Online course

Open the Door to European Aquaculture

5 ECTS (c.135 hours)

8 weeks in total length, workload of 15-20 hours per week

Course Guide

Introduction

Fish are considered as one of the healthiest foods available for humans, certainly one of the reasons why farming finfish as well as shellfish and aquatic plants are part of one of the world's fastest growing food sectors. Aquaculture already provides the planet with about half of all the fish we eat. However, in the EU, overall output has been more or less constant in volume since 2000 whereas global production has been growing at nearly 7% per year. Consequently, about 60% of the fish, which is consumed in the EU, has to be imported.

The EU aquaculture sector has a significant growth potential and can offer top-quality products which comply with the highest standards for consumer health, environmental protection and animal welfare. To boost the development of EU aquaculture, the European Commission has issued strategic guidelines, cooperating with Member States and stakeholders in overcoming the challenges facing the sector.

To meet the challenge of an increasing aquaculture production in the EU, more well-educated specialist and well-informed consumers are required. Thus, an important requirement is to strengthen education in the field of aquaculture. Aqua-tnet III (a network of European universities that provide aquaculture education) has developed an introductory online-course, designed to provide an overview of aquaculture and the common species cultured in Europe and their related production methods. The online-course is designed to provide basic principles of aquaculture including fish biology, culture system design, feeding, handling, water quality management and legislation.

In summary, the purpose this online course is to open the door to aquaculture for master level students who want a foundation in aquaculture principles to apply towards more advanced coursework in aquaculture or other aquatic sciences, or to prepare for graduate research and a career in aquaculture.

The course consists of 4 modules av varying lengths within a period of 8 weeks. Course assessment is based on assignments given in each module as well as a learning journal. There are both individual and group assignments and in most cases you are asked to give feedback on one another's work.

Learning journal

In this course, you will be expected to write a personal learning journal, which includes your thoughts, experiences and impressions related to the course and your own learning. Entries in your journal should include your reflections on the objectives of the modules and the course, as well as your reflections on how you have contributed to course discussions, and on the comments given to you by other students. Some examples of text that might help you write your own reflections are:

- "As I already know from..."
- "Since my last entry, I have..."
- "I am surprised..."
- "I felt annoyed..."

You can find more information about writing a learning journal here: http://www.mindtools.com/pages/article/journaling.htm

You will be expected to make entries in your journal each week. At the end of the course you will be asked to submit a reflection document (4-5 pages) based on your journal that describes and analyses your own learning journey through the course. The reflection document will count 40% of the final grade. You will receive feedback on your journal midway through the course.

Note: Students who want to participate in the course will be required to write a letter of motivation as to why he/she should be accepted. Before the start of the course the student is expected to introduce him/herself with a photo and a short *curriculum vitae* or by a short video of about 2-3 minutes. The files have to be uploaded in the INTRODUCTION folder.

1. Guidepost Module 1 - European aquaculture as a source of food **(2 weeks)**

Introduction: In this first module you will get acquainted with aquaculture production in Europe, especially in respect to global aquaculture production as well as to the production of farm animals. You will also discover the differences in biology of different species, which will

help you to understand the limitations and challenges of aquaculture. In this module, you will also need to do some practical research: you must find out what is going on in your nearby market regarding seafood products. Finally, you will learn more about the importance of seafood consumption for human health.

Learning outcome for module:

- To be able to explain and analyse the role of aquaculture in European food production

Learning activities

1. **Explore production.** This learning activity consists of two parts. In the first part the work is individual: find information in the web about global, European and your home country (if under cultivation) production trends for one species according to the list below. For seafood fisheries and aquaculture production should be separated.

Group	Student	Species	Group	Student	Species
1	A	Chicken	3	K	Carp
1	B	Lobster	3	L	Tuna
1	C	Sole	4	M	Beef
1	D	Tilapia	4	N	Sturgeon
2	E	Pork	4	O	Sea bream
2	F	Mussel	4	P	Oyster
2	G	Sea bass	5	Q	Catfish
2	H	Salmon	5	R	Crayfish
3	I	Eel	5	S	Trout
3	J	Clam	5	T	Algae

Look for these information:

Species
Culture environment
Fisheries (Tonnes) 2000 and 2010
Aquaculture (Tonnes) 2000 and 2010
Fisheries (Euros) 2000 and 2010
Aquaculture (Euros) 2000 and 2010
More

In the second part you are requested to work in groups: share your information with the other students of the group and prepare a presentation comparing the production trends of the four species of your group. Choose one student of the group who will put the presentation in the folder. Your presentation should be made in PowerPoint (or similar) and be a maximum of 12 slides. Be sure to indicate the sources of your information. Name the document "**(for example: Group1)**" and upload the file in the **Production folder** in **Module 1 folder**.

Suggested learning materials:

FAO statistics,
http://www.rlc.fao.org/en/publications/yearbook-fishery-aquaculture/
http://www.fao.org/fishery/sofia/en

EU statistics (Eurostat),
http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Fishery_statistics

EUMOFA (2014) The EU Fish Market -
http://ec.europa.eu/fisheries/market-observatory/documents/10157/bf18cf2c-1b33-440d-8870-e05b2644b58b

Norway statistics
http://www.fiskeridir.no/english/statistics/norwegian-aquaculture/aquaculture-statistics

The Economic Performance of the EU Aquaculture Sector
(http://stecf.jrc.ec.europa.eu/documents/43805/622206/2013-12_STECF+13-29+-+Aquaculture+economics_JRCxxx.pdf)

http://ec.europa.eu/fisheries/cfp/eff/national_plans/index_en.htm

Specific learning outcome for learning activity 1: The student will acquire knowledge about the role of aquaculture by searching information about production trends of different meat types: chicken, pork, beef and aquaculture products (fish, molluscs, crustaceans, algae) in the world and in Europe.

Teacher suggestions: Before starting to prepare the slides study the subject and decide which information is important for you and for your classmates.

2. Explore the biology of the aquaculture animals: Present the general biology (life cycle, growth, geographical distribution, temperature limits, water quality requirements) of one aquaculture species by a PowerPoint (or similar) file of maximum 10 slides (Indicate the source). Each student has a specific species to consider. Name the document "**The species - Your name**" (**for example: Cod-JohnSmith**) and upload the file in the **Biology** folder in **Module 1** folder. Your file will be visible to the classmates and the teacher and will be evaluated by the teacher (from 1 to 5 points). Have also a look at the files of your classmates.

Here is the list with the name of the student associated with the assigned species.

Student	Species	Student	Species
A	Atlantic Salmon	K	Sole
B	Cod	L	Mackerel
C	Rainbow trout	M	Crayfish
D	Sea bass	N	Lobster
E	Sea bream	O	Carp
F	Eel	P	Tuna
G	Catfish	Q	Sturgeon
H	Mussel	R	Nile tilapia
I	Oyster	S	Halibut
J	Clam	T	Anchovy

Suggested learning materials:

Start from these two sites. You can easily find other information in ichthyology or biology textbooks or the web.

- European aquacase http://www.aquacase.org/
- Biology of fish. http://www.fishbase.org/

Specific learning outcome for learning activity 2: The student will acquire an understanding of the biology of different types of aquaculture products (fish / molluscs etc.) produced in Europe.

Teacher suggestions: the individual work is on one species that must be considered as an example. Knowing more on the biology of the species will make easier the following activities in the next Modules.

3. Explore fish trade: Go to a fish market or to a supermarket. Distinguish between fisheries and aquaculture products if possible. Take a picture of the subjects. Make a list of the most important seafood products, and take notes which are from fisheries and which from aquaculture. Compare your list with the statistics in the web. Answer to the question: the presence of certain aquaculture species in this market (supermarket) depends on the environmental conditions (you can easily find aquaculture salmon in Scotland) or on trade (you can also find salmon in Italy, but only in few markets) or both?
In the supermarket you can find different products. They can be fresh, processed (like tuna fish or vacuum-packed fillet) or deep-frozen. They can be fish, molluscs or crustaceans. Present some of them by a PowerPoint (or similar) presentation or a 3 minute video. Name the file with **your name** and put it in the **Trade** folder in **Module 1** folder. Distinguish between European products and extra-European products.
Describe the information written in the labels of different products. Pay special attention to the possible labelling related to sustainability or to eco-friendliness. Discuss the importance of the label in order to inform the consumers.
Prepare a document in word where you can answer to all the requests, name it "**Trade You name**" and put it in the **Trade** folder in **Module 1** folder. Your files will be visible to the classmates and to the teacher.

Each student must read the work of at least three other students and send them some comments of their work and as cc to the teacher. The document and at least one comment of each student will be evaluated.

Suggested learning materials:

See Learning activity 3 in http://www.aquacase.org/

Visit the sites

http://www.thefishsite.com/articles/1256/markets-and-trade-in-aquaculture

Josupeit et al.] Aquaculture products: quality, safety, marketing and trade

http://www.fao.org/fishery/topic/14884/153098/en

http://www.worldfishcenter.org/our-research/ongoing-projects/sustainable-trade-in-ethical-aquaculture#.U6Gqufl_tqX

Specific learning outcome for learning activity 3: The student can describe European aquaculture trade and identify the most important European aquaculture products and product exchanges between EU, Norway and the other countries.

Teacher suggestions:

4. Role of aquatic products in human nutrition

Find information on seafood consumption (per capita) statistics by country in the EU countries, Norway, Iceland and Japan. What is the average life expectancy in the same countries? Make a plot (in Excel) between seafood consumption and life expectancy. Is there any correlation?

Study the biochemistry of fats: what is their biochemical composition, and how different fats are formed and how different fats are named. Write a 1 page summary.

Compare the fatty acid profile of beef, chicken, salmon, blue mussel and one other aquaculture species (you choose the species). Make a table of the fatty acid profile in Excel, and make a graph of the omega-3, omega-6 fatty acids, as well as of saturated and unsaturated fatty acids. Write a short (2-4 pages) report with the graphs of the differences / similarities.

What kind of information is available of the health benefits of the seafood?
And about risks associated to eating seafood?

Prepare the files you need and name them with "**Your name**" and put it in the **Health** folder in **Module 1** folder. Your files will be visible to the classmates and to the teacher.

The students are grouped in groups of 4 (1 A,B,C,D; 2 E,F,G,H; 3 I,J,K,L; 4 M,N,O,P; 5 Q,R,S,T). Read the works of your groupmates, discuss with them in a web meeting about the importance of aquaculture products for human health. Include a table with benefits and potential risks of consuming seafood. One in each group write a report of 1 page on the discussion and put the file with the name **"number group"** in the **Health** folder in **Module 1** folder. Individual files and group file will be evaluated.

Suggested learning materials:
Information on the healthy value of fish oil. Put in Google the ISBN 978-90-8686-078-4. It is part of a book entitled Marine Functional food Ed.J.B.Luten, Wageningen Academic Publisher. You can see the index so you can decide if it is worth buying it.
Find in Module 1 folder the scientific articles in a file named Barcelo-Coblijn and a second file named Bradbury.

You can visit the sites of FAO and Eurostat to find statistics

Information on the value of fish oil for human health
http://www.nutrasource.ca/ifos/fish-oil-facts/health-benefits.aspx
Lipid structure
http://www.lipidmaps.org/data/structure/LMSDSearch.php

http://www.forbes.com/sites/realspin/2014/09/19/the-activist-led-panic-against-mercury-in-fish-is-harming-the-american-diet/

EFSA. 2010. Scientific opinion on dietary reference values for fats, including saturated fatty acids, polyunsaturated fatty acids, trans fatty acids and cholesterol. *EFSA Journal*, 8(3): 1461.

Hornstra, G, Vonhouwelingen, A.C. & Foremanvandrongelen, M.M.H.P. 1995. Essential fatty-acids in pregnancy and early human development. *European Journal of Obstetrics Gynaecology and Reproductive Biology*, 61(1): 57–62.

Richardson, A.J. & Montgomery P. 2005. The Oxford-Durham study: a randomized, controlled trial of dietary supplementation with fatty acids in children with developmental coordination disorder. *Pediatrics*, 115(5): 1360–1366.

Thilsted, S.H., Roos, N. & Hassan, N. 1997 The role of small indigenous fish species in food and nutrition security in Bangladesh. *WorldFish Centre Quarterly*, July–December: 82-84.

Specific learning outcomes for learning activity 4:

The student will acquire knowledge of the role of seafood in nutrition and will be able to answer the following questions:

- What are the benefits and potential risks of consuming seafood?
- What makes seafood beneficial for human health?
- What kind of benefits does seafood offer?

Time table: Module 1 is starting January 29th 2015 at 9 AM and closes February 11th 2015 at 8PM.

Activity	Type of work	Due date
Explore the sites related to the production and find the information you need.	Individual	Sunday February 1st at 4 PM
Share the information and produce the file.	Group	Monday February 2nd at 4 PM
Explore the sites related to the biology of the aquaculture animals and find the information you need. Prepare the file.	Individual	Tuesday February 3rd at 4 PM
Go to the market and the supermarket and collect all the informations	Individual	Wednesday February 4th
Prepare the document and put in the **Module 1** folder	Individual	Thursday February 5th 4 PM
Send your comments to at least three other participants	Individual	Friday February 6th 4 PM
Explore the files and read the articles related to the nutritional value of the aquaculture products. Prepare your	Individual	Monday February 9th 4 PM

files. Put them in the **Module 1** folder.		
Organize the web meeting and prepare the report. Put it in the **Module 1** folder	Group	Wednesday February 11th 8 PM

At the end of the module you will receive a report with the evaluation.

Responsible teacher(s): Maria Messina (maria.messina@uniud.it)
Juhani Pirhonen (juhani.pirhonen@jyu.fi)

2. Guidepost Module 2 (3 weeks, 15-20 hours per week)

Introduction: The European "aquaculture landscape" reveals various methods and the production of a wide variety of species. In the majority species selection and production methods are made according to the biotic and abiotic conditions in a region or country. For example, in Norway, the majority of the produced fish is Salmon, whereas the majority of the fish produced in Greece is Seabream; in both cases, the environmental and biological conditions favor the production of the respective species.

Prior to selecting a species for a culture project, it is important to consider the species' biological requirements and the economics and market potential. The biological knowledge required allowing a successful culture of a species is manifold and needs thorough considerations prior to start of a business of the applicable conditions. Thus these aspects are in the focus of this module 2.

The following general factors should be considered when selecting a species for a successful aquaculture venture:

- Knowledge on biology, ecology, and life history
- Knowledge on reproductive culture methods
- Possibility of captive breeding and closing the life cycle under controlled farming conditions
- Ability to culture at high population densities in artificial holding facilities

- Ability to consume and efficiently grow on artificial formulated diets
- Ability to mimic the natural life cycle in a controlled environment
- Attainability of market size within economically feasible period of time
- Low vulnerability to pathogens

The ideal aquaculture species possesses all the above characteristics. However few if any species are ideal. More often there is some compromise in terms of these characteristics.

Learning outcomes:
After completing module 2, students will be able to:

- Analyze and explain factors influencing the distribution and production methods in European aquaculture (see suggested workflow in the flowchart, Fig.1).
- Describe most important fish species propagated in aquaculture at present
- Explain the biological features and culture methods of commonly cultured fish
- Select species to farm based on certain local conditions

"You can raise whatever kind of fish you want. You would only be limited by your budget, time, space and climate and the market conditions".

Learning activities:

a) **Explore the climate regime for a given region/country (or choose the local area):**

Task: Two to three students explore one region; (most useful if the regions or countries among the groups have quite diverse conditions).

- Check the annual climate and specifically the temperature regime in the area where you want to produce the species (production cycle).
- Consider deviations in air – water temperature regime (e.g. in case you want to deploy net cages in a lake).

Suggested learning resources:

- Meteorological resources about the area (Internet);
- „Species summary pages" in FishBase;

b) Check for the available water source & quality, specifically evaluate the following conditions:

Task: The groups continue to explore the conditions (list below) for the regions, which they considered in the first task.

- Marine conditions (varying salinity) or freshwater
- Check details available water sources: groundwater, surface water, rain, municipal water sources, seawater.
- Check if you can heat- or cool the water (Recirculation unit e.g. attached to a Biogas facility..)
- Check other important features of your water source (e.g. flow through-rate, oxygen, pH, sediment, nutrients…).
- In case, there is no appropriate water source available or the opportunities does not fit to the species which is in the focus, check for other options, such as RAS (a recirculation facility)

Suggested learning resources:

- "Water advisor" in LarvalBase (www.larvalbase.org/water_source/watersource1.htm)
- Regional Water Quality Control Boards (if applicable)
- Official information of local (agriculture/aquaculture) ministries
- Aquaculture breeding information (FAO, Books etc.)

c) Explore, if fry of the selected species is available on a sustainable basis.

Task: The groups continue to explore "their" species, which may be favorable according to the conclusions from the first and the second tasks.

- Check if the reproduction cycle is mastered artificially;
- Check if offsprings are available only from natural sources (e.g. eel);
- Check availability of juveniles throughout the year;

Suggested learning resources:

- FishBase, LarvalBase, AquaCase
- Aquaculture breeding information (FAO, Books etc.)
- FAO-Species Fact Sheets www.fao.org/fishery/species/search/en
- Established literature on propagation of fish

d) Make the final decision, which species match to the abiotic/biotic conditions of the selected region/country.

Task in two steps:

i) Each group prepares a final report under considerations of the tasks below and present their results to the other groups in an asynchronous manner; each group must then provide comments on the work of the other groups (notes for teacher: establish a Blog with comment functionality or use a learning management system, which allows the student to send comments).

ii) Final synchronous "plenum" discussion, chaired by the teacher: For guidelines for the discussion see recommendations for teachers below (notes for teacher: choose an appropriate ICT tool to accomplish an online discussion, such as Skype or Adobe Connect).

- Prepare a matrix, in the style of Decision Supporting System (DSS, see example doc www.aquacase.org/online_docs/DSSdesign.doc , more background information: www.aquacase.org/online_docs/DSS for sustainable cage aquaculture.pdf)
- Compare optimal water temperature and water quality
- Explore if necessary production units will be available for the selected species
- Compare the production cycle and requirements for production units on different life stages
- Compare with feeding, available feed types, feed conversion rate, feed ratio
- Compare with existing aquaculture business in the respective region/country
- Compare the selected species and the products with the economic/market preferences and consumer preferences (e.g. in France, consumer prefer whole fish, in Germany consumer prefer "convenience products" such as filets) with the support of the outcome of Module 1
- Check environmental issues; evaluate options to produce fish in recirculation facilities (with low discharge to the environment).
- Check if certified production of the selected species exists.
- Look into the future (Module 4)

Suggested learning resources:

- Learning outcome of Module 1 & 4
- Various market studies and statistics
- Country information in AquaCase, www.aquacase.org
- WWF documentaries, other NGO reports on sustainable fish production.
- FAO statistics, EU statistics (Eurostat)
- www.aquaculture.stir.ac.uk/public/GISAP/pdfs/Borja.pdf

- www.fao.org/3/a-ab412e/ab412e07.htm

Suggestions for the teacher:

Beyond the major learning outcome of this Module (2), discuss with students about the following context related to aquaculture production (relates to Module (1), (3) and (4).

- Country-specific laws and regulations which may apply (restrictions)
- In case, non-native species are the choice: indigenous versus exotic species (precautions to prevent adverse effects on local fauna and flora);
- Fast growth, short food chain, efficient conversion of food, ready acceptance of compounded feeds, good table quality, disease resistance;
- Social and environmental sustainability, consumer acceptance and marketability;
- Cost of production;
- Domestic consumption versus export;

Responsible teacher(s): n.a.

Time table: Module 2 is starting at Wednesday and closes on Tuesday

Activity	Type of work	Due date
Explore the climate regime for a given region/country (or choose the local area)	Internet resources	Wednesday to Friday (3 days, 5 hours)
Check for the available water source & quality	Internet resources	Monday to Thursday (4 days, 10 hours)
Explore, if fry of the selected species is available on a sustainable basis	Internet resources, books	Friday to Thursday (5 days, 10 hours)
Make the final decision, which species match to the abiotic/biotic conditions of the selected region/country	Amalgamation and evaluation of the previous results. Group discussion	Friday to Tuesday (10 days, 20 hours)

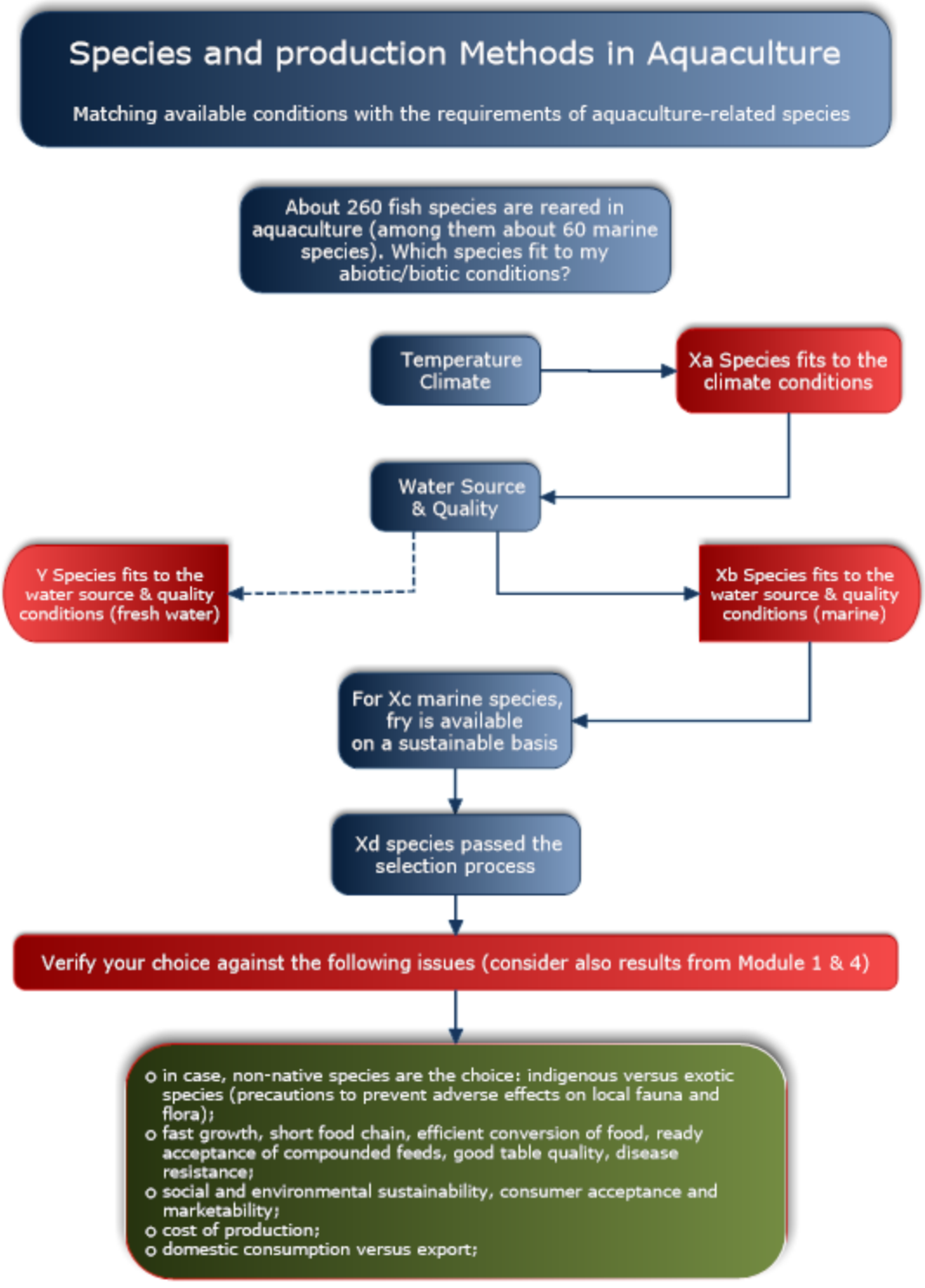

Fig. 1: Workflow of the selection process according to the tasks in Module 2

Guidepost module 3. (1 week)

Knowledge of European aquaculture policy

The student will understand the European Community Policy on fisheries and aquaculture (CFP).

- Learning activity:

Students are asked to take on the role of a Member of the European Parliament. They receive a letter from a branch of GreenPeace within their constituency objecting to EU support for aquaculture based on the following arguments:

"Fish farming has been promoted by the fishing industry and governments as the solution to ever-decreasing stocks in our oceans. However, in most cases fish farming only makes the problem worse! This is because:

i) *Wild-caught fish are used for fish meal and oil to feed farmed stocks which increases the pressure on the marine environment rather than reducing it. The fish meal and oils used in fish farming come from fish such as sand eels. Their removal in massive quantities by industrial fishing vessels has a devastating effect on the marine ecosystem.*

ii) *Some breeding stocks are taken from wild populations.*

iii) *Diseases spreads from farmed fish to wild populations making wild populations further depleting their numbers.*

iv) *Water and environments surrounding fish farms are polluted by fish waste, uneaten food and the chemicals, antibiotics and vaccines used to control disease."*

(Reference: http://www.greenpeace.org.uk/oceans/what-we-are-doing/sustainable-seafood/sustainable-seafood-frequently-asked-questions#9)

Using the following resources and others that they may identify for themselves, they should compose an informative reply which seeks to reassure the group on these issues of concern and underlines the rationale for EU support for sustainable aquaculture production.

- Learning materials:

http://ec.europa.eu/fisheries/cfp/aquaculture/index_en.htm
http://www.europarl.europa.eu/RegData/etudes/STUD/2014/529084/IPOL_STU(2014)529084_EN.pdf (Study on impacts of further growth in European aquaculture)
http://www.sciencedirect.com/science/article/pii/S0044848603004769 Aquafeeds and the environment: policy implications
Doi 10.1023/A:1023963326201 Uncertainties and values in European aquaculture: Communication, management and policy issues in times of "changing public perceptions" by M. Kaiser, S. M. Stead

Time table: Module 3 is starting and closes .

Activity	Type of work	Due date
Essay in form of reply to local GreenPeace group	Essay	End of week

Responsible teacher: Sonia Seixas

4. Guidepost Module 4 (2 weeks)

Introduction:
In the three previous modules, you have explored the role of aquaculture in European food production, looked at various factors that influence the distribution and production methods in European aquaculture, as well as gained an understanding of European aquaculture policy. In Module 4, we would like to look to the future. What are some of the specific challenges facing European Aquaculture and how can we meet these challenges?

As we have seen, the context in which aquaculture production is carried out is complex and involves many different considerations and stakeholders. The continued development of European Aquaculture is dependant therefore, on how well we are able to operate within this complex reality. What species are most appropriate for a specific region? What are the water, energy and nutrient demands for these species? Will production have adverse effects on the environment? What policies and regulations are in place? What are consumer perceptions? How do we certify production? Are our production methods sustainable in the long-term?

In this module, you are asked to consider an application to local planning authorities from the Salmar Corporation to expand their smolt production unit in northern Norway (aquacase.org). You will work in groups, each representing the interests of a specific stakeholder.

Learning outcomes:

After completion of module 4, students will be able to:

- Evaluate challenges and propose solutions for the development of European aquaculture.
- Adopt a multidisciplinary approach to problem identification and information appraisal
- Apply different *perspectives* in an attempt to achieve multiple goals or meet the expectations of multiple objectives.

You will approach the application from the Salmar Corporation to expand their smolt operation from several different perspectives to give the best possible foundation for the proposed expansion. As a way of introducing this module, please consider the following fable:

The Blind Men and the Elephant

A Hindu Fable by John Godfry Saxe

It was six men of Indostan
To learning much inclined,
Who went to see the Elephant
(Though all of them were blind),
That each by observation
Might satisfy his mind.

The First approached the Elephant,
And happening to fall
Against his broad and sturdy side,
At once began to bawl:
“God bless me! but the Elephant

Is very like a wall!”

The Second, feeling of the tusk,
Cried, “Ho! what have we here
So very round and smooth and sharp?
To me ‘tis mighty clear
This wonder of an Elephant
Is very like a spear!”
The Third approached the animal,
And happening to take
The squirming trunk within his hands,

Thus boldly up and spake:
“I see, “quoth he, “the Elephant
Is very like a snake!”

The Fourth reached out an eager hand,
And felt about the knee.
“What most this wonderous beast is like
Is mighty plain,” quoth he;
“Tis clear enough the Elephant
Is very like a tree!”

The Fifth, who chanced to touch the ear,
Said: “E’en the blindest man
Can tell what this resembles most;
Deny the fact who can,
This marvel of an Elephant
Is very like a fan!”

The Sixth no sooner had begun
About the beast to grope,
Than, seizing on the swinging tail
That fell within his scope,
“I see,” quoth he, “the Elephant
Is very like a rope!”

And so these men of Indostan
Disputed loud and long,
Each in his own opinion
Exceeding stiff and strong,

Though each was partly in the right,
And all were in the wrong!

Perspectives are ways of looking at a situation. Any given situation or scenario can be viewed from a number of different perspectives. Compiling these perspectives helps us understand the entire situation (or the elephant!) and find better and more sustainable solutions..

Learning activities:

Role play exercise: Participating students will be organised into 4 groups each assigned one of the following roles:

1) Salmar Corporation (http://www.salmar.no/)
2) Tranøy municipality community council
3) Green Warriors of Norway NGO (http://www.nmf.no/), Greenpeace or similar NGO
4) Norwegian Seafood Council (http://en.seafood.no/)

If the student group is large and further groups are required, these could optionally be:

5) The Aquaculture Stewardship Council (http://www.asc-aqua.org/)
6) Environmental consultants employed by Salmar Corporation to conduct an impact assessment of their plans
7) Representatives of boating/shipping interests
8) Representatives of other local business such as haulage

Representatives of each of the above groups are required to prepare and then present their case to a meeting of the County Governor of Troms (http://www.fylkesmannen.no/en/Troms/) which has juristiction on planning and environmental protection for the proposed site expansion. The County Governor of Troms will be represented by the module teachers (or others whom they delegate to). The meeting will discuss the presentations and reach a conclusion on whether the development should proceed.

Agenda

1) Presentation by the company to make the case for expansion
2) Presentation by supporting organisations
3) Presentations by organisations opposing the development
4) Cross examinations and discussions
5) Summary by County Governor representatives (and decision?)

Further guidance on roles:

Salmar Corporation - will need to present clearly the nature of the planned expansion and its implications - e.g. additional area required, types of buildings, water requirements and source, expected discharges or waste disposal issues, additional employment and infrastructure etc. Potential economic benefits to the area etc. The scale and nature of the intended expansion will need to be communicated to the other stakeholders well in advance of the meeting. The options are for either an expansion to 4 million smolt production per year using the existing infrastructure with more efficient utilisation of water and space. Alternatively, the site could be re-developed to a full recirculated system producing between 10 and 15 million smolts per year. If need, ideas may be found from the following planning applications:

Meridian Salmon, Furnace, Scotland
http://pa2.argyll-bute.gov.uk/online-applications/applicationDetails.do?activeTab=summary&keyVal=LRVACICH06C00

Marine Harvest Scotland Planning Application for Recirculated Smolt unit:
http://wam.highland.gov.uk/wam/applicationDetails.do?activeTab=summary&keyVal=LCOZPNIH09K00

Tranøy municipality community council - represent the views of local people with respect to issues such as visual amenity, infrastructure development (particularly roads/transport, energy infrastructure and social services including schools and hospitals, employment and concerns about pollution, smells, noise etc.

Green Warriors of Norway NGO (or Greenpeace etc) - Anti-fish farming lobby group concerned about environmental and ecological impacts both locally and globally including feed sourcing, disruption of natural gene pools, use of chemicals and organic discharges etc.

Norwegian Seafood Council - Promoting the rising demand for salmon around the world and the economic opportunities for Norway.

Learning materials:

Troms Stamfiskstasjon, Salmon smolt, AquaCase http://aquacase.org/hatcheries/list.html

Seas at Risk (2014): Joint NGO Paper - Priorities for environmentally responsible aquaculture in the EU -
http://www.seas-at-risk.org/1mages/Joint%20NGO%20position%20paper%20-%20aquaculture%20-%20FINAL%2015%20August%202014.pdf

World resources Institute (2014): Improving Productivity and Environmental Performance of Aquaculture - http://www.wri.org/publication/improving-aquaculture

Teacher suggestions:

The aim of this exercise is to help students to understand the views of different stakeholders and how the planning process aims to give each group voice and come to a judgement about a new development. Where possible, examples of real planning documents could be used to help illustrate the process.

The major task is the preparation of the fish farm development plans which should be available to each stakeholder group in time for responses to be prepared. In some cases, the class may already have worked on the suggested farm and have expansion plans available. Alternatively, the teacher could set the key parameters for the development (e.g. system type and scale) at the outset and allow each group to consider the technical implications as necessary. However, it is suggested that the first week is spent with the whole group working on the overall system specification and then focusing on their respective stakeholder roles during the second week.

For grading, the following scheme is suggested, but may be modified as appropriate by the tutor, in line with institutional requirements:

Group Mark: 50% of total comprising 25% on group performance in the stakeholder meeting and 25% on submitted joint materials (plans, presentations, statements etc as guided by the tutor).

Individual Mark: 50% of total comprising 35% of individual submission of written appraisal of the exercise and 15% on outcome of peer review (each group asked to score their own and fellow group members contribution).

The overall grade is the sum of the group and individual marks.

Responsible teacher(s): (John Bostock)

Time table:

Activity	Type of work	Due date
Group work on Salmar hatchery case	Specification of expansion plans including land, water, building, infrastructure and other resource implications	End of 1st week
Stakeholder group work on Salmar hatchery case	Preparation for role play exercise	Mid second week
Role play exercise on hatchery expansion proposal	Presentations and discussion	penultimate day of second week
Individual write-up of learning outcomes from the exercise	Assessed written assignment	End of last day

Technology:
It is strongly suggested that students and tutors as different physical locations are linked through dedicated IP-based video conferencing suites (Older ISDN based systems may also still be available). Most universities have these facilities. Typically equipment is manufactured by companies such as Cisco or Tandberg and utilise dedicated computers and equipment including a multipoint control unit which is required if more than two sites need to be connected at the same time. The specialist software implements various international standards such as H.323 (protocol for the transmission of audio-visual material over IP networks) and H.460 (to deal with routing through firewalls and other network components). (See http://en.wikipedia.org/wiki/Videoconferencing for more information).

If it is not possible to use dedicated video conferencing, then there are a wide range of desktop (or laptop) based systems which could also be used in a seminar room with the help of a large screen or data projector etc., or can be used by individuals from their own homes or offices etc. Commercial systems such as Blackboard Collaborate (http://www.blackboard.com/Platforms/Collaborate/Overview.aspx), Adobe Connect (http://www.adobe.com/uk/products/adobeconnect.html), GoToMeeting (http://www.gotomeeting.com/), Spreed (http://www.spreed.com/eu) or WebEX (http://www.webex.com/) have more advanced facilities for conference management and participation and can potentially cater for a large number of users. However, most require software downloads and installations which might cause problems for some users. Quality of connections can also be variable.

Other options that could be considered, especially for smaller groups include Skype (www.skype.com). Many users will already be familiar with this, and the service is free with

basic functionality. However, for multiple shared video and desktop sharing etc. one of the participants would need a subscription account. Google Hangouts (https://plus.google.com/hangouts) may also be worth investigation as most people will already have a gmail account. If one of the participant organisations is able to install it on their own server, the open source programme “Big Blue Button” (http://bigbluebutton.org/) could be an option. Other commercial software with free services for small numbers of users etc. include AnyMeeting (http://www.anymeeting.com/), JoinMe (http://www.join.me) and MeetingBurner (https://www.meetingburner.com/).

If participants are connecting from their own computers (or tablets or smart phones), then it is recommended that they are encouraged to use headsets and keep their microphones muted unless they wish to speak. This is to avoid problems with feedback, echos and general background noise. Most systems provide a chat facility so participants can communicate via onscreen text. Some also provide additional tools that allow users to “raise their hand” to ask a question, or vote in instant polls etc. The use of PowerPoint or similar presentations should be tested in advance of the meeting. Sometimes the file type needs to be converted before it can be shown (e.g. into separate graphic files), Uploading large files to the system can also take time.

Unless participants are regular users of the chosen system it is advisable to allow at least 30 minutes before the main session is due to start for users to connect and become familiar with the software. An opportunity for participants to introduce themselves is also usually a good idea. It is suggested one person acts as chairperson to lead the session whilst a second person is appointed as assistant to watch for text messages and other signals from users and provide feedback and assistance where appropriate.