



Australian Government
Department of Agriculture, Fisheries and Forestry

Aquatic Animal Diseases Significant to Australia: Identification Field Guide 4th Edition

Biosecurity

USER GUIDE



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Foreword



The Australian Government Department of Agriculture, Fisheries and Forestry is pleased to introduce the fourth edition of this field guide.

The field guide aims to help people recognise diseases of significance to aquaculture and fisheries in Australia. This edition incorporates new and updated information gathered from an extensive review of the third edition. It now covers 48 aquatic animal diseases of significance to Australia that affect species of finfish, crustaceans, molluscs and, for the first time, amphibians.

Early recognition and reporting of suspected disease outbreaks is critical to protecting our unique aquatic biodiversity, and fisheries and aquaculture sectors. It can permit a rapid disease response to contain outbreaks, increasing the opportunity for disease eradication and thereby limiting potential impacts on aquatic animal industries and the environment. People who work closely with aquatic animals are usually the first to notice signs of a significant disease event. This field guide provides guidance for these people—commercial fishers, aquaculture workers, recreational fishers, quarantine staff, scientists, conservationists and students—to recognise significant aquatic animal diseases, should they occur.

Many people and institutions have contributed to the field guide, including fish health experts from industry, research organisations, state and territory governments, and government agencies of the Asia–Pacific region (including New Zealand), Canada, Denmark, Norway, the United Kingdom and the United States of America. Drawing extensively on experience and research activities in aquatic animal health management, both in Australia and abroad, the guide complements the growing body of practical knowledge published for aquaculture and fisheries in Australia. On behalf of the Australian Government, I thank all contributors to this production for their efforts and commend this field guide to you.

Dr Mark Schipp

Australian Chief Veterinary Officer

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Members of the Australian Government Department of Agriculture, Fisheries and Forestry—Aquatic Animal Health Program coordinated the production of this fourth edition including Alexandra McLaren, Ryan Keightley, Suzanne Payne and Steve Wortley. Alistair Herfort is recognised as co-ordinator of the first three editions of the field guide and provided advice in the production of this edition.

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- Staff of the Department of Microbiology and Immunology, James Cook University
- Staff at New South Wales Department of Primary Industries

How to use this field guide

The field guide begins with coverage of finfish, mollusc, crustacean and amphibian anatomy including images and illustrations to help the reader describe lesions when reporting a suspected disease. It follows with descriptions for each infectious disease present in Australia's National List of Reportable Diseases of Aquatic Animals. These are presented alphabetically and classified into infectious diseases affecting finfish, molluscs (e.g. oysters), crustaceans (e.g. prawns) and amphibians (e.g. frogs)

Each disease page describes the signs of disease (at the farm/tank/pond level and gross and microscopic pathological signs), the disease agent, host species that carry the disease agent, the presence of the disease in Australia, epidemiology of the disease, other diseases in the field guide that may have similar signs, and sample collection and reporting of disease outbreaks. Most disease pages have photographs of animals with gross signs of disease or histological images detailing the typical tissue changes present.

Diagnosing diseases of aquatic animals is a structured process which begins with making detailed observations, then asking the right questions. The primary aim of this process is to create a broad list of possible diseases which may account for the observed signs. This can be further refined by targeted questioning and diagnostic tests. Questions to ask may include; which species, age class, sizes and sex of animals are involved? What specifically have you observed—for example, behavioural changes, changes in feed intake (reduced or increased), changes in faecal output? Are there obvious gross lesions (colour changes, ulcers, spots, etc.)? Does disease result in morbidity only or are there mortalities? What level of mortality has been observed? Do animals show signs of recovery? At what rate did you observe disease (sudden death or chronic progression of disease)? Is this the first occurrence of disease with this presentation in your facility? Are any neighbouring properties or facilities reporting diseases? Have there been recent introductions to the facility or any changes in practice?

After making your initial observations, go to the 'signs of disease' section of the disease entries. Look up the diseases listed that match your observations, and you will find photographs and further information to help you narrow the search for the cause of the disease. For example, you might have observed disease in a marine fish, but then find that the listed disease with similar presenting signs affects only freshwater species—in this way, you can eliminate the unlikely, and your list of

differential diagnoses will be shorter. In all cases, however, laboratory tests would be required for a definitive diagnosis. Local authorities with responsibility for aquatic animal health can advise on further courses of action should you suspect any disease listed in the field guide.

Signs of disease

Diagnostic information based on disease signs at the farm, tank or pond level, and gross pathological signs (abnormalities that can be seen with the naked eye) is important. However, in most cases, it is impossible to arrive at a definitive diagnosis on the basis of these signs alone. Although some users will not have experience in histological examination or the equipment required for such examination in the field, the field guide also lists microscopic pathological disease signs.

Mass mortality

A fish kill involving a range of species is more likely caused by an environmental problem (such as toxicity or oxygen depletion). Deaths limited to one species (where other species are also present) is more likely a result of an infectious agent.

Behavioural changes

All species of aquatic animals have characteristic protection, food-gathering and breeding behaviours. Abnormal behaviour, such as a decrease in feeding, could indicate stress from disease.

Some behavioural changes can occur across groups of species, or even across different phyla. In molluscs, few behavioural differences are observed such as delayed closing (in oysters) and decreased feeding or adhesion to vertical surfaces (in abalone). Finfish often gather at water inlets or gasp for air at the surface if the water is depleted of oxygen. If irritated by skin parasites, they may scrape themselves on hard surfaces. Whirling or 'corkscrew' swimming could indicate disease from an infectious agent or aquatic toxins. In both finfish and crustaceans, gathering at the surface or pond edges can often be a sign of disease.

Gross signs

Gross pathological changes may indicate the presence of infectious disease. Careful observation and further laboratory investigation is required to make a definitive diagnosis because many of the signs are not singularly pathognomonic (characteristic for a specific disease) and may be common pathological changes associated with multiple infectious agents. The table below describes some of the more commonly observed visible signs and the groups of aquatic animals dealt with in this field guide for which these are most often observed.

Sign	Finfish	Molluscs	Crustaceans	Amphibians
Changes in the colour, texture and opacity of flesh	*	*	*	*
Tissue necrosis and lesions	*	*	*	*
Retraction of gill margins		*		
Pustules	*	*		
External spots	*		*	
Changes in surface colour	*		*	*
Secondary fungal or bacterial growth	*		*	*
Deformities and tumours	*		*	*
Swollen or discoloured organs or faecal castes	*	*	*	*
White midgut line	*		*	
Broken or damaged appendages			*	
Erosion of shell			*	
Lesions or ulcers of skin or gills	*			*
Haemorrhaging with associated anaemia	*			*
Granulomas	*			
Exophthalmos (pop-eye)	*			
Ascites (accumulation of fluid in peritoneal cavity)	*			*
Petechial haemorrhages (pinpoint bleeding in skin and mucous membranes)	*			*
Ecchymotic haemorrhages (bleeding or bruising beneath the skin or mucous membranes)	*			*
Excessive mucus on gills and skin	*	*		
Dropsy (accumulation of fluid in body tissues)	*			*
Protrusion of scales	*			

Host range

A list of species known to be susceptible to the infectious agent is provided. Species are further classified as either naturally susceptible (diseased animals have been identified in the wild) or experimentally susceptible. Lists of susceptible species reflect the information available at the time of publishing; however, with further understanding and sampling, it is expected that such lists will expand and/or require refining. Common and scientific names for hosts are provided.

Presence in Australia

Information on the national distribution of diseases listed in the field guide is based on formal reporting through the regional Quarterly Aquatic Animal Disease reporting program (managed by NACA, FAO and OIE). Australia has been an active participant since 1998.

Where a listed disease has been reported under the program to have been present, a map illustrating where it occurred in Australia is included. States or territories having reported disease are shown in orange in the distribution map. It is important to note that, although a map may identify a state or territory as having reported a disease, this neither implies that it is present at the time of publication or that it occurs across the entire state or territory.

Readers should consult the World Animal Health Information Database (WAHID) interface (www.oie.int/wahis/public.php?page=home) or the International Database on Aquatic Animal Diseases (www.collabcen.net/idaad) for current information on global distribution of diseases outside Australia.

Exotic diseases

Diseases in this field guide described as exotic are those that do not occur in Australian aquatic animal populations.

Endemic diseases

Endemic (enzootic) diseases are those that have established in Australian aquatic animal populations. They might be native to Australia or might have been introduced in the past.

Epidemiology

The field guide describes epidemiological factors that are important to each disease. The key to describing the epidemiology of a disease involves understanding the relationship between the infectious agent, the host/s and the environment. Factors relating to the infectious agent include its life cycle (direct transmission or a requirement for intermediate host stages), survival outside the host (carriage on fomites, passage in waste water) and sensitivity to certain temperatures or salinities. Host factors may include the susceptible species, ages, sexes and sizes involved. Environmental factors include seasonal and non-seasonal variations in temperature, food availability, salinity, available oxygen, species movement and exposure to different environments (for example, migrations or gathering for breeding); these factors can affect disease agent survivability and host immune competence.

Differential diagnosis

The list of similar diseases at the bottom of each disease page refers 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 used as a guide to a definitive diagnosis, but rather as a tool to help identify the diseases included in this field guide that most closely account for the observed gross signs. Further diagnostic testing will be required to confirm either presence or freedom from a suspected disease.

Introduction

This field guide has been designed to provide ready access to information on the aquatic animal diseases significant to Australia. These diseases have potential to cause disruption to Australia's aquatic animal biodiversity, fisheries and aquaculture productivity, and international trade. The diseases covered here are in Australia's National List of Reportable Diseases of Aquatic Animals, which includes those reportable through the regional Quarterly Aquatic Animal Disease reporting program (managed by NACA, FAO and OIE), as well as other diseases considered of national significance.

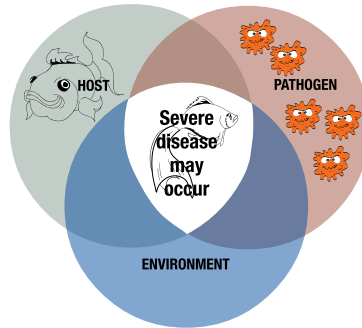
The field guide is aimed at fishery and aquaculture managers, their field staff, veterinary workers and students of aquatic animal health. The publication is also relevant to people in the seafood processing and retail industry, recreational and commercial fishers, and the general public. For people participating in national surveillance and monitoring for aquatic animal disease, the field guide is a valuable disease reference. For the casual reader, the field guide gives an informative and often graphic account of the diseases and organisms that threaten Australia's expanding aquaculture industries.

The marine and freshwater environments in Australia are rich with many types of animals. The field guide focuses on fish, molluscs (e.g. oysters), crustaceans (e.g. prawns) and amphibians (e.g. frogs). It is not possible to list every disease for every species in a publication of this type, so the emphasis is on infectious diseases found on Australia's National List of Reportable Diseases of Aquatic Animals, significant to our aquaculture industries, fisheries and environment.

Nature of disease

The diseases described in this field guide are caused by infectious agents—viruses, bacteria, fungi or parasites; diseases with non-infectious causes are outside its scope. Non-infectious causes of disease in the aquatic environment are often attributable to the environment itself: morbidity and mortality can result from natural or human-influenced events that lead to oxygen depletion, production of aquatic toxins, or changes in water temperature or salinity.

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



However, disease will not occur simply because an infectious agent is present. Rather, the likelihood of disease being expressed is determined by the specific interactions between the host (the aquatic animal), the infectious agent or pathogen, and the environment (Figure 1).

Laboratory tests and sampling

Photographs of gross disease signs, such as those in this field guide, can help an investigator to create a preliminary list of possible disease agents (differential diagnosis list) for the case under investigation. However, although gross signs narrow the search for possible agents, they

are not adequate for definitive diagnosis; consequently, representative samples from the diseased animal(s) and the environment in which they live need to be taken for analysis. Information about sampling can be found in the following publication:

- Asia diagnostic guide to aquatic animal diseases, Food and Agriculture Organization of the United Nations Fisheries Technical Paper 402/2 (www.fao.org/docrep/005/y1679e/y1679e00.htm).

The website of the Australian Government Department of Sustainability, Environment, Water, Population and Communities (www.environment.gov.au/water/index.html) provides information on the management of inland water quality. The OIE Manual of diagnostic tests for aquatic animals 2011 provides standard diagnostic methods for OIE-listed diseases.

Reporting disease

Fishery and aquaculture industry managers, as well as farmers and their staff, should be aware of their responsibilities to rapidly report any suspicion of diseases on Australia's National List of Reportable Diseases of Aquatic Animals to local authorities.

In preparation for a possible disease incursion, fishery and aquaculture industry managers should develop an emergency management plan, in consultation with farmers and appropriate extension staff.

If you identify signs of disease in a culture system, contact your aquatic animal health officer. If your observation is of wild aquatic animals, contact a wildlife or fisheries officer. The contacts page at the end of this field guide provides current state and territory government contact details so that you can report your find and ask further questions on the observations you have made. You will be directed to an expert on diseases of aquatic animals within your state or territory. A national emergency animal disease watch hotline number has been established to assist early reporting of suspicious disease events. Call 1800 675 888 (free call and available 24 hours).

Follow the directions and advice provided by the officer you contact. This field guide will help you find the information the officer needs.

Scientific Names

Finfish

Scientific name

Abramis brama

Acanthopagrus australis

Acanthopagrus latus

Acanthopagrus schlegelii

Acipenser baeri

Acipenser gueldenstaedtii

Acipenser transmontanus

Ambassis agassizii

Ambloplites rupestris

Ameiurus catus

Ameiurus melas

Ameiurus natalis

Ameiurus nebulosus

Ammodytes hexapterus

Ammodytes lancea

Ammodytes personatus

Ammodytes spp.

Amniataba percooides

Anabas testudineus

Anarhichas lupus

Anarhichas minor

Common name/s

Freshwater bream

Yellowfin bream

Western yellowfin bream

Black seabream or black porgy

Siberian sturgeon

Russian sturgeon

White sturgeon

Chanda perch

Rock bass

White catfish

Black bullhead

Yellow bullhead

Brown bullhead

Pacific sand lance

Lesser sand eel

Pacific sand eel

Sand eel

Barred grunter

Climbing perch

Wolffish or Atlantic wolffish

Spotted wolffish

Scientific name	Common name/s
<i>Acanthurus triostegus</i>	Convict surgeonfish
<i>Anguilla anguilla</i>	European eel
<i>Anguilla australis</i>	Eel
<i>Anguilla japonica</i>	Japanese eel
<i>Anguilla rostrata</i>	American eel
<i>Anguilla</i> spp.	Eels
<i>Anodontiglanis dahlia</i>	Toothless catfish
<i>Anoplopoma fimbria</i>	Sablefish
<i>Apistogramma</i> spp.	Dwarf cichlids
<i>Aplocheilichthys normani</i>	African lampeye killifish
<i>Aplodinotus grunniens</i>	Freshwater drum
<i>Apogon exostigma</i>	Narrowstripe cardinalfish
<i>Argentina sphyraena</i>	Lesser argentine
<i>Aristichthys nobilis</i>	Bighead carp
<i>Arius leptaspis</i>	Triangular shield catfish
<i>Arius</i> spp.	Fork-tailed catfish
<i>Astronotus ocellatus</i>	Oscar
Atherinidae	Silversides
<i>Atractoscion nobilis</i>	White seabass
<i>Aulorhynchus flavidus</i>	Tubesnout
Bagridae	Bagrid catfishes
<i>Barbus graellsii</i>	Spanish barbel
<i>Bidyanus bidyanus</i>	Silver perch
<i>Blicca bjoerkna</i>	Silver bream
Bothidae	Left-eye flounders
<i>Brachydanio rerio</i>	Zebra danio
<i>Branchiostegus japonicus</i>	Japanese or red tilefish
<i>Brevoortia tyrannus</i>	Atlantic menhadden
Carangidae	Trevally and amberjacks
<i>Carassius auratus</i>	Goldfish
<i>Carassius carassius</i>	Crucian carp
<i>Carassius</i> sp.	Shububkin
<i>Catostomus commersoni</i>	White sucker
<i>Channa marulius</i>	Bullseye snakehead
<i>Channa striatus</i>	Striped snakehead
<i>Chanos chanos</i>	Milkfish
Cichlidae	Cichlids

Scientific name	Common name/s
<i>Cinetodus froggatti</i>	Froggatt's catfish
<i>Cirrhinus cirrhinus</i>	Mrigal
<i>Clarias batrachus</i>	Walking catfish
<i>Clarius</i> spp.	Torpedo-shaped catfishes
<i>Clupea harengus</i>	Atlantic herring
<i>Clupea pallasii</i>	Pacific herring
Clupeidae	Herrings and sardines
<i>Cnidoglanis macrocephalus</i>	Estuary catfish
Cobitidae	Loaches
<i>Colisa lalia</i>	Dwarf gourami
<i>Colisa</i> spp.	Gourami
Coregonidae	Whitefish
<i>Coregonus artedii</i>	Cisco
<i>Coregonus clupeaformis</i>	Lake whitefish
<i>Coregonus peled</i>	Whitefish
<i>Coregonus muksun</i>	Whitefish
<i>Coregonus</i> spp.	Whitefish
Cotostomidae	Suckers
<i>Cottos gobio</i>	Bullhead
<i>Cromileptes altivelis</i>	Humpback grouper
<i>Ctenolabrus rupestris</i>	Goldsinny
<i>Ctenopharyngodon idellus</i>	Grass carp
<i>Cymatogaster aggregata</i>	Shiner perch
Cyprinidae	Cyprinids
<i>Cyprinus carpio</i>	Common carp and koi carp
<i>Damalichthys vacca</i>	Pile perch
<i>Danio devario</i>	Sind danio
<i>Danio rerio</i>	Zebrafish
<i>Dicentrarchus labrax</i>	European seabass
<i>Dorosoma cepedianum</i>	Gizzard shad
<i>Eigenmannia virescens</i>	Glass knifefish
<i>Enchelyopus cimbrius</i>	Fourbeard rockling
<i>Eopsetta grigorjewi</i>	Shotted halibut
<i>Epinephelus aeneus</i>	White grouper
<i>Epinephelus akaara</i>	Red-spotted grouper or Hong Kong grouper
<i>Epinephelus awoara</i>	Yellow grouper
<i>Epinephelus bruneus</i>	Longtooth grouper

Scientific name	Common name/s
<i>Epinephelus coioides</i>	Orange-spotted grouper
<i>Epinephelus fuscoguttatus</i>	Brown-marbled grouper
<i>Epinephelus lanceolatus</i>	Giant grouper
<i>Epinephelus malabaricus</i>	Malabar grouper
<i>Epinephelus marginatus</i>	Dusky grouper
<i>Epinephelus septemfasciatus</i>	Seven-band grouper
<i>Epinephelus sexfasciatus</i>	Six-bar grouper
<i>Epinephelus</i> spp.	Grouper and estuary cod
<i>Epinephelus tauvina</i>	Estuarine rockcod
Esocidae	Pikes
<i>Esox lucius</i>	Pike
<i>Esox masquinongy</i>	Muskellunge
<i>Etroplus maculatus</i>	Orange chromides
<i>Evynnis japonica</i>	Crimson seabream
<i>Evynnis tumifrons</i>	Yellowback seabream
<i>Exocoetus volitans</i>	Tropical two-winged flying fish
<i>Fundulus heteroclitus</i>	Mummichog
<i>Gadus macrocephalus</i>	Pacific cod
<i>Gadus microgadus</i>	Tomcod
<i>Gadus morhua</i>	Atlantic cod
<i>Galaxias olidus</i>	Mountain galaxias
Galaxiidae	Minnnows
<i>Gambusia affinis</i>	Mosquito fish
<i>Gasterosteus aculeatus</i>	Three-spined stickleback
<i>Girella punctata</i>	Girella or rudderfish
<i>Glossamia aprion</i>	Mouth almighty
<i>Glossogobius giuris</i>	Flathead goby
<i>Glyptocephalus stelleri</i>	Korean flounder
<i>Hexagrammos otakii</i>	Greenling
<i>Hippoglossoides platessoides</i>	American plaice
<i>Hippoglossus hippoglossus</i>	Atlantic halibut
<i>Hippoglossus stenolepis</i>	Halibut
<i>Hoplobrotula armata</i>	Armoured weaselfish
<i>Hucho hucho</i>	Danube salmon
<i>Hyperoplus lanceolatus</i>	Great sandeel
<i>Hypomesus pretiosus</i>	Surf smelt
<i>Hypophthalmichthys molitrix</i>	Silver carp

Scientific name	Common name/s
<i>Ictalurus catus</i>	White catfish
<i>Ictalurus furcatus</i>	Blue catfish
<i>Ictalurus nebulosus</i>	Brown bullhead
<i>Ictalurus punctatus</i>	Channel catfish
<i>Kurtus gulliveri</i>	Nurseryfish
<i>Labeo</i> spp.	Rhinofishes
Labridae	Wrasse
<i>Labrus bergylta</i>	Wrasse
<i>Laetacara curviceps</i>	Curviceps
<i>Lampetra fluviatilis</i>	River lamprey
<i>Lateolabrax japonicus</i>	Japanese seabass
<i>Lateolabrax</i> spp.	Seabass
<i>Lates calcarifer</i>	Barramundi
<i>Latris lineata</i>	Striped trumpeter
<i>Leiopotherapon unicolor</i>	Spangled perch
<i>Lepomis gibbosus</i>	Pumpkinseed
<i>Lepomis macrochirus</i>	Bluegill
<i>Lethrinus haematopterus</i>	Chinese emperor
<i>Lethrinus nebulosus</i>	Spangled emperor
<i>Leuciscus cephalus</i>	Chub
<i>Leuciscus idus</i>	Ide or orfe
<i>Leuciscus leuciscus</i>	Dace
<i>Limanda limanda</i>	Dab
<i>Liza auratus</i>	Golden grey mullet
<i>Lota lota</i>	Burbot
<i>Lutjanus argentimaculatus</i>	Mangrove jack
<i>Lutjanus erythropterus</i>	Red snapper
<i>Maccullochella peelii peelii</i>	Murray cod
<i>Macquaria ambigua</i>	Golden perch
<i>Macquaria australasica</i>	Macquarie perch
<i>Macquaria novemaculata</i>	Australian bass
<i>Macropodus opercularis</i>	Paradise fish
<i>Melanogrammus aeglefinus</i>	Haddock
<i>Melanotaenia splendida</i>	Rainbow fish
<i>Merlangius merlangus</i>	Whiting
Merlucciidae	Hake
<i>Merluccius productus</i>	Pacific hake

Scientific name	Common name/s
<i>Microgadus proximus</i>	Pacific tomcod
<i>Micromesistius poutassou</i>	Blue whiting
<i>Micropterus dolomieu</i>	Smallmouth bass
<i>Micropterus salmoides</i>	Largemouth bass
<i>Mikrogeophagus ramirezi</i>	Ram cichlid
<i>Misgurnus anguillicaudatus</i>	Loach
<i>Morone americanus</i>	White perch
<i>Morone chrysops</i>	White bass
<i>Morone mississippiensis</i>	Yellow bass
<i>Morone saxatilis</i>	Striped bass
Moronidae	White seabass
<i>Moxostoma anisurum</i>	Silver redhorse
<i>Moxostoma macrolepidotum</i>	Shorthead redhorse
<i>Mugil cephalus</i>	Mullet
Mugilidae	Mulletts
<i>Mullus barbatus</i>	Red mullet
<i>Nematolosa erebi</i>	Bony bream
<i>Neoarius berneyi</i>	Berney's catfish
<i>Neogobius melanostomus</i>	Round goby
<i>Neosilurus ater</i>	Black catfish
<i>Notemigonus atherinoides</i>	Emerald shiner
<i>Notropis atherinoides</i>	Emerald shiner
<i>Notropis cornutus</i>	Common shiner
<i>Notropis hudsonius</i>	Spottail shiner
<i>Noturus gyrinus</i>	Tadpole madtom
<i>Oncorhynchus aguabonita</i>	Golden trout
<i>Oncorhynchus clarkii</i>	Cutthroat trout
<i>Oncorhynchus gorbuscha</i>	Pink salmon
<i>Oncorhynchus keta</i>	Chum salmon
<i>Oncorhynchus kisutch</i>	Coho salmon
<i>Oncorhynchus masou</i>	Masu salmon
<i>Oncorhynchus mykiss</i>	Rainbow trout
<i>Oncorhynchus mykiss</i> × <i>O. kisutch</i>	Hybrid rainbow trout × coho salmon
<i>Oncorhynchus nerka</i>	Sockeye salmon
<i>Oncorhynchus rhodurus</i>	Amago salmon
<i>Oncorhynchus</i> spp.	Pacific salmon
<i>Oncorhynchus tshawytscha</i>	Chinook salmon

Scientific name	Common name/s
<i>Oplegnathus fasciatus</i>	Japanese parrotfish
<i>Oplegnathus punctatus</i>	Spotted knifejaw
<i>Oreochromis niloticus</i>	Nile tilapia
<i>Oxyeleotris lineolatus</i>	Sleepy cod
<i>Oxyeleotris marmoratus</i>	Marble goby
<i>Oxyeleotris selheimi</i>	Giant gudgeon
<i>Pagrus auratus</i>	Snapper
<i>Pagrus auriga</i>	Redbanded seabream
<i>Pagrus major</i>	Red seabream
<i>Pampus argenteus</i>	Silver pomfret
<i>Pangasius hypophthalmus</i>	Sutchi catfish
<i>Parachondrostoma toxostoma</i>	Southwest European nase
Paralichthyidae	Flounders
<i>Paralichthys dentatus</i>	Summer flounder
<i>Paralichthys lethostigma</i>	Southern flounder
<i>Paralichthys olivaceus</i>	Japanese flounder
<i>Parambassis gulliveri</i>	Giant glassfish
<i>Parapristipoma trilineatum</i>	Chicken grunt
<i>Parophrys vetulus</i>	English sole
<i>Pelteobagrus fulvidraco</i>	Yellow catfish
<i>Pelvicachromis pulcher</i>	Rainbow krib
<i>Perca flavescens</i>	Yellow perch
<i>Perca fluviatilis</i>	Redfin perch or European perch
Percidae	Perches
<i>Percopsis omiscomaycus</i>	Trout-perch
<i>Petromyzon marinus</i>	Sea lamprey
Petromyzontidae	Lampreys
<i>Phoxinus phoxinus</i>	Minnow
<i>Pimephales notatus</i>	Bluntnose minnow
<i>Pimephales promelas</i>	Fathead minnow
<i>Platichthys flesus</i>	Flounder
<i>Platycephalus fuscus</i>	Dusky flathead
<i>Platycephalus indicus</i>	Bartail flathead
<i>Plecoglossus altivelis</i>	Ayu
<i>Plectorhinchus cinctus</i>	Crescent sweetlips
<i>Plectropomus maculatus</i>	Spotted coralgroupier
<i>Pleuronectes platessa</i>	Plaice

Scientific name	Common name/s
<i>Poecilia latipinna</i>	Sailfin mollies
<i>Poecilia reticulata</i> or <i>Lebistes reticulatus</i>	Guppy
<i>Poecilia sphenops</i>	Molly
<i>Pollachius virens</i>	Coalfish or pollock
<i>Pomatoschistus minutus</i>	Sand goby
<i>Pomoxis nigromaculatus</i>	Black crappie
<i>Psetta maxima</i>	Turbot
<i>Pseudocaranx dentex</i>	Silver trevally
<i>Pseudochondrostoma polylepis</i>	Iberian nase
<i>Pseudopleuronectes americanus</i>	Winter flounder
<i>Pseudosciaena crocea</i>	Croceine croaker
<i>Pterapogon kauderni</i>	Banggai cardinalfish
<i>Pterophyllum scalare</i>	Angelfish
<i>Puntius conchonius</i>	Rosy barb
<i>Puntius sophore</i>	Pool barb
<i>Rachycentron canadum</i>	Cobia
<i>Reinhardtius hippoglossoides</i>	Greenland halibut
<i>Rhombosolea tapirina</i>	Greenback flounder
<i>Rutilus rutilus</i>	Common roach
<i>Salmo clarki</i>	Cutthroat trout
<i>Salmo hucho</i>	Dunube salmon
Salmonidae	Salmonids
<i>Salmo salar</i>	Atlantic salmon
<i>Salmo trutta</i>	Brown trout
<i>Salmo trutta labrax</i>	Black sea salmon
<i>Salvelinus alpinus</i>	Arctic char
<i>Salvelinus confluentus</i>	Bull trout
<i>Salvelinus fontinalis</i>	Brook trout
<i>Salvelinus leucomaenis</i>	Whitespotted char
<i>Salvelinus namaycush</i>	Lake trout
<i>Salvelinus namaycush</i> × <i>S. fontinalis</i>	Lake trout × brook trout
<i>Sander lucioperca</i>	Pike perch
<i>Sardinops sagax</i>	Pacific sardine
<i>Scardinius erythrophthalmus</i>	Rudd
<i>Scatophagus argus</i>	Scat
Sciaenidae	Drums and croakers
Sciaenidae spp.	Croakers

Scientific name	Common name/s
<i>Sciaenops ocellatus</i>	Red drum
<i>Scleropages jardini</i>	Saratoga
<i>Scomber japonicus</i>	Chub mackerel
<i>Scomberomorus niphonius</i>	Japanese Spanish mackerel
<i>Scophthalmus maximus</i>	Turbot
<i>Scortum barcoo</i>	Barcoo grunter
<i>Sebastes schlegeli</i>	Black rockfish
<i>Sebastes</i> spp.	Rockfish
<i>Seriola dumerili</i>	Greater amberjack
<i>Seriola hippos</i>	Samson fish
<i>Seriola lalandi</i>	Yellowtail kingfish
<i>Seriola quinqueradiata</i>	Japanese yellowtail
<i>Sillago ciliata</i>	Whiting
<i>Silurus asotus</i>	Chinese catfish
<i>Silurus glanis</i>	Wels catfish or sheatfish
<i>Siniperca chautsi</i>	Chinese perch or mandarin fish
<i>Solea senegalensis</i>	Senegalese sole
<i>Solea solea</i>	Common sole
Soleidae	Soles
<i>Sparus aurata</i>	Gilt-head seabream
<i>Sprattus sprattus</i>	European sprat
<i>Stephanolepis cirrhifer</i>	Thread-sail filefish
<i>Strongylura krefftii</i>	Long tom
<i>Symphysodon discus</i>	Discus fish
<i>Takifugu rubripes</i>	Tiger puffer
<i>Thaleichthys pacificus</i>	Eulachon
<i>Theragra chalcogramma</i>	Walleye pollock or Alaska pollock
<i>Thunnus thynnus</i>	Northern bluefin tuna
<i>Thymallus thymallus</i>	Grayling
<i>Tinca tinca</i>	Tench
<i>Toxotes chatareus</i>	Archer fish
<i>Toxotes lorentzi</i>	Primitive archer fish
<i>Trachinotus blochii</i>	Snubnose dart
<i>Trachinotus falcatus</i>	Yellow-wax pompano
<i>Trachurus japonicus</i>	Japanese horse mackerel
<i>Trichiurus lepturus</i>	Hairtail
<i>Trichogaster leerii</i>	Pearl gourami

Scientific name	Common name/s
<i>Trichogaster microlepis</i>	Silver gourami
<i>Trichogaster pectoralis</i>	Snakeskin gourami
<i>Trichogaster trichopterus</i>	Three-spot gourami
<i>Trisopterus esmarki</i>	Norway pout
<i>Trisopterus minutus</i>	Poor cod
<i>Umbrina cirrosa</i>	Shi drum
<i>Verasper moseri</i>	Barfin flounder
<i>Verasper variegatus</i>	Spotted halibut
<i>Xiphophorus helleri</i>	Swordtail or green swordtail
<i>Xiphophorus maculatus</i>	Southern platyfish or red wagtail platy
<i>Zoarces viviparus</i>	Viviparous blenny

Molluscs

Scientific name	Common name/s
<i>Anadara trapezia</i>	Sydney cockle
<i>Argopecten gibbus</i>	Calico scallop
<i>Austrovenus stutchburyi</i>	New Zealand cockle
<i>Barbatia novae-zelandiae</i>	New Zealand cockle
<i>Cardium edule</i>	Common cockle
<i>Chamelea gallina</i>	Striped venus clam
<i>Crassostrea ariakensis</i>	Suminoe oyster
<i>Crassostrea corteziensis</i>	Cortez oyster
<i>Crassostrea gigas</i>	Pacific oyster
<i>Crassostrea nippona</i>	Iwagaki oyster
<i>Crassostrea rhizophorae</i>	Mangrove oyster
<i>Crassostrea sikamea</i>	Kumamoto oyster
<i>Crassostrea virginica</i>	American oyster
<i>Haliotis corrugata</i>	Pink abalone
<i>Haliotis cracherodii</i>	Black abalone
<i>Haliotis cyclobates</i>	Whirling abalone
<i>Haliotis discus hannai</i>	Japanese abalone
<i>Haliotis diversicolor supertexta</i>	Small abalone
<i>Haliotis diversicolor</i>	Diversicolor or juukong abalone
<i>Haliotis fulgens</i>	Green abalone
<i>Haliotis laevigata</i>	Greenlip abalone
<i>Haliotis rubra</i>	Blacklip abalone
<i>Haliotis rubra</i> × <i>Haliotis laevigata</i>	Tiger abalone
<i>Haliotis rufescens</i>	Red abalone

Scientific name	Common name/s
<i>Haliotis scalaris</i>	Staircase abalone
<i>Haliotis sorenseni</i>	White abalone
<i>Haliotis tuberculata</i>	European abalone
<i>Haliotis wallalensis</i>	Flat abalone
<i>Katelysia rhytiphora</i>	Sand cockle
<i>Macoma balthica</i>	Baltic macoma
<i>Macomona liliana</i>	New Zealand cockle
<i>Mya arenaria</i>	Sand gaper mussel
<i>Mytilus edulis</i>	Blue mussel
<i>Mytilus galloprovincialis</i>	Mediterranean mussel
<i>Ostrea angasi</i>	Southern mud oyster or Australian flat oyster
<i>Ostrea chilensis</i>	New Zealand dredge oyster
<i>Ostrea conchaphila</i>	Olympia oyster
<i>Ostrea denselammellosa</i>	Asiatic oyster
<i>Ostrea edulis</i>	European flat oyster
<i>Ostrea equestris</i>	Crested oyster
<i>Ostrea puelchana</i>	Argentinian flat oyster
<i>Ostrea stentina</i>	Dwarf oyster
<i>Patinopecten yessoensis</i>	Japanese scallop
<i>Pecten maximus</i>	Common scallop
<i>Pinctada fucata martensii</i>	Japanese pearl oyster or Akoya oyster
<i>Pinctada margaritifera</i>	Pearl oyster
<i>Pinctada maxima</i>	Silverlip pearl oyster
<i>Pinctada sugillata</i>	Pearl oyster
<i>Pitar rostrata</i>	Venerid commercial clam
<i>Ruditapes decussatus</i>	Groove-shelled clam
<i>Saccostrea cucullata</i>	Rock oyster
<i>Saccostrea glomerata</i>	Sydney rock oyster
<i>Solen marginatus</i>	European razor clam
<i>Tridacna crocea</i>	Crocus clam
<i>Tridacna gigas</i>	Giant clam
<i>Tridacna maxima</i>	Elongated giant clam or rugose giant clam
<i>Venerupis aurea</i>	European aurora venus clam
<i>Venerupis philippinarum</i>	Asian littleneck clam or Manila clam
<i>Venerupis pullastra</i>	Pullet carpet shell
<i>Xenostrobus securis</i>	Small brown mussel

Crustaceans

Scientific name	Common name/s
<i>Ascetes</i> spp.	Paste prawn
<i>Astacopsis gouldi</i>	Giant Tasmanian crayfish
<i>Astacus astacus</i>	Noble crayfish
<i>Astacus leptodactylus</i>	Turkish crayfish
<i>Austropotamobius pallipes</i>	White-clawed crayfish
<i>Austropotamobius torrentium</i>	Stone crayfish
<i>Camabroides japonicus</i>	Japanese crayfish
<i>Carcinus maenas</i>	European shore crab
<i>Charybdis feriatus</i>	Mud crab
<i>Cherax quadricarinatus</i>	Red-claw freshwater crayfish
<i>Cherax</i> spp.	Freshwater crayfish
<i>Eriocheir sinensis</i>	Chinese mitten crab
<i>Euastacus kershawi</i>	Gippsland spiny crayfish
<i>Farfantepenaeus aztecus</i>	Northern brown shrimp
<i>Farfantepenaeus duorarum</i>	Northern pink shrimp
<i>Fenneropenaeus californiensis</i>	Yellow-leg shrimp
<i>Fenneropenaeus chinensis</i>	Chinese white shrimp
<i>Fenneropenaeus indicus</i>	Indian banana prawn
<i>Fenneropenaeus merguensis</i>	Banana prawn, gulf banana prawn or white banana prawn
<i>Litopenaeus occidentalis</i>	Western white shrimp
<i>Litopenaeus schmitti</i>	Southern white shrimp
<i>Litopenaeus setiferus</i>	Northern white shrimp
<i>Litopenaeus stylirostris</i>	Pacific blue shrimp
<i>Litopenaeus vannamei</i>	Pacific white shrimp
<i>Macrobrachium rosenbergii</i>	Giant freshwater prawn
<i>Macrobrachium sintangene</i>	Sunda river prawn
<i>Marsupenaeus japonicus</i>	Kuruma prawn
<i>Metapenaeus bennettiae</i>	Greentail prawn
<i>Metapenaeus ensis</i>	Red endeavour prawn
<i>Orconectes</i> sp.	Crayfish (native to the eastern states of America)
<i>Palaemon serrifer</i>	Barred estuarine shrimp
<i>Palaemon styliiferus</i>	Mysid shrimp
<i>Panulirus</i> spp.	Tropical spiny lobsters
<i>Pasifastacus leniusculus</i>	Signal crayfish
<i>Penaeus esculentus</i>	Brown tiger prawn
<i>Penaeus monodon</i>	Black tiger prawn
<i>Penaeus semisulcatus</i>	Green tiger prawn or grooved tiger prawn

Scientific name	Common name/s
<i>Penaeus</i> spp.	Sand shrimp
<i>Portunus pelagicus</i>	Mud crab
<i>Portunus sanguinolentus</i>	Mud crab
<i>Procambarus clarkii</i>	Louisiana swamp crayfish
<i>Scylla serrata</i>	Mud crab

Amphibians

Scientific name	Common name
Anura (order)	Frogs and toads
<i>Bufo marinus</i>	Cane toad
Caudata (order)	Salamanders, newts and sirens
<i>Cophixalus ornatus</i>	Ornate nursery frog
<i>Cyclorana brevipes</i>	Short-footed frog
Gymnophiona (order)	Caecilians
<i>Limnodynastes ornatus</i>	Ornate burrowing frog
<i>Litoria alboguttata</i>	Striped burrowing frog
<i>Litoria caerulea</i>	Green tree frog
<i>Litoria inermis</i>	Bumpy rocket frog
<i>Litoria rubella</i>	Red tree frog
<i>Mixophyes fasciolatus</i>	Great barred frog
<i>Pseudophryne coriacea</i>	Red-backed toadlet
<i>Taudactylus acutirostris</i>	Sharp-snouted day frog

Other species

Scientific name	Common name
<i>Ardea cinerea</i>	Grey heron
<i>Argulus foliaceus</i>	Fish louse
<i>Callibaetis</i> spp.	Mayflies
<i>Lepeophtheirus salmonis</i> and <i>Caligus elongatus</i>	Salmon louse
<i>Piscicola</i> spp.	Leeches
<i>Salminicola</i> spp.	Gill lice

Who to contact if you suspect a disease

If you see any unusual symptoms in wild or farmed aquatic animals, play it safe and **report it immediately**. Don't worry about how insignificant it may be—small signs may be an early indication of a serious disease problem.

The national 24 hour Emergency Animal Disease Watch Hotline is 1800 675 888 (freecall)

Each state or territory can also be contacted if you suspect a disease. The table below shows the state and territory government agencies responsible for aquatic health, and provides points of contact.

State or territory	Government agency	Internet site	State telephone
Australian Capital Territory	Environment and Sustainable Development Directorate	www.environment.act.gov.au	132 281
New South Wales	Department of Primary Industries	www.dpi.nsw.gov.au	1800 043 536
Northern Territory	Department of Resources—Primary Industries	www.nt.gov.au	0413 381 094 (fish kills) or 08 8999 2126
Queensland	Queensland Department of Agriculture, Fisheries and Forestry	www.dpi.qld.gov.au	132 523 or 07 3404 6999
South Australia	Primary Industries and Regions SA	www.pir.sa.gov.au	Fishwatch (24 hours) 1800 065 522 or 08 8463 3000
Tasmania	Department of Primary Industries, Parks, Water and Environment	www.dpiw.tas.gov.au	1300 368 550
Victoria	Department of Primary Industries	www.dpi.vic.gov.au	136 186
Western Australia	Department of Fisheries	www.fish.wa.gov.au	1800 815 507

Contact details and hyperlinks were correct at the time of publication.

Further reading and weblinks

Further reading

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Aquatic animal health websites

Australian Government Department of Agriculture, Fisheries and Forestry—Aquatic Animal Health program: www.daff.gov.au/animal-plant-health/aquatic

Fisheries and Oceans Canada—Synopsis of infectious diseases and parasites of commercially exploited shellfish:
www.pac.dfo-mpo.gc.ca/sci/shelldis/title_e.htm

Centre for Environment, Fisheries and Aquaculture Science—Aquatic animal disease:
www.cefasc.defra.gov.uk/our-science/animal-health-and-food-safety/aquatic-animal-disease.aspx

European Union Reference Laboratory for Fish Diseases: www.crl-fish.eu

FishBase: www.fishbase.org

International Database on Aquatic Animal Diseases: www.cefasc.defra.gov.uk/idaad

Marine Scotland Science:
www.scotland.gov.uk/Topics/marine/Fish-Shellfish/18364/18610/diseases

Network of Aquaculture Centres in Asia–Pacific:
www.enaca.org

Sub-Committee on Animal Health Laboratory Standards (SCAHLs) website at www.scahls.org.au/procedures/anzsdps2

United States Department of Agriculture, Animal and Plant Health Inspection Service—Aquaculture disease information:
www.aphis.usda.gov/animal_health/animal_dis_spec/aquaculture

World Organisation for Animal Health: www.oie.int

All hyperlinks were correct at the time of publication.