FISH FARM QUALITY ASSURANCE MANAGEMENT MANUAL

Work-based training materials

In

ENGLISH/FRENCH/SPANISH/GREEK POLISH/HUNGARIAN/ TURKISH/GALICIAN

With printable forms useful for training purposes

This module was written, compiled and designed for use a distance/online learning module that can be used in tutor-led blended learning or in self-directed learning which can take place anywhere, at any time. Further information on the AQUALEX Fish Health Toolset can be found in the Appendix to this module.

Table of Contents

Introduction

This online Quality Assurance Fish Health Manual outlines the Standard Operating Procedures for farm management and the maintenance of fish health. It is a training tool, useful for preparation for work placements and/or on-the-job training.

The training tool content is set at Level 5 of the Scottish National Progression awards in Fish Husbandry (GE4N 45). This could enable users to fulfill some of the performance criteria needed to gain a National Vocational award, leading to accreditation at the European Qualifications Framework (EQF) Level 3 (knowledge of facts, principles, processes and practical skills needed to accomplish tasks and solve problems using basic methods, tools, materials and information).

For users

You will be able to:

- Include this in your EUROPASS, including EUROPASS Digital Credentials (https://europa.eu/europass/en/europasdigital-credentials) This will also help you to draw up your EUROPASS CV.
- Include these skills in browsing the ESCO list of skills, competences and knowledge, while searching for jo opportunities throughout Europe. (https://ec.europa.eu/esco/portal/home)

AQUALEX Training Tool

Online or on-site training package, for on-the-job training, corresponding to

National Progression awards in Fish Husbandry (GE4N 45):

H03C 11 (Fish

Husbandry) H03D11

(Live Fish Handling)

H03G 11 (Water

Quality)

H036 11 (Aquatic Environments)

Provides

✓Basic operational procedures in good fish farm management

✓Explanations of simple but essential procedures

✓Direct online access for the student, at home, in class or at the workplace

√7 basic record-keeping forms required in the day-to-day running of the farm

Translates

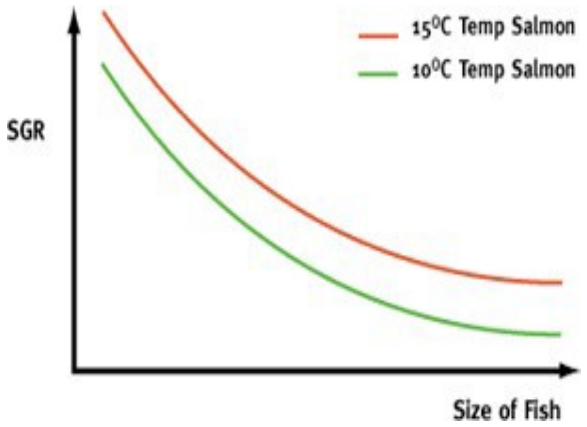
All information and forms available in 9 languages especially useful for aquaculture:
English (here)
French, Spanish, Greek, Polish, Hungarian, Turkish, Galician, (to come).

1. DAILY MONITORING OF WATER QUALITY PARAMETERS

Different fish species have different specific environmental requirements with regard to temperature, oxygen, pH etc.

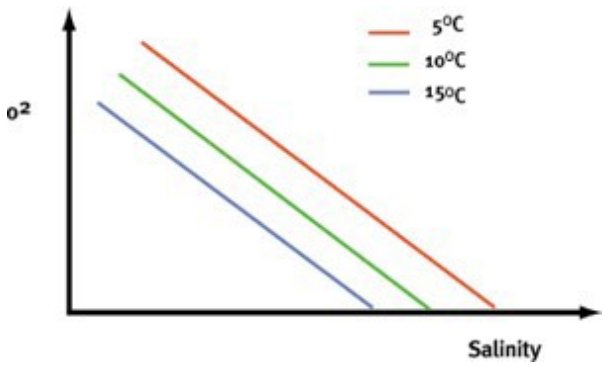
Temperature

Temperature should be measured daily at a fixed point on the farm. These temperature measurements should be taken by means of a max.-min thermometer and preferably at the same time each day. However, random measurement of temperatures can also be taken during peak temperatures in the summer in order to assess their degree of impact on fish.
Alternatively, a resistance temperature measuring device can be used with an automatic display read- out. It is possible to purchase measuring instruments which can carry out a variety of measuring functions such as temperature, oxygen and conductivity.



Dissolved Oxygen

Oxygen is normally measured with an electronic oxygen meter. Oxygen readings should be taken at a fixed point on the farm and preferably at the same time each day. However, supplementary random oxygen readings can also be taken during times of peak temperatures in the summer. Ensure that the meter is correctly calibrated before use and check it regularly to comply with the manufacturer's instructions.

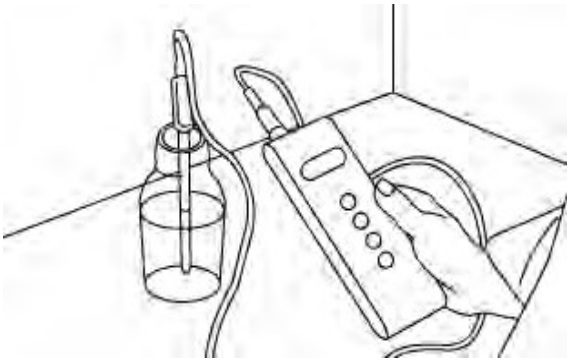


pH

Water pH can be measured by means of an electronic pH meter. Although this is not as crucial as regular daily temperature and oxygen monitoring, it should be measured as deemed necessary by the farm management. Alternatively, monthly monitoring of pH can be undertaken along with other water analysis criteria.

Rainbow trout can tolerate a range in pH from approximately 5.6 to 8.5. Both extreme acidic and alkaline water conditions can have detrimental effects on fish health. High pH also increases the toxicity of ammonia (NH_3) which is toxic to fish in quite low concentrations. The maximum concentration of 'undissociated' ammonia for salmonid culture is considered to be 0.025mg/l.

Form 1. Daily Activity Record: Annex 1



2. MONTHLY MONITORING OF ENVIRONMENTAL CONDITIONS

WATER QUALITY PARAMETERS.

Water Samples

Monthly water samples should be taken at the intake and discharge points, and possibly at intermediate points on the farm, throughout the stocking season. This frequency could be increased when fish numbers are at a maximum and environmental parameters have their most marked effects on water quality (summer months).
Exact locations of sampling stations can be decided in conjunction with the analytical laboratory.

Collection of samples should be carried out as follows:

Water samples should be collected in previously, acid-washed 1 litre plastic bottles (obtainable from a water analysis laboratory).Water samples should be delivered as soon as possible to the laboratory. However, it is important to give prior notice and make prior arrangements for intended deliveries to the laboratory.

Range of Monthly Water Parameters

A number of physico-chemical variables which give indications of the impact of the farm operations on the water quality can be measured in the laboratory. These include:

- Hardness
- Ammonia
- Nitrite
- Total phosphate
- Biological oxygen demand(BOD)
- Suspended solids

In addition, a number of more specific analyses can be undertaken, for example, of trace elements such as minerals and heavy metals. This may become necessary when a disease symptom is linked to the suspected presence of toxic compounds in the water column.

3. ON-SITE VISUAL INSPECTION

Continuous visual observation and assessment of the well-being of fish is an integral part of good husbandry practice and a prerequisite to the health care of stocks on site. One approach is to use the following checklist of questions on the first morning tour of the farm and the last evening tour of inspection.

Are the fish exhibiting any unusual swimming behavior?

Are they crowding near the surface or at the bottom of the pond/tank, or are they well-distributed and behaving normally?

Are the fish flashing, head shaking, jumping or scraping themselves off the tanks/pond sides?

Are the fish swimming eagerly near the surface prior to feeding, displaying normal appetite behaviour or are they unusually lethargic?

Are there any obvious signs of disease or damage such as dark coloration, eroded fins, bulging eyesore visible lesions?

Are moribund fish or mortalities present?

Often, irregularities noted at this stage can prompt quick action and prevent a disease outbreak. Feeding behavior should be examined in much the same way, with feeding response and signs of unusual behavior or diseased fish being recorded on a daily basis.

Form 2. Visual Checks: Annex 1

4. FEED STORAGE

Storage

Fish feed is stored in a secure container/shed on the site. The maximum feed storage capacity on each site is determined by the farmer, according to his needs or preferences, the decision being whether to store a large quantity with few deliveries, or a small quantity with frequent deliveries.

1. The shed should be maintained in a condition that eliminates the entry of water and/or vermin. It should be locked after use at the end of the daily work shift. In addition, vermin traps should be placed inside the shed and inspected weekly.

2. Feed should be stored neatly, in an orderly way (by delivery date and by pellet size) that facilitates a 'first-in-last-out' stock rotation system.

3. Feed should not be ordered too far in advance, e.g.1-2 month period, to avoid exceeding the shelf- life expiry date. The quantity ordered should be dependent on the forecasted stock for that relevant period.

4. Feed that has gone past its expiry date should be dumped in a safe, secure and hygienic manner, for example at the local council tip (by agreement).

5. Feed should be stacked in the shed on wooden pallets, in case of water damage. During the working day any opened feed bags, in use, should be stored in sealed plastic barrels on the farm ready for immediate use. Such opened bags should be returned to the feed shed overnight.

6. As a matter of routine, a 2kg composite sample of fish food, from each size-batch delivered to the farm should be taken and stored in a deep freeze until the fish stocks have been harvested/transferred.

7. A feed stock sheet should be kept in the feed storage area. This should provide details of feedstuffs in (deliveries) and out (daily/weekly for feeding).

8. An appropriate feed size (or mixture of sizes) corresponding to the fish size range should be available for feeding to the fish.

Form 3a. Feed Storage: Annex 2

Feed Delivery

The following general points should be considered in feed delivery:

1. Feed should be hand-delivered to each pond/tank of fish with a plastic scoop (in the following manner):

2. Fish should be fed to appetite, or demand, rather than to a specific feed regime/table.

Form 3b. Feed Usage: Annex 2

Feed Usage

Feed Size	Opening	In	Sample	Out	Balance
02	500	-	-	50	450
03	200	1000	5	70	1125

3. Care should be taken not to deliver feed too quickly or too slowly to fish. The former may result in feed wastage and fouling of fish holding unit. The latter could cause unnecessary feeding aggression, as fish will tend to fight for the smaller number of pellets: this will cause damage to finsand ofteneyes of fish. Feeding hierarchies can also develop resulting in a large variation in fish size within a cohort.

4. Initially, feed is delivered to the stocks at a faster rate and then reduced as fish become satiated. Observation of feeding behaviour is a crucial part of this operation, both to assess the quantity to feed and also to detect any stock abnormalities, such as stressful behaviour (head shaking, gasping, unusual swimming motion, etc.) and also to detect any early signs of disease development such as skin and eyelesions.

5. The quantity of feed that is fed to each unit should be recorded on each occasion. In the absence of accurate measuring devices, feed can be fed from a plastic bin, the volume of which has been previously graduated according to feed weight. A small handbook can then be used to record the quantities that are fed.

Form 4. Feeding Schedule: Annex 3

5. FISH GROWTH

Measurement of fish growth rate provides an essential assessment of the performance of stocks, the health of the fish and the effectiveness of husbandry practices in use.
It is recommended that a number of fish (a minimum of 50) from each (or selected) pond/tank(s) be removed and weighed, at regular interval (normally on a monthly basis). For such routine sampling, it is acceptable to use a "batch-weight" procedure: in "batch-weighing" a netful of fish are removed from the holding unit and added to a pre-weighed bin of water, the total weight is noted and the fish are counted back into the pond/tank. An average weight of fish is then calculated.

1. Weighing operations, as any other fish handling procedure, will result in a small amount of stress for stocks. It is, therefore, advisable to combine operations involving handling fish such as weighing with routine fish health monitor in gassessment.

2. Handling operations should never be carried out in extreme environmental conditions e.g. high water temperatures, low dissolved oxygen, high suspended solids, or if fish are suffering or recovering from disease.

3. Fishshouldbestarvedforatleast24hoursduringhandling operations such as weighing.

4. Actual and Specific Growth Rates can be recorded overtime.

Actual Growth Rate of stocks can be calculated as:

$$\text{Abs. growth} = \frac{(Wf - Wi)}{T}$$

This can be expressed as g/day or as % body weight /day

Specific Growth Rate of stocks can be calculated over a given period as:

$$SGR = \frac{\ln Wf - \ln Wi}{T} \times 100$$

where: SGR = Specific Growth Rate (%/day)

Wf = Final weight

Wi = Initial weight

T= Time (days)

6. FISH TRANSFER PRACTICES

Fish transportation procedures should take place with the minimum of stress to fish. However, species such as rainbow trout can be transported over quite large distances provided that a few basic rules are followed:

1. Avoid any husbandry practices or treatments that involve undue handling and stress to the fish for some days prior to, and for one week following, transfer.

2. Fish should be starved for 24- 48 hours before transfer depending on size and, where long journeys are anticipated, this should be increased to 72hours.

3. Fish should be gently netted and counted into the previously aerated/oxygenated transport tank so that stocking density can be controlled. Oxygen content of water in the transport tank should be at minimum of saturation point (100%).

4. Oxygen bottles should be rigged to a pressure gauge and oxygen distributed at the bottom of the tank via a distribution grid.

5. Fish in tanks will naturally be agitated initially, although when settled they should be evenly distributed in the tank and sit near or on the bottom if conditions are right.

6. During transportation oxygen levels of the water should be monitored on a regular basis. This should be hourly when water temperature is above 15^{o}C, and at least every 2 hours, at other times.

7. When water temperatures are above 17^{o}C, the necessity of fish movement should be limited or contingencies to reduce water temperatures should be implemented.

Form5.Pre-transfer details(2pages):Annex4

Intake of Fish Stocks

The following information should be sought prior to a delivery of fish to a site, allowing adequate site preparation:

1. Numbers, age and mean weight offish
2. Information on previous rearing conditions (temperature, feed type, pellet size)
3. Information on disease status (fish transfer and disease-free certification)
4. Any recent (prophylactic) chemical treatment sand date (e.g., for external bacteria, lesions, fungus)
5. Any antibiotic treatments and date
6. A timed log with records/notes of transfer journey

Unloading Stocks Post-transfer

During a stock transfer operation, the care and welfare of the fish is of prime importance. The following measures should be taken to ensure minimum stress to fish stocks during transfer.

1. On arrival of a fish transport truck, water temperature and oxygen concentration of the water in the transport tank should be checked with a calibrated electronic meter.

2. Oxygen level of the water should be at or near saturation point. If it is below 6.5mg/l, emergency oxygen on hand at the site to be administered, allowing gentle re-saturation of the water prior to transfer offish.
Ideally, the water temperature of the transport tank should be within 2 to 3^{o} C of that of the receiving waters.
If there is a marked difference in water temperature, the fish should be acclimatised for 30-60 minutes (min.) by the addition of water. Ensure there is adequate aeration or oxygenation of water during such acclimatisation periods/practices.

3. Particular care should be taken to monitor the performance of the stocks following initial transfer: this should include observing feeding behavior and noting any mortalities

4. Ensure that the interior of pipes and tubes used for fish transfer are free from rough edges and sharp bends that may cause damage to fish.

5. Ensure that adequate water flow is administered down the pipe during fish transfer. A small water pump is useful for this purpose.

6. Fish should not be all owed to drop from a height in to the water but rather the end of the pipe should reach the water surface so as to gently introduce fish into pond/tank.

7. Hand nets should be of a knotless netting variety to reduce scale loss and fin damage.

8. Any abnormalities or mortalities observed at the initial delivery time should be indicated to person in charge of the transfer, noted in writing on the delivery docket and relevant information passed to the appropriate managers.

Form 5. Delivery Form: Annex 5

7. DISINFECTION AND HYGIENE PROTOCOLS

An effective disinfection and hygiene protocol is an essential precaution against the spread of pathogens both from (and between) holding tanks or different fish stocks. The following protocol should be followed.

1. Small disinfection bath(s) should be set up and maintained on the site to allow staff and visitors to disinfect their boots and waterproof clothing before and after all activities. A suitable disinfection point should be established. This could be located beside or next to the site entrance with adequate "soak-away" drainage nearby.

2. Disinfection equipment should consist of a large 1-02m^3 polypropylene bin (such as those used in fish processing trade) with bottom drainage plug. The disinfectant should be added to freshwater in accordance with the manufacturer's instructions. It is essential that wastes from these baths are not discharged directly into water courses.

3. Disinfectant water should be exchanged regularly (at least weekly)depending upon demand/use or according to manufacturer's instructions.

4. The disinfection agents used (normally iodophor compounds) should be suitable for use in aquaculture and should be capable of destroying both viral and bacterial pathogens. Several proprietary compounds (e.g. Actomaror Virkon) are readily available. Manufacturers' instructions should always be followed when diluting and using any disinfectant.

5. Separate hand nets, one for each pond/tank, should be used for the removal of mortalities. These should be disinfected immediately after such operations.

6. Separate hand nets should be used for the routine on-site handling/movements of fish between pond/tanks groups.

7. Routine cleaning and disinfection of all farm equipment and structures should take place on a regular basis.

8. Routine disinfection of the fish transporter and associated equipment should take place prior to and after each stocking operation. On return from a stocking transfer operation, personnel should disinfect all equipment that has come in contact with the external fishery such fish nets, boots, waterproofs and the vehicle wheels. An aerosol dispenser is useful for such operations.

Form 6. Stock Monitoring (including Mortalities): Annex 6

8. HANDLING AND DISPOSAL OF MORTALITIES.

The following practices and protocols are recommended:
All pond/tanks should be checked for fish mortalities on a regular basis (several times per day - when feeding and accurate records should be kept of the number of mortalities recovered from each pond/tank.

Floating mortalities or moribund fish should be immediately removed from each pond/tank as soon as they a observed, with a hand net used only for mortremoval.

Relatively fresh and moribund fish may be placed in a labeled (date, stock no.) plastic bag and returned to the office/laboratory facility (if available) for examination, if desired.

Mortalities should be placed in a suitable, tightly-closing, container or thick polythene bag that can be tight sealed so as to prevent drainage and reduce the risk of contamination to other ponds/tanks.

Mortalities should be removed from the site and/or disposed of in a designated mortality pit, treated with slake lime and covered as soon aspossible.

The designated mort pit should be readily accessible but situated so as to avoid drainage into any nearby wat course and deep enough to prevent it from being easily uncovered by scavengers. If possible, security measures such as a perimeter fence and an appropriate notice should be put inplace.

The mort pit site should allow a number of small pits to be dug in rotation so as to allow degradation of earlier material prior to unearthing. An area of approx. 15-20m^2 in total is adequate, with each smaller p measuring 1x1m.

DO NOT USE QUICK LIME, THIS IS AN EXTREMELY CAUSTIC UBSTANCE CAUSING DAMAGE IF IN CONTACT WITH SKIN OR IF INHALED.

In the event of a sudden mass mortality in stocks, beyond that which the normal site mort pit can safely contain, contingency plans in accordance with local, national and EU regulations for the safe, hygienic removal and disposal of fish should be in place and implemented.

Annex 1

Form 1. Daily Activity Record sheet

Environmental Monitoring		
	AM	PM
Temperature		
O^2		
pH		

Form 2. Visual Checks

Water intake (land-based) Moorings (marine cages)			
Nets			
Feeding behaviour			
Signed by:		Date:	

Annex 2

Form 3a: Feed Storage

Feed Size	Opening	In	Sample	Out	Balance

Form 3b: Feed Usage

Feed Size	Opening	In	Sample	Out	Balance

Annex 3

Form 4: Feed Schedule

Cages Pond	Feed type	Recommended Feed WEIGHT	ACTUAL AMOUNT AM.	PM	TOTAL
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					

Annex 4

Form 5: Pre-Transfer Details (Page 1)

Number of Fish	Age of Fish	Mean weight of Fish
Rearing Conditions: temperature, feed type, pellet size,		
Date:		
Fish Health Details		
Please provide a history of the fish with regard to any disease + a disease-free certificate		
Have there been any (prophylactic) chemical treatments? E.g., external bacteria, lesions, fungus		
Date:		
Have there been any antibiotic treatments?		
Date:		

Form 5: Pre-Transfer Details (Page 2)

Journey Log				
Departure time:				
Notes:				
Environmental checks on route				
Time	**O^2**	**Temperature**	**Behaviour**	**Notes**
Date:				

Annex 5

Form 6: Delivery Form

Delivery Company:	
Consignment Details:	
Date:	**Recipient signature:**

Annex 6

Form 7: Stock Monitoring (including mortalities)

Cages/ Pond	Date	AM	PM	TOTAL
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

APPENDIX

How to use the AQUALEX online language lessons

http://www.aqualex.org/index.php/multilingual-esp-language-courses

The AQUALEX language lessons are designed for **COMPLETE BEGINNERS in English**, whose first/native languages are French, Spanish, Greek, Norwegian, Polish, Portuguese, Swedish, Hungarian, Turkish and Galician.
These language learning lessons support **tutor-ledblended courses**. They are designed to help complete beginners in each language to learn basic grammar points and important aquaculture keywords in English.

They are **NOT** a complete online course. They simply give basic grammar points in a vocational context (aquaculture). They are designed to give beginners a chance to understand and handle simple sentence with essential keywords.
Because English is still the most popular choice for a second language, English grammar points are explained, in English and in the user's language. Where the user language is different from English (i.e., French masculine and feminine nouns), then explanations of the user language structures are given in both English and the user language
Level 1 lessons for **beginners with no previous knowledge** of the target language.
Level 2 lessons for those **with some knowledge**, though still at the **basic level**.
You can enter the lessons (English, French, Galician, Greek, Hungarian, Polish, Norwegian, Portuguese, Swedish, Turkish) by **clicking on the country flags.**
You can enter each level via the dropdown menus at the top of the page.

Each lesson is organised into **TEXT, GRAMMAR, and HOMEWORK** with clickable menus at the top of each page.
The **TEXT menu** contains the lesson itself, which may have 5 pages.
Each page of the lesson can be entered via the **NEXT and PREVIOUS** links at the bottom of the page.
The **GRAMMAR** section can be entered via the top drop down menu. Each page of the grammar can be entered via the NEXT and PREVIOUS live links at the bottom of the page.
The **HOMEWORK** section cannot be entered until all the TEXT and the GRAMMAR pages have been viewed, in order to consolidate language acquisition.
All **TEXT** pages are inter-changeable in all AQUALEX languages, by clicking on the Country flag at the bottom of the page.

- **BUT GRAMMAR and HOMEWORK** sections are specific to each language and do not have an interactive function.

*TEXT pages also contain **audio material** which can be heard by running the mouse over the words on the page. Click on live items to hear the term as recorded by native speakers (make sure you have the necessary software for this facility (i.e., Quicktime Player).*

In Level 1 you learn

The use of

✓numbers (lesson 1)
✓definite article (lesson 1)
✓indefinite article the/a/an (lesson 2)
✓ countable/uncountable nouns (lesson 6)
✓many, some, a lot, more (lesson 6)
✓demonstrative pronouns this/that these/those (lesson 2)
✓singular/plural nouns (lessons 1,3)

the use of prepositions
✓of place (lesson 8)
✓of time (lesson 9)
✓names of days (lesson 13)
✓names of months (lesson 14)

the use of verbs

✓is, are (lesson 1)
✓has, have (lesson 2)
✓this is, there are (lessons 2, 3)
✓present tense (lessons 11, 12, 13)
✓agreements (subject/verb)(lessons11-13)

how to make statements (lesson1)
✓negative statements (lesson 2)
✓how to ask /answer questions (lesson 2)
✓true/false response (lesson 4)
✓how to tell the time (lesson 6)

how to make simple measurements
✓temperature (lesson 9)
✓length, breadth, width, height (lesson 10)
✓volume (lesson 10)

In Level 2 you learn

✓more adjectives and adverbs (lesson 2)
✓comparisons (lesson 3)
✓pronouns: personal, relative (lesson4)
✓Imperative (lesson5)
✓past tense (lesson6)
✓future tense (lesson 7)
✓conditionals (lesson 7)
✓modals/gerundive (lesson 8)
✓passive (lesson 9)

Language attainment levels

Level 1 (CEFR) levels A1, A2)

The priority for many **first-time language learners** is to understand and convey simple but vital pieces of information (i.e., keywords) in a new language. The AQUALEX online language lessons in English, French, Spanish, Greek, Norwegian, Polish, Hungarian, Turkish, Portuguese, Swedish and Galician are designed to allow complete beginners to build on their native languageknowledgeoffamiliaritemsintheworkplace/laboratory,inastep-by-stepvisualpresentationwithaudioinput.This methodgivesthemachancetofast-tracktheirlearning,attheirchosentimeandattheirown speed.

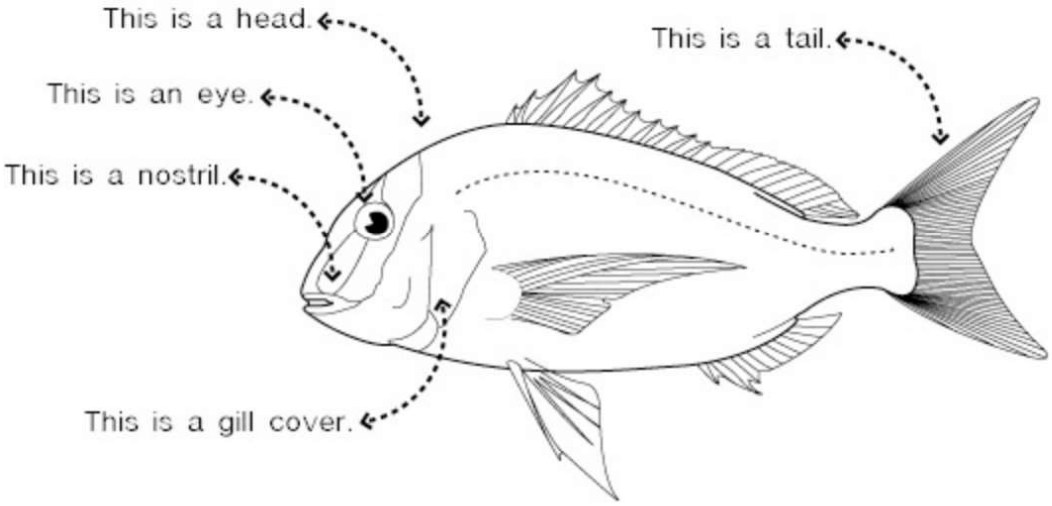
Level 2 (CEFR levels B1, B2)

Having picked up the first essentials in a user-friendly way, **students or workers** requiring vocationally relevant fish health information can progress at their own pace of learning through the Toolset Fish Health multi-lingual course materials (shown above) in English, French, Spanish, Greek, Norwegian, Polish, Hungarian, Turkish and Galician This can be done online at: **http://www.aqualex.org/index.php/multilingual-esp-language-courses**

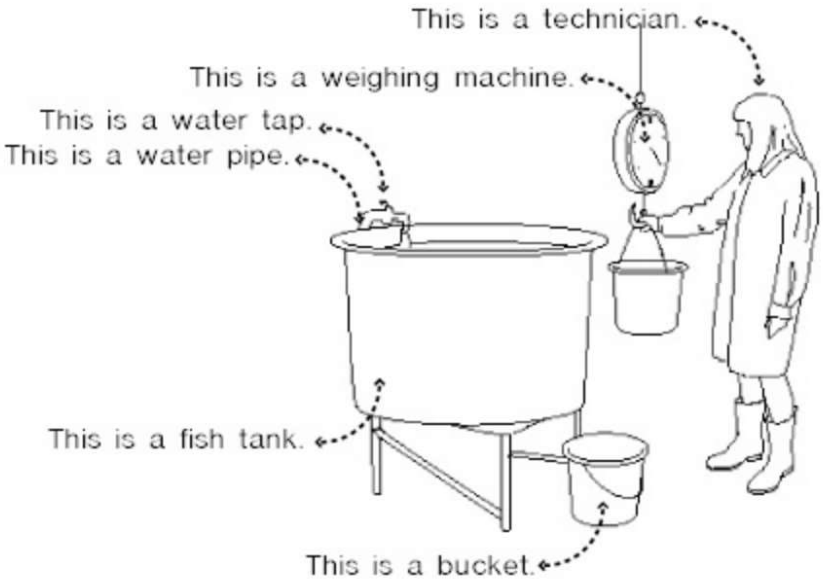
Level 3 (CEFR levels C1, C2)

For these as one practitioner, Ph.D. student or academic, the AQUALEX Toolset contains two **multi-lingual aquaculture and fish diseases glossaries (http://www.aqualex.org/index.php/glossaries)** in English, French, German, Spanish, Italian, Greek, Norwegian, Polish, Hungarian, Turkish and Galician. These online resources presenting h-level information and detailed definitions in the accepted academic format.

This is a fish



Previous Page UK EL FR ES NO PL PT SV HU TR GA Next Page



Previous Page UK EL FR ES NO PL PT SV HU TR GA Next Page

Here is a list of numbers to help you in the next task.

1 One	5 Five	9 Nine	13 Thirteen	17 Seventeen
2 Two	6 Six	10 Ten	14 Fourteen	18 Eighteen
3 Three	7 Seven	11 Eleven	15 Fifteen	19 Nineteen
4 Four	8 Eight	12 Twelve	16 Sixteen	20 Twenty

Previous Page UK EL FR ES NO PL PT SV HU TR GA Next Page

Say if these statements using symbols + – x ÷ are true or false.

2 x 3 = four	TRUE	FALSE
15 – 5 = three	TRUE	FALSE
6 x 2 = nine	TRUE	FALSE
12 ÷ 3 = eleven	TRUE	FALSE

Previous Page UK EL FR ES NO PL PT SV HU TR GA Next Page