

# Unit 5: Understanding Fish Health and Welfare

<b>Unit code:</b>	<b>J/600/9232</b>
<b>QCF Level 3:</b>	<b>BTEC National</b>
<b>Credit value:</b>	<b>10</b>
<b>Guided learning hours:</b>	<b>60</b>

## ● Aim and purpose

This unit aims to introduce learners to skills and knowledge related to fish health and welfare, and how these can be applied in practice. It is designed for learners in centre-based settings looking to progress into the sector or on to further/higher education.

## ● Unit introduction

Maintaining the health of fish is a vital part of managing fish populations in any situation. Increasingly, it is important to understand what causes health problems as more traditional methods of control, such as chemical treatment, become more ineffective or restricted in use. In the fish management industry it is vital to understand the pathogens that cause the major diseases in order to plan the use of the various techniques available to both treat and prevent disease.

Learners will investigate a range of the pathogens that can cause disease, from viruses and bacteria, to fungi and parasites. This will include studying the aetiology and possible symptoms of a disease outbreak. Learners will then go on to investigate treatment and, more importantly, preventative measures that can be used to mitigate against the development of diseases.

Learners will investigate health problems associated with environmental and nutritional factors. There will be particular emphasis on how to identify the symptoms of these health problems and therefore how to differentiate them from health problems caused by pathogens. Learners will explore relevant EU and UK legislation and codes of practice relating to the management of fish health.

## ● Learning outcomes

### On completion of this unit a learner should:

- 1 Understand the causes, symptoms and management of viral and bacterial diseases
- 2 Understand the causes, symptoms and management of fungal and parasitic diseases
- 3 Know the symptoms, causes and management of nutritional and environmental health problems
- 4 Understand the relevant codes of practice and legislation relating to the management of fish health in the UK.

# Unit content

---

## 1 Understand the causes, symptoms and management of viral and bacterial diseases

*Viral infections:* significant viral diseases of fish, eg Koi Herpes Virus, Infectious Pancreatic Necrosis; biology of viruses, structure, life cycles, pathology; symptoms of major viral infections of fish; methods used to identify viral infections; methods used in the management of viruses, eg biosecurity, hygiene, husbandry, vaccination; environmental and economic risks of the continued spread of viral diseases; health and safety, legislative and animal welfare issues

*Bacterial infections:* significant bacterial infections eg furunculosis, bacterial kidney disease; biology of bacteria, structure, life cycles, symptoms and modes of pathology; identification of bacterial pathogens; methods used to treat or manage bacterial diseases eg biosecurity, hygiene, husbandry, antibiotics; environmental and health risks of using antibiotics; environmental and economic risks of the spread of bacterial diseases; health and safety, legislative and animal welfare issues

## 2 Understand the causes, symptoms and management of fungal and parasitic diseases

*Fungal infections:* significant fungal infections, eg Saprolegnia, branchiomycosis; biology of fungi, structure, life cycles, symptoms, pathology; identification of fungal pathogens; methods used to treat or manage fungal infections eg biosecurity, hygiene, husbandry, therapeutics; environmental and economic risks of the spread of fungal diseases; health and safety, legislative and animal welfare issues

*Parasitic infections:* significant parasitic infections eg whitespot, *Ergasilus sieboldi*; biology of parasites, structure, life cycles, range of types, symptoms and modes of pathology; identification of parasitic pathogens; methods used to treat or manage parasitic infections eg biosecurity, hygiene, husbandry, therapeutics; environmental and economic risks of the spread of parasitic diseases; health and safety, legislative and animal welfare issues

## 3 Know the symptoms, causes and management of nutritional and environmental health problems

*Nutritional health problems:* significant nutritional disorders eg ocular disease, vertebral deformity; symptoms and causes of nutritional problems; identification of nutritional problems; methods used to manage and avoid nutritional problems; legislative and animal welfare issues

*Environmental health problems:* significant environmental problems eg hypoxaemia, gas bubble disease; symptoms and causes of environmental health problems; identification of environmental problems; methods used to manage and avoid environmental problems; legislative and animal welfare issues

#### 4 Understand the relevant codes of practice and legislation relating to the management of fish health in the UK

*Current EU and UK legislation covering the management of fish health in the UK: development and purpose of the legislation; relevant legislation eg Diseases of Fish Act 1983, Salmon and Freshwater Fisheries Act 1975, Aquatic Animal Health Directive 2006, Small Animal Exemption Scheme; dangers of transferring new species and diseases into new geographical locations; Government agencies involved in fish health and welfare issues eg the Centre for Environment, Fisheries and Aquaculture Science (CEFAS), Department of the Environment, Food and Rural Affairs (DEFRA) and The Environment Agency; other organisations involved in fish health and welfare issues, eg Ornamental and Aquatic Trade Association (OATA), Salmon and Trout Association (STA), Institute of Fisheries Management (IFM), Angling Trust (AT); codes of practice for fish stocking, fish transport, fish husbandry, humane slaughter; record-keeping.*

## Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade, the evidence must show that the learner is able to:	To achieve a merit grade, the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade, the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
<b>P1</b> explain the structure and life cycle of selected viral fish pathogens and the symptoms of the diseases they cause		
<b>P2</b> explain the structure and life cycle of selected bacterial fish pathogens and the symptoms of the diseases they cause	<b>M1</b> explain the main methods of management and treatment of bacterial and viral infections	<b>D1</b> assess the impact of a named viral infection on a major, selected area of the fish industry
<b>P3</b> explain the structure and life cycle of a selected fungal fish pathogen and the symptoms of the disease it causes	<b>M2</b> explain the management of parasitic and fungal pathogens, including prophylactic and therapeutic methods, in a given situation	
<b>P4</b> explain the structure and life cycle of selected parasites of fish and the symptoms of the diseases they cause [IE]		<b>D2</b> evaluate the use of biosecurity protocols to prevent fish health problems in a given situation
<b>P5</b> describe the symptoms caused by selected nutritional deficiency and excess syndromes	<b>M3</b> assess the health status of a fish population through observation, dissection and identification of infections and gross pathology	<b>D3</b> evaluate a given situation to recommend improvements in environmental conditions and fish nutrition.
<b>P6</b> describe the symptoms caused by selected environmental health problems [SM]		
<b>P7</b> describe the main symptoms of an environmental or nutritional problem that would differentiate it from a problem caused by pathogens [CT]		

Assessment and grading criteria		
To achieve a pass grade, the evidence must show that the learner is able to:	To achieve a merit grade, the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade, the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
<p><b>P8</b> explain how the main relevant legislation and codes of practice help protect a particular sector of the fish industry. [SM]</p>	<p><b>M4</b> explain the risks involved in the trade in live fish.</p>	

**PLTS:** This summary references where applicable in the pass criteria, in the square brackets, the elements of the personal, learning and thinking skills. It identifies opportunities for learners to demonstrate effective application of the referenced elements of the skills.

<b>Key</b>	IE – independent enquirers CT – creative thinkers	RL – reflective learners TW – team workers	SM – self-managers EP – effective participators
------------	--	---	--

# Essential guidance for tutors

---

## Delivery

Lectures, discussions, seminar presentations, site visits, supervised laboratory and fish health management practicals, research using the internet and library resources, and the use of personal and/or industrial experience would all be suitable for the delivery of this unit. Delivery will also involve practical assessments, written assessment and visits to suitable collections and will link to work experience placements.

Work experience can be particularly useful in this unit. During work experience placements, it would be beneficial if learners and supervisors were made aware of the requirements of this unit before any work-related activities are undertaken, so that naturally occurring evidence can be collected at the time. For example, learners may have the opportunity to complete fish examinations, identify parasites and assist in treatment and management regimes. Learners should be asked for observation records and/or witness statements to be provided as evidence of this.

During delivery of this unit, it is essential that tutors stress the importance of animal welfare and sound, legal environmental management. Health and safety issues relating to working in a laboratory and using chemicals must be stressed and reinforced regularly, and risk assessments must be undertaken before any practical activities. Adequate personal protective equipment (PPE) must be provided and used following the production of suitable risk assessments.

Learning outcomes 1 and 2 are directly linked in terms of addressing the major pathogen groups important to fish health. These are likely to be delivered using formal lectures, discussion, laboratory practicals, site visits and independent learner research. Learners will be aware of the associated activities of identifying pathogens and researching the current methods of treatment and management. Visiting expert speakers will add to the relevance of the subject for learners. For example, a fish farmer could talk about their work, the particular situations they face and the methods they use.

Learning outcome 3 deals with the management of nutritional and environmental health problems. These are intrinsically linked with learning outcomes 1 and 2, and identifying these problems is vital in dealing with health issues in any fish population. It is likely to be delivered using formal lectures, discussion, site visits and independent learner research.

Learning outcome 4 covers the legislation and codes of practice relevant to fish kept in the EU and UK. It is likely to be delivered using formal lectures, discussion and independent learner research. Delivery of this learning outcome must be linked to the delivery of learning outcomes 1, 2 and 3, as they deal with the health issues and pathogens covered in the legislation. Codes of practice are increasingly important, and this learning outcome should also be linked to other units to show how legislation and codes of practice underpin much of the work in fish management. Visiting expert speakers could add to the relevance of the subject for learners.

## Outline learning plan

The outline learning plan has been included in this unit as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan gives **an indication of the volume of learning it would take for the average learner** to achieve the learning outcomes. It is **indicative and is one way of achieving the credit value**.

Learning time should address all learning (including assessment) relevant to the learning outcomes, regardless of where, when and how the learning has taken place.

Topic and suggested assignments/activities and/assessment
Introduction.
Review pathogen groups.
<b>Assignment 1: Fish Pathogens</b> (P1, P2, P3, P4, M1, M2, D1, D2)
Tutor introduces the assignment.
Discuss treatment and management options for various important pathogens
Site visit (eg fish farm) to discuss important pathogens and management options undertaken at the site.
Introduce legislative framework.
Discuss environmental and nutritional problems.
Practical session – review the environment and nutrition of various fish kept in different situations.
Practical session—practice dissection and review of health information.
<b>Assignment 3: Fish Mortality Investigation</b> (P5, P6, P7, M3, D3)
Tutor introduces the assignment.
Investigate specific legislation in detail.
Review codes of practice within each sector of the fish industry.
<b>Assignment 3: Fish Health Legislation</b> (P8, M4)
Tutor introduces the assignment.
Unit review.

## Assessment

For P1, learners must describe the structure and life cycles of selected significant viral pathogens and the symptoms of the diseases they cause. Tutors should identify the viral pathogens that could be used and agree them through discussion with learners. Learners need to cover at least two different viral fish pathogens. Descriptions should include the names of the viruses, their structural characteristics, their life cycles, the fish species they infect and the symptoms of infection. Evidence could take the form of a pictorial presentation with notes, an annotated poster or leaflet, a web page, or a project. This may be linked to assessment for P2, P3 and P4.

For P2, learners must describe the structure and life cycles of selected, significant bacterial pathogens and the symptoms of the diseases they cause. Tutors should identify the bacterial pathogens that could be used and agree them through discussion with learners. Learners need to cover at least two, different bacterial fish pathogens. Descriptions should include the names of the bacteria, their characteristics, life cycles, the fish species they infect and the symptoms of infection. Evidence could take the form of a pictorial presentation with notes, an annotated poster or leaflet, a web page, or a project.

For P3, learners must describe the structure and life cycle of a selected, significant fungal pathogen and the symptoms of the disease it can cause. Tutors should identify the fungal pathogens that could be used and agree them through discussion with learners. Learners need to cover at least one fungal fish pathogen. Descriptions should include the names of the fungus, its characteristics, life cycle, the fish species it infects and the symptoms of infection. Evidence could take the form of a pictorial presentation with notes, an annotated poster or leaflet, a web page, or a project.

For P4, learners must describe the structure and life cycles of selected significant fish parasites and the symptoms of the infections they cause. Tutors should identify the parasite pathogens that could be used and agree them through discussion with learners. It is expected that, as a minimum, learners will cover at least four different fish parasites. Evidence may be in the same form as for P1 and may be linked to it.

For P5, learners must describe the symptoms caused by selected nutritional deficiency and excess syndromes.

Tutors should identify the nutritional deficiency or excess syndromes that could be used and agree them through discussion with learners. Evidence may be in the same form as for P1 and may be linked to it.

P6 requires learners to describe the symptoms caused by selected environmental health problems. Tutors should identify the environmental health conditions that could be used and agree them through discussion with learners. Evidence may be in the same form as for P1 and may be linked to it.

P7 requires learners to describe the main symptoms of an environmental or nutritional problem that would differentiate it from a problem caused by pathogens. Evidence should contain at least three key symptoms that would differentiate these types of problem. Tutors can identify scenarios for learners to base their answers on and these should relate to learners' fields of interest. Evidence could be a written response to a specific scenario, or to short-answer questions.

P8 requires learners to explain how the main, relevant UK fish-health legislation and codes of practice help protect a particular sector of the fish industry. Their explanation should address the overall purpose and detail of the legislation, the species and situations covered and the sources of the codes of practice. Tutors should agree the sector of the fish industry through discussion with learners. Evidence may be in the form of a pictorial presentation with notes, an annotated poster or leaflet, a web page or a project.

For M1, learners must explain the main methods of managing and treating bacterial and viral infections. Learners may contextualise their answer to a specific fish industry, for example fish farming, ornamental trade, or sports fishery management. Evidence should identify various management methods and how the industry has adapted to deal with problems caused by viral and bacterial infections. Evidence may be in the form of a pictorial presentation with notes, an annotated poster or leaflet, a web page or a project.

For M2, learners must explain the management of parasitic and fungal pathogens, including prophylactic and therapeutic methods, in a given situation. Tutors should agree the sector and situation through discussion with learners. Care must be taken to ensure that the size and complexity of the task is the same for all learners. Evidence should identify a range of relevant management methods as well as prophylactic and chemotherapeutic methods. Evidence may be in the form of a pictorial presentation with notes, an annotated poster or leaflet, a web page, or a project.

M3 requires learners to assess the health status of fish populations through observation, dissection and identification of infections and gross pathology. This requires a given scenario as well as access to laboratory equipment. Tutors should agree the sector and scenario through discussion with learners. Evidence will most likely be in the form of a written report and practical log, as well as through direct observation.

For M4, learners must explain the risks associated with fish movements between inland water bodies in the UK. Learners should provide wide ranging evidence, citing specific examples. Evidence may be in the same form as for M2.

For D1, learners need to assess the impact of a named viral infection on a major area of the fish industry. This may be the same area as that used to provide evidence for other grading criteria, and should be agreed in discussion with the tutor. Learners should provide wide-ranging evidence, citing specific examples to back up their points. Evidence may be in the same form as for M2.

D2 requires learners to evaluate the use of biosecurity protocols to prevent fish-health problems in a given situation. Tutors may identify, through discussion with learners, a particular situation relating to an actual or hypothetical fish farm, sport fishery, ornamental fish house or aquarium, possibly arising from a visit to such premises. Attempts should be made to use real biosecurity protocols instead of hypothetical ones. Evidence could take the form of a pictorial presentation with notes (possibly using appropriate software or an overhead projector), or an annotated poster or leaflet or a project.

D3 requires learners to evaluate a given situation in order to recommend improvements in environmental conditions and fish nutrition. The situation should be agreed between the tutor and learners. Learners should produce a complete analysis of the current situation and all aspects of nutrition and feeding regimes as well as suggestions for improvements.



## Programme of suggested assignments

The following table shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the grading grid. This is for guidance, and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1, P2, P3, P4, M1, M2, D1, D2	Fish Pathogens	A scenario of a well-described or real aquaculture facility, aquarium system or fishery should be developed. Learners should describe viral, bacterial, fungal and parasite pathogens that may be encountered in that situation. Learners can then go on to explain the management and treatments available. Learners should then evaluate the use of biosecurity protocols in the given situation. They can also assess the impact of a viral infection within that area of the industry.	Report.
P5, P6, P7, M3, D3	Fish Mortality Investigation	A group of fish should be made available to learners. A background history should be prepared. Learners should describe possible nutritional and environmental symptoms that could be observed. Using these symptoms, learners should evaluate whether symptoms are related to a problem with pathogens or nutrition/environment. Learners should select suitable fish to examine. They should describe the expected management regime that should have prevented any nutritional or environmental problems. From the results, a series of recommendations should be made to improve the situation for the fish.	Practical observation and written evidence.
P8, M4	Fish Health Legislation	You are the manager of a fish-keeping unit. Explain how the current legislative framework helps protect your particular sector. What are the risks that impact on your unit and the wider fish management area? Describe the impact the legislative controls have on your business.	Report.

## Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit forms part of the BTEC Land-based sector suite. This unit has particular links with:

Level 2	Level 3
Introduction to Fish Health	Understanding Fish Biology and Behaviour
Introduction to Fish Biology	Understanding Freshwater Aquarium Systems
	Understanding Marine Aquarium Systems

## Essential resources

Learners will need access to a laboratory with adequate dissection equipment, stereo and compound microscopes. Access to fish farms, sports fisheries and aquaria will be required to see real-life fish health and welfare situations.

Tutors delivering this unit should be competent and experienced fish health managers.

## Employer engagement and vocational contexts

This unit focuses on the underlying learning required to understand fish health and welfare. It then goes on to cover practical issues of pathogen identification. Learners will go on to develop the skills needed to carry out routine examination of fish and their environments including an understanding of the importance of good water quality and nutrition. Learners should be encouraged to practise these skills during work experience placements. Guest lectures and off-site visits should also be used to highlight how this understanding and these skills are important within the industry.

## Indicative reading for learners

### Textbooks

Andrews C, Exell A and Carrington N – *The Interpet Manual of Fish Health, 2nd Edition* (Interpet Publishing, 2002) ISBN 1842860674

Barnes R and Mann K – *Fundamentals of Aquatic Ecology, 2nd Edition* (Blackwell Science, 1991) ISBN 0632029838

Holmes K and Pitham T – *The Interpet Manual of Koi Health* (Interpet Publishing, 2004) ISBN 1842860992

Hoole D, Bucke D, Burgess P and Wellby I – *Diseases of Carp and Other Cyprinid Fish* (Blackwell Science, 2001) ISBN 0852382529

Jepson L – *Koi Medicine* (Kingdom Books, 2001) ISBN 1852791772

Roberts R – *Fish Pathology, 3rd Edition* (Elsevier Health Sciences, 2001) ISBN 0702025631

Roberts R and Shepherd C – *Handbook of Trout and Salmon Diseases, 3rd Edition* (Blackwell Science, 1997) ISBN 0852382448

Schlotfeldt H J and Alderman D J – *European Association of Fish Pathologists 'What Should I Do' Practical Guide for Freshwater Fish Farmers* (EAFP Publications, 1998) ISBN 0952624206

## Journals and magazines

*Fish Farmer* magazine

*Fish Farming International* magazine

*FISH Journal* – Institute of Fisheries Management

*Fisheries Management and Ecology*

*Koi Carp* magazine

*Koi* magazine

*Practical Fish Keeping* magazine

## Websites

[www.defra.gov.uk](http://www.defra.gov.uk)

Department for Environment, Food and Rural Affairs

[www.environment-agency.gov.uk](http://www.environment-agency.gov.uk)

Environment Agency

[www.efishbusiness.co.uk](http://www.efishbusiness.co.uk)

A multi agency government site for aquaculture in England and Wales

[www.fishdoc.co.uk](http://www.fishdoc.co.uk)

Fish disease diagnosis and treatments

[www.hse.gov.uk](http://www.hse.gov.uk)

Health and Safety Executive

[www.ifm.org.uk](http://www.ifm.org.uk)

Institute of Fisheries Management

[www.marine.gov.uk/cefafas\\_fa.htm](http://www.marine.gov.uk/cefafas_fa.htm)

Centre for Environment, Fisheries and Aquaculture Science (CEFAS)

[www.ornamentalfish.org](http://www.ornamentalfish.org)

“Ornamental Fish” is designed for aquatic hobbyists and the aquatic industry.

[www.salmon-trout.org](http://www.salmon-trout.org)

The Salmon & Trout Association

[www.scottishsalmon.co.uk](http://www.scottishsalmon.co.uk)

Scottish Salmon Producers' Organisation Online

## Delivery of personal, learning and thinking skills (PLTS)

The following table identifies the PLTS opportunities that have been included within the assessment criteria of this unit:

Skill	When learners are ...
<b>Independent enquirers</b>	explaining the structure and life cycle of selected parasitic fish pathogens and the symptoms of the diseases they cause
<b>Creative thinkers</b>	describing the main symptoms of an environmental or nutritional problem that would differentiate it from a problem caused by a pathogen
<b>Self-managers</b>	describing how the main relevant legislation and codes of practice help protect a particular sector of the fish industry describing the symptoms caused by selected environmental health problems.

Although PLTS opportunities are identified within this unit as an inherent part of the assessment criteria, there are further opportunities to develop a range of PLTS through various approaches to teaching and learning.

Skill	When learners are ...
<b>Independent enquirers</b>	assessing the impact of a named viral infection on a main selected area of the fish industry
<b>Creative thinkers</b>	explaining the main methods of managing and treating bacterial and viral infections.
<b>Reflective learners</b>	explaining the risks involved in the trade in live fish assessing the health status of a fish population through observation, dissection and identification of infections and gross pathology
<b>Effective participators</b>	assessing the health status of a fish population through observation, dissection and identification of infections and gross pathology.

## ● Functional Skills – Level 2

Skill	When learners are ...
<b>ICT – Use ICT systems</b>	
Select, interact with and use ICT systems independently for a complex task to meet a variety of needs	explaining the structure and life cycle of selected parasitic fish pathogens and the symptoms of the diseases they cause
Manage information storage to enable efficient retrieval	assessing the health status of a fish population through observation, dissection and identification of infections
<b>ICT – Find and select information</b>	
Select and use a variety of sources of information independently for a complex task	assessing the impact of a named viral infection on a main area of the fish industry
<b>ICT – Develop, present and communicate information</b>	
Enter, develop and format information independently to suit its meaning and purpose including: <ul style="list-style-type: none"> <li>• text and tables</li> <li>• images</li> <li>• numbers</li> <li>• records</li> </ul>	<p>explaining the structure and life cycle of selected viral fish pathogens and the symptoms of the diseases they cause</p> <p>explaining the structure and life cycle of selected parasitic fish pathogens and the symptoms of the diseases they cause</p>
<b>English</b>	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	<p>evaluating the use of biosecurity protocols to prevent fish-health problems in a given situation</p> <p>assessing the health status of a fish population through observation, dissection and identification of infections</p>
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	explaining the structure and life cycle of selected parasitic fish pathogens and the symptoms of the diseases they cause
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	explaining the structure and life cycle of selected parasitic fish pathogens and the symptoms of the diseases they cause.