

Unit 17: Understand the Principles of Aquatics Husbandry and Management

Unit code:	J/600/9442
QCF Level 3:	BTEC National
Credit value:	10
Guided learning hours:	60

● Aim and purpose

This unit aims to provide learners with an understanding of the principles of aquatics husbandry and management. This unit is primarily aimed at learners within a centre-based setting looking to progress into the sector or to further education and training.

The aim of this unit is to develop learner skills and knowledge of aquatics to improve welfare of aquatics animals in captivity. This will be achieved by looking at the biology of aquatic creatures, feeding methods and foods, maintenance of aquatic systems and recognition of diseases and health.

● Unit introduction

Understanding the principles of keeping fish in aquaria is vital for anyone working in the animal care and management industry where fish are involved. This includes fish sold in the retail or wholesale trade or kept as one group in a zoo or wildlife park's animal collection. Those employed in the industry need these skills to ensure the welfare of captive fish is maintained, to build display systems and to advise customers in an appropriate manner.

This unit provides the technical knowledge and practical skills needed for the upkeep of fish stocks in the aquaria they live in. Animal welfare and health and safety will be stressed throughout the unit.

Learners will focus on the biology and breeding strategies of different fish and will learn to identify fish species commonly kept in aquaria. They will look at aspects of their biology, link this to their reproductive strategies and consider the diets and feeding requirements of fish kept in aquaria. Learners will use this information to devise appropriate feeding regimes for given species of fish and link the feeding of fish to water quality deterioration. Learners will investigate how suitable filtration systems can help to maintain water quality.

Learners will develop their knowledge of aquaria equipment and the practical skills required to set up and maintain aquatic systems to maintain healthy stocks of fish. Learners will identify causes of normal and abnormal conditions and behaviour and suggest remedial actions.

● Learning outcomes

On completion of this unit a learner should:

- 1 Understand commonly kept fish species and aspects of their biology
- 2 Understand foods and feeding techniques for aquatic species
- 3 Understand how to develop and maintain aquatic systems
- 4 Know the main fish diseases and causes of ill health.

Unit content

1 Understand commonly kept fish species and aspects of their biology

Commonly kept species and their biology: major ecosystems eg tropical, marine, temperate, brackish; compatibility and mixing of species

External and internal anatomy: functions of major internal and external structures and organs eg skin, scales, fins, lateral line, liver, kidney, swimbladder

Breeding strategies: differentiation of sexes; care of broodstock; cues to sexual maturation eg temperature, light; breeding strategies eg mouth brooders, livebearers, egg scatterers

2 Understand foods and feeding techniques for aquatic species

Diets and feeding: dietary requirements; types and preparation of food eg live, dry, frozen, fresh, freeze dried; storage of food; feeding records; costs of feeding and storage

Fish feeding mechanisms: eg filter feeding, herbivores, piscivores; feeding methods and routines; feed quality and quantity; effects of over- or under-feeding; fish welfare issues eg fish health, fish deaths, water quality deterioration; health and safety

3 Understand how to develop and maintain aquatic systems

Aquatic systems: aquarium types and requirements eg marine, freshwater, tropical, temperate; considerations in location and siting; size requirements; temperature control; lighting, filtration; aeration; plants; invertebrates; fish

Maintenance: stocking regimes; stocking densities; sources of system instability, water quality factors and measurement eg dissolved oxygen, temperature, pH, ammonia, nitrite; stabilising and maintaining water quality; cleaning; maintenance routines and records; animal welfare issues, health and safety

4 Know the main fish diseases and causes of ill health

Health: recognition of normal and abnormal conditions and behaviour; common causes of ill health eg stress, presence of pathogens, predators; common conditions, diseases and parasitic infections eg nutritional problems, dropsy, white spot

Maintenance routines and records: disease prevention and control (environmental management, isolation and quarantine, hygiene, transportation methods, sources of specialist advice); maintenance routines and records; animal welfare issues, health and safety

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:	
P1 explain the functions of the physical features of given fish species [IE, SM]	M1 describe the habitat requirements of a given fish species	D1 compare the advantages and disadvantages of different breeding strategies	
P2 evaluate the breeding strategies of given species of fish [IE, SM]			
P3 evaluate the feeding strategies of given fish species [IE, SM, CT]	M2 explain the correct storage requirements for selected fish feed		
P4 discuss methods of presenting foods to fish in an aquarium [IE, SM, CT]			
P5 explain how incorrect feeding of fish can impact on water quality [IE, SM, CT]			
P6 explain the equipment requirements for a selected aquarium [IE, SM]	M3 explain the importance of environmental management in the welfare of fish and potential causes of water quality deterioration		D2 compare the advantages and disadvantages of two different filtration systems and their importance in maintaining water quality
P7 evaluate given locations for suitability for an aquarium [IE, SM]			
P8 explain the health and safety requirements of a given aquarium [IE, SM]			
P9 discuss how a given aquarium system complies with relevant current legislation [IE]			

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:
P10 describe the common causes of disease in fish [TW]	M4 identify normal and abnormal conditions or behaviour in fish.	D3 discuss remedial actions for abnormal conditions or behaviour in fish.
P11 describe the records which should be kept for a given aquarium. [TW]		

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

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

Essential guidance for tutors

Delivery

Delivery of this unit will involve practical and written assessments, visits to suitable collections and will link to work experience placements.

Human health and safety issues must be addressed before learners work with any aquarium. Adequate personal protective equipment (PPE) must be provided and used following the production of suitable risk assessments.

The physical features of fish, fish biology and fish breeding strategies are likely to be delivered through formal lectures, discussions and supervised practical activities. Learners will need to know about aspects of fish anatomy, physiology and biology. Breeding strategies can be demonstrated through practical breeding activities and visits to breeding centres. Visiting speakers such as an aquarist or curator may also be useful.

The feeding of fish can be delivered through formal lectures, discussion and the use of audio-visual materials. Practical activities may also be appropriate. Learners are likely to research feeding strategies and the correct storage and presentation of food. Visits to breeding centres and aquaria would be useful. Learners could carry out practical activities such as measuring the water quality of different aquaria, and note the changes that may occur over time.

Learners need to know how to set up, establish and maintain an aquarium. This could involve some formal input, but should be based around practical activities. Current relevant UK animal welfare legislation can be investigated through formal input. It is not expected that all legislation is covered in detail, but tutors must ensure that learners have an overview of the range of relevant legislation and how to research it further. Specific examples of legislation, for example the Animal Welfare Act 2006, are likely to be covered in more depth.

Learning outcome 4 could be delivered by means of formal input, discussion and the use of good quality audio-visual materials. Learners will need to undertake research on fish health and behaviours.

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 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 to the unit, structure and programme of assignments.
Assignment 1: Fish Breeding and Biology (P1, P2, M1, D1)
Tutor introduces the assignment brief.
Formal input and visiting speakers eg fish breeder, curator.
Breed identification activity.
Learner research – fish biology and breeding strategies.
Preparation of materials for information guide.

Topic and suggested assignments/activities and/assessment
Assignment 2: Feeding and Water Quality (P3, P4, P5, M2, D2)
Tutor introduces the assignment brief.
Formal input and visits eg breeding centre, large aquaria.
Learners prepare and feed fish over time.
Learners measure water quality over time.
Learner research – methods of feeding, storage and preparation.
Preparation of materials for article.
Assignment 3: Habitat Maintenance (P6, P7, P8, P9, M3)
Tutor introduces the assignment brief.
Formal input and visits eg breeding centre, large aquaria.
Learners set up, establish and maintain an aquarium, monitor water quality.
Learner research – aquarium set-up.
Preparation of materials for article.
Assignment 4: Fish Health (P10, P11, M4, D3)
Tutor introduces the assignment brief.
Formal input and visits eg breeding centre, large aquaria.
Condition and behaviour practical assessment.
Learner research – normal and abnormal conditions and behaviour.
Record keeping activity.
Preparation of materials for and set up of display.
Unit review.

Assessment

Learners need to be able to identify a minimum of 10 different fish from each of three different ecosystems, for example tropical, marine and temperate. For P1, learners need to explain the physical features of fish and their functions. They should cover the features as set out in the unit content. For P2, they need to evaluate the breeding strategies of a minimum of two fish and, for M1, describe the habitat requirements of a given fish species. This could be the same species as for P2. For D1, they need to compare the advantages and disadvantages of different types of breeding strategies of at least three different fish. One could be the fish species looked at in P2 and M1. The tutor could choose the fish species themselves, or in discussion with learners. As evidence, learners could produce an illustrated information guide on fish breeding and biology. Learners should illustrate the guide and refer to appropriate examples throughout.

For P3, P4, P5, M2 and D2, learners need to consider fish feeding and foodstuffs. For P3, learners must evaluate the feeding strategies of at least three fish species and, for P4, discuss the different methods of presenting food to fish in an aquarium. Learners need to explain the importance of feeding the correct quantity and quality of food to fish in an aquarium. Learners should cover the range of food types and presentation methods as per the unit content. M2 requires learners to explain the correct storage requirements for different food types. P5, M2 and D2 require learners to consider the effects of incorrect feeding on the quality of the water in the aquarium. Learners could devise and carry out appropriate feeding regimes for fish and measure and record changes in water quality over a period of time. Learners could write an article for a fish journal about food and water quality as evidence.

For P6, P7, P8 and P9, learners should be able to set up, establish and maintain an aquarium system. Learners must describe the factors to consider in deciding on the location, siting and maintenance of an aquarium. M3 requires learners to explain the importance of environmental management in maintaining the health and welfare of fish in an aquarium. Learners should include examples of good and poor environmental management. As evidence, learners could produce an information booklet aimed at people new to fish keeping, covering the set up and maintenance requirements of an aquarium.

For P10, learners need to describe the common causes of disease in fish. Learners need to identify normal and abnormal conditions and behaviour in fish and, for D3, discuss remedial actions for observed abnormalities. For P11, they need to describe the different types of records that have to be kept for aquaria. Learners could work in small groups to produce a display on fish health and record keeping.

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, M1, D1	Fish Breeding and Biology	You work for a large aquatic breeding centre. Your supervisor has asked you to prepare an illustrated information guide for the centre's customers. Choose one species of fish and explain the functions of its main physical features (eg skin, scales, fins, lateral line, liver, kidney and swimbladder). Describe the habitat requirements of your chosen fish. Research and compare the breeding strategies of your chosen fish with two other fish that have different breeding strategies. Produce a comparison of the advantages and disadvantages of each type of breeding strategy.	Written information guide.
P3, P4, P5, M2, D2	Feeding and Water Quality	You have been asked to write an article for the magazine Practical Fish Keeping about the correct feeding of fish and maintenance of water quality. In the first part of your article evaluate the feeding strategies of given fish species and discuss the different methods by which food can be presented to fish in an aquarium. Include an explanation of how different fish foods should be stored. In the second part of your article explain the effects of incorrect feeding on water quality and identify the potential causes of water quality deterioration. Complete your article with a comparison of the advantages and disadvantages of two different filtration systems and explain their importance in maintaining water quality.	Magazine article.

Criteria covered	Assignment title	Scenario	Assessment method
P6, P7, P8, P9, M3	Habitat Maintenance	Your supervisor has asked you to produce an information booklet for customers explaining the equipment needed to set up a selected aquarium. Choose one type of aquarium set-up and evaluate given locations for suitability and explain the health and safety requirements for that aquarium. Discuss how the aquarium system complies with current relevant legislation. Finally explain the importance of environmental management in the maintenance of the health and welfare of the fish in your chosen aquarium.	Information booklet.
P10, P11, M4, D3	Fish Health	The breeding centre is having an Open Day and you have been asked to produce a display called 'Fish Health'. Working in small groups, produce a display which describes the common causes of disease in fish and identifies the normal and abnormal conditions or behaviour in fish. Describe the remedial actions which can be taken for abnormal conditions or behaviours. Finally, describe the records which should be kept for a given aquarium.	Written evidence. Production of display in small groups.

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 Caring for Ornamental Aquatics	Understand Animal Anatomy and Physiology

Essential resources

Learners will need access to suitably equipped, well-stocked aquaria. The equipment required will include a range of water quality test kits and a range of equipment needed for the establishment and maintenance of aquaria.

Employer engagement and vocational contexts

Visits to breeding centres and large aquaria and visiting speakers from fish breeders and curators, along with relevant work experience placements, will support delivery of this unit.

Indicative reading for learners

Textbooks

Alderton D – *Freshwater Aquariums: Basic Aquarium Set up and Maintenance* (Bow Tie Press, 2003)
ISBN 9781931993111

Andrews C, Excell A and Carrington N – *The Interpet manual of Fish Health* (Interpet Publishing, 2002)
ISBN 9781842860670

Bailey M – *Complete Guide to Aquarium Fish Keeping (Practical Handbook)* (Lorenz Books, 2004)
ISBN 9780754813828

Bailey M and Burgess P – *Tropical Fishlopaedia: A Complete Guide to Fish Care* (Howell Books, 2000)
ISBN 9781582451664

Gay J – *Aquarium Manual: The Complete Step-by-Step Guide to Keeping Fish* (J H Haynes & Co, 2009)
ISBN 9781844256402

Jepson L – *Practical Guide to Keeping Healthy Fish in a Stable Environment* (Interpet Publishing, 2001)
ISBN 9781903098011

McDowall A (editor) – *Quick-N-Easy Guide to Keeping Tropical Fish* (Interpet Publishing, 2006)
ISBN 9781842861288

Journals and magazines

Freshwater and Marine Aquarium Magazine

PBW News

Practical Fish Keeping

Websites

Department for Environment, Food and Rural Affairs

www.defra.gov.uk

Health and Safety Executive

www.hse.gov.uk

Lantra Sector Skills Council

www.lantra.co.uk

Marine Aquarium Council

www.aquariumcouncil.org

Practical Fishkeeping magazine

www.practicalfishkeeping.co.uk

The home of fish health and fish disease diagnosis and treatment. Whether your interest is koi, goldfish or tropical fish, the FishDoc site has a wealth of information about fish health related topics.

www.fishdoc.co.uk

Tropical Fish Centre

www.tropicalfishcentre.co.uk

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 ...
Independent enquirers	researching information about fish biology and breeding strategies for an information guide
Creative thinkers	evaluating feeding strategies and identifying methods of presenting food to fish
Team workers	working in a small group to produce a display on fish health
Self-managers	organising their time and resources when researching and planning the production of assessment evidence.

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 ...
Independent enquirers	carrying out research for assessment activities
Creative thinkers	planning how to complete the assessment activities and deal with any issues that may arise
Reflective learners	identifying opportunities for assessment
Team workers	working with others to research and complete assessment activities
Self-managers	managing own time
Effective participators	working with others to research and complete assessment activities.

● Functional Skills – Level 2

Skill	When learners are ...
ICT – Use ICT systems	
Select, interact with and use ICT systems independently for a complex task to meet a variety of needs	using ICT systems in order to research information for the assignments
Use ICT to effectively plan work and evaluate the effectiveness of the ICT system they have used	action planning and monitoring work that needs to be completed
Manage information storage to enable efficient retrieval	saving information into files and folders
Follow and understand the need for safety and security practices	safely using ICT systems – sitting correctly at the computer, keeping food and drink away from computer equipment
ICT – Find and select information	
Select and use a variety of sources of information independently for a complex task	carrying out research for assignments
Access, search for, select and use ICT-based information and evaluate its fitness for purpose	planning which information to select and use for the display
ICT – Develop, present and communicate information	
Enter, develop and format information independently to suit its meaning and purpose including: <ul style="list-style-type: none"> • text and tables • images • numbers • records 	producing materials for an information booklet or display, incorporating relevant illustrations and/or images
Bring together information to suit content and purpose	creating documents from research for assessment activities
Present information in ways that are fit for purpose and audience	producing an information booklet, article and display
Select and use ICT to communicate and exchange information safely, responsibly and effectively including storage of messages and contact lists	contacting others by email for information
English	
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	reading documents which relate to their assessment activities
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	writing documents for their assessment activities, information booklet, article and display.