue Date: Fri 22-Dec-2000

CHEMWATCH 62472

CD 2003/2 Page 7 of 8

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## SAFE HANDLING ...

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### TRANSPORTATION

No restrictions.

### SPILLS AND DISPOSAL

#### MINOR SPILLS

Remove all ignition sources.

Clean up all spills immediately.

Avoid breathing vapours and contact with skin and eyes.

Control personal contact by using protective equipment.

Contain and absorb spill with sand, earth, inert material or vermiculite.

Wipe up.

Place in a suitable labelled container for waste disposal.

#### MAJOR SPILLS

Clear area of personnel and move upwind.

Alert Fire Brigade and tell them location and nature of hazard.

Wear breathing apparatus plus protective gloves.

Prevent, by any means available, spillage from entering drains or water courses.

No smoking, naked lights or ignition sources.

Increase ventilation.

Stop leak if safe to do so.

Water spray or fog may be used to disperse / absorb vapour.

Contain or absorb spill with sand, earth or vermiculite.

Collect recoverable product into labelled containers for recycling.

Collect solid residues and seal in labelled drums for disposal.

Wash area and prevent runoff into drains.

After clean up operations, decontaminate and launder all protective clothing and equipment before storing and re-using.

If contamination of drains or waterways occurs, advise emergency services.

#### DISPOSAL

Recycle wherever possible or consult manufacturer for recycling options.

Consult State Land Waste Management Authority for disposal.

Bury residue in an authorised landfill.

Recycle containers if possible, or dispose of in an authorised landfill.

### FIRE FIGHTERS' REPORT

#### EXTINGUISHING MEDIA

There is no restriction on the type of extinguisher which may be used.

#### FIRE FIGHTING

Alert Fire Brigade and tell them location and nature of hazard.

Wear breathing apparatus plus protective gloves.

Prevent, by any means available, spillage from entering drains or water courses.

Use water delivered as a fine spray to control fire and cool adjacent area.

DO NOT approach containers suspected to be hot.

Cool fire exposed containers with water spray from a protected location.

If safe to do so, remove containers from path of fire.

Equipment should be thoroughly decontaminated after use.

continued...

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CHEMWATCH 62472

CD 2003/2 Page 8 of 8

## SAFE HANDLING ...

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### FIRE/EXPLOSION HAZARD

Heat produces toxic and flammable vapours.

The material is not readily combustible under normal conditions.

However, it will breakdown under fire conditions and the organic component may burn.

Not considered to be a significant fire risk.

Heat may cause expansion or decomposition with violent rupture of containers.

Decomposes on heating and may produce toxic fumes of carbon monoxide (CO).

May emit acrid smoke.

Other decomposition products include carbon dioxide (CO<sub>2</sub>) and aldehydes

### FIRE INCOMPATIBILITY

Avoid contamination with strong oxidising agents as ignition may result

### HAZCHEM

None

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## CONTACT POINT

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### COMPANY CONTACT

(+61 8) 8222 3370

### AUSTRALIAN POISONS INFORMATION CENTRE

24 HOUR SERVICE: 13 11 26

POLICE, FIRE BRIGADE OR AMBULANCE: 000

### NEW ZEALAND POISONS INFORMATION CENTRE

24 HOUR SERVICE: 0800 764 766

NZ EMERGENCY SERVICES: 111

End of Report

Issue Date: Fri 22-Dec-2000

Print Date: Fri 23-May-2003

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## **WHY REPORT OYSTER MORTALITY?**

Oyster mortality is often due to predation or environmental effects such as heat or freshwater input and may not be the result of disease. It is important however, that **all** unusual mortality is reported as the actual cause of the mortality may not be obvious and may be masked by other events. Oysters have very few ways of demonstrating sickness and empty shell may be the only sign of ongoing disease.

A number of oyster diseases pose a significant threat to the NSW oyster industry. These diseases are listed as declared under the *Fisheries Management Act 1994* and *Fisheries Management Aquaculture Regulation 1995*. These diseases include Winter Mortality and QX disease and a number of other diseases not known to be present in NSW.

It is a condition of every Class A Aquaculture Permit that “the permit holder must report to the local Fisheries Office the details of any suspected disease or unusual mortality affecting the fish or marine vegetation on the leased area, as soon as practical, and no later than 48-hours from becoming aware of any such occurrence”.

### **Protocol for reporting oyster mortality**

In the event that a significant oyster disease/mortality is observed the following actions need to be taken by the permit holder:

- 1. Phone Fish Kill Hotline (24 h service) 1800 043 536 immediately.**
- 2. Notify your local NSW Fisheries Office of the event as soon as possible and no later than 48-hours after becoming aware of the occurrence.**
- 3. Obtain an Oyster Mortality Report form (available from your local Fisheries Office or the NSW Fisheries website). Complete the Oyster Mortality Report and fax or mail completed form to:**
  - a) NSW Fisheries Aquatic Animal Health Unit, Regional Veterinary Laboratory, Bruxner Highway, Wollongbar NSW 2477. Fax: (02) 6626 1276**
  - b) Biosecurity Manager, Port Stephens Fisheries Centre, Private Bag 1, Nelson Bay NSW 2315. Fax (02) 4982 1107**
- 4. To supply oyster samples for laboratory examination and testing the following steps need to be observed when collecting the samples:**
  - Select a minimum of 20 ‘sick’ oysters showing signs typical of the problem being seen (dead oysters are usually of little diagnostic value).
  - Keep the sample oysters cool and damp (loosely packed in ‘Coolite’ drink esky in damp newspaper with good air circulation around oysters is ideal). Do not refrigerate as this may further stress the oysters.
  - Label the container with the estuary, date of collection and location within the estuary (i.e. oyster lease number).
  - Arrange courier and address samples to:  
NSW Fisheries Aquatic Animal Health Unit  
Regional Veterinary Laboratory  
Bruxner Hwy Wollongbar NSW 2447



## NSW Fisheries Oyster Mortality Report Form

<b>Estuary Name:</b>	
<b>Species:</b>	
<b>Name (Aquaculture Permit Holder / Lease Holder):</b>	
<b>Aquaculture Permit Number:</b>	
<b>Date of this mortality report:</b>	<b>Date mortality first observed:</b>

Oyster Lease No.	Cultivation Type <i>Insert either: Dredge or Stick or Tray or Longline or Floating or Raft or Baskets/tumbers or Slats.</i>	Type of Stock <i>Insert either: Stick culture Single seed (Wild) Single seed (Hatchery)</i>	Size of Stock Affected <i>Length in (mm)</i>	Origin of Stock <i>If applicable insert the estuary or location from which the stock was moved. If locally caught write "Locally Caught".</i>	Mortality Estimates %	Stock Loss Estimated (bags/dozens)
OL88/888	Raft	Single Seed (Hatchery)	30 - 50	Big Creek Hatchery	20 - 30%	200 bags
OL88/088	Rack	Stick Culture	50 - 60	Brisbane Waters	30 - 40 %	80 bags
OL88/808	Stick	Single Seed (Hatchery)	30 - 50	Big Creek Hatchery	5 - 10%	30 bags

**Comments**

Please fax this information to the NSW Fisheries Biosecurity Manager on 02 4982 1107.  
Make sure you enclose a copy with your samples before you package them for diagnosis.

# NSW Fisheries Oyster Mortality Report Form

## Why report oyster mortality?

A number of oyster disease pose a significant threat to the NSW oyster industry, these disease are listed as declared under the Fisheries Management (Aquaculture) Regulation 2002. These diseases include marteilosis (QX) and mickrocytosis (Winter mortality).

It is a condition of every Class A Aquaculture Permit:

***“The permit holder must report to the local fisheries office the details of any suspected disease or unusual mortality affecting the fish or marine vegetation on the leased area, as soon as practical, and no later than 48-hours from becoming aware of any such occurrence”.***

## Protocol for reporting oyster mortality:

In the event that a significant oyster disease/mortality is observed

1. Within 48 hours phone either:
  - a) 24 hour hotline 1800 043 536
  - b) your local/regional NSW Fisheries office
  - c) NSW Fisheries Aquatic Animal Health Unit (02) 6626 1261, mob 0428 698 112
  - d) NSW Fisheries Biosecurity Management (02) 4916 3904, mob 0407 272 947
2. Complete a NSW Fisheries Oyster Mortality Report. Accurate information is required as it will assist in determine the cause of the disease event. Please provide comments on any suspected cause or unusual environmental conditions.
3. Collect, preserve and package the samples as directed by your Aquatic Animal Health Professional or using the instructions provided in the “Collecting, Preserving and Packaging Oysters for Disease Testing” brochure.
4. Lodge completed form with local Fisheries Office and place a copy together with the samples being sent to the laboratory.
5. Arrange freight of samples to laboratory as requested by the personnel at your Aquatic Animal Health unit or local fisheries officer.
6. Await laboratory diagnosis and exclusion of potentially exotic disease. While awaiting this result it is advisable to minimise stock movement to other estuary sites, in case you may be spreading an infectious agent (eg virus, new parasite).

**Oyster mortality is often due to predation or environmental effects such as heat or freshwater input and may not be the result of a disease. Even so, it is important that all events of unusual mortality are reported. Why? Causes of disease can go undetected to the naked eye.**

Please fax this information to the NSW Fisheries Biosecurity Manager on 02 4982 1107.  
Make sure you enclose a copy with your samples before you package them for diagnosis.



# PROTOCOL FOR INVESTIGATING AND REPORTING FISH KILLS



**All fish kills are potentially significant and should be investigated thoroughly and as soon as possible**

Information on fish kills is available at [www.fisheries.nsw.gov.au](http://www.fisheries.nsw.gov.au)

## Notification

When a report of a fish kill is received all information is to be recorded on the **Fish Kill Notification & Investigation Report [Part A]**. Officers of NSW Fisheries who receive this information are to notify the nearest EPA office and vice versa. Local offices of DLWC and council are also to be notified. Completed Part A forms should be faxed to the relevant Regional Office of NSW Fisheries and EPA for information. Each agency will be responsible for information exchange within their respective departments.

## Initial assessment

The officer receiving notification of the fish kill will decide whether a field investigation is warranted. This decision will be made following discussions with other staff (e.g. NSW Fisheries or EPA biologists) on the basis of: size of kill, sensitivity of waterway, potential cause, species affected, potential public interest, etc. If a field investigation is warranted, and NSW Fisheries or EPA officers are not available, the department with primary responsibility for the investigation (see below) will arrange an inspection by the local council or another government department, whichever is most appropriate.

## Field investigation

Generally, NSW Fisheries officers will investigate fish kills in non-metropolitan areas while EPA officers will investigate fish kills in Sydney, Newcastle and Wollongong metropolitan areas. In some cases a joint inspection may be appropriate. Regardless of the location, EPA Officers will be responsible for detailed investigation of kills which appear to be related to hazardous chemical incidents or discharges from commercial or industrial premises. Investigating officers will inspect the site and complete the **Notification & Investigation Report [Part B]**. If officers of a Council or a department other than EPA or NSW Fisheries investigate a fish kill, the investigating officer should discuss the fish kill with NSW Fisheries Conservation Managers at the earliest opportunity. Completed **Part B** forms should be faxed to both the relevant NSW Fisheries office and EPA office.

## Collection and analysis of samples

On-site water quality measurements may help elucidate the cause of the kill. However, detailed laboratory testing will be required to detect most contaminants and diseases, and this will require sampling of water and/or fish. Sampling of water is to be carried out according to EPA guidelines (see **Water Sampling Protocols - A Training Manual for NSW Fisheries in the Collection of Water Samples for Fish Kill Investigations** prepared by Science Management and Support Branch). Sampling of fish should be discussed with NSW Fisheries Pathologist or Conservation Managers or EPA laboratory staff. Without such guidance, and as an interim measure, eight, freshly dead, individuals of each species affected should be placed in separate plastic bags on ice. In general, subsequent preservation in formalin (for disease testing) or freezing (for contaminant testing) will be required until analysis can be undertaken.

## Reporting of laboratory analysis

The officer responsible for organising transportation and analysis of water and fish samples will be responsible for reporting results of the analysis to all organisations previously involved with the fish kill.

## Media contact

Fish kills can generate significant media interest. Prior to any response to the media, a common view should be established between EPA and NSW Fisheries officers. At that time an agreed co-ordinator for media contact will be established.

## Database

All completed **Notification and Investigation Report** forms and results of analyses are to be forwarded to NSW Fisheries Shoalhaven/Nowra office for inclusion on the state-wide fish kill database. Information from the database is available on request.

# FISH KILL Notification & Investigation Report

## Part A - Notification

NAME OF WATERBODY:  
.....

CATCHMENT (e.g. Murray River, Sydney Harbour, Tuggerah Lakes): .....

PRECISE LOCATION WITHIN WATERBODY:  
.....

HABITAT DESCRIPTION: (circle as appropriate): (A) Freshwater, estuarine, marine (B) stream, river, anabranch, lake, billabong, swamp, drain, channel, impoundment, bay, lagoon, farm dam, beach, open ocean, other: .....

REPORTED BY (Name, address, phone):  
.....

TIME/DATE REPORTED..... TIME/DATE KILL FIRST OBSERVED.....

WEATHER CONDITIONS PRIOR TO OBSERVATION OF KILL:  
.....  
.....  
.....

TIDAL STATE/WATER LEVEL AT TIME OF KILL (if applicable):  
.....

NUMBERS OF FISH AFFECTED (circle): less than 10, 10 to 100, 100's, 1000's, 10,000's, 100,000's, millions

CONDITION OF FISH (circle): dying, freshly dead, few hours old, few days old, decomposed

SIZE OF FISH (circle): all similar size, wide range of size classes (specify size/size range in cm) .....

SPECIES OF FISH AFFECTED (circle): one species only, few species, many different species, (please list if known):  
.....  
.....

LOCATION OF FISH (circle): floating in water, on bottom, along waters edge, onshore

EXTENT OF KILL (area (ha) or length (m) of habitat affected):  
.....

GENERAL OBSERVATIONS OF REPORTING PERSON :  
.....  
.....  
.....

OTHER FORMS OF WILDLIFE AFFECTED ? (specify):  
.....

WHAT IS THE SUSPECTED CAUSE?

# FISH KILL Notification & Investigation Report

## Part B - Investigation

TIME/DATE KILL INVESTIGATED: .....

HABITAT DESCRIPTION: (circle as appropriate): (A) Freshwater, estuarine, marine (B) stream, river, anabranch, lake, billabong, swamp, drain, channel, impoundment, bay, lagoon, farm dam, beach, open ocean, other .....

ADJACENT LAND USES (specify):  
.....

PHYSICAL EVIDENCE OF POLLUTION (OR ALGAL BLOOMS) OBSERVED: .....

ON-SITE WATER SAMPLING RESULTS WATER SAMPLES COLLECTED: Yes  No

Sample no.	1	2	3	4	5	6
Name of sampling site						
pH						
Temp. (°C)						
Dissolved Oxygen						
Others (specify)						

**Attach map/diagram showing total area of fish kill and sample sites. Colour photographs would also assist analysis and identification.**

CONDITION OF FISH (circle as appropriate): dying, freshly dead, few hours old, few days old, decomposed

FISH AFFECTED			
SPECIES -(Full name)	LENGTH RANGE (cm)	NUMBERS	SAMPLES COLLECTED
			yes/no
			yes/no
			yes/no
			yes/no
			yes/no

**OTHER COMMENTS:** (eg behaviour/appearance of fish)

SUSPECTED CAUSE OF FISH KILL: .....

WATER SAMPLES DESPATCHED TO:.....TO BE TESTED FOR: .....

FISH SAMPLES DESPATCHED TO:.....TO BE TESTED FOR: .....

INVESTIGATED BY: .....POSITION: .....

ORGANISATION: .....DATE: .....

RECOMMENDATION(S) FOR FUTURE ACTION: .....

REMINDER. Send copies of Parts A and B to NSW Fisheries, Office of Conservation - PO Box 456, Nowra 2541 (fax 02 4423 2007).

<b>Project</b>	
<b>Estuary</b>	
<b>Sample No.</b>	
<b>Comments:</b>	
<b>Collection Date:</b>	<b>Collected by:</b>

OTHER INDIVIDUALS & AUTHORITIES NOTIFIED :

INDIVIDUAL	DEPARTMENT	LOCATION	COMMENTS

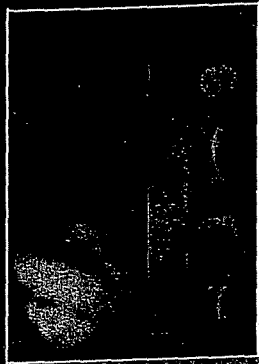
REPORTED TO : .....POSITION: .....LOCATION.....

ORGANISATION : .....DATE: .....PHONE.....

REMINDER. Send copies of Parts A and B to NSW Fisheries, Office of Conservation, PO Box 456 NOWRA 2541 (fax (02)4423 2007).

This Field Guide provides a valuable tool in surveillance and monitoring for exotic aquatic animal disease in Australia at a national level.

The Field Guide also gives an informative and sometimes graphic account of the diseases and organisms which threaten Australia's developing aquaculture industry.



*The Australian Aquatic Animal Disease Identification Field Guide* has been produced under AQUAPLAN, Australia's national strategic plan for aquatic animal health (1998-2003).

For more information about AQUAPLAN contact the Aquatic Animal Health Unit on 61 2 6272 4328.

# Australian Aquatic Animal Disease

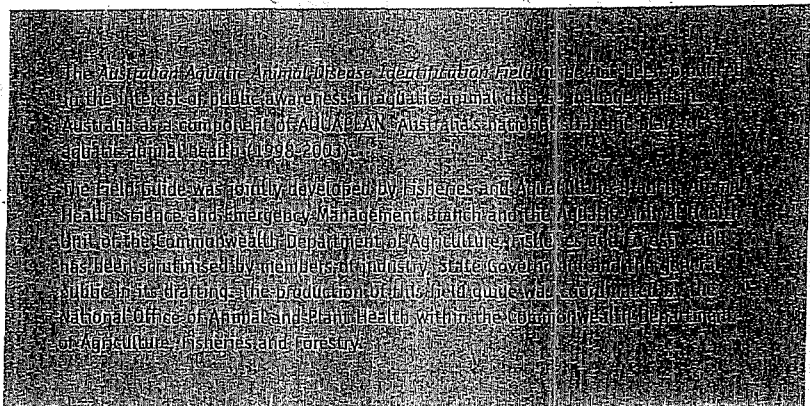
Identification Field Guide

Alistair Herford  
Grant Rawlin





# CONTENTS



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Further copies of the *Australian Aquatic Animal Disease Identification Field Guide* are available from the AFFA Shopfront at a cost of \$12.00 per copy (plus postage and handling).

For further information please contact:

The AFFA Shopfront  
Agriculture, Fisheries and Forestry—Australia  
GPO Box 858  
Canberra, ACT 2601

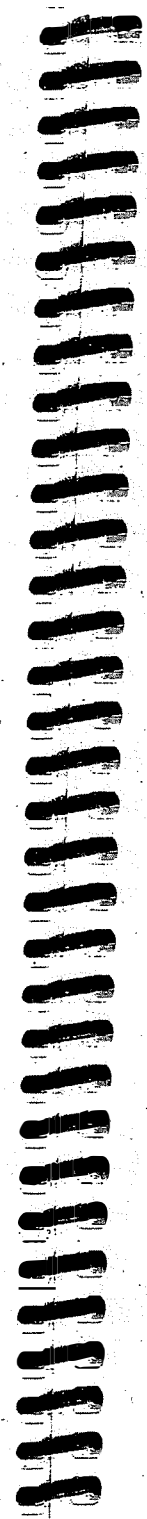
Telephone (02) 6272 5550 or  
freecall - 1800 020 157  
Facsimile (02) 6272 5771 or E-mail:  
shopfront@affa.gov.au

<http://www.affa.gov.au/shopfront/>

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Contents	3
Foreword	5
Acknowledgments	6
Introduction	8
Diseases and the Environment	8
Diseases of National Concern	9
Exotic	9
Endemic	10
Observations of Disease	10
Mass mortality	10
Skin ulcers in fish	10
Staining of shell margins in filter feeding shellfish	10
Other skin changes	10
Granulomas	11
Gill changes in finfish	11
Petechial haemorrhages in finfish	11
Behavioural abnormalities	11
Sample Collection, Storage and Reporting	11
First contact	11
Specimens	12
Anatomy of a typical	13
– Salmonid	13
– Mollusc	14
– Crustacean	15
Differential Diagnostic Table	16
DISEASES OF FINFISH	17
Viral Diseases	
Epizootic Haematopoietic Necrosis (EHN)	18
Infectious Haematopoietic Necrosis (IHN) <i>EXOTIC</i>	20
Oncorhynchus Masou Virus Disease (OMV) <i>EXOTIC</i>	22
Spring Viraemia of Carp (SVC) <i>EXOTIC</i>	24
Viral Haemorrhagic Septicaemia (VHS) <i>EXOTIC</i>	26
Viral Encephalopathy and Retinopathy (VER)	28
Infectious Pancreatic Necrosis (IPN) <i>EXOTIC</i>	30
Infectious Salmon Anaemia (ISA) <i>EXOTIC</i>	32
Bacterial Diseases	
Furunculosis <i>EXOTIC</i>	34
Goldfish Ulcer Disease	36
Bacterial Kidney Disease (BKD) <i>EXOTIC</i>	38
Enteric Redmouth Disease/Yersiniosis	40
Piscirickettsiosis <i>EXOTIC</i>	42

## CONTENTS

<b>Fungal Diseases</b>	
Epizootic Ulcerative Syndrome	44
<b>Parasitic Diseases</b>	
Gyrodactylosis <i>EXOTIC</i>	46
Whirling Disease <i>EXOTIC</i>	48
<b>DISEASES OF MOLLUSCS</b>	51
<b>Viral Diseases</b>	
Iridoviroses <i>EXOTIC</i>	52
<b>Parasitic Diseases</b>	
Bonamiasis	54
Marteiliosis – QX disease	56
Mikrocytosis – Winter Mortality Disease	58
Perkinsosis	60
<b>DISEASES OF CRUSTACEA</b>	63
<b>Viral Diseases</b>	
Baculoviral Midgut Gland Necrosis (BMN)	64
Infectious Hypodermal and Haematopoietic Necrosis (IHHN) <i>EXOTIC</i>	66
Yellowhead Disease (YHD) <i>EXOTIC</i>	68
White Spot Baculovirus Complex (WSBC) <i>EXOTIC</i>	70
Taura Syndrome (TS) <i>EXOTIC</i>	72
Nuclear Polyhedrosis Baculoviroses	
– ( <i>Baculovirus penaei</i> )	74
– ( <i>Monodon baculovirus</i> )	76
<b>Bacterial Diseases</b>	
Necrotising Hepatopancreatitis (NHP) <i>EXOTIC</i>	78
<b>Fungal Diseases</b>	
Crayfish Plague <i>EXOTIC</i>	80
<b>PROLONGING YOUR FISH'S SHELF LIFE</b>	82
<b>GLOSSARY</b>	85
<b>BIBLIOGRAPHY</b>	88
<b>CONTACTS</b>	91

## FOREWORD

I have great pleasure in introducing this Field Guide as part of AQUAPLAN, Australia's national five-year strategy for managing aquatic animal health.

Australians are privileged to have extensive and beautiful waterways, and to have such a large number of aquatic animals that make these waterways their home. As well as their environmental value, these marine and freshwater areas also provide livelihoods for professional fishers, aquaculturists, aquarium owners and recreational fishers. All these people have an interest in protecting our aquatic animal populations from disease.

Because of our geographical isolation and strict quarantine, Australia's aquatic animals are free from many of the diseases that afflict similar populations overseas. The price for such a position is constant vigilance and readiness to respond to outbreaks of infectious disease, whether due to foreign (exotic) or native (endemic) agents. One of AQUAPLAN's objectives is to continue to develop this philosophy. This book will help protect our aquatic animals from exotic diseases, help us to learn more about the diseases that affect aquaculture in other parts of the world, and how these diseases could affect aquatic species in Australia.

The Field Guide provides easy-to-read information on diseases of aquatic animals for those whose livelihoods or interest mean they are well situated to spot changes in aquatic animal populations.

Many people contributed to the Field Guide – industry, States, Territories, research institutions within Australia and abroad and recreational fishing groups. I, on behalf of the Fish Health Management Committee of the Standing Committee on Fisheries and Aquaculture would like to thank them for their efforts.

Gardner Murray

Managing Director  
National Offices of Animal and  
Plant Health and Food Safety

## INTRODUCTION

### Diseases and the Environment

#### The nature of disease in the aquatic environment and how to use this Field Guide

This guide has been designed to provide ready access to information on the major exotic diseases of aquatic animals as well as the more common diseases found in Australia. It is aimed at the recreational and commercial fisher as well as those in aquaculture and the seafood processing industries. The Field Guide provides this audience with a valuable tool to participate in the surveillance and monitoring for exotic aquatic animal disease in Australia at a national level. At the very least, the field guide gives an informative and sometimes graphic account of the diseases and organisms which threaten Australia's developing aquaculture industry.

The marine and freshwater environments are rich with many types of animals. This guide focuses on finned fish, crustaceans (e.g. prawns) and molluscs (e.g. oysters). It is not possible to list every disease for every species in a book of this type. Apart from the issue of size, the diseases of many species have as yet been studied very little, if at all. Hence, infectious diseases of commercially important fish, and most often those in aquaculture are over-represented in this book. This is not because other species do not have diseases, but is simply because these stocks of animals have been more closely observed than others. In addition, sick individuals within wild stocks are very quickly eaten and are not noticed by humans. Similarly, diseases of finfish listed appear to be highly skewed towards

freshwater fishes (for example, trout and salmon). This is primarily because most of the aquatic animals cultured in Australia are from freshwater environments.

In writing this guide, the authors have assumed that the average user of this book is unlikely to have easy access to equipment much past their eyes, a knife and maybe some ice. Hence, much of the diagnostic information is based on 'gross pathology' — abnormalities that can be seen by the naked eye.

The nature of disease in aquatic animals is such that gross pathology will only go so far in determining a diagnosis. Unfortunately, many diseases show similar signs to the naked eye. Hence, gross pathology alone is enough to get to a point of 'this could be disease A, B or C' (this is called a differential diagnosis); it is rarely enough to get to the point of 'this *is* disease D' (this is called a definitive diagnosis).

What is a disease? In this guide, most descriptions of diseases involve those caused by infectious agents — viruses, bacteria, fungi or parasites. However, disease does not have to be infectious — especially in the aquatic environment. The term 'disease' should be used in the same way as 'abnormality'. A common cause of unusual deaths in the aquatic environment is the environment itself (for example, water temperature, salinity changes and oxygen depletion). Added to these environmental variations are other circumstances that involve the release of toxins into the water. Aquatic toxicology is a very complex field, and toxic chemicals can originate naturally or after the intervention of people.

## INTRODUCTION

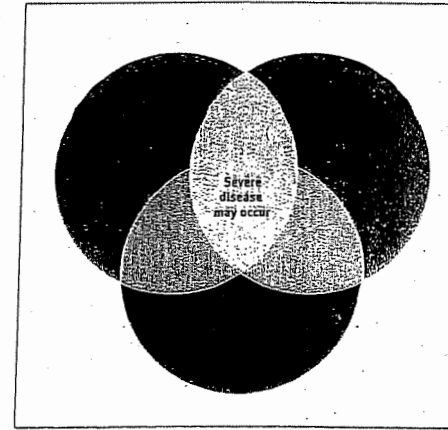


Figure 1: Relationship between host, pathogen and the environment in disease outbreaks.

Just as animals have behaviour patterns, so do diseases — for they too exist in a balance of nature. In the case of aquatic animal diseases, the balance is first between the host (e.g. fish) and its normal environment. Added to this is a complicating factor of an infectious agent or an environmental change. Simply because an infectious agent is present does not mean a disease outbreak will be seen. For one thing, the host may be in good enough condition to fight off an infection, or the infection rate may be so low that the few sick fish are not noticed by us. However, sometimes conditions are such that infections will occur in sufficient numbers to be noticed. Fortunately, these behavioural patterns of disease can be used as a tool to help differentiate diseases.

When presented with an abnormality (be it large numbers of dead fish or a single ulcer on a single fish) start by asking 'what do I see here?'. The answer to this question

at first should not be in the form of 'Disease A' but should be an observation such as 'lots of dead fish, with ulcers on the skin'. After making this type of observation, go to Table 1. There the entries within this book are connected to what you see. Look up the diseases listed beside your observation in the table and you will find photographs and further information to help you narrow down the search for the cause of the disease. For example, you may find that one disease is present only in freshwater species but you are looking at a marine fish — in this way you will eliminate the unlikely and your list of differential diagnoses will be shorter. However, in most cases extensive laboratory tests would also be required to achieve a definitive diagnosis. Please remember that not all diseases of all species are represented in this book.

**A list of contact numbers has been provided at the back of this book so you can report your find and ask further questions on diseases you may see. This number will direct you to an expert on diseases of aquatic animals within your State or Territory.**

### Diseases of National Concern

Each disease in this book appears on Australia's 'National List of Reportable Diseases' and is seen as a serious potential threat to Australia's growing aquaculture and related industries.

### Exotic

Diseases exotic to Australia are those that have not been seen in the Australian environment. The concern for introducing exotic diseases is that not only are the nature and severity of the effect of a new disease on local populations uncertain, but

## INTRODUCTION

the expected range of species affected is also often unclear. The fact that most of the diseases featured in this book are exotic indicates how important it is to maintain vigilance over these diseases from entering Australia.

### Endemic

Diseases that are endemic are those that have a permanent niche in the local environment. A disease that is endemic in Australia is therefore either native or has been introduced at some time in the past and is now established in some part of Australia.

## Observation of Disease

### Mass mortality

Although a seemingly obvious and final sign of disease — much can be learnt by observation of the type and location of a fish kill. Mass mortality of a single species is more likely to be of an infectious origin than multiple species kills, unless the species involved is in a captive situation or normally moves in large schools. A fish kill that involves a range of species of various sizes will normally indicate an environmental problem (such as oxygen depletion) or a toxicity problem.

### Skin ulcers in fish

The skin of a fish is a highly important organ. It is relatively thin and is highly active in metabolism. When the skin layer is breached, red sores with a pale border may be seen as the underlying tissue is revealed. These lesions are often referred to as ulcers. Ulcers can also have major effects on metabolism of the whole fish as they disrupt the control the fish has over the amount of water in its body.

### Staining of shell margins in filter-feeding shellfish

When filter feeders such as oysters are weakened by disease, the soft body tends to decrease in size in relation to the shell. When the inner edges of the shells are no longer cleaned by the animal's normal feeding, green algae grow to cover the inner edges of the shells.

### Other skin changes

**Colour:** The skin colour of many finfish is under nervous control and the shade varies, especially when nerves are damaged in the area. If this effect is seen, the damaged areas will generally darken. The colour of some crustaceans (e.g. prawns) will change in response to disease. This is often due to changes in the internal organs rather than on the colour of the shell itself, and is often reflected in the name of the disease (e.g. white spot, and yellow-head viruses in prawns; white-tail in yabbies).

**Parasites:** Parasites are common on fish. A vast majority of organisms living on or within aquatic animals cause few problems to their host. Parasitic problems generally become more of a problem as water temperatures increase in summer and the life cycles of the parasites speed up. Relatively few parasites are visible to the naked eye, and most parasitic diseases will be noticed only by changes to the amount of mucus on the gills and skin or the opacity of muscle tissue rather than seeing the parasites themselves.

## INTRODUCTION

**Fungus:** Filaments of fungus trailing from the skin of sick finfish are often seen. Although the fungus may be the true cause of its associated lesion, it is more likely that the fungus is a secondary invader after there has been damage to the skin by physical or chemical trauma or by another infectious agent.

### Granulomas

Granulomas are signs of a long-term illness in finfish. The immune system of finfish reacts to the presence of some agents by laying down large numbers of immune cells around the affected area. Granulomas are often found in the internal cavity or muscle. They are abnormally pale, fleshy areas that can contain areas of dead tissue and pus.

### Gill changes in finfish

The gills are highly important to fish. Not only do they absorb oxygen for the creature in the place of the mammalian lung, they also excrete wastes and control body fluids — much as the kidney does in mammals. Gills should be a clean bright red when fresh. When affected by disease, the gills commonly show increased mucous coating and may show pale patches. Finfish that have freshly died of oxygen deprivation often have brick red to brown gills as red blood cells change from bright to dull red when they are not carrying oxygen.

### Petechial haemorrhage in finfish

Petechial (pin-point) haemorrhages are multiple red spots less than 1 mm in size and are a common sign of disease. The most common sites to see these spots are at the base of the fins or on the outer surface of any internal organ. These spots are caused by bleeding into the tissue due to weaknesses in the lining of the blood

vessels. Petechial haemorrhages can be caused by anything that causes these vessel linings to weaken. They are most commonly seen with advanced viral infections, advanced bacterial infections of the whole body (i.e. septicaemias) and with some toxins.

### Behavioural abnormalities

What is normal for one species may be abnormal in another. This statement should be kept in mind when reading generalisations on the behaviour of aquatic animals. All species of aquatic animals have characteristic behaviours related to protection, food gathering and breeding — and an alteration from the norm for the species should be considered suspicious (e.g. a slow-closing oyster is often weak and close to death). A common abnormal behaviour seen in finfish suffering from lack of oxygen is gathering at water inlets or mouthing at the surface. Finfish that are irritated by skin parasites tend to scrape themselves on rocks or jump up into the air and fall back into the water surface — a behaviour known as flashing due to the flashes of light reflected by the sudden movement. Abnormal swimming behaviour such as whirling in a cork-screw action can be seen if the brain is affected by an infectious agent or toxin such as ammonia.

## Sample Collection, Storage and Reporting

### First contact

If you come across an aquatic animal (fish, crustacean or mollusc) that, after consulting the Field Guide, you suspect is diseased, you need to consider a number of things before taking further action. First, has the disease you suspect been listed in the Field Guide as



## INTRODUCTION

EXOTIC? Secondly, if endemic (i.e. not exotic to Australia), does the location where the animal under question was caught (or observed) lie outside of the known distribution of the disease within Australia? If your answer to either of these questions is 'yes', then contact the aquatic animal health officer closest to where you are, as soon as possible. You can find this phone number at the back of this book. If the answer to both questions is 'no', then there is no requirement to report your find to animal health or water authorities.

The person taking your call may ask you to describe the condition of the animal, where and how the animal was caught, and how the animal has been kept. Try to take note of the general environment such as water turbidity, temperature, flow rate, time of day and any relevant physical features such as proximity to inflow or dam wall.

### Specimens

You may be asked by the contact officer to retain the animal for confirmation by an authorised veterinarian or fisheries scientist. Collection, preparation and storage of samples for scientific examination must be done correctly and consistently for any examination to be valid. You may be asked to collect further specimens.

The contact officer will describe to you the appropriate method for collection, preparation and storage of samples for further examination.

### Animal

If the animal is dead it is important that it be kept cold to minimise any change to its original condition once taken from the water. The ideal way to keep non-living specimens cold is on ice (DO NOT FREEZE). A colour photograph of the animal, clearly showing abnormalities of disease while the

animal is still alive or freshly dead, is very useful if possible. It is very important to seek advice on how to collect, prepare and store as soon as possible. The person you speak with will advise you on what to do if you have neither camera nor ice box.

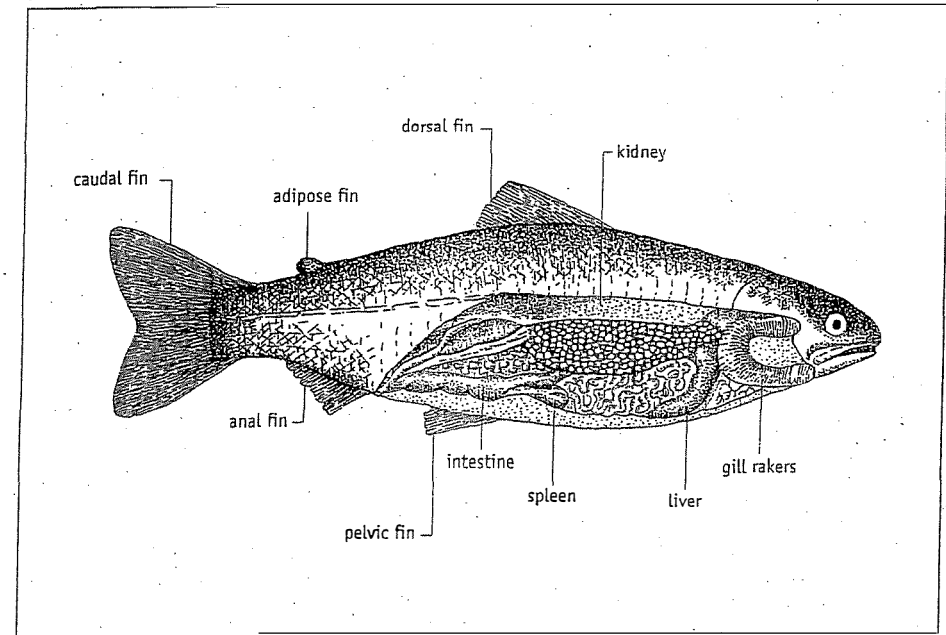
### Water

You may be asked to collect samples of water from which the animal has come. The type of container used for taking water samples is important. Many plastics release chemical compounds to water, which can produce errors when interpreting test results. The best types of plastic container for collecting water samples are the two litre bottles used for orange juice, or a similar food-grade plastic. It is important to rinse the sample bottle several times (up to 10 times if previously used) with water taken from the same body of water being sampled for analysis. Fill containers right to the top to exclude any air from the sample. If you do not have suitable containers, it is possible to collect water samples using plastic bags provided they are unbroken, previously unused, and doubled-up.

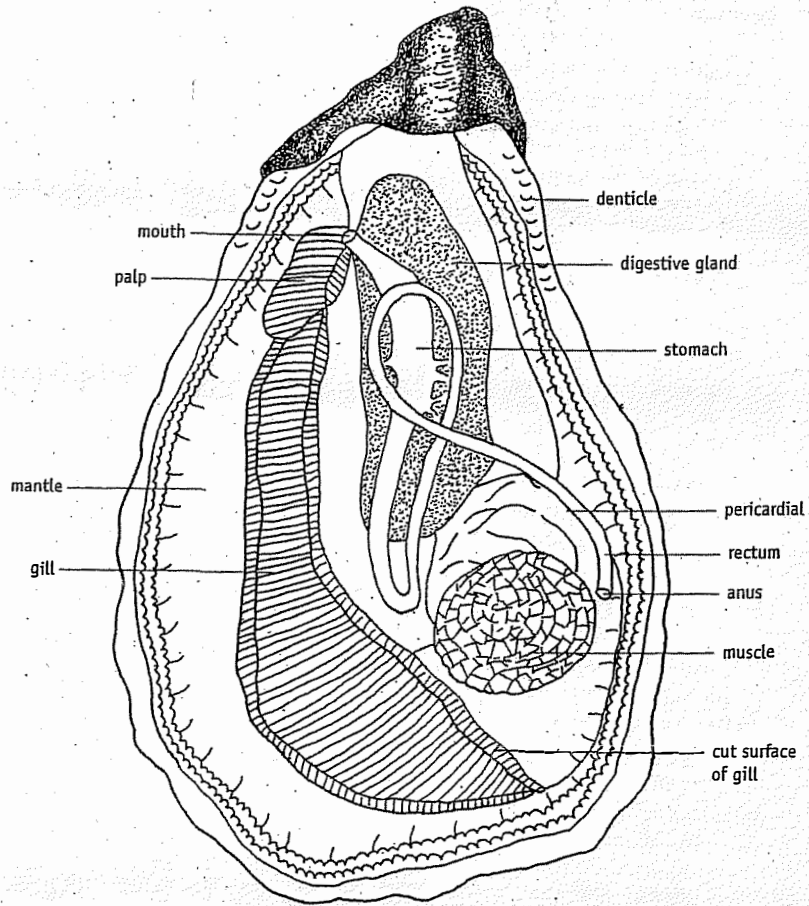
Both the amount of light and the temperature to which a water sample is exposed can affect the concentration of dissolved oxygen, pH, and nutrients in the water sample. For this reason, it is important that samples be kept cold (below 4°C), on ice and in the dark.

**Note:** More detailed information about sampling of aquatic animals and water can be found on the Queensland Fisheries website <http://www.dpi.qld.gov.au/fishweb/welcome.html>. Another useful site to review Australia's strategy for managing water quality can be found at <http://www.environment.gov.au/science/water/index.html>

## ANATOMY OF A TYPICAL SALMONID

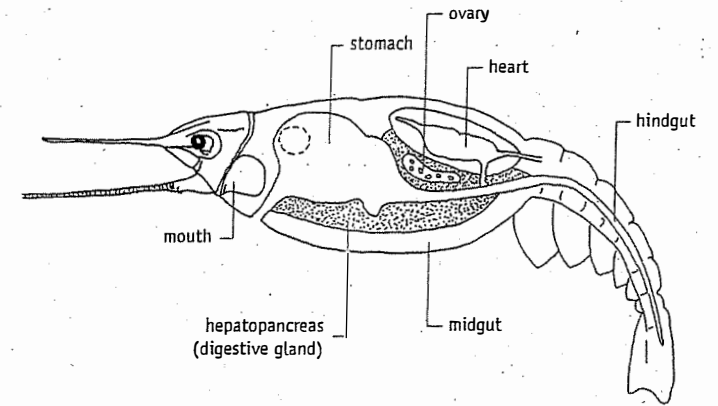


# ANATOMY OF A TYPICAL MOLLUSC (OYSTER)

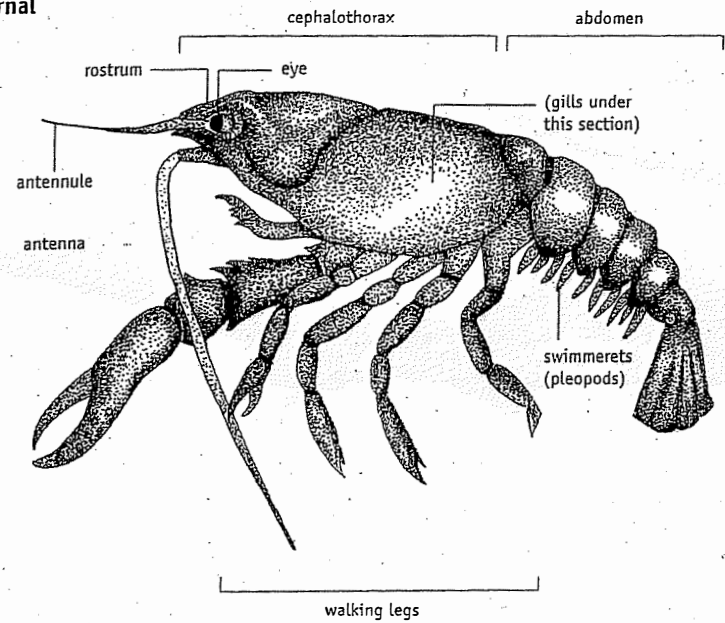


# ANATOMY OF A TYPICAL CRUSTACEAN

## Internal organs in section



## External

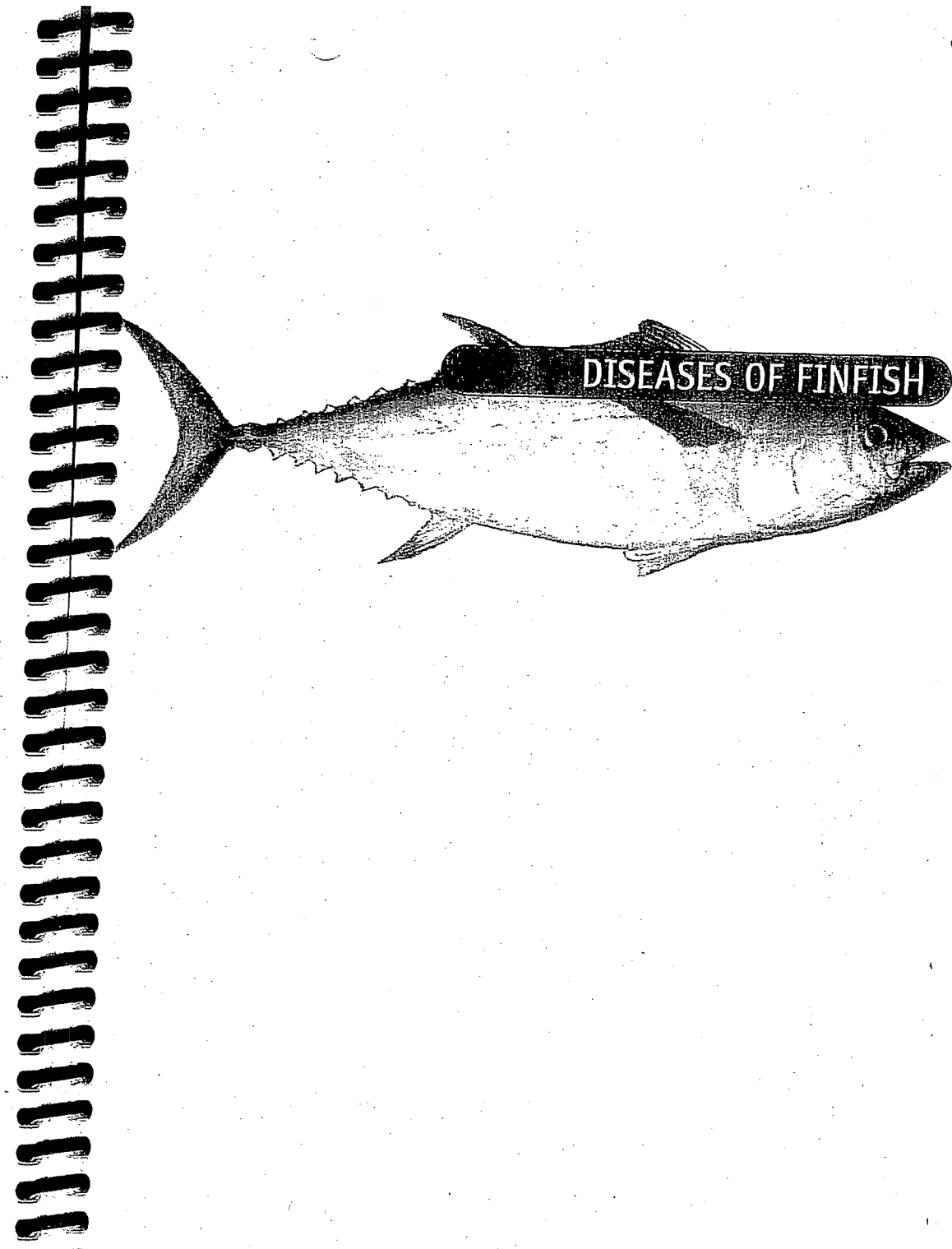




# DIFFERENTIAL DIAGNOSTIC TABLE

	Pop eye or swollen stomach	Pin prick haemorrhages or septicaemia	External or internal growths or cysts	Behavioural abnormalities	Skin/body lesions/ulcers or discoloration	Mass mortality	Possible disease or disease agent responsible	Page
<b>DISEASES OF FINFISH</b>								
•							Epizootic Haematopoietic Necrosis	18
•							Infectious Haematopoietic Necrosis	20
•							Onchorhynchus Masou Virus Disease	22
•							Spring Viraemia of Carp	24
•							Viral Haemorrhagic Septicaemia	26
•							Viral Encephalopathy and Retinopathy	28
•							Infectious Pancreatic Necrosis	30
•							Infectious Salmon Anaemia	32
•							Furunculosis	34
•							Goldfish Ulcer Disease	36
•							Bacterial Kidney Disease	38
•							Enteric Redmouth Disease	40
•							Piscirickettsiosis	42
•							Epizootic Ulcerative Syndrome	44
•							Gyrodactylosis	46
•							Whirling Disease	48
<b>DISEASES OF MOLLUSCS</b>								
•							Tridoviroses	52
•							Bonamiasis	54
•							Marteiliosis-QX	56
•							Mikrocytosis-Winter Mortality	58
•							Perkinsosis	60
<b>DISEASES OF CRUSTACEA</b>								
•							Bacterial Mid-gut Gland Necrosis	64
•							Infectious Hypodermal and Haematopoietic Necrosis	66
•							Yellowhead Disease	68
•							White Spot Baculovirus Complex	70
•							Taura Syndrome	72
•							Nuclear Polyhedrosis Baculoviroses ( <i>Baculovirus penaei</i> )	74
•							Nuclear Polyhedrosis Baculoviroses ( <i>Monodon baculovirus</i> )	76
•							Necrotising Hepatopancreatitis	78
•							Crayfish plague	80

Table 1. Does the animal you are looking at show one or more of these gross signs?



# BONAMIASIS

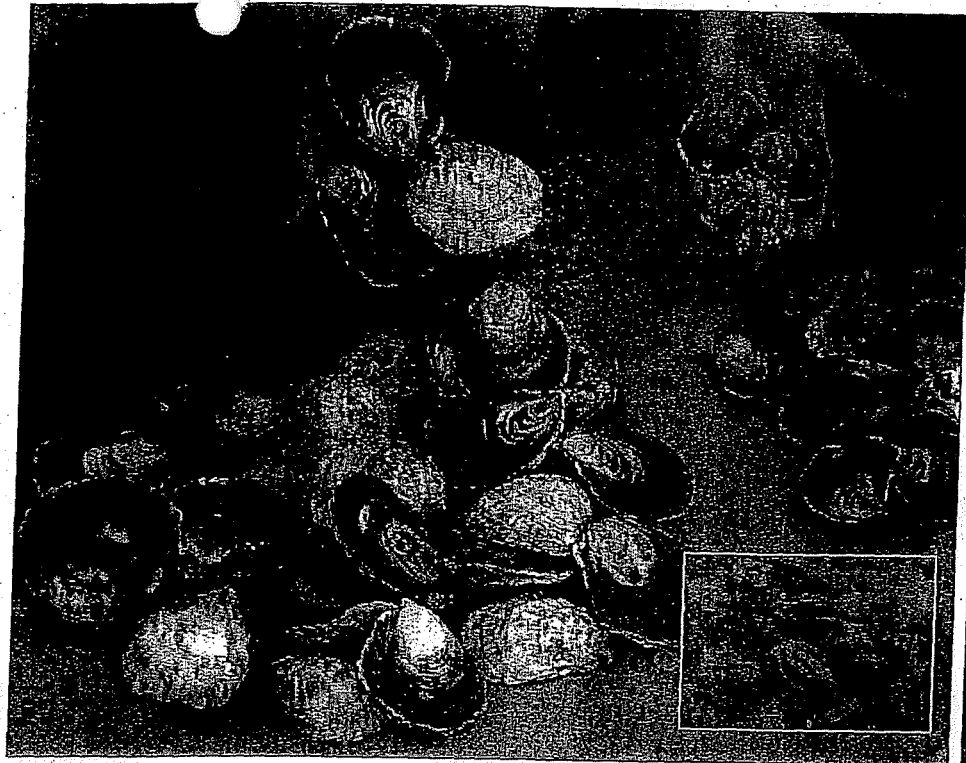
(*Bonamia* species)

## Physical condition of shellfish

- shellfish are undergrown
- may show weakened shell closure leading to slight gaping
- flesh looks watery
- mortalities of oysters can be very high when an outbreak first occurs
- lips of the shell may be covered in algae due to the mantle shrinking and not reaching the edges.
- deformities to gill margins

## Disease ecology

- mortalities can occur all year but are usually associated with warming spring and summer months
- significant mortalities usually occur at water temperatures of between 12°C and 20°C, especially for *B. ostreae*
- infects blood cells, destroying immune system and interferes with other critical physiological processes
- animals may be infected with no mortalities being seen— the reason for severe outbreaks in some situations and not others is not known
- even though agent may be present, the disease does not necessarily occur every year
- spread through Europe, from California, largely due to human movement of infected oysters and some stocks of Australian flat oyster seem well adapted to cope with the parasite



G.T Rawlin

Bonamiasis in oysters. Oysters on left are normal, while those on right are infected. The inset illustrates typical gaping.

PARASITIC DISEASES

### CAUSE OF CONDITION

*Bonamia ostreae* is the protozoan parasite that causes bonamiasis in Europe. Another, as yet unnamed *Bonamia* species, referred to as *Bonamia* sp., causes disease in New Zealand and Australian oysters.

### SHELLFISH AFFECTED

Shellfish in Australia that are susceptible to the disease are:  
Flat oyster (southern mud oyster)  
Shellfish in other countries but not present in Australia that are known to be susceptible:  
Chilean oyster  
New Zealand dredge oyster (bluff oyster)  
Olympia oyster  
European flat oyster

### WHERE THE DISEASE OCCURS

Bonamiasis occurs in Europe, North America and southern Pacific. *B. ostreae* in Europe and North America. *Bonamia* sp. in New Zealand and southern Australia.

### PRESENCE IN AUSTRALIA

*Bonamia* species (but not *Bonamia ostreae*) is present in Australian waters.



# MARTEILIOSIS

## QX disease

### Physical condition of shellfish

- high mortalities of up to 90%
- tissues becomes colourless and translucent
- digestive gland (usually a deep green) becomes pale yellow-brown
- body is greatly shrunken
- death occurs within 60 days of infection from starvation

### Disease ecology

- very little is known about how this parasite infects the oysters
- the disease is associated with low salinity and high water temperature
- although outbreaks can occur all year round, they are most likely after heavy rain in early autumn (March–April)



*Marteiliopsis in oysters. The infected oyster on the right has a yellow, watery body (known as pale sick). The oyster on the left is normal.*

#### CAUSE OF CONDITION

Marteiliopsis is a disease of oysters also known as QX disease and is caused by the protozoan agent *Marteilia sydneyi*. A similar disease is caused by *Marteilia refringens* in Europe in a different species of oyster and in mussels.

#### SHELLFISH AFFECTED

Shellfish in Australia that are susceptible to the disease:

Sydney rock oyster  
(possibly) giant clams  
(possibly) mussels

#### WHERE THE DISEASE OCCURS

*Marteilia sydneyi* is native to Australia and does not occur anywhere else in the world.

#### PRESENCE IN AUSTRALIA

*Marteilia sydneyi* is responsible for losses in the Sydney rock oyster industry in parts of Queensland and northern New South Wales; the north-western coast of Western Australia, and at Albany on the South Coast of Western Australia.

# MIKROCYTOSIS

## Winter Mortality Disease

(*Mikrocytos roughleyi*)

### Physical condition of shellfish

- ulceration and lesions in the gonad, mantle and gills
- weakened adductor (foot) muscle
- oysters gape open and are often raided by opportunistic organisms, leaving an abundance of empty oyster shells

### Disease ecology

- the disease agent requires high salinity (30–35 ppt) and low water temperature
- mortality up to 70% of mature oysters in their third winter before marketing
- mortality occurs in spring (September–October) and sometimes in winter
- dry autumns (raising salinity) and early winters seem to increase the likelihood of severe mortality

B. Munday, B. Lester



Winter mortality in oyster. Note lesions (orange blisters) in mantle.

#### CAUSE OF CONDITION

This condition is caused by the protozoan parasite *Mikrocytos roughleyi* and is known as winter mortality disease.

#### SHELLFISH AFFECTED

Shellfish in Australia that are susceptible to the disease:  
Sydney rock oyster

#### WHERE THE DISEASE OCCURS

Winter mortality disease is native to Australia and does not occur anywhere else in the world.

#### PRESENCE IN AUSTRALIA

New South Wales, between Port Stephens and the Victorian border.

# PERKINSOSIS

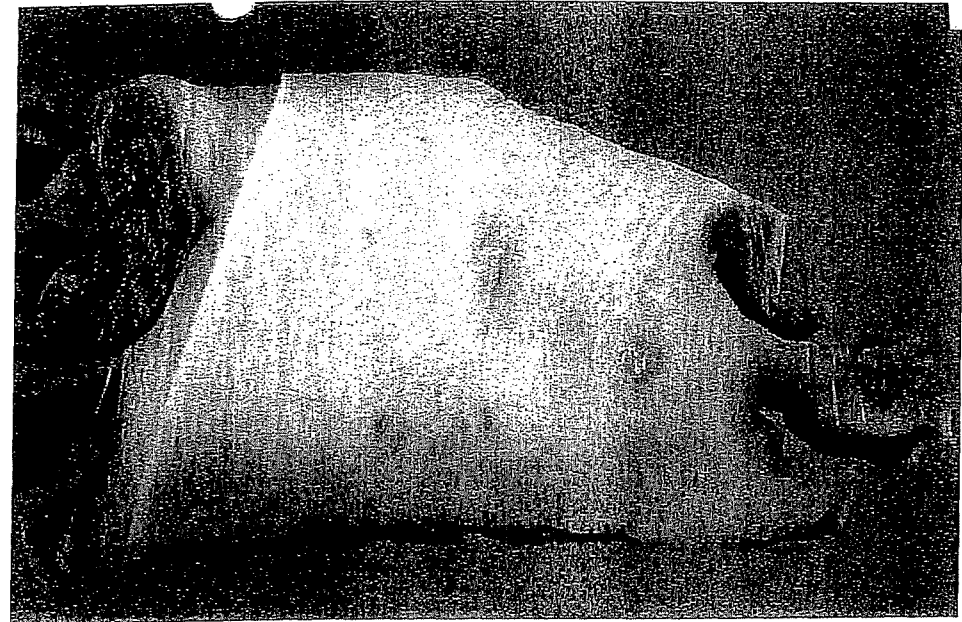
(*Perkinsus olseni*)

## Physical condition of shellfish

- halts growth and body shrinks resulting in high mortalities in American oysters
- in Australia *P. olseni* affects abalone with yellow/green pus filled blisters 0.5 to 8 mm in diameter containing a creamy-brown deposit
- the lesions will be seen as pale brown circles in processed abalone

## Disease ecology

- high temperatures (>20°C) seem to predispose abalone to the disease
- blacklip abalone can contain and eliminate the infection below 15°C and during winter
- outbreaks of disease are not commonly seen



D. Callinan

Perkinsosis in abalone. Note the blisters on the body.

### CAUSE OF CONDITION

Perkinsosis in Australian abalone is caused by the protozoan parasite *Perkinsus olseni*. American oysters are afflicted by a close relative to *P. olseni*, *Perkinsus marinus*.

### SHELLFISH AFFECTED

Shellfish in Australia that are susceptible to the disease:

**blacklip abalone**  
**greenlip abalone**  
**boring or crocus clam**

However, a wide range of molluscs may be mildly affected or carry the disease.

### WHERE THE DISEASE OCCURS

American oyster disease (caused by *P. marinus*) is found on the east coast of the United States. Australian *P. olseni* is known only from Australian waters.

### PRESENCE IN AUSTRALIA

*Perkinsus olseni* has severely affected abalone stocks in Queensland, New South Wales and South Australia.

## PROLONGING YOUR FISH'S SHELF LIFE

### General tips to maintaining quality and maximise shelf life

- remove fish from water as quickly and as gently as possible
- wash if necessary to reduce the bacterial load of the seafood  
*this is particularly important for farmed fish, prawns and other crustaceans that are grown in waters that are sometimes heavily loaded with bacteria*  
*farmed prawns and crayfish often have mud under the shell that requires careful and thorough washing for removal*
- chill (or freeze) rapidly
- maintain low and steady temperatures in storage and re-ice as required
- gill and gut fish wherever and as soon as possible (after chilling, if necessary, such as in tropical waters)
- ensure that all kidney and other internal material has been removed from the abdominal cavity

N.B. Quick chilling is more important than gutting in most cases.

#### SOURCE:

Lawley, R.A. and Gibbs, P., eds (1998)

*Microbiology Handbook 3. Fish and Seafood.* Leatherhead Food RA, Surrey.

Ruello and Associates (1998) Seafood Handling and Marketing School Workshop Proceedings. University of Western Sydney.

## GLOSSARY

abdomen	area of body containing the vital organs (e.g. stomach, kidney, liver, intestines)
abdominal cavity	cavity in which vital organs are contained
acute disease	disease of abrupt onset or lasting a relatively short period
agent	the primary organism responsible for changes in host animal, leading to disease
anaemia	reduced concentration of red blood cells in blood, making organs and gills appear pink rather than red
aquaculture	commonly termed 'fish farming', it refers more broadly to the commercial hatching and rearing of marine (mariculture) and freshwater aquatic animals and plants (limniculture)
broodstock	spawning adults
cannibalism	the eating of a species of animal by the same species of animal
carrier	an individual which, although showing no outward signs of disease, carries the harmful organism within, spreading the infection to others
chronic disease	a disease of slow progress and lasting over a long time
dorsal	the upper surface
dropsy	state of retaining fluids
ectoparasite	parasite which lives on the outside surface of its host
epizootic	the outbreak and rapid spread of disease in a population of animals, affecting many individuals at the same time
epidemic	same as epizootic, but may be used specifically to refer to the rapid spread of disease in human populations
external fouling	the mass attachment of ectoparasites to the external surface of a host
fins:	<p><i>dorsal</i> fin on the topside of fish, can appear to extend full length of dorsal surface or appear as numerous independent fins on dorsal surface</p> <p><i>caudal</i> the tail fin</p> <p><i>paired</i> the pectoral and pelvic fins of a fish are always paired</p> <p><i>pectoral</i> the fins on either side of a fish, usually behind the gill cover.</p> <p><i>pelvic</i> the fins on the underside of a fish closest to the head region</p>
fry	newly hatched fish
furuncles	an abscess or boil-like blister
gaping	shellfish can not close shell properly, leaving it exposed to predation
granulomas	are abnormally pale, fleshy areas that can contain areas of dead tissue and pus, often in the internal cavity or muscle

## GLOSSARY

gross signs	signs of disease that are obvious to the naked eye
haematopoietic	relates to the formation of blood cells
haemorrhage	bleeding
hepatopancreas	digestive gland of crustacea; performs similar function as liver in mammals.
histology	examination of the internal organ, tissue and cellular changes
host:	<i>intermediate</i> a host necessary in the early stage of a pathogens life cycle, usually unaffected by the pathogen
	<i>range</i> the types of species affected by a pathogen
	<i>species</i> the species infected by a pathogen
hyperactivity	more active than usual
infectious	capable of being transmitted or of causing infection
Infection	invasion of the body by living microorganisms that may or may not result in illness
lymphoid gland	organ secreting lymph of the lymphatic system (i.e. interstitial fluids containing many white bloods cells)
melanisation	abnormal deposits of dark pigment in various organs or tissues
metamorphosis	a change in form or function as the phase in development of certain organisms from larva to adult
mortality	the whole sum of deaths in a given population or a given time
motile	having the ability to move at will
mottling	a condition marked by spotty colouration
nauplii	early larval stage of crustacea
necrosis	death of tissue
obligate parasite	unable to survive without host
outbreak	the sudden onset of disease in epizootic proportions
parasite	any organism that, in its natural habitat feeds and lives on the surface of, or within, another organism
pathogenicity	the capacity for something to cause disease
piscivorous	any organism that feeds on fish
pleiopod	small swimmerets on the underside of the crustacean tail
pop-eye	abnormal protrusion of the eyes from eye sockets
postlarvae	the stage following metamorphosis from larvae to juvenile in the life cycle of crustacea
predispose	to make susceptible
progeny	offspring
protozoan	unicellular organism with a true nucleus
punctate	marked by many minute dots

## GLOSSARY

respiratory stress	apparent problems breathing
secondary infection	infection resulting from a reduction in the host's resistance as a consequence of an earlier infection
septicaemia	presence of bacterial toxins and bacteria in the blood. Where disease is spread around the body via blood, commonly referred to as blood poisoning
susceptible	likely to be vulnerable
tail rot	disintegration of tail and fin tissue
transmission:	transfer of disease from one organism to another
	<i>horizontal</i> directly from environment (eg via ingestion, skin and gills) or
	<i>vertical</i> prenatal transmission (i.e. passed from parent to egg)
ventral	the underneath surface
viable	capable of living
virulence	the disease producing capability of a microorganism
water column	that part of the aquatic environment from the river/lake/sea bed and sediments to the water surface
zoospores	motile, flagellated and asexual spores

## COMMON NAMES

*Seriola quinqueradiata*  
*Sillago ciliata*  
*Spratelloides delicatulus*  
*Thyrstites atum*  
*Toxotes chartareus*  
*Toxotes jaculatrix*

yellowtail kingfish  
 whiting  
 blue sprat  
 barracouta  
 archer fish  
 archer fish

## MOLLUSCS

### Scientific name

*Crassostrea gigas*  
*Saccostrea glomerata*  
*Ostrea angasi*  
*Tridacna gigas*  
*Tridacna crocea*  
*Haliotis rubra*  
*Haliotis laevigata*

### Common name

Pacific oyster  
 Sydney rock oyster  
 flat oyster (southern mud oyster)  
 giant clam  
 boring or crocus clam  
 blacklip abalone  
 greenlip abalone

## CRUSTACEA

### Scientific name

*Astacus astacus*  
*Astacus leptodactylus*  
*Austropotamobius pallipes*  
*Cherax destructor*  
*Cherax quadricarinatus*  
*Cherax tenuimanus*  
*Euastacus armatus*  
*Euastacus kershawi*  
*Pacifastacus leniusculus*  
*Metapenaeus ensis*  
*Penaeus esculentus*  
*Penaeus indicus*  
*Penaeus japonicus*  
*Penaeus merguensis*  
*Penaeus monodon*  
*Penaeus plebejus*  
*Penaeus semisulcatus*  
*Penaeus aztecus*  
*Penaeus setiferus*  
*Penaeus stylirostris*  
*Penaeus californiensis*  
*Penaeus vannamei*

### Common name

noble crayfish  
 European crayfish  
 white-clawed crayfish  
 yabby  
 red claw  
 marron  
 Murray cray  
 Gippsland spiny crayfish  
 North American crayfish  
 red endeavour or greasy back prawn  
 brown tiger prawn  
 Indian or red legged banana prawn  
 Japanese king or Kuruma prawn  
 common or Gulf banana prawn  
 giant black tiger prawn  
 eastern king prawn  
 grooved tiger or green tiger prawn  
 northern brown shrimp  
 northern white shrimp  
 blue shrimp  
 yellowleg shrimp  
 white shrimp

## CONTACTS

### Person to contact if a disease is suspected

A government-employed fisheries pathologist has been designated to coordinate reports of disease in each of the States and Territories within Australia. One of these should be your first point of contact should you encounter an aquatic animal you suspect of being diseased.

### AUSTRALIAN CAPITAL TERRITORY

Environment ACT (02) 6207 2357

### NEW SOUTH WALES

NSW Fisheries (02) 4982 1232

Port Stephens Research Centre

### NORTHERN TERRITORY

Department of Primary Industries and Fisheries, Northern Territory (08) 8999 2254

### QUEENSLAND

Queensland Department of Primary Industry (07) 3404 6999

### SOUTH AUSTRALIA

Department of Primary Industry and Resources, South Australia (08) 8226 2311

### TASMANIA

Tasmanian Department of Primary Industry, Water and Environment (03) 6233-6833

### VICTORIA

Department of Natural Resources and Environment, Victoria (03) 9637 8000

### WESTERN AUSTRALIA

Fish Health Section Department of Fisheries Western Australia (08) 9368 3649



# Recording Keeping

Accurate records of the event are extremely important. These records assist with establishing the cause of the event.

Contact local Fisheries Office for an Oyster Mortality Report Form. Alternatively, go to [www.fisheries.nsw.gov.au](http://www.fisheries.nsw.gov.au) and search for "Oyster Mortality Report form".

Please make sure you fill in the form completely.

Label all sample containers with type of sample collected, collection date, farm/site location (eg lease number), name of the estuary, name and contact details of the collector.

For example: Sydney Rock Oysters  
 Collected on 22/09/2003  
 From Oyster Lease OL79/526  
 Located Upper Red Lake  
 Collected by John Citizen  
 Telephone 02 8888 8888

## Address samples to;

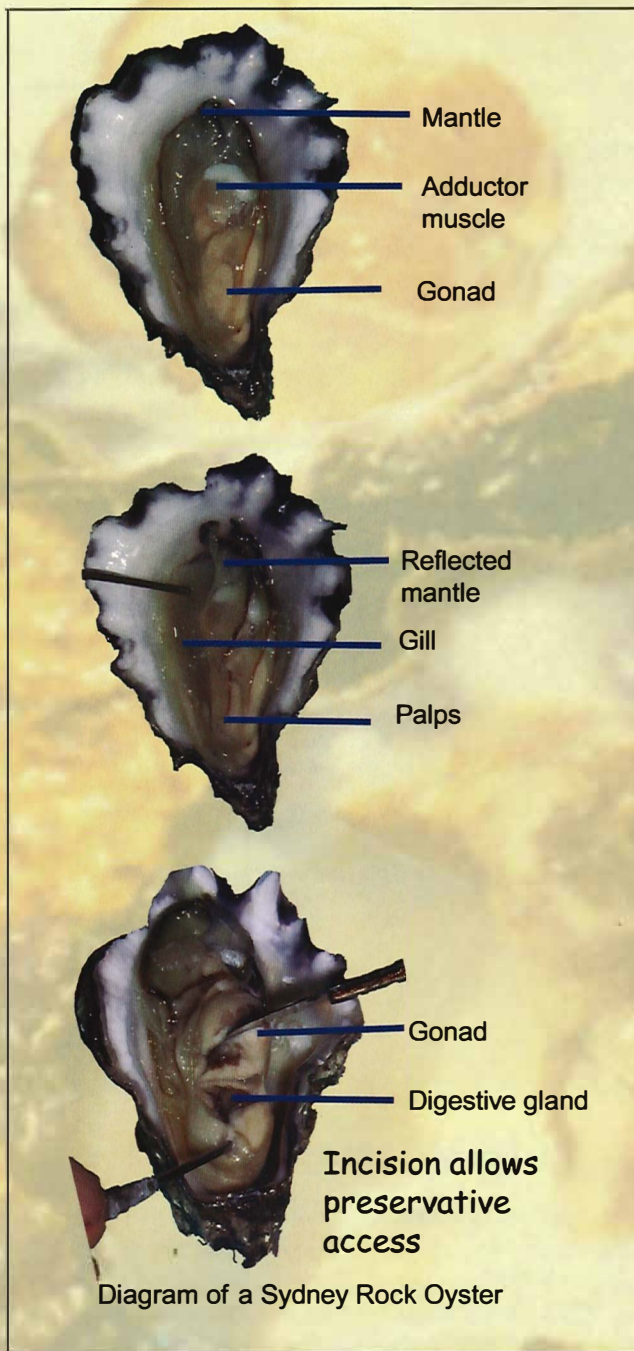
Matt Landos  
 NSW Fisheries  
 Aquatic Animal Health Unit  
 Regional Veterinary Laboratory  
 Bruxner Highway, Wollongbar NSW 2477

Telephone (02) 6626 1261  
 Mobile 0428 698 112  
 Fax (02) 6626 1276

Cost of testing is typically between \$60 and \$100 for histopathology, invoiced to submitter.



# Oyster Anatomy



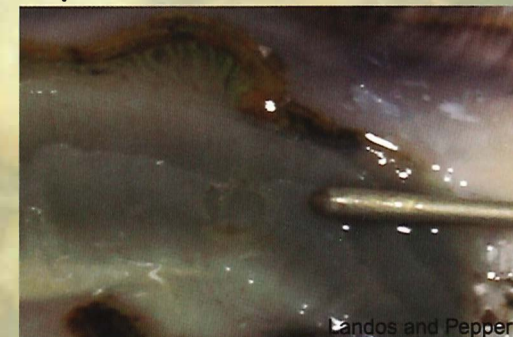
(Images by Landos & Pepper)



## Collecting, preserving and packaging oysters for disease testing

This brochure outlines the collection, preservation and packaging of oysters for disease testing and is an output of the 2003 disease simulation "Exercise Kilpatrick".

Call 1800 043 536 to Report Disease Outbreak



Gill necrosis consistent with winter mortality



QX effected oyster

Normal oyster



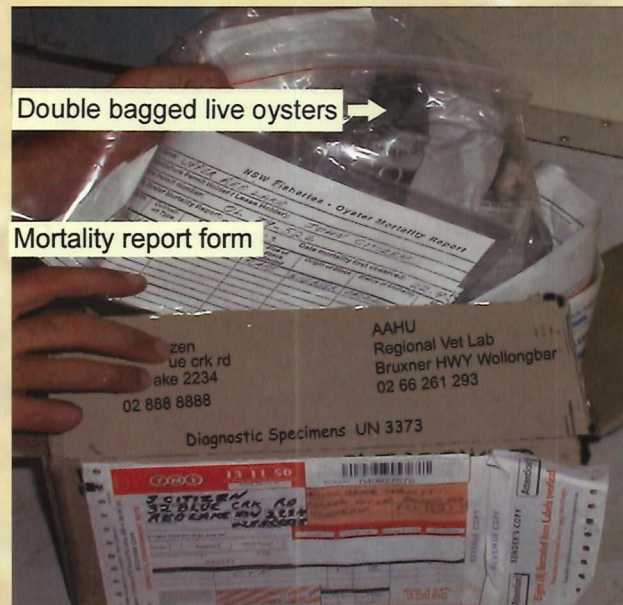
## Collection of Oysters

Select a minimum of 20 typically affected, live oysters from the impacted site. Also collect 20 from apparently unaffected nearby site. It is always preferable to send live oysters.

Collect the majority of the oysters from the areas where the most severe losses have been suffered. Select oysters that are capable of closing their hinge for live shipment to the laboratory. Use prompt courier service (< 24 hours) to send live oysters for diagnosis.

Where delivery may be delayed use 10% formalin preservative as follows.

Recently dead oysters are not suitable for disease diagnostics.



## Preserving Oysters

To preserve shellfish tissues 10% formalin is used.

This solution can be sourced premixed or can be made from concentrate by mixing one part formaldehyde (37-40% concentrate) with nine parts clean full strength seawater.

Prepare at least 10 times the volume of preservative solution to the volume of shellfish tissue you propose to preserve.

Oysters need to be opened and cut away from their attachments to the shell, prior to preservation.

The gonad/digestive gland also needs to be lanced open to allow penetration of the 10% formalin preservative.

Immerse the entire oyster in the formalin solution.

Allow 24 hours for the 10% formalin preservative to penetrate and preserve the specimen. After 24 hours excess formalin can be poured off prior to postage or Oysters can be sent immediately in preservative with appropriate packaging as follows.



## Formaldehyde/formalin

Formaldehyde and formalin are classified as hazardous substances. Request WorkCover guidelines Ph 131050. Request a Material Safety Data Sheet from your supplier and follow precautions for use including: avoid contact with eyes; do not breathe fumes; wear suitable protective clothing; and use only in well ventilated areas.

## Packaging Guidelines

The following should only be used as a guide. Please, consult your courier to obtain their current requirements.

Where ever possible send live affected (20) and unaffected (20) oysters, wrapped in moist newspaper labelled and sealed in a plastic bag.

If courier delays are expected, preserve affected (10) and unaffected (10) in 10% formalin, in separate labelled leak proof containers (no larger than 500ml). Remaining affected (10), unaffected (10) live oysters packaged as above; should be included in shipment.

Wrap absorbent material (eg cotton wool, newspaper) around primary containers in sufficient quantity to absorb liquid contents, spillages.

Place the wrapped primary container in a leak-proof secondary container (eg sealed plastic bag, larger sealable container). Place specimens in a third container eg (hard frame esky or cardboard box). Place a copy of the Oyster Mortality Report Form in a zip-lock bag and place into the outer container before you seal it.

Sender and receiver addresses and phone numbers, the words "Diagnostic Specimen UN3373" and the net sample volume (not to exceed 4L) must be written on the box and the consignment note.

Overnight courier service desirable.

