



National Unit specification: general information

Unit title: Aquaculture: Water Quality

Unit code: H03G 11

Superclass: SJ

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Summary

The purpose of this Unit is to provide candidates with a basic knowledge of water types and water quality, and how these relate to the hydrological cycle including influences of the water catchment area on the physical and chemical characteristics of water.

The effects on farmed fish behaviour caused by changes in water quality will be described and include reference to the tolerance limits and optimum conditions required by the fish being farmed. Candidates will also routinely monitor and measure a range of water quality indicators.

This is a mandatory Unit in the NPA in Fish Husbandry (SCQF level 5) and an optional Unit in the NPA Fish Health and Nutrition (SCQF level 5). It is also available as a freestanding Unit.

The Unit is suitable for candidates who are either new entrants or those already working in aquaculture.

Outcomes

- 1 Describe water quality and type.
- 2 Describe the factors influencing water type and quality for a given water source.
- 3 Measure water quality.
- 4 Describe the effect of changes in water quality on farmed fish behaviour and physiology.

Recommended entry

Entry is at the discretion of the centre.

General information (cont)

Credit points and level

1 National Unit credit at SCQF level 5 (6 SCQF credit points at SCQF level 5*).

**SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.*

Core Skills

Opportunities to develop aspects of Core Skills are highlighted in the support notes of this Unit specification.

There is no automatic certification of Core Skills or Core Skills components in this Unit.

National Unit specification: statement of standards

Unit title: Aquaculture: Water Quality (SCQF level 5)

Acceptable performance in this Unit will be the satisfactory achievement of the standards set out in this part of the Unit Specification. All sections of the statement of standards are mandatory and cannot be altered without reference to SQA.

All activities must be carried out according to current legislation and recognised Standard Operating Procedures (SOP).

Outcome 1

Describe water quality and type.

Performance Criteria

- (a) Describe the chemical properties of water.
- (b) Describe the physical properties of water.
- (c) Describe the hydrological cycle.

Outcome 2

Describe the factors influencing water type and quality for a given water source.

Performance Criteria

- (a) Describe the effects of natural influences on water quality.
- (b) Describe the effects of common human influences on water quality.

Outcome 3

Measure water quality.

Performance Criteria

- (a) Collect samples of water according to SOP.
- (b) Measure the physical characteristics of water according to the recognised procedure.
- (c) Carry out chemical analyses according to recognised procedures.
- (d) Record the information gathered in the appropriate Units of measurement.

Outcome 4

Describe the effect of changes in water quality on farmed fish behaviour and physiology.

Performance Criteria

- (a) Describe the effects of changes in the physical characteristics of water on farmed fish behaviour and physiology.
- (b) Describe the effects of changes in the chemical characteristics of water on farmed fish behaviour and physiology.

National Unit specification: statement of standards (cont)

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Evidence Requirements for this Unit

Evidence is required to demonstrate that candidates have achieved all Outcomes and Performance Criteria. All activities must be carried out according to current legislation and recognised Standard Operating Procedures (SOP). Candidates must have access to a laboratory and appropriate water analysis equipment to achieve the practical competences.

Outcomes 1 — Written and/or recorded oral evidence is required that demonstrates that the candidate can:

- ◆ describe a minimum of three chemical properties of water.
- ◆ describe a minimum of three physical properties of water.
- ◆ describe a minimum of three stages of the hydrological cycle.

Evidence will be produced in closed-book conditions.

Outcomes 2 — Written and/or recorded oral evidence is required.

The candidate must describe the effects of each of the following on a minimum of two water characteristics:

- ◆ describe the effect of two natural influences on water quality.
- ◆ describe the effect of two common human influences on water quality.

The assessment will be carried out under closed-book conditions.

Outcome 3 — Written and/or recorded oral evidence and Performance Criteria is required.

The candidate must carry out the following tasks on a minimum of two separate occasions.

- ◆ collect a water sample according to SOP.
- ◆ measure three physical water characteristics.
- ◆ analyse three chemical characteristics.
- ◆ record the information gathered using the correct units.

Evidence will be produced in supervised open-book conditions and recorded using an assessor checklist.

Outcome 4 — Written and/or recorded oral evidence is required.

The candidate must describe the effects of changes on a given farmed fish species for a minimum of two water characteristics:

- ◆ describe the effects of changes to the physical water characteristics on farmed fish behaviour and physiology.
- ◆ describe the effects of changes to the chemical water characteristics on farmed fish behaviour and physiology.

Evidence will be produced in under closed-book conditions.

National Unit specification: support notes

Unit title: Aquaculture: Water Quality (SCQF level 5)

This part of the Unit specification is offered as guidance. The support notes are not mandatory.

While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 40 hours.

Guidance on the content and context for this Unit

This is a mandatory Unit in the NPA in Fish Husbandry (SCQF level 5) and an optional Unit in the NPA Fish Health and Nutrition (SCQF level 5). It is also available as a freestanding Unit.

This Unit is aligned to the following LANTRA Sector Skills Council's National Occupational Standard (NOS):

- ◆ Aqu 1 Prepare holding units to receive fish
- ◆ Aqu 12 Monitor the aquatic production environment
- ◆ Aqu 13 Maintain environmental conditions within holding units
- ◆ Aqu 16 Establish and maintain green egg incubation
- ◆ Aqu 17 Prepare to and maintain fish eggs in a hatchery
- ◆ Aqu 37 Work safely in an aquatic environment

Candidates must have access to a laboratory and appropriate water analysis equipment to achieve the practical competencies.

The candidate will develop knowledge of the water types available for fin fish and shell fish farming in water catchments and coastal waters, including the suitability of different types in relation to aquaculture activities. The characteristics of farm water types (surface, ground and marine) should be considered with the emphasis on those parameters most significant to fish farmers. Water temperature, dissolved oxygen, ammonia, pH, salinity and suspended solids should be included.

The common human and natural influences on water quality which are of most relevance to fish farmers should be discussed. These will include the following: acidification by acid rain and coniferous forestry; organic pollution by agriculture and its effect on Biological Oxygen Demand (BOD) and dissolved oxygen levels; increases on suspended solid levels due to land cultivation, quarrying and construction works; the effect of industrial pollutants. Catchment drainage characteristics due to rainfall patterns, geology, soil type and land drainage should also be considered.

Instruction in water analysis using recognised test kits and probes should be given. The importance of careful sample collection should be emphasised, ensuring that sediments are not disturbed and allowed to contaminate the sample. Fish farm effluents should be included to demonstrate the effect fish farms can have on the aquatic environment.

National Unit specification: support notes (cont)

Guidance on learning and teaching approaches for this Unit

This Unit lends itself to a range of teaching and learning approaches that give consideration to the Curriculum for Excellence capacities and Equalities legislation, through reasonable adjustment for all candidates. Tutor led knowledge development can be used effectively in the early stages, building an understanding of underpinning concepts, including the hydrological cycle, the factors influencing the water characteristics of different water supplies.

There is scope for candidate centred learning exercises based on text references, web based resources and interactive IT based learning objects presented within a virtual learning environment (VLE). Interactive exercises and regular formative assessment, incorporating online multiple-choice is recommended, in order to develop the candidates understanding of the inter-relationships between the landscape, geology, land use and the aquatic environment.

It would be advantageous to have learning packages for each water type (marine, running freshwater, still freshwater) to allow independent study following the introduction of underpinning concepts (fresh, lentic, lotic, brackish, and salt).

Practical instruction must be included covering water sampling, water testing and candidates should sample a range of water supplies to gain competence in these collection methods.

Field work can be either teacher led or, if it is practicable and safe, groups of candidates can plan and organise their own field work, thereby providing opportunities for team leadership, team work and communication.

The Unit could be enhanced considerably through site visits to a range of aquatic environments and aquaculture sites illustrating key concepts. Talks from aquaculture unit managers, emphasising the influence that the conditions of the water supply have on their aquaculture operation and particularly welfare and management issues are encouraged.

Guidance on approaches to assessment for this Unit

Outcomes 1 and 2 could be assessed using short response questions or multiple choice.

Outcome 3 requires the observation of practical activity with the results recorded on checklists to satisfy the Performance Criteria.

Outcome 4 could be assessed using extended response questions.

Time should be allowed for any necessary re-assessment. Centres must be satisfied that the evidence submitted is the work of individual candidates.

Assessor observation checklists and other assessment records should be maintained and kept up to date to keep track of candidate progress and to provide evidence for internal and external verification purposes.

National Unit specification: support notes (cont)

Opportunities for the use of e-assessment

E-assessment may be appropriate for some assessments in this Unit. By e-assessment we mean assessment which is supported by Information and Communication Technology (ICT), such as e-testing or the use of e-portfolios or social software. Centres which wish to use e-assessment must ensure that the national standard is applied to all candidate evidence and that conditions of assessment as specified in the Evidence Requirements are met, regardless of the mode of gathering evidence. Further advice is available in *SQA Guidelines on Online Assessment for Further Education (AA1641, March 2003)*, *SQA Guidelines on e-assessment for Schools (BD2625, June 2005)*.

Opportunities for developing Core Skills

In this Unit candidates will develop skills in routine monitoring and measuring of physical and chemical characteristics of water.

Candidates will:

- ◆ describe the water types available to fin fish and shell fish farming in water catchments and coastal waters and the relative merits of each source.
- ◆ describe the characteristics of potential farm water types (surface, ground and marine) with the emphasis on those parameters most significant to fish farmers.
- ◆ describe the common human and natural influences on water quality which are of most relevance to fish farmers.
- ◆ measure physical characteristics of water to determine whether they meet required tolerance limits and optimum conditions.
- ◆ describe the effects a change in water characteristics could have in the fishes behaviour and physiology and the welfare and management of the fish stocks.
- ◆ use test kits and probes to gather water samples for analysis while adhering to current health and safety legislation.
- ◆ record water quality data in the appropriate units of measurement.

This means that as candidates are doing this Unit they will be developing aspects of the Core Skills of *Communication* and *Numeracy*.

National Unit specification: support notes (cont)

Unit title: Aquaculture: Water Quality (SCQF level 5)

Disabled candidates and/or those with additional support needs

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering whether any reasonable adjustments may be required. Further advice can be found on our website www.sqa.org.uk/assessmentarrangements

History of changes to Unit

Version	Description of change	Date

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