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InTerAct

Industry - Academia Interaction in the Marine Sector



InTerAct

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Authors:

G. Ólafsdóttir, G.A. Jónsdóttir,
I.L. Ómarsdóttir, G.B. Tryggvadóttir,
M. Fredriksen, H.P. Kirkegaard,
C. Baron, O.I. Lekang, T. Rustad,
A. Kiessling, and S.G. Bogason

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Authors:

G. Ólafsdóttir, G.A. Jónsdóttir,
I.L. Ómarsdóttir, G.B. Tryggvadóttir,
M. Fredriksen, H.P. Kirkegaard,
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A. Kiessling, and S.G. Bogason

Publisher:

Nordic Innovation, Stensberggata 25,
NO-0170 Oslo, Norway
Phone: (+47) 22 61 44 00.
E-mail: info@nordicinnovation.org
www.nordicinnovation.org

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Nordic Innovation

Stensberggata 25, NO-0170 Oslo,
Norway

Phone: +47 47 61 44 00

info@nordicinnovation.org

www.nordicinnovation.org



norden

Nordic Innovation

AVS rannsóknasjóður í sjávarútvegi

Byggðastofnun, Ártorgi 1,
550 Sauðárkrókur
Iceland

Phone: +354 455 54 00

peturb@byggdastofnun.is

www.avs.is



Innovasjon Norge

Akersgata 13, 0158 Oslo
Norway

Phone: +47 80 05 07 89

post@innovasjon norge.no

www.innovasjon norge.no



norden

Project participants

Iceland

University of Iceland (UoI) ASCS
Applied Supply Chain Systems
Research Group
Guðrún Ólafsdóttir (Coordinator)
Email: go@hi.is
Sigurður Bogason (Steering committee)

University of Iceland (UoI) SSRI
Social Science Research Institute
Guðbjörg Andrea Jónsdóttir
(Steering committee)
Ingibjörg Lilja Ómarsdóttir
Gunnar Þór Jóhannesson
Guðný Bergþóra Tryggvadóttir
Hafsteinn Einarsson

Norway

Norwegian University
of Life Science (NUMB)
Odd Ivar Lekang

Norwegian University
of Sci. & Technology (NTNU)
Turid Rustad

Sweden

Swedish University of Agricultural
Science (SLU)
Anders Kiessling
Andreas Pettersson
Anna Norman Haldén

Denmark

Technical University of Denmark (DTU)
National Food Institute
Caroline P. Baron (Steering committee)
Paw Dalgaard
Michael Engelbrecht Nielsen
Marco Frederiksen (Steering committee)

Eurofish

Marco Frederiksen (Steering committee)

Umano

Hans Peter Kirkegaard
(Steering committee)

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Preface & acknowledgements

The InTerAct project was collaboration between social scientists¹, communication experts² and the AQFood consortium from Nordic universities³. The AQFood programme was applied as a case study in the project. The disciplines in the consortium are food science/technology, biology, chemistry, engineering and aquaculture with experts who are focusing their research on aquatic food production and processing and challenges of the aquatic food value chain. Canadian participation in the project was initially planned, but funding was not granted. However, the survey of the general public in the project included Canada.

The AQFood master programme Aquatic Food Production – Quality and Safety, is an international master programme that was launched in 2012 through a collaborative effort of five Nordic universities and supported by funding from the Nordic Council of Ministers. This Nordic higher educational programme focuses on the marine sector and provision of education to meet the industry requirements for recruitment of staff with an excellent scientific and technological background and innovation potential. www.aqfood.org

Key features of the programme are:

- Double degree 60/60 ECTS
- Mobility of students between two universities
- e-learning (30 ECTS)

The key findings from the InTerAct project are summarised in the first part of this report and extensive reporting on the social science studies is in the following sections of the report (PART I Higher education for the aquatic food value chain; PART II Internal Image of the Nordic Seafood Industry (interviews); PART III External Image of the Nordic Seafood Industry (surveys)).

Dissemination from the project has been through websites, Newsletters, the Eurofish Magazine and conferences.

¹ Social Science Research Institute University of Iceland

² Umano, DK and Eurofish

³ Technical University of Denmark (DTU), National Food Institute, Kgs. Lyngby, Denmark.

University of Iceland (UoI), School of Engineering & Natural Sciences, Reykjavik, Iceland.

Norwegian University of Science and Technology (NTNU), Department of Biotechnology, Trondheim, Norway.

Norwegian University of Life Science (NUMB), Department of Mathematical Sciences and Technology, Aas, Norway.

Swedish University of Agricultural Sciences (SLU), Department of Wildlife, Fish and Environmental studies, Umeå, Sweden

Nordic Innovation website: InTerAct Industry – Academia Interaction in the Marine Sector
<http://nordicinnovation.org/en-GB/projects/marine-innovation-projects/interact-industry-academia-interaction-in-the-marine-sector/>

Documentary about the InTerAct project by Sigurður Bogason is available at:
<http://youtu.be/x6g0HTLnUi8>

InTerAct News Issue 1 Sept 2012 Available at:
http://www.ascs.is/wp-content/uploads/2012/03/Interact_news_Issue1_Sept2012.pdf

InTerAct News Issue 2 Jan 2013 Available at:
http://www.ascs.is/wp-content/uploads/2012/03/Interact_news_Issue2_Jan2013.pdf

InTerAct Newsletter 3 Available at:
<http://www.ascs.is/2013/09/interact-newsletter-3rd-issue-sep-2013/>

The project was presented in a special InTerAct session
at the EAS Aquaculture Europe 2013 in Trondheim, Norway
<http://www.easonline.org/images/stories/Meetings/AE2013/AE13blue8-5.pdf>.

The links to the presentations from the session are in InTerAct Newsletter 3
(see above) EUROFISH Magazine 1/2012: AQFood a new Nordic master's degree
programme within aquatic food offers the possibility of a double diploma. Available at:
http://issuu.com/eurofish/docs/eurofish_magazine_1_2012/8

EUROFISH Magazine 5/2013:
Improving collaboration between industry and academia. Available at
http://issuu.com/eurofish/docs/eurofish_magazine_5_2013/18?e=1376257/5302144

Eurofish Magazine Feb 1/2014:
Higher education and working carriers in the seafood industries. Available at:
http://issuu.com/eurofish/docs/eurofish_magazine_1_2014/23?e=1376257/6707627

The final InTerAct Symposium was held at DTU in Kongens Lyngby on January 31st
2014, where first steps were taken to form permanent links between the AQFood
programme and the seafood industry (Royal Greenland).

News about the InTerAct Symposium and links to presentations
are available on ASCS Uol website:
<http://www.ascs.is/2014/02/royal-greenland-and-aqfood-msc-program-at-the-inter-act-symposium/>



Figure 1. Teachers and students from the AQFood programme and the InTerAct project's participants at the symposium

Acknowledgements

The InTerAct project (P11073) was funded by Nordic Innovation through the Nordic Marine Innovation Programme 2012-2014. Thanks are due to the many interviewees from the aquatic food value chain in the Nordic countries, the students who responded to the surveys and the general public.

Executive summary

The InTerAct project “Industry - Academia Interaction in the Marine sector”, was initiated to explore the education needs of the aquatic food industry and to identify the interest areas of students that qualify for higher education programmes such as the international master programme AQFood Aquatic Food Production - Safety and Quality (www.aqfood.org). The main activities of the InTerAct project were aimed at positioning the higher education programme and creating new ways to recruit students.

Main Objectives

The main objectives were to strengthen the image of the marine sector, to demonstrate interesting future career opportunities for students and to support the development of a higher education programme with a focus on the aquatic food value chain.

The objectives were met by:

- Interacting with stakeholders in the aquatic food value chain to assess the industry's challenges and identify gaps in the education.
- Defining sustainable platforms for industry– academia interaction in educational programmes.
- Promoting the marine sector's image as an attractive career opportunity for students with higher education.
- Strengthening the image of the Nordic marine sector by using new media to reach to students and stakeholders.

Implementation /Methods

- Focus groups were conducted to obtain the stakeholders view towards the need for higher education and to compare the industry's challenges with the content of a current master programme dedicated to the aquatic food value chain.
- Interviews were applied to analyse the internal image of the marine sector by performing a stakeholder analysis.
- The external image of the North Atlantic marine sector was explored by conducting surveys among the general public in Iceland, Norway, Sweden, Denmark and Canada.
- The views of students towards the marine industry and higher education as well as analysis of what factors influence their choice of education and career were obtained by on-line surveys in the Nordic Universities.
- Finally, the results from the image analysis and student surveys were applied to create promotion material to present a new image and a value proposition for the AQFood programme.

Results

The research has created a benchmark for the marine sector and has clearly pointed out that the general image of the sector should be improved. The project's results are an important step towards the mission to enhance innovation in the marine sector which can be realised through students' projects and numerous opportunities that have been identified for industry and academia collaboration. The surveys made in the project have also created a benchmark for higher education and identified ways to improve the image of the education. The main outcome of the project is the image film (see [AQFood Image Film](#)) and promotion videos to apply in recruitment of students in higher education for the marine sector and to enhance the awareness of the AQFood programme and other similar programmes which focus on the needs of the industries.

Higher education with an emphasis on the aquatic food value chain

The general objective of the new AQFood master programme is to deliver a unique education covering the whole value chain from the raw material sourcing and the aquatic food production and processing. The holistic approach supports a continuous and prosperous growth of fisheries, aquaculture and fish processing industries aiming at delivering safe and high quality products and thus focuses on issues of importance for tomorrow's consumers, industry and society.

The aim is to attract students in natural sciences and engineering to the AQFood programme to transfer technological know-how and scientific excellence to the aquatic food industries. The number of students enrolling in the new programme has been low and shows that it is necessary to increase students' awareness of both the programme itself and interesting job opportunities in the aquatic food industry and derived jobs in supporting fields.

Between 12-14% of students in Denmark, Iceland and Norway and 5% in Sweden had heard about the AQFood programme. When asked if they would consider enrolling in the programme almost half of the Norwegian students, 41-42% of the Icelandic and Swedish students and 19% of the Danish students said they would consider enrolling in it.

Students were asked to evaluate statements about the content of the programme, i.e. what would make the programme more or less interesting. The majority of students believed it would make the programme much more interesting if it emphasised enhanced sustainability and how to minimize waste and if it was about full utilization of valuable natural resources. Interestingly, the programme deals with these topics and they could be promoted more in the context of collaborative industry linked students' projects to meet the interest of the students and simultaneously meet the current needs to enhance sustainability of the industries.

Industry challenges and content of AQFood international master programme

The main areas identified for collaboration between higher education and industry by stakeholders were linked to product development, how to obtain better yield, enhanced quality and value, optimisation of processes, production planning, quality control, ways to enhance sustainability, supply chain management, traceability, better communication and planning, and opportunities in marketing. Students graduating from the AQFood education would be qualified to work in various fields linked to aquatic food production, innovation and implementation of procedures to enhance the quality and safety of food products

Internal image of the Nordic seafood industry

The importance of the industry differs substantially from one country to the other. The industry in Iceland and Norway is of great importance for their national economies, with the seafood sector as one of the largest industries. In Denmark and Sweden the seafood industry only represents a small part of national production. Overall, stakeholders viewed the industry as a dynamic, exciting, highly innovative and a competitive business with significant growth potential in an international and challenging working environment. They highlighted sustainable, fresh and healthy food as one of the major motivational factors to work in the business. Although most of the respondents (DK, IS, SE) characterized the industry by low levels of education they claimed that the industry offered a variety of career possibilities for people with different university education. Other qualifications were also considered important for recruitment like personal characteristics and values. Emphasis was put on factors such as being open minded, having working experience and being practical as well as knowledge of the industry.

External image of the North Atlantic seafood industry

The image of the seafood industry was perceived differently in the Nordic countries and Canada by the general public. This can be explained by the diversity of the seafood industry in these countries and the importance it has in the overall economy and in the society. When asked to state the first thing that came to mind when respondents heard the term seafood industry, words related to food like "Fish" were dominating in Sweden, and characteristic seafood species like "lobster" in Canada. In Denmark the fish processing town "Esbjerg" and "bad smell" were mentioned often, while in Norway, "salmon farming" was most frequently mentioned. In Iceland, political and economic issues like "fishing quotas" and the "main industry" were the most frequent top of mind thoughts about the seafood industry.

Positive statements about the seafood industry made by the general public were food or taste and health while environmental issues were stated as negative aspects. Economic or political issues were considered as both negative and positive aspects by the Icelandic respondents and they were most likely to be positive towards capture fishing. Swedish and Canadian populations were the least likely to be very positive towards capture fishing and similar differences towards fish farming were observed, where 80% of the Icelandic population were very or rather positive compared to 44-54% of the Canadian, Danish, Norwegian and Swedish populations.

The stakeholders' views towards their own industry were significantly more positive than what was expressed by the public. Majority of the industry stakeholders were aware of a rather negative external image of the seafood industry in the respective countries. The Norwegian stakeholders were the only participants believing that the general external image was good. The stakeholders were of the opinion that the seafood and aquaculture industry deserved a better general image and they stated that the main reason was lack of effective dissemination of information about the activities of the industry. Using experts in promoting the activities of the industry would be more effective according to participants:

"I think that we must be more open. And we also have to employ educated people that can document and disseminate information about our activities and inform that we are doing this business with a lot of knowledge."

(Female, BSc in Economics, Fisheries, processing, marketing and sales)

Students' views on job opportunities in the seafood industry

When students were asked about certain areas of the aquatic food industry where they would be most interested to work, there were differences between countries. Innovative technologies, innovation, product development and laboratory research were considered most interesting by the Icelandic and Danish students. These students were not interested in working in aquaculture production or fisheries operation and the Icelandic students considered seafood processing the least interesting area to work in. Norwegian students ranked aquaculture production higher than students in other countries, and environmental assessment and management was more appealing to Swedish students than others. Although “starting my own company” was not of high interest to Swedish students (12%), the Danish (28%) and Norwegian (31%) students were more interested and the highest interest was in Iceland (43%), which may reflect different entrepreneurial potential between countries. The difference in the students' background also appeared to influence their choice of future jobs. For example, engineering students may be more interested in innovative technologies than students in food science and biotechnology who might favour laboratory research. Between 34-55% of the students believed it would hinder somewhat or a lot to pursue job opportunities when considering industries which are located in rural areas. In Sweden almost half of the students believed it would encourage them that the companies are often located in rural areas compared to 10-21% in the other countries.

Students' choice of higher education

A vast majority of students chose their current subject, because they were interested in the content and they thought it would lead to good employment opportunities in general. The intention to obtain a higher degree or another study or qualification after their graduation differed between countries. The Icelandic students were the most likely to plan to continue studying (65%) while the Swedish students were the least likely to plan to continue (11%). Around 45% of the Danish and Icelandic students had a clear idea of their long term career plan, compared to almost 40% of the Norwegian students and 20% of the Swedish students. When asked what motivated them in terms of choosing their future professional career, the majority stated they had an interest in the subject matter and more than two thirds of students stated job security as a key element...

Target groups

The main target groups in the project were stakeholders from the aquatic food industry value chain, students studying for a bachelor's degree in engineering or natural sciences, and the general public. The outcome has relevance for educational institutes, in particular administrative and academic staff in the universities, the aquatic food industries and policy makers.

Recommendations

The following recommendations are aimed at universities and the aquatic food industry's stakeholders.

The research has created a benchmark for the marine sector and a clear message that the external image of the sector should be improved.

- Information about the various activities and the dynamic and innovative characteristics of the marine industry should be disseminated much more effectively to the general public.

The image and visibility of the relevant industries in the respective countries appears to have had an influence on the students' interests and their choice of career.

- The industry needs to communicate its activities much better to students.
- Explain the various roles of qualified staff with higher education in the enterprises.
- Describe prospective job opportunities that will meet the interests of the students.
- Promote the marine sector as an attractive career opportunity for students.

Despite the diversity of the seafood sector in the Nordic countries all participants believed that the educational level of the industry should be improved. They expressed a great need for people with higher education dedicated to the marine industry and were interested in a closer collaboration between the academia and the industry sector as an effective approach to enhance the education level in companies and boost innovation.

- Increase the cooperation between enterprises in the aquatic food industry and higher education.
- Create a structured collaboration and communication platform between the marine sector and universities.
- Establish formal links between the industry and academia through students' projects.
- Provide opportunities for internship in companies as a way to bridge the gap between the two different worlds, the industry and the academia.

Based on the fact that a minority of students were aware of the AQFood programme, it needs to be much better communicated and promoted by the universities

- The university websites are the key source of information about education programmes. Videos and promotion materials need to be disseminated to raise the awareness of the programme.
- Provide examples and clear description of students' projects and link the basic academic skills to problem solving in the aquatic food industries.
- Focus on the values that students are interested in like sustainability and innovation.
- Demonstrate how academic skills can give value and benefits for the society and the companies.
- Industry and higher education need to communicate to students the value of academic skills for the industry and demonstrate that job opportunities within the seafood business include working on innovative technologies, innovation, research, quality and environmental issues linked to sustainable development of the seafood sector.

Part 1

InTerAct overview

– key findings

Higher education for the aquatic food value chain

InTerAct P11073

Higher Education for the Aquatic Food Value Chain

Publisher:

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Main Authors:

Guðrún Ólafsdóttir
Guðbjörg Andrea Jónsdóttir
Ingibjörg Lilja Ómarsdóttir
Guðný Bergþóra Tryggvadóttir
Gunnar Þór Jóhannesson
Marco Frederiksen
Hans Peter Kirkegaard
Sigurður Bogason

InTerAct project partners:

Technical University of Denmark (DTU)
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Norwegian University
of Life Science (NUMB)
Norwegian University
of Science and Technology (NTNU)
Swedish University
of Agricultural Sciences (SLU)
Eurofish
UMANO

Objective:

To explore the need for higher education aimed at solving challenges in aquatic food industry

Administration:

University of Iceland – Applied Supply Chain Systems Research Group

Preparation, data collection and compilation of overview:

Guðrún Ólafsdóttir
Guðbjörg Andrea Jónsdóttir
Ingibjörg Lilja Ómarsdóttir
Guðný Bergþóra Tryggvadóttir
Gunnar Þór Jóhannesson
Marco Frederiksen
Hans Peter Kirkegaard
Sigurður Bogason

Editor:

Guðrún Ólafsdóttir
e-mail:go@hi.is

Introduction

Need for education and skills in the aquatic food value chain to enhance innovation

Collaboration of industry and academia has been identified as one of the key drivers to enhance innovation in companies as well as preparing students for their future careers. There are various established forms of collaboration i.e. visits to companies, collaboration in R&D projects, short term study visits in companies, and various internship practices, which enhance the employability of students after graduation (Ballinger & Lalwani, 2000; Shoenfelt et al., 2013). According to a survey carried out by Aalborg University, Denmark (AAU) companies acknowledge that the driving force in competition is to some extent the renewal of methods and technologies in combination with the skills and competences of the workforce (Karriercentret, 2010). On one hand, developments are sometimes moving with a much faster speed within companies than research based development and the industry can then point out directions for future research of the higher education institutions like universities (Rokkjær et al., 2010). On the other hand, the lack of technical skills within smaller companies is often a barrier for implementing novel and innovative technologies. The seafood industry is rather traditional and the innovation capacity is in general low among a large number of SMEs, which in return are very vulnerable to market conditions. Yet, there is a great potential for innovation and overall growth of SMEs for example by forming industrial clusters and fostering innovation at all levels of the value chain. By enhancing the level of education in the enterprises they should be in a better position to embrace innovation and address today's challenge in terms of sustainability and growth.

Communication barriers between industry and academia have been encountered because of different expectations towards higher education, the qualification of students may not fit the need of the industry, and competitive business issues may hinder collaboration and integration. The gap between industry needs and the competence of the employees has been identified to be 'more knowledge of how a company works' and 'more understanding of running a business', and not very specific to the type of job. The general academic skills that enable employees to acquire the knowledge they need for solving problems are valued by companies according to the survey of graduates at AUU in Denmark (faculties: Humanities, Social Sciences and Engineering & Science) (Karriercentret, 2010).

Opportunities in the aquatic food industries

Career choice and choice of education path towards that career is influenced by various different practical, interpersonal and personal factors, such as attitudes of family, friends and teachers (Malgwi, Howe, & Burnaby, 2005), perceived job opportunities, expected earnings, prestigious career (Yazici & Yazici, 2010) and last but not least, interest of the individual making the choice.

With the North-Atlantic's rich fisheries, the fishing industry has been one of the main industries in Iceland and Norway, making it an obvious career for a large number of people in the 20th century. While the number of people working in fisheries has become smaller with advances in new technology and possibly declining mean trophic (food chain) levels (Hamilton & Otterstad, 1998), various derived jobs have been created in the seafood industry and related fields.

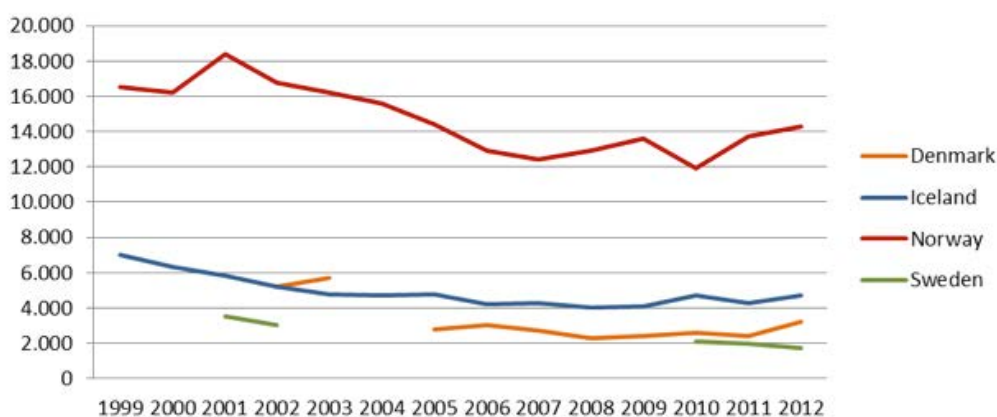


Figure 2. Number of people employed in fishing, fish farming and related service activities from 1999 to 2012 in the Nordic countries (Source: Eurostat, 2014).

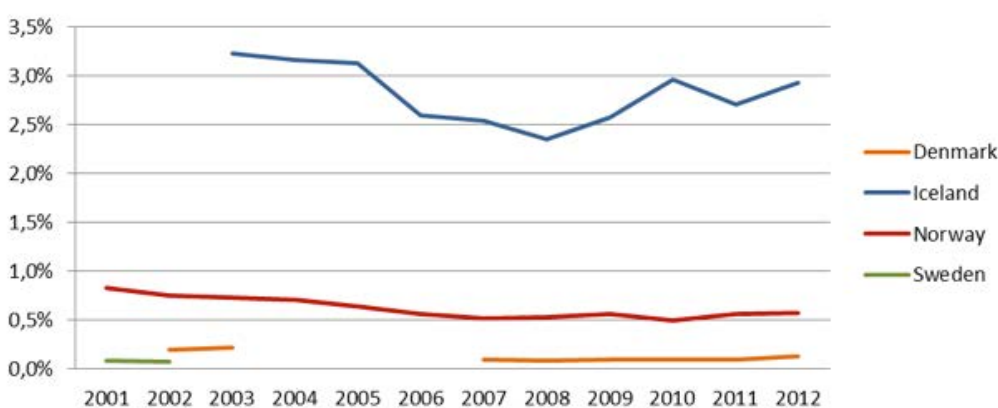


Figure 3. Percentage of employed people in fishing, fish farming and related service activities from 1999 to 2012 in the Nordic countries (Source: Eurostat, 2014).

The seafood industry plays a significant role in the Nordic countries. In Norway, more than 14,000 people are employed in fishing and in aquaculture 0.6% of the population, in Iceland 4,700 people are employed in the sector, or about 2.9% of the population. In Denmark and Sweden between 0.1-0.2% of the populations were employed in the seafood industry the years between 1999 and 2012 (Figure 2 and Figure 3). With an enhanced level of education within the task force at all levels in the seafood industry, innovation and a more sustainable operation of the aquatic food supply chains is foreseen and thus a greater potential for the seafood industry including aquaculture to become a more competitive player in the economy.

Recruitment of students in higher education

The recruitment of students in higher education programmes in the area of natural sciences, including food-, aquaculture-, fisheries sciences and engineering programmes has been rather low in the last decade in the Nordic countries. Similar trends are seen in the US, although there appears to be a steady enrolment in higher education programmes in many areas. This is mainly explained by an increase in the number of international students, but there appears to be “a widening gap between U.S. and interna-

tional first-time enrolments in engineering, math, and computer science" (Patton, 2013; Gonzales et al., 2013). The reasons may in part be because of the economic collapse, where national students may perceive uncertainties in the job market for graduates from universities. Universities in general are facing a challenge to maintain their graduate programmes with limited resources. New study programmes need to adapt to the economic constraints but at the same time they should deliver qualified staff to boost innovation and sustainable growth of the industries.

Successful efforts have been made in recent years to reshape and develop further existing study programmes for example in fisheries science in Iceland at the University of Akureyri (Valtýsson et al., 2011a,b) and Aqua-tnet is the largest multidisciplinary European Education Network in the field of aquaculture, fisheries and aquatic resources management. Aqua-tnet has a co-operative role between higher education institutions and other partners such as academic organisations, research institutions and industry, aiming to enhance quality and to define and develop a European dimension within its academic disciplines (Aqua-tnet, 2014). Since the European education reforms with the implementation of the Bologna process and the common European Credit Transfer and Accumulation System (ECTS), there is increased student mobility in aquaculture and fisheries education and harmonised accreditation has removed local boundaries so students can easily enrol in exchange programmes in Europe and select study programmes that optimally meet their needs and interests (Dhong, 2008). Nordic Master Programmes for international students in various fields have been running since 2008 and according to a survey from 2012 about half of the students were interested in the programme because it offered mobility between Nordic countries (Oxford, 2012).

The aim of the InTerAct project is to influence the development of higher education to be more in line with current needs of the Nordic aquatic food supply chain by promoting interaction between industry and academia and to identify gaps and develop new approaches. The interdisciplinary AQFood education is a Nordic Master programme that is built on the existing academic education and aims to be aligned to the needs of the industry to deliver a more competitive working force. The education offers mobility of students and is designed to give a general knowledge about the characteristics of the global aquatic food supply chains and an understanding of the trends in the business, but the general academic skills are based on the existing curriculum and disciplines at the universities.

Methods and Specific Aims

The project consisted of four work packages (WP1 to WP4) that each had its own objective.

WP1: Motivation of Stakeholders

Aim: To motivate discussions with stakeholders from the marine value chain by hosting industry - academia focus groups and identify challenges and perceived need for education.

Outcome: An overview of challenges and perceived need for education – An input to formulate guidelines for interviews and questionnaires in WP2 and 3. InTerAct final report PART I Higher education for the aquatic food value chain

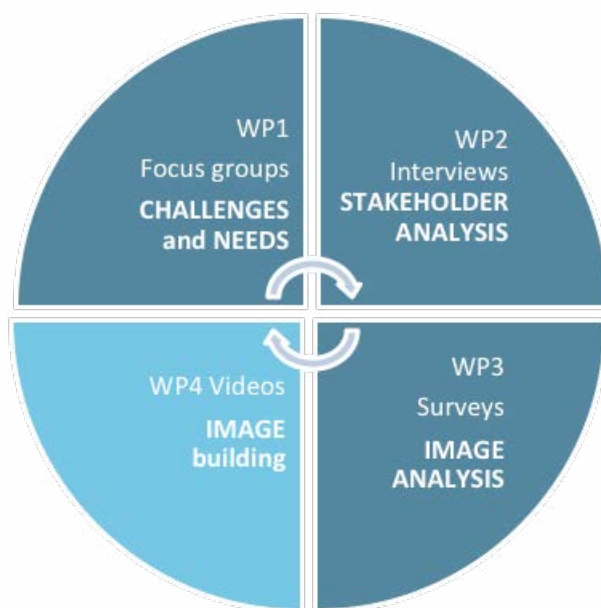


Figure 4. The InTerAct project's activities were organised into four workpackages (WP) where different approaches were applied to probe the view of the various groups of stakeholders. This included focus groups, interviews and on-line surveys. The results are input to image creation for the marine industry and higher education aimed at enhancing recruitment of students with the long term mission to enhance the innovation potential of the Nordic marine industries

WP2. Stakeholder Analysis

Aim: To assess the marine industry's need for higher education and identify gaps between skills in the sector and required education necessary to address the global challenges of the aquatic value chain.

Qualitative methods using semi-structured interviews were applied to perform a stakeholder analysis. The scope of the analysis was the value chain of the marine industry where participants were sampled purposefully. For each country, ten managers from different links of the value chain were interviewed (in total 40 participants).

Outcome: Collection of transcribed in-depth interviews; and communication material to be used in image building in WP4; A report summarising the views of the marine industry: InTerAct final report PART II Internal Image of the Nordic Seafood Industry

WP3: Image analysis

Aim: To apply a multi-level approach to obtain an overview of the position and status of the marine sector

- Internal image. A part of the qualitative interviews in WP2 was devoted to the internal image of the industry to reflect the view within the enterprises, which has a substantial effect on corporate image and reputation.

- External image. An internet survey was conducted among the target group of the AQFood programme in the different countries, to assess the demand for the programme and the interest of prospective students in the area of natural sciences and engineering
- External image - general image. A survey on the image of the marine sector as a working environment was conducted among the general public in the relevant countries. This was facilitated through online web panels.

Outcome: Communication of qualitative and quantitative data on the image of the marine sector: InTerAct final report PART III External Image of the North Atlantic Seafood Industry

WP4: Positioning and image building

Digital promotion material was applied for image building and dissemination, based on inputs from student surveys, stakeholders' interviews, workshops and other data on image analysis collected in WP1-WP3:

Aim: To enhance the interest of stakeholders and students in the new AQFood master education and define a brand image and create tangible articulation.

This will include:

- Development of the strategic brand image for the AQFood Master education based on information in WP1-WP3
- Development of the brand architecture for the AQFood Master education
- Design of an identity system including brand logo, support elements and visual language
- Design of applications as prototypes to communication materials for stakeholders and students
- Development of storyboard that brings digital promotion material to life in the form of a creative orientation

Outcome: Digital promotion material and overall identity of the AQFood Nordic master website www.aqfood.org

Results

Stakeholders in higher education for the marine sector

Actors in the aquatic food value chain are among the key stakeholders in the AQFood Master programme. They were identified as the main target group for interviews in the project to obtain their perception on the need for higher education and to describe the internal image of the industry. The industry stakeholders were identified in all steps of the aquatic food value chain and related sectors i.e. equipment manufacturers, ICT and technology companies and consulting companies (see Figure 5). Although the industry was the main target group it is obvious that the view of students is of utmost importance, since recruitment is essential for the viability of the master programme. Additionally, the overall society represented by the general public is also a key influential group.

When motivating career opportunities for young people in the marine industries, they will inevitably be influenced by the general image of the industries. Therefore, surveys in the projects were aimed at identifying the external image of the aquatic food industry as perceived by students who are qualified to enter a master level education and the general public. Various other stakeholders, besides the industrial actors are of key importance in the successful development of the educational programme. Other key stakeholders who can influence the education are the teachers and the administration in the universities as well as the authorities and policy makers. Recommendations based on the results of the project will be addressed to all stakeholders who can influence the education and enhance the innovation in the aquatic food value chain.

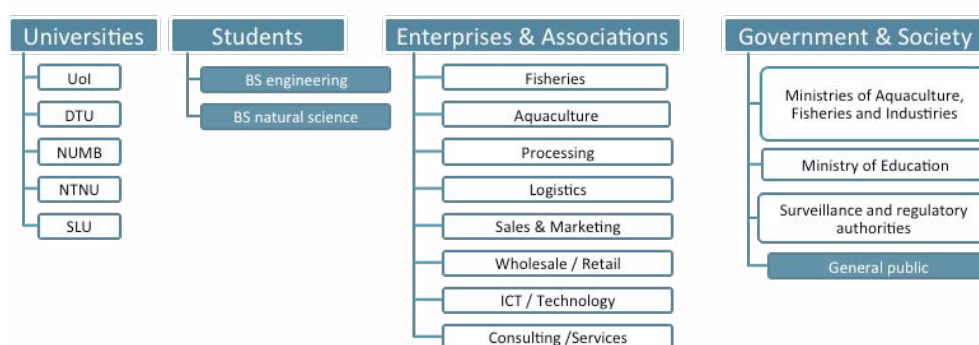


Figure 5. Key stakeholders of the AQFood master programme are students, universities, enterprises, associations, and governmental organisations with an interest in the outcome of the programme, either as a result of being affected by it, or by being able to influence the activity

Stakeholders' Focus Groups

Method: Focus groups / Business Model Canvas (WP1)

Target groups: Stakeholders in the aquatic food value chain

Participants: Fifteen participants from companies, education and research, were trained in using the "Business Model Canvas" methodology by Innovit personnel in Iceland.

The stakeholder meeting on March 21st, 2012, was hosted by the fisheries companies Þorbjörn hf and Vísir hf. in Grindavík, Iceland⁴. The event was a joint effort of two projects InTerAct and Nordic Marine Marketing funded by Nordic Innovation. The aim of the Nordic projects was to improve the image of the marine industries and motivate young people to select education to prepare for carrier opportunities in the marine sector⁵.

Since the main concern of the industry on a day to day basis is to meet the require-

⁴ InTerAct News, 1st Issue Sept 2012

http://www.nordicinnovation.org/Documents/Newsletters/Marine%20Innovation%20projects/Interact_news_Issue1_Sept2012.pdf

⁵ Marine Innovation Projects (2012-2014).

<http://www.nordicinnovation.org/projects/marine-innovation-projects/marine-innovation-projects/>

ments of their customers it was considered relevant to put the focus in the workshop discussion on these issues and use the Business Model Canvas as a tool to facilitate the discussion. The value chain approach was the background for the discussion.

The use of the Business Model Canvas methodology as a discussion framework implies that participants worked in small groups (3-4) and went through nine factors integral to the general business model: Key partners; key activities; value propositions; customer relationships; customer segments; channels; cost structure; revenue streams; and key resources. For each factor participants discussed current status, perceived challenges and opportunities for improvement. Further improvements of interest for the business and need for education in the value chain were identified by focusing the discussion in the groups on different links in the chain.

Identified Need for Education

The key issues coming up in the mapping exercise of the Business Model Canvas as well as in discussions that took place after the group work are summarised here where the focus is solely on issues of education.

In general, it can be said that the educational system had a weak presence in the discussion on challenges and opportunities of the fishery sector. It was identified as a "Key partner" but in vague and general terms. There was a general agreement among participants that the links between educational institutes, the industry and consumers were too weak, the cooperation between universities and the industry needed improvement and the image of the industry was not appealing to young people. It was noted that the importance of the fishing industry for the economy in Iceland was not reflected at all in the educational system. Few study offers are available and there is lack of study programmes that cater to the special needs of the industry.

A theme running through comments and the general discussion was the lack of interest by the industry in university education. In the discussion on "key activities", this was described as "small demand for knowledge by the industry". While this was reckoned to pose serious problems to the industry, its rate of innovation and thus overall competitiveness, the situation was also thought to provide plenty of opportunities for amendments. Examples are the design and implementation of shorter courses in life-long learning programmes, high quality distance education that would offer more flexibility for the student and the establishment of study programmes focusing on the needs of the industry in terms of business and marketing education, processing and logistics.

Participants also mentioned the possibility to create stronger links between particular study programmes and the industry. This could be done by creating opportunities for students to obtain practical training within companies, as well as taking part in R&D projects within them or direct financing through scholarships. Hence, the companies would increase their investment in education and potentially appreciate its value.

Different reasons for the weak connection between the educational system and the industry were mentioned. The lack of presence of fisheries in the curriculum in the whole educational system was thought to be very important in this regard but also the general image of the fishing sector as being old fashioned and not providing career

opportunities for highly educated “modern” people. In order to change the situation it was noted that both partners, i.e. educational institutes and industry stakeholders would need to be active. The universities for instance, would need to be much more active in promoting their study offers to the industry and the studies offered would need to be more practical and thus more in line with the actual problems the companies are facing on a day to day basis. It was however also noted that while the academia can be said to have little understanding of the hustle and bustle of the industry the same can be said about the understanding by the industry of academic knowledge. There is a lack of understanding of the value of basic research and how higher education in different areas (not only in business and marketing) can improve efficiency and raise the level of competitiveness. Thus, there appears to be a limited awareness of how knowledge can be a resource for the industry.

The perceived challenges identified in the meeting can be categorized as follows:

- New and improved educational programmes
- Connection and cooperation between educational institutes and the industry
- Low demand by the industry for university education and problematic attitude regarding higher education in general
- Low demand for education related to fisheries by students
- The promotion of educational offers not efficient enough
- Financial support lacking

In the same way the suggestions for how to tackle the current situation can be categorized as follows:

- To create new educational offers in the form of shorter courses, better and enhanced distance learning and more specific offers for the fishery sector
- Direct financial support by the industry in the form of scholarships, research grants and direct collaboration between firms and educational institutes such as universities.

Stakeholders’ Views - Challenges in the Aquatic Food Value Chain

The participants in the focus groups also discussed the challenges that the industry is facing in different parts of the aquatic food value chain (aquaculture and fisheries, processing, and retail) and one group was dedicated to universities to address also the status of the current education. The following questions were assessed.

What are the main problem areas that the companies are facing where higher education might help?

Are challenges in industry a basis for problem solving in collaborative higher education students’ projects?

Do stakeholders’ business interests and expectations towards innovation in companies reflect a need for higher education?

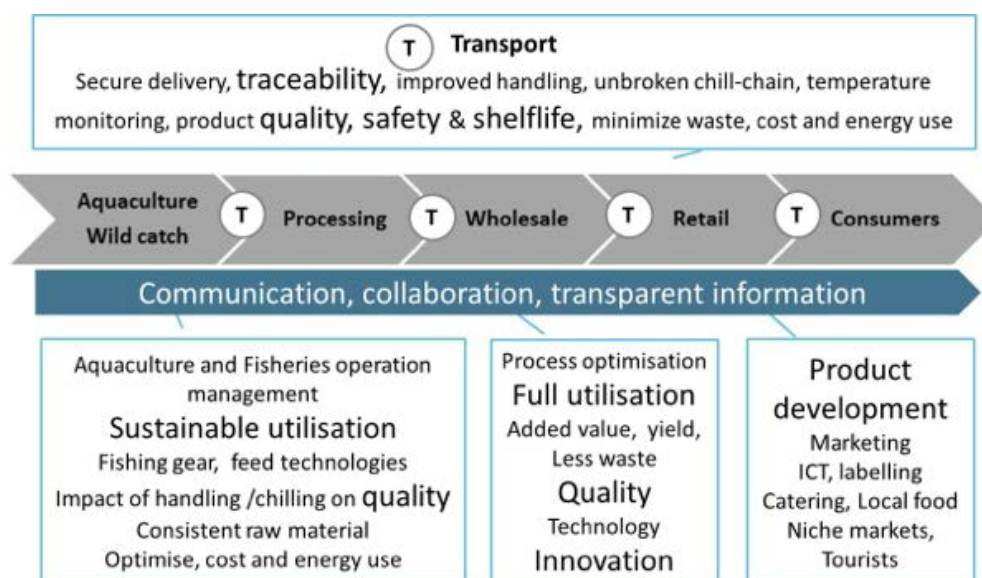


Figure 6. Key challenges identified by stakeholders in the aquatic food value chain and opportunities for industry and academia collaboration through student's projects. The comments and suggestions from the different groups regarding the selected parts of the chain Aquaculture /Fisheries, Processing , Retail and Universities were compiled and grouped according to the main themes identified i.e. opportunities for solving problems and enhancing the innovation by industry – academia collaboration and education.

The main themes identified, where education was considered needed to support improvements, were product development, improved processes, quality and shelflife, sustainable utilisation of resources and innovation. The key words related to problem areas in the chain or expectations for improvement as suggested by specific actions were extracted from the discussion and linked to the main steps in the value chain (Figure 6). In this way the key words describing the main attributes of the problem areas were identified for example: better yield, fish freshness, quality and value, optimisation of processes and quality, production planning, quality control, ICT, monitoring technologies, sustainability, supply chain management, traceability, communication, collaboration and planning, marketing and communication, and product development.

Industry challenges and the AQFood Master programme

The key problem areas as identified by the stakeholders are reflected in the content of the AQFood education and in general the education addresses challenges of the industry. AQFood combines the expertise of different disciplines and will deliver knowledge which is expected to promote innovation in companies. The economic growth of the businesses in the aquatic food value chain is linked to sustainable use of resources, optimized production and processes with a focus on safety and quality of food to maintain the health of the consumer. The conceptual presentation of sustainable development as shown in Figure 7 is applied here to fit the content and the scientific disciplines involved in AQFood to the key areas identified by stakeholders where higher education is needed. The main difference between this programme and other existing master programs is the value chain approach where education in aquaculture production and fisheries is combined with industrial processing and

the final product. Thus the students will obtain a holistic view on the sector and gain an understanding of how the initial steps in production and handling in processing; storage and transport will influence the final quality of the products.

The education is aimed at promoting a better understanding of production technologies, management of resources, characteristics of different aquatic species and products, processing operations in the overall value chain, and an insight into how regulatory requirements on hygiene and safety and industrial standards comply with consumer's values and health. This includes food safety, quality management, product development, production and processing techniques, the effect of handling and processing on quality, traceability and environmental impact of the aquatic food processes. Although the programme does not specifically deal with marketing, the underlying expertise on seafood in general is considered by the stakeholders a valuable knowledge to support marketing of products.



Figure 7. The scientific disciplines and the main themes covered in the AQFood master programme representing the key areas of importance for sustainable development of the aquatic food value chain

Internal Image of the Nordic Aquatic Food Industry

Method: Semi structured qualitative interviews (WP2)

Target group: Stakeholders in the aquatic food value chain

Participants: 40 senior employees of enterprises in the aquatic food value chain in Denmark, Iceland, Norway and Sweden.

The qualitative interviews reflected the views that there is a bright future for the industry with a lot of opportunities for students graduating from the AQFood Programme. Overall a vision of a dynamic, exciting, highly innovative, competitive business was perceived. The industry stakeholders highlighted sustainable, pure and healthy food as one of the major motivation factors to work in the business.

Interviews in the four countries show that the importance and the image of the

industry differ substantially from one country to the other. The industry in Iceland and Norway is of great importance as one of the largest industries whereas it is only a small part of national production in Denmark and Sweden. Interviewees with a higher education working in the seafood business today, find it interesting, innovative and full of opportunities. There is a vision of growth in the sector and plenty of opportunities for future development in a very international and challenging business. Despite differences between the Nordic countries all the respondents expressed a great need for people with higher education.

Views on higher education in the seafood industry in the Nordic countries

Key findings: Overall, participants were positive towards the interaction of education and the seafood industry. Participants in most countries thought that the educational level of the industry needed to be improved and considered increased cooperation with the academic sector an effective approach in order to achieve that goal. They were confident that the seafood industry was full of opportunities for educated people but knowledge of the industry was also important. The seafood industry in the Nordic countries has great expertise and this knowledge must also be attractive for foreign students who want to specialize in the seafood industry.

VIEWS ON EDUCATION	Low levels of education (DK)
	The educational level can be improved (IS)
	High educational level (NO)
	A self-taught industry (SE)
THE INTERACTION OF EDUCATION AND THE SEAFOOD INDUSTRY	Numerous opportunities for people with a higher education (DK)
	Job opportunities for people with higher education (IS)
	The industry needs diverse education (NO)
	Different perspectives on educational needs (SE)
	Education is only a part of the qualification requirements (DK)
	Important to know the industry (IS)
	High level of expertise on fisheries in Denmark and the Nordic countries (DK)
	A sea of opportunities (NO)
	Good cooperation with the academic sector (DK)
	Unexplored opportunities in academic cooperation (IS)
	Considerable research cooperation (NO)
	Variety of cooperation with the academic sector (SE)

Diverse seafood industry in the Nordic countries

Perceptions of the seafood industry

Comments from interviews with stakeholders on the characteristics of the seafood industries

Denmark	Norway
Relatively large sector in the Nordic countries, but small compared to the Danish agriculture sector	A progressive sector full of opportunities
• Small but good industry • External factors influencing the industry • Various methods in marketing • Cost is an obstacle to innovation	• High in costs • Opportunities in better utilization and marketing • High activity in innovation
Large import from other countries (2/3 of raw material)	The fishing industry has adapted very well to the changes in the environment in Norway
Relatively low level of research/development in fisheries	Large aquaculture sector Large fisheries sector
Higher level of innovation in aquaculture technology business	Second largest sector after oil – and the future sector!
Minor focus point for younger people	Positive attitude towards fisheries and aquaculture
Very hard to recruit master students	Hard competition with the oil sector (working conditions/salary)
Northern region, fishing industry the backbone of the industry / other places no knowledge or focus	Hard to recruit students in that competition
The processing industry is moving towards Germany / Poland / Baltic states	The salmon farming industry has a very good reputation
Aquaculture environmental issues, the major constraint for development, when solved great potential	People with higher education often want to live in larger cities
Aquaculture the most environmentally friendly food production method	High education level in the aquaculture business today
Family owned companies, many small	A very effective and sustainable aquaculture production
Below critical mass for development, need to consolidate	High innovation level in the industry
Most had very positive attitudes towards their industry and their daily working life	A need for educated people, plenty of job opportunities
An international sector - Plenty of options for travelling	Easy to move the sector towards low cost countries
	Some large companies have their own research and development departments both within fisheries and aquaculture
	All want a sustainable sector, also the fishermen

Diverse seafood industry in the Nordic countries

Perceptions of the seafood industry

Comments from interviews with stakeholders on the characteristics of the seafood industries

Iceland	Sweden
Most important industry in the country	Very small fisheries and aquaculture sector
The sector is in the forefront, dynamic and innovative	Agriculture business is relatively large and has more focus
• One of the pillars of the society • Opportunities in marketing • Progress in innovation	Other very large industry sectors dominate the picture
Great focus on improving attitude towards the sector	Fisheries has a bad reputation from the past (overfishing), but people in the business know that this has changed
Easier to recruit master students	
Exciting industry, many opportunities ahead	Hard to recruit students
Pride, <i>"we are the best"</i>	Some processing companies have in-house innovation / development
<i>"The rural areas know the industry, the capital nothing..."</i>	In some cases the fishery industry is not mature enough to understand that they need people with higher education
Often family business, somehow a closed business	
• Growing gap between the industry and the general public • Limited access to the industry • External factors influencing the industry	Aquaculture business is so small that they do not see any options for people with higher education
	Within seafood business (food processing) a lot of opportunities and a good future for educated people
	People are proud to work with good and healthy products

External Image of the Aquatic Food Industry

Method: Interviews (WP2)

Target groups: Stakeholders in the aquatic food value chain

Key findings: Majority of participants considered the image of the seafood industry to be rather negative. The participants believing that the general image was good were from Norway while the ones that perceived the general image to be bad were from Sweden. The stakeholders in the aquatic food value chain were more positive towards the industry than the general public and believed that it deserved a better image. The main reason mentioned was lack of effective dissemination of information about the activities of the industry.

The views portrayed in the interviews with employees in the fisheries and aquaculture industry does not reflect the same image as the general public has of the sector. The image is portrayed differently in the Nordic countries and reflects the characteristics of the industry in each country and the impact it has on the economy and the society. The results show that there is a clear need to strengthen communication between the public and the industry.

VIEWS ON IMAGE	The image of the industry is not good (DK)
	The image should be dynamic and global (DK)
THOUGHTS ON THE PUBLIC	Industry with a negative image (IS)
	The image should be much more positive (IS)
IMAGE OF THE INDUSTRY	Good image in general (NO)
	Room for improvements on the image (NO)
	Bad image (SE)
	Difficult to explain this bad image (SE)

Views of the general public on the image of the N- Atlantic marine industry

Method: On-line survey (WP3)

Target group: General public in Iceland, Norway, Denmark, Sweden and Canada
In order to obtain a general image of the seafood industry the respondents among the general public were asked to state the first thing that came to mind when they heard the term seafood industry. Respondents were asked to mention one thing to elicit what people thought was the most important. As can be seen in the following figures it was different between countries what things came up in people's mind. As the words get bigger, more respondents have mentioned them as the first thing that comes to mind.

Key findings: Lobster, fish, shrimp and fishing were the most common things in Canada. In Denmark respondents mentioned fish most often, then Esbjerg and smell. In Iceland completely different words came to mind such as fishing quotas, main industry, fishing fees and fishing. Respondents in Norway most commonly mentioned

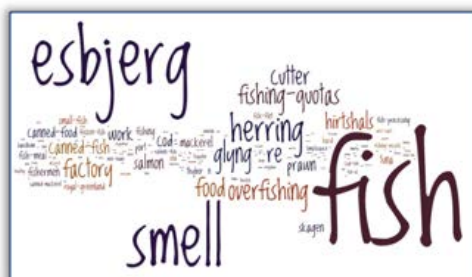
salmon, fish, salmon farming and fish farming. In Sweden fish was the most common word that came to their mind, then food, Abba seafood and prawn.

Sweden:



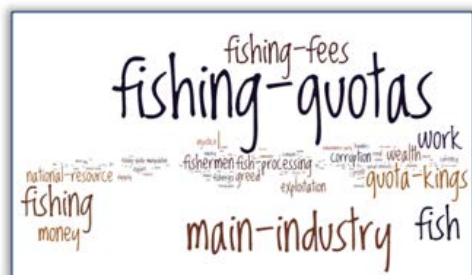
Sweden Stakeholders' view WAYS TO IMPROVE THE IMAGE	Very small industry with a rather negative image Emphasis on responsibility, sustainability, marketing and role models in the industry were factors that were often mentioned in the discussion on improved image in relation to the Swedish seafood industry.
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Denmark:



Denmark Stakeholders' view WAYS TO IMPROVE THE IMAGE	Disseminating information about the activities and possibilities in the industry is one of the most successful methods to improve the image and to attract young people into the industry according to participants. It is effective to hear stories from people working in the industry describing it as an exciting, dynamic, international and profitable sector.
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Iceland:



Iceland
Stakeholders' view
WAYS TO IMPROVE THE IMAGE

Norway:



Norway Stakeholders' view WAYS TO IMPROVE THE IMAGE	Dissemination of information to the general public about the sector was repeatedly mentioned by the participants. The emphasis should be on sustainability and high quality products that are in great demand around the world.
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Respondents in the general population were also asked to state one negative and one positive aspect of the seafood industry (see more details in Part III and Appendix B Table 4 and 5).

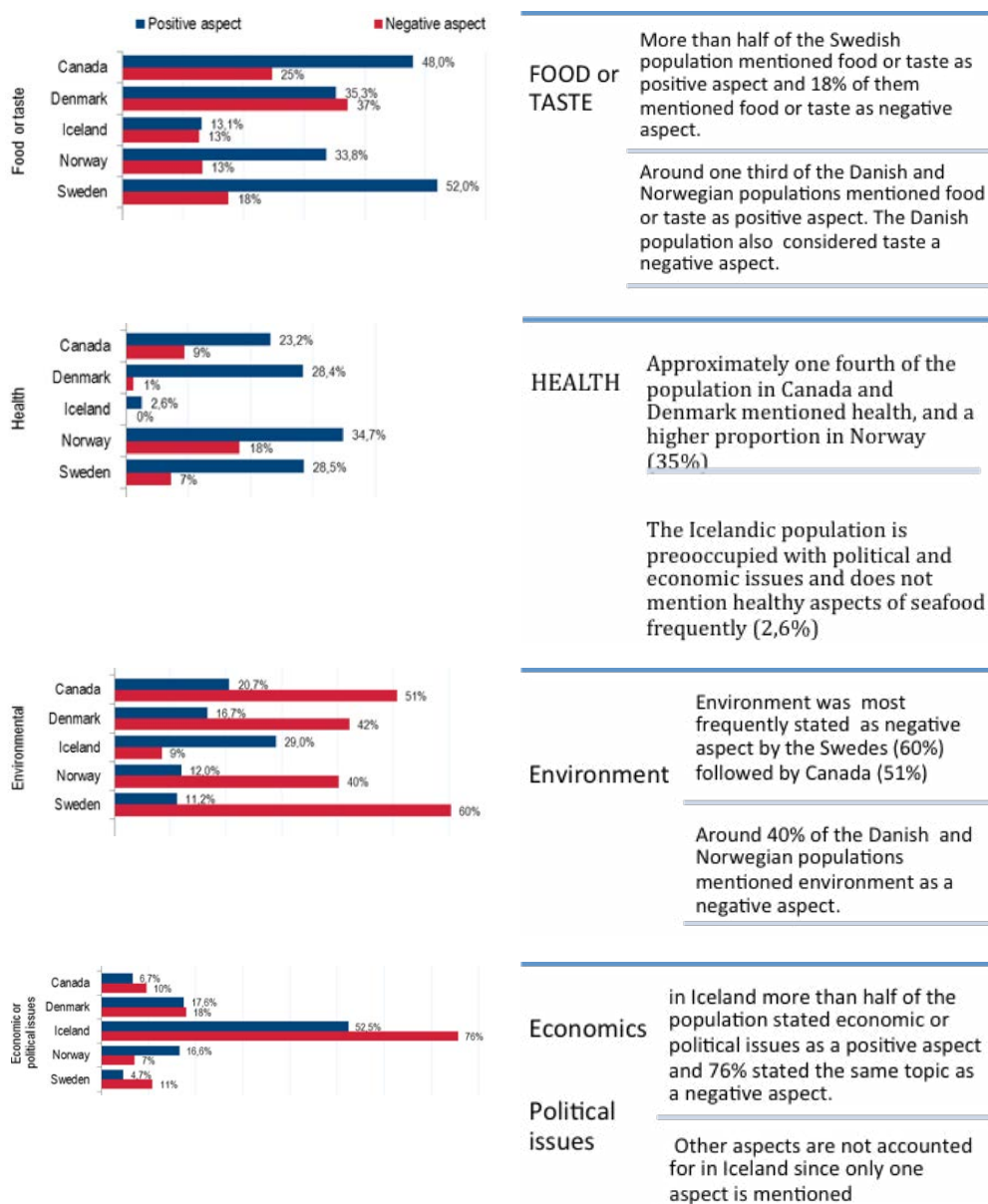


Figure 8. Positive and negative aspects when asked to state one positive and one negative aspect of the seafood industry. Comparison between countries, general population Note that since respondents were asked to name ONE aspect only the most important aspect was obtained.

What interest areas of students motivate them towards the aquatic food industry?

Method: On-line survey (WP3)

Target group: Students

Key findings: The online survey was focussing on intentions of natural science and engineering students to go to graduate school and on attitudes towards jobs in the seafood industry. The study was conducted among 2nd and 3rd year undergraduate students at the universities that are involved in the AQFood programme.

The results show that interest in a particular subject and perceived job opportunities are the major motivational factors for students' choice of a professional career. When asked about how interested they are to work in various fields it becomes clear that relatively few of them, only around a quarter, are somewhat or very interested in working in the traditional seafood industry such as in an aquaculture farm, operation of fisheries, fish processing or fish inspection. However, more than half of the students are interested in working within innovation, innovative technologies, product development, research on aquatic food, quality management and environmental management and assessment, areas that they may not necessarily relate all to the seafood or aquatic industry (Figure 9)

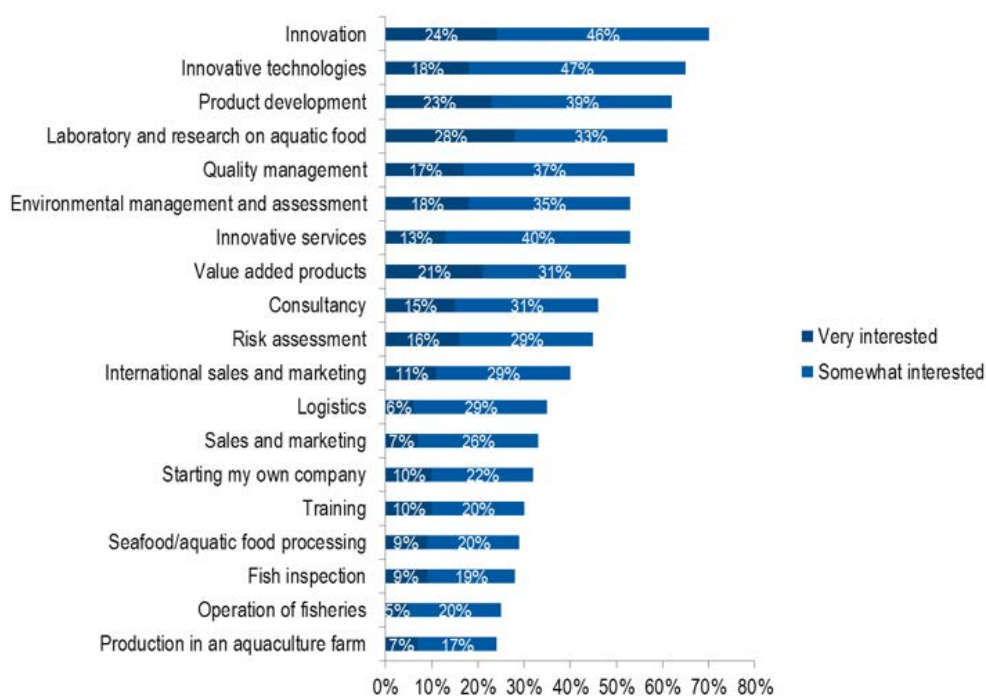


Figure 9. How interested would you be to work in...? (IS, DK, SE, NO)

What motivates students to enter a master programme and focusing on the aquatic food industry?

Although not very familiar with the AQFood programme, students find interesting that it emphasises on minimising waste, sustainability, full utilisation of valuable natural resources and environmental impact along with requiring mobility between the Nordic countries (see Figure 10). A third of the students said they would consider enrolling in the programme.

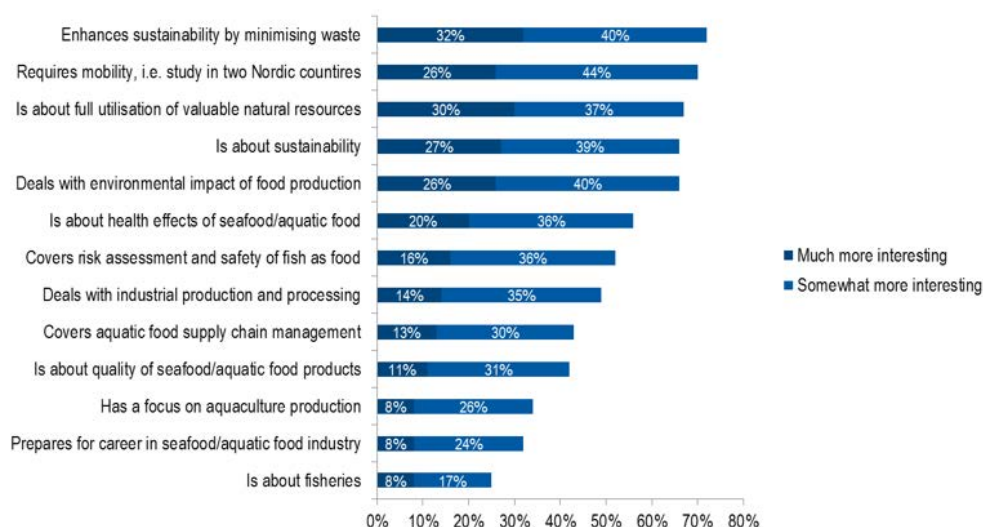


Figure 10. Do you think that it makes the programme more or less interesting that it....? (13 statements) (IS, DK, SE, NO)

The surveys also revealed differences in students' views depending on the country where they came from and their educational background. In particular students from Norway were more positive, than their colleagues in the other Nordic countries, towards jobs in the primary production and processing industries and had higher interest for product development, value added products, laboratory/ research on aquatic food, fish inspection and training. Students from Sweden had higher interest in industrial production, supply chain management and topics related to environmental management, sustainability, full utilisation of raw material, environmental impacts of food production and how to minimize waste. This view is not surprising considering that primary production (fisheries and aquaculture) is not as economically important in Sweden as it is in Norway and Iceland. Additionally, Sweden has been a pioneer in many aspects of environmental awareness and this is reflected in higher interest of the students in sustainable production.

Students views on the seafood industry and career opportunities

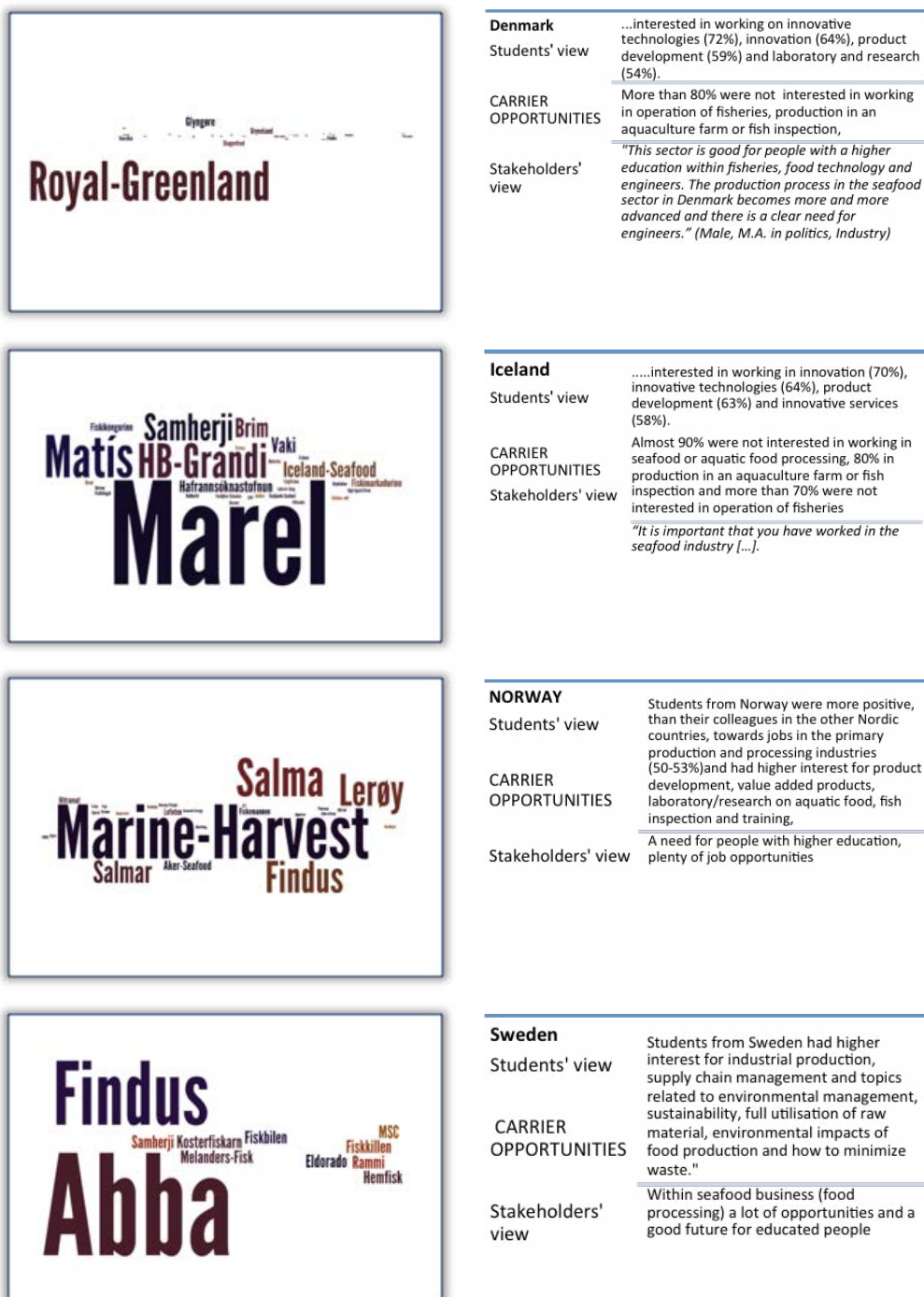


Figure 11. What kind of companies come to mind when you hear the term seafood industry? Comparison between countries, students

Image Building – Higher Education for the Marine Industries

Conclusions - Identity and Image (WP4)

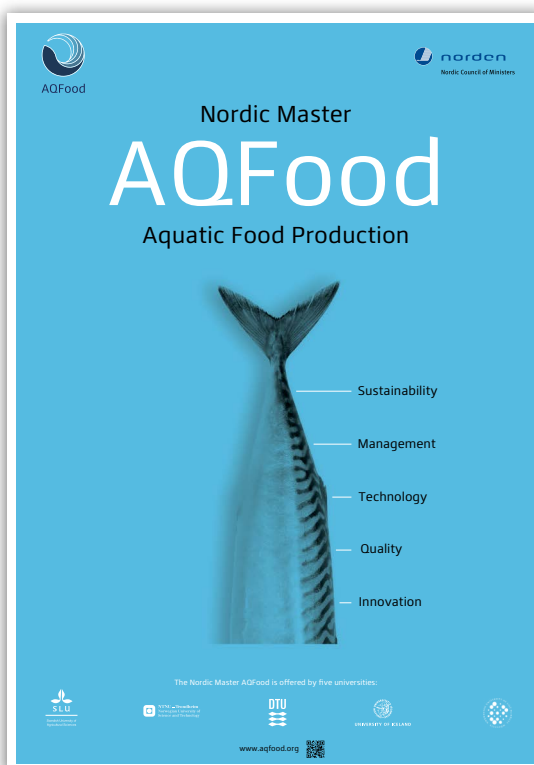
The internal image as expressed by the stakeholders within the sector was that it was perceived as a dynamic, sustainable industry with a huge potential for career opportunities for educated young people. With the new identity and image creation for AQFood it is the ambition that the seafood industry and the education will be articulated more in line with the internal image and in a different way from that revealed by the general public's perception.

The focus is on what aquatic food production and education contribute to the society and the potential for future growth and dreams.

- The creative concept 'The ocean is the future' refers to both a positive and an optimistic faith in the profession's role in the future, which is a basic and vital message to be heard.
- The future offers many new and well paid job opportunities for students. This needs to be emphasised, and will simultaneously contribute positively to the development of a higher education level and innovation for the profession.
- Aquatic food production can help to solve some of the major challenges we face in society, such as food, health and environment.
- Aquatic food production already plays a significant role in the Nordic societies in relation to the food supply, employment, exports, etc.

We have only added a bit to create a new image of the profession in order to attract new students to the international AQFood Master Programme. The ocean, people and the future will show us where it takes AQFood and the profession, and there is still a big challenge ahead to spread out the word.

Various promotional videos have now been created to enhance the awareness of higher education possibilities such as the AQFood master programme.



Key steps in creating new image



POSITIVE IMAGE

Emphasis on the positive image:

"...very effective industries and sustainable production. You use less resources for a kg of fish than a kg of meat. This is something the business should better communicate to the public. It is food with a high quality, healthy fat, good taste." (Female, Veterinarian)

"To improve the image – we need to tell the good stories about exciting business with healthy products"

Brand pyramide



BRAND PYRAMIDE

Build a brand image of an admired and compelling education

Provide a unique value-added master education suited for the industry and students at five universities in 4 different Nordic countries

Make students excited about thinking of themselves as holding an AQFood Master degree. Students joining the new AQFood master programme will have different motivations, act differently, and create the atmosphere that the AQFood master needs, to attract more students



STORYBOARD IMAGE FILM

Attracting students requires emphasizing what they are interested in:

Innovation - Sustainability - Job opportunities

.....build positive perceptions into AQFood's image

.....be more explicit with AQFood value propositions



VIDEOS

Industry recognizes importance of **increased level of education**

IMAGE FILM & INTERVIEWS

.....be proactive as a "collaborator" in the industry, **addressing future growth**, critical industry issues and perhaps setting the agenda (and sense of urgency) for aquatic food production

View the: [AQFood Image film](#)

Messages to bring forward about the AQFood program

1. Students will gain knowledge on how to ensure and improve safety and quality aspects of seafood
2. Aquatic food is healthy, ecological and high quality food which is produced in a sustainable way
3. Many exciting jobs and opportunities in the aquatic food production industry and the value chain
4. Aquatic food industry is a dynamic, exiting and highly innovative industry
5. There is a need for highly educated people both natural scientists and engineers
6. Students can help to influence a transparent, sustainable and responsible growth
7. There is a close global interaction between universities and aquatic food industry



Figure 12. Anne-Mette Christensen the iPad Winner in the InTerAct students' survey and Poul Melgaard Jensen from the Danish Seafood Association who donated the award at the InTerAct Symposium (January 2014)

Links to AQFood image videos and interviews

AQFood Image Film 1 min.movie

<http://www.youtube.com/watch?v=WdfN36zB9s4>



Aquatic Food production

- Safety and Quality 2 min.mov

<http://www.youtube.com/watch?v=cZVsvrfkY>

How do I apply to the AQFood master programme

<http://www.youtube.com/watch?v=lazo5y7REIM>

1. Paw Dalgaard Professor DTU, National Food Institute
2. Guðrún Olafsdóttir Ph.D. Applied Supply Chain Systems Researchh Group, University of Iceland
3. Jacob Bregnballe M.Sc. Sales Director Land Base AKVA group Denmark

How is a working day in the aquatic food industry

http://www.youtube.com/watch?v=JGWac_h-kc4

1. Tom Andre Vespestad Sales Director Aqualine A/S
2. Jacob Bregnballe M.Sc. Sales Director Land Base AKVA group Denmark

How is student life at campus

http://www.youtube.com/watch?v=3CVFxU_jjTs

1. Rasmus Heuch Studen Biotechnology NTNU
2. Kolbrún Bjargmundsdóttir Student Engineering University of Iceland



Job opportunities in the aquatic food industry

<http://www.youtube.com/watch?v=RCE48ZtV8I8>

1. Stein Hennes Regional General Manager Marel Scandianvia
2. Finn Victor Willumsen Managing Director Aquaculture Engineering A/S
3. Gry Førre Marketing Manager Marel Norway

What attracts you to the aquatic food industry

<http://www.youtube.com/watch?v=-VTlkwpScFM>

1. Tom Andre Vespestad Sales Director Aqualine A/S
2. Kristín Anna Thorarinsdóttir Ph.D. Food Scientist Marel Iceland

What attracts you to a master in aquatic food

http://www.youtube.com/watch?v=K_hYA9oYmK

1. Elvar Steinn Traustason AQFood MS Student University of Iceland
2. Kolbrún Bjargmundsdóttir Student Engineering University of Iceland
3. Rasmus Heuch Studen Biotechnology NTNU

What does it take to become a good scientist

<http://www.youtube.com/watch?v=8rqeOXlIFs>

1. Kristín Anna Thorarinsdóttir Ph.D. Food Scientist Marel Iceland
2. Jacob Bregnballe M.Sc. Sales Director Land Base AKVA group Denmark

What facilities are available

<http://www.youtube.com/watch?v=HDK1LeP78ek>

1. Paw Dalgaard Professor DTU, National Food Institute
2. Rasmus Heuch Student Biotechnology NTNU
3. Elvar Steinn Traustason AQFood MS Student University of Iceland

What is aquatic food production all about

<http://www.youtube.com/watch?v=HUTZdEVwyKQ>

1. Finn Victor Willumsen Managing Director Aquaculture Engineering A/S
2. Turid Rustad Professor of Biotechnology NTNU
3. Stein Hennes Regional General Manager Marel Scandianvia

What is so exiting about your job

http://www.youtube.com/watch?v=6J_I5i6svDc

1. Tom Andre Vespestad
Sales Director Aqualine A/S
2. Jacob Bregnballe M.Sc.
Sales Director Land Base AKVA group Denmark
3. Stein Hendes Regional
General Manager Marel Scandianvia



What is the link between theory and practice

<http://www.youtube.com/watch?v=hzwI0JCYsf8>

1. Turid Rustad Professor of Biotechnology NTNU
2. Elvar Steinn Trustason AQFood
Master Student University of Iceland
3. Michael Engelbrecht Nielsen Associate Profes-
sor DTU, National Food Institute



What is unique about AQFood master

<http://www.youtube.com/watch?v=Vm7zxfJs1og>

1. Elvar Steinn Traustason AQFood
Master Student University of Iceland
2. Michael Engelbrecht Nielsen
Associate Professor DTU, National Food Institute
3. Guðrún Olafsdóttir Ph.D. Applied Supply
Chain System University of Iceland

Why should I join AQFood master programme

<http://www.youtube.com/watch?v=H6LYMbKdx-M>

1. Turid Rustad Professor of Biotechnology NTNU
2. Stein Hendes
Regional General Manager Marel Scandianvia

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Part 2

Interviews with industry stakeholders

Internal Image of the Nordic Seafood Industry

InTerAct P11073

Internal Image of the
Nordic Seafood Industry

Publisher:

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Main Authors:

Ingibjörg Lilja Ómarsdóttir
Guðbjörg Andrea Jónsdóttir

InTerAct project partners:

Technical University of Denmark (DTU)
University of Iceland (UoI)
Norwegian University
of Life Science (NUMB)
Norwegian University
of Science and Technology (NTNU)
Swedish University
of Agricultural Sciences (SLU)
Eurofish
UMANO

Objective:

To explore the image
of the seafood industry.

Administration:

Social Science Research Institute

Preparation, data collection:

Ingibjörg Lilja Ómarsdóttir
Marco Frederiksen
Guðbjörg Andrea Jónsdóttir
Guðrún Ólafsdóttir

Data analysis:

Ingibjörg Lilja Ómarsdóttir

Report:

Ingibjörg Lilja Ómarsdóttir

Summary

The InTerAct project addresses possible challenges occurring when establishing industry – academia interaction in education programmes and promoting attractive career opportunities. This part of the report deals with results yielded in the qualitative part, that is to say personal histories from people with certain educational background on their experiences and career with focus on how their education has been useful and how they perceive the need by the sector for higher education.

Qualitative methods using semi-structured interviews were applied to perform a stakeholder analysis from each participating country. The study focused on stakeholders within the marine industry and consisted of 40 interviews, 10 interviewees in each country in IS, NO, SE, and DK. Interviewees were sampled purposefully by the administrators of the AQFood Nordic master programme. The selection of participants was based on their education, their career and job experience in the aquatic food value chain.

Overall, stakeholders viewed the industry as a dynamic, exciting, highly innovative and a competitive business with significant growth potential in an international and challenging working environment. They highlighted sustainable, pure and healthy food as one of the major motivation factors to work in the business. The importance of the industry differs substantially from one country to the other according to stakeholders in the Nordic countries. The industry in Iceland and Norway is of great importance as one of the largest industries whereas it is only a small part of national production in Denmark and Sweden. Despite of diversity in the Nordic countries all participants believed that the educational level of the industry should be improved and considered increased cooperation with the academic sector an effective approach in order to achieve that goal. They expressed a great need for people with higher education dedicated to the marine industry. The results of the internal image analysis indicate an interest and opportunities in a closer collaboration between the academic sector and the industry.

Majority of the industry stakeholders were aware of that the external general image of the seafood industry was rather negative in the respective countries. The Norwegian stakeholders were the only participants believing that the general external image was good. The stakeholders' view towards their own industry was significantly more positive than what was expressed by the general public and the stakeholders believed that the seafood and aquaculture industry deserved a better external general image. The main reason mentioned was lack of effective dissemination of information about the activities of the industry. The results show that there is a clear need to strengthen communication between the public and the industry.

1. Objectives

The aim of the stakeholder analysis reported herein was to assess the marine industry's need for higher education and identify gaps between skills in the sector and required education necessary to address the global challenges of the aquatic value chain.

In order to achieve the objectives above both qualitative and quantitative social science research methods were applied. The qualitative methods involved interviews with managers or senior employees in the industry and the quantitative methods were comprised of online surveys among university natural science and engineering students on one hand and the general public on the other.

2. Methodology

Qualitative methods using semi-structured interviews were applied to perform a stakeholder analysis from each participating country. The focus of the analysis was the value chain of the marine industry where participants were sampled purposefully. The data collection and analysis is based on Grounded theory approach (Martin & Turner, 1986).

Participants

The study focused on stakeholders within the marine industry and consisted of 40 interviews, 10 interviewees in each country⁶. Interviewees were sampled purposefully by the administrators of the AQFood Nordic master programme. The selection of participants was based on their education and their position to ensure that participants were from various parts of the value chain. They were to have completed tertiary education, preferably within engineering and natural sciences and each part in the value chain had to have at least one representative among the interviewees in each country. Table 1 contains information about the participants by countries.

Table 1. Information about participants by countries

Participants from Denmark		
Gender	Education	Position in the value chain
M	MA in Fisheries technology from Denmark	Processing
M	MA in Chemical engineering from Denmark.	Industry
M	BS in Biology and MBA from Denmark	Aquaculture
M	Ph.D. in Fisheries technology from Denmark	Processing
M	MA in Politics from Denmark	Industry
F	Master of Science in Economics from Denmark	Processing
M	BA in Business Administration	Processing
M	BA in Danish and Grad. Dipl. in Business Admin. from Denmark	Aquaculture
F	Industrial laboratory technician	Processing
M	BCom in Economics and business administration	Technical companies

⁶ Denmark, Iceland, Norway and Sweden.

Participants from Iceland		
Gender	Education	Position in the value chain
F	BSc in Economics from USA	Fisheries, proc., marketing and sales
M	Cand. Oecon. from Iceland	Logistics
M	MSc in electrical and computer engineering from USA	Technical companies
F	MA in Mechanical engineering from Iceland	Technology in processing equipment
M	MSc in Industrial engineering from Denmark	Aquaculture association
M	BS in Food science and MBA from UK	Sales and marketing / Export-Import
M	Diploma in business administration from Iceland	Sales and marketing / Export-Import
M	MBA from Iceland	Insurance companies
M	MA in Thermodynamics and Fluid Mechanics from Canada	Fishing and processing
M	BS in Fisheries technology from Iceland	Fisheries, proc., mktg. and sales

Participants from Norway		
Gender	Education	Position in the value chain
M	Cand Oecon from Norway	Association
F	MA in Veterinary from Norway	Processing
M	BA in Food technology from Norway	Aquaculture
F	Ph.D. in Biotechnology from Norway	Fish Oil
M	Ph.D. in Fish physiology from Norway	Fish Feed
F	Ph.D. in Food Science from Denmark	Processing
M	MA in Society planning from Norway	Association
M	Ph.D. in Fish nutrition from Norway	Fish production
M	MA in Chemistry and biotechnology from Norway	Fish Oil
F	MA in Biology from Norway	Processing

Participants from Sweden		
Gender	Education	Position in the value chain
M	BA in Sales and marketing from Sweden	Processing
F	MS in Agriculture from Sweden	Processing
M	Degree in Horticulture from Sweden	Association
F	MA in Biology from Sweden	Authorities
M	MA in Law from Sweden	Association
M	BS in Chemistry and Math from Sweden	Sales and marketing / Export-Import
M	BA in Business from Sweden	Sales and marketing / Export-Import
M	BA in Water science from Sweden	Insurance companies
M	MA in Biology from Sweden	Aquaculture
F	BA in Marketing from USA	Association

Data collection

The participants were contacted by phone or by e-mail and were invited to suggest the timing and place for the interview. The interviews took place in the respective countries, 10 in Iceland from the 7th of June to the 26th of September 2012, 10 in Denmark between the 26th of October to the 27th of November 2012, 10 in Norway and 10 in Sweden in February and March 2013.

Registration and processing of data

All interviews were recorded and then copied verbatim. Each interview was read carefully and its main points highlighted by coding text fragments. All text from the interviews was then grouped into main themes and sub-themes.

3. Views on characteristics of the industry**3.1. Key findings**

In general, participants had a rather positive vision of the industry although they were aware of factors that could be improved. Participants were ambitious, devoted and proud of the industry and appeared to thrive on the dynamic work environment and different tasks.

The main issues put forward by the Danish participants when they discussed perceptions of the seafood industry were:

- Small but good industry
- External factors influencing the industry
- Various methods in marketing
- Cost as an obstacle to innovation

The main issues put forward by the Icelandic participants when they discussed perceptions of the seafood industry were:

- One of the pillars of the society
- Growing gap between the industry and the public
- Limited access to the industry
- External factors influencing the industry
- Opportunities in marketing
- Progress in innovation

The main issues put forward by the Norwegian participants when they discussed perceptions of the seafood industry were:

- High cost
- Opportunities in utilization and marketing
- High innovation activity

The main issues put forward by the Swedish participants when they discussed perceptions of the seafood industry were:

- The industry deserves a better reputation
- Many opportunities in the seafood industry
- Focus on role models and the quality of the products in marketing
- Low innovation activity

3.2. Perceptions of the seafood industry

At the start of the interviews the participants were asked to describe the daily activities in their workplace and what came to mind when they thought about the seafood industry in general. This was followed by further discussion of the issues that arose.

3.2.1. Denmark

The issues that were relatively consistent across all the Danish interviews regarding perceptions of the seafood industry included four major themes. First is the notion of the size of the companies in the industry. The second theme, external factors that influence the industry including discussion about environmental issues, high personnel cost and governmental issues. The third theme involved marketing within the sector and the last one addressed innovation in the sector.

Small but good industry

The size of the companies in the industry was a recurring theme. Many respondents considered them too small resulting in delicate operations where employees need to perform a variety of tasks.

“In general the fisheries industry is a very fragmented business. The industry in Denmark has basically been family owned companies with a lot of very small companies” (Male, BA in Business Administration, Processing)

“As a director of a small company there are an amazing number of tasks to do.” (Female, Master of Science in Economics, Processing)

A few participants mentioned the importance of consolidation in the industry in order to strengthen the industry.

“If you are small in this business you cannot exist. We need to consolidate more in this business. We are 35 people and we are a small company. The critical mass is very important and at least 30-40 people are needed in a research and development department. In Denmark we have one competitor but for instance in Greece we have 21 competitors.” (Male, BS in biology and MBA, Aquaculture)

Despite this opinion, most of the participants had positive views towards the industry. The diversity in the industry was frequently mentioned and they saw the industry as leading in their field, global, dynamic and exciting.

“I think it is a very exciting and dynamic sector with a good atmosphere. The market and the raw material sources are constantly changing. The freshness of the fish is a part of that dynamics.” (Male, MA in politics, Industry)

“I think it is worth mentioning that you are able to travel. I have been working in 10 years in Greenland and went to Canada as well. There are so many exciting possibilities to travel the world in the seafood industry.” (Female, Master of Science in Economics, Processing)

“For me this is the most interesting food production method in the world. It has the fastest growth and it is the most environmentally friendly form of production.” (Male, MA in chemical engineering, Industry)

Many participants mentioned healthy products as one of the pillars of the industry. Fish and fish products are considered healthy by the public which is very positive for the industry when it comes to promotion of any kind.

“People know that fish is healthy, and that is positive.”

(Male, MA in chemical engineering, Industry)

“We produce very good products. We are the food business with the most environmentally friendly production.” (Male, MA in chemical engineering, Industry)

External factors influencing the industry

When discussing external factors influencing the industry the topic was in broad terms threefold: employment cost repeatedly came up together with environmental considerations and governmental issues. Many participants viewed personnel expenses, environmental and governmental issues in a negative light. They saw it as dominant factors challenging the industry and thus having a negative effect on efficiency and innovation.

“The problem is that we are not allowed to produce more. As soon as we overcome the production problem we need people educated within management, economics etc.” (Male, MA in chemical engineering, Industry)

A number of participants outsourced part of the operations to countries where staff cost are lower in order to reduce operational costs.

“Another issue is that the cost in other countries is just 1/3 of the Danish cost to employ a worker. A lot of Danish processing companies move just south of the border towards Germany today. In Germany they accept that a group of people from another country works on a lower salary in the same company.”

(Female, Master of Science in Economics, Processing)

“We are many leaders and only a few workers because we have outsourced most of the production to Sweden and Latvia. By outsourcing we have more administrative work and less manual work.” (Female, Master of Science in Economics, Processing)

Discussions on environmental and governmental issues involved many aspects of the industry. A number of participants were negative towards environmental restrictions and considered communication with the public sector at times to be quite a challenge. Some participants believed these issues resulted in a conflict between those who live in cities on the one hand and in rural communities on the other hand.

“The most important thing is to lobby the politicians, “green” organisations and other stakeholders. Today we have established an aquaculture committee where we can make deals with the green organisations. That is fine; the green organisations have their attitudes we just have to reach an understanding with them. Now we work to let the authorities implement what we have agreed in the committee - that is not so easy. ” (Male, MA in chemical engineering, Industry)

“We are the food business with the most environmentally friendly production. At the same time we are in a political situation where the environmental restrictions are very high. And companies cannot evolve within that framework. Then there is also the difference between rural communities and the cities. The journalists live in the cities and it is easy to sit there and be critical of the agriculture and aquaculture business. And if you, as a journalist, need a commentator, the green organisations

are right around the corner. There is very little respect for food production."

(Male, BA in Danish and Graduate Diploma in Business Administration, Aquaculture)

"As an example, in Northern Jutland there is a clear attitude that the seafood industry is the backbone of the industry. This is not the case in Copenhagen."

(Female, Master of Science in Economics, Processing)

Various methods in marketing

Most participants were satisfied with their performance in marketing. A number of them claimed to use a variety of methods in order to achieve the best results.

"We have a good company homepage for general information, products, recipes and information of general interest. We have made advertisements and customer competitions which have been published in daily papers. We are good in getting the attention of journalists and we are regularly interviewed for articles. We also give presentations about our company when we are asked to do so. I think we do a lot."

(Female, Master of Science in Economics, Processing)

"Our company supports the local area, the handball team for instance. We also promote ourselves on the homepage."

(Female, Industrial laboratory technologist, Processing)

"We do what we can to promote the sector. We will for instance produce a little movie for the education sector. We write in newspapers and participate in debates. We have no money for large campaigns."

(Male, MA in chemical engineering, Industry)

A few participants believed that the industry could be more efficient in promoting their activities, both within companies and in terms of the overall level of promotion.

"The companies or interest organisations could be better in disseminating the success stories instead of focusing on the bad stories."

(Male, BCom in Economics and business administration, Technical company)

"There are no activities on a more overall level to promote the industry but I think there could be made a lot of activities to promote the sector for instance by a campaign."

(Female, Industrial laboratory technologist, Processing)

Cost as an obstacle to innovation

Many participants considered the innovation to be at a high level in Denmark. There was much discussion about diversity and innovation in product development.

"We are very innovative in product development. "

(Female, Industrial laboratory technologist, Processing)

"We are very innovative and we have chemistry engineers or personnel educated in biology for quality assurance and certification. "

(Male, BA in Business Administration, Processing)

“We work with innovation all the time but we do not call it innovation. We have to be innovative all the time. “

(Male, BA in Danish and Graduate Diploma in Business Administration, Aquaculture)

Some of the participants mentioned high cost in relation to innovation. It takes time to generate profit and that time is not always available. Some also mentioned the economic crisis and how its consequences reduced all innovation in the industry.

“We are very innovative but of course money is a limiting factor for how innovative we can be. New initiatives cost money.” (Male, BS in biology and MBA, Aquaculture)

“After the financial crisis we are as innovative as our customers want us to be. But it has been very expensive for us. If the profit time is less than two years we can do anything but that has been the restriction since the financial crisis started.” (Male, BCom in Economics and business administration, Technical company)

Not all participants agreed with the ones that found the industry innovative. Some of them found the level of innovation rather limited and explained that with financial factors and difficulties in relation to utilizing the outputs.

“Another issue is little research and development and innovation in the sector. We spend 3% of our turnover on this which is in line with the “Barcelona target”. Environmental innovation has not been rewarded by the authorities by allowing the producers to produce more fish. For this reason there have not been so many innovations in that area recently. More technically based innovation is needed in the business. The only bottleneck is the ability to implement the projects in practice afterwards.” (Male, MA in chemical engineering, Industry)

“The level of innovation in Denmark within the seafood section is unfortunately not high. The reason is probably that earnings are very low and there is limited profit to invest in innovation.” (Female, MS in Economics, Processing)

3.2.2. Iceland

The perceptions of the seafood industry conveyed in all the Icelandic interviews included six major themes. First, is the notion of the industry being one of the pillars of the society. Second, is the growing gap between the industry and the Icelandic general public. The third theme is limited access for new actors within the seafood industry. The fourth theme addresses external factors influencing the industry. The fifth theme concerns marketing opportunities of the sector. The sixth and final theme involves innovation in Iceland.

One of the pillars of the society

The idea of the seafood industry as one of the main pillars of the society was a recurrent theme across all the interviews. This opinion went hand in hand with the vision of the industry as adapting well to all environmental changes, being in the forefront, dynamic and progressive and therefore full of opportunities.

“I believe that the seafood industry in Iceland has adapted very, very well to all the changes that have occurred in our environment and is in fact one of the main

pillars when it comes to the quality of life here in Iceland.” (Male, B.S. in food science and MBA, Sales and marketing / Export-Import)

“As I see the industry today, I find it really exciting and I see so many opportunities ahead.” (Male, Cand. Oecon., Logistics)

“You have a playground fully equipped in front of you and you can do everything, there are so many opportunities.”
(Female, M.A. in mechanical engineering, Technical company)

“In this, we are really good. So participating in something that we are best in is a real catch for everyone.” (Male, Cand. Oecon., Logistics)

Growing gap between the industry and the general public

Many respondents were concerned about the growing gap they experienced between the industry and the Icelandic public. This often mentioned growing gap was also associated with increased hostility between people living in the capital region and people in rural communities along with its complex relation to domestic politics.

“You just have to hope that this will gradually be forgotten by younger generations, this is such a difficult debate, and it has been an on-going topic, especially in the last 20 years. But now when things are difficult, the standard of living is less favourable, people are angry at the system and at bankers because of the indexation, this sector which has the reputation of being the bad guy is facing even greater hostility from the general public. ”
(Female, BSc in Economics, Fisheries, processing, marketing and sales)

“We here in rural communities always talk about 101 Reykjavík like they have no idea what is going on and what this all is about.” (Male, B.S. in fisheries technology from Iceland, Fisheries, processing, marketing and sale)

“The atmosphere is like the rural communities against the capital area. People are reluctant to admit it but that’s the way it really is. The people in the rural communities know much more about the seafood industry because they have seen the vessels, they have worked in the fishing process industry while most of the people from Reykjavík have not.”
(Female, BSc in Economics, Fisheries, processing, marketing and sales)

Limited access to the industry

Limited access to the industry and its monotony was often mentioned by the participants in terms of recruitment in the sector. The participants saw this industry as a male-dominated industry consisting to a large extent of companies founded by families living in rural communities. A few participants mentioned some positive changes in the sector and believed in progress in this context, it would just take time.

“They must have the courage to change this pattern; this is a boring male dominated sector.” (Male, M.A. in Thermodynamics and Fluid Mechanics, Fisheries and Processing)

“These companies are often a family business. Companies that were founded by parents or grandparents and the children were raised within the companies. They were young when they started working there and continued to work there. Maybe the sector is closed in a way.” (Male, MBA, Insurance company)

“I just think that the industry needs to be a bit more open, it has been rather closed through the years. It needs to be more visible and I think that people need to be informed about all aspects of this industry.” (Male, B.S. in food science and MBA, Sales and marketing / Export-Import)

“You do find women within this industry; it isn't just old men arguing.”
(Female, BSc in Economics, Fisheries and Processing)

External factors influencing the industry

Participants mentioned various external effects on the industry. Many respondents found it difficult to develop future policies within their companies due to external effects. Others mentioned the importance of seeking opportunities and taking advantage of them.

“It is hard to be strategic when you don't even have any information about the future, you do not even have operational foundation. Consequently all our time is spent on other things than we should be doing. We are defending our operations, trying to explain what we are doing instead of being strategic.”
(Female, BSc in Economics, Fisheries, processing, marketing and sales)

“IT development took place only because of regulations from the government and the Ministry. Things can evolve in different directions. This demonstrates that there are markets and opportunities out there, things just happen in different ways and for different reasons. It's just reassuring to know that.”
(Male, Diploma in business administration, Sales and marketing / Export-Import)

Opportunities in marketing

Many respondents considered the marketing of the industry quite inadequate, both domestically and abroad. Most respondents went immediately on to the discussion about general marketing of the industry, mentioning the debate about the arrangement of marketing campaigns; if they should be managed by the public sector and/or the private sector and who should fund the marketing. This was important to many respondents because they saw many opportunities in marketing, both to create a better image of the industry at home and to become more visible abroad.

“Yes, the marketing is insufficient because the funding isn't there. We often get comments from customers because if they buy fish from Norway they receive posters to put up in the restaurant or in the store, but what do I have for them?”
(Female, BSc in Economics, Fisheries, processing, marketing and sales)

“The attitude towards the industry is positive in rural areas since it is the main pillar of these societies. But the attitude is not as positive in the capital area and one of the reasons is inadequate marketing by the sector, I would think. I have also heard that we have not been paying attention to marketing abroad for quite a long time.” (Male, MBA, Insurance company)

*"It is vital to see the whole process, from fishing to marketing and actually realize how important this industry is for the economy. If we had some room *for effective marketing and would promote the variety of derived jobs in the industry and the technical advantages that have taken place, all the new companies, it would help the image a lot!"* (Male, B.S. in food science and MBA, Sales and marketing / Export-Import)

"In our company, the people that are selling the fish are usually employees that have been working here in other tasks before. But I think it would be good to get marketing people, there is a need for further marketing. It is becoming more and more important to analyse the market." (Male, BS in Fisheries technology, Fisheries, processing, marketing and sales)

Participants emphasized the marketing abroad and there were also some suggestions about the practicality of having a comprehensive mapping of the market, both at home and abroad.

"It feels good to be Icelandic in this industry when you are selling fish-related products abroad. We should take advantage of this reputation and use this opportunity to move forward and start marketing our technical knowledge" (Female, MA in mechanical engineering from Iceland, Technology in processing equipment)

"However, we need to know more about the market in general, we need to know what the general public thinks and what people want in terms of fish products. Some surveys are conducted by various parties but nothing comprehensive, we need a holistic research which is of use for all stakeholders in the sector." (Female, MA in Veterinary, Processing, Marketing and sales)

Progress in innovation

Many respondents experienced strong growth in innovation and much collaboration between seafood companies and related business.

"We have seen several outstanding companies arise in this industry, companies that are today known worldwide for their operations and some of them have even accomplished to link their activities to other industries." (Male, B.S. in food science and MBA, Sales and marketing / Export-Import)

"The collaboration between the seafood industry and technology companies has been very successful and it has helped the technology companies to expand. We have been very active regarding innovation when it comes to by-products." (Female, BSc in Economics, Fisheries, processing, marketing and sales)

"It is easy to convince companies to participate in research projects, pilot projects and test some new technology. We develop it further and they provide labour and sometimes even capital. This type of collaboration is beneficial for us all." (Male, MSc in electrical and computer engineering, Technical company)

Several respondents mentioned shortage of capital for product development. They found the funding system in Iceland poor and considered this a serious situation.

“The problem is that it takes a long time to develop a product and it takes even more time to gain from it financially. But by increasing the funding into this sector we would be able to take bigger steps and create value in less time. It’s a question of priorities, but it would be a win-win situation for everyone to prioritise product development.”

(Male, MSc in electrical and computer engineering, Technical company)

“Aqua-culture for example requires large capital, much patience and time. So they need to have considerable resources and as things stand today it is a struggle about funding. This is also a political question, if the state should control the funding or the industry itself.”

(Male, B.S. in food science and MBA, Sales and marketing / Export-Import)

3.2.3. Norway

The perceptions of the seafood industry expressed in all the Norwegian interviews included three major themes. The first theme addressed high cost factors in the industry. The second theme involved opportunities in utilization and marketing. The final theme concerned the emphasis on innovation.

High in cost

The sector was considered innovative but at the same time high in cost by many participants. The cost was considered to be problematic for the industry. It affected the development within the industry in a negative way and some of its activities were exported from Norway to other countries where labour cost is lower according to some participants.

“In Norway we have very high cost and it is very easy to move the production to low cost countries.” (Male, Master in Chemistry and Biotechnology. Fish oil)

Opportunities in utilization and marketing

In general the Norwegian participants identified a number of opportunities related to several aspects of the industry. The utilization could be more efficient, for example in terms of feed from the aquaculture business and discard from the fishery business. The strategy in marketing could also be better organized and more effective.

“They have a low coefficient of utilization both concerning feed from the aquaculture business and discard from the fishery business.”

(Female, PhD in Fish physiology. Processing)

“The biggest challenge is being able to disseminate the truth about the aquaculture business, information about the feed, the medicine, salmon lice and similar.”

(Female, BSc in Economics, Fisheries, processing, marketing and sales)

Many of the respondents felt that the industry should be more open and closer to the public. Using experts in promoting the activities of the industry would be more effective according to participants.

"I think that we must be more open. And we also have to employ educated people that can document and disseminate information about our activities and inform that we are doing this business with a lot of knowledge."

(Female, BSc in Economics, Fisheries, processing, marketing and sales)

High activity in innovation

A majority of participants considered the industry very active when it comes to innovation. The challenges are diverse and according to the participants the industry is meeting these challenges with all kinds of innovation activities whether it was concerning the aquaculture, food processing, equipment or marketing.

"We have a high level of innovation. We participate in many different research projects with new equipment and methods for aquaculture and food processing."

(Female, MA in Veterinary, Processing)

"I find the innovation rate very good. We are very cost effective, I think. The competition in the business has increased in recent years."

(Male, Ph.D. in Fish physiology, Fish feed)

"The aquaculture sector is one of the most important sectors in Norway. They are very innovative within technological development and breeding techniques."

(Male, MA in Society Planning, Association)

"It is at a high level. We use a lot of resources on research and innovation. There are plenty of opportunities for new ways of thinking and innovation."

(Female, Ph.D. in Biotechnology, Fish Oil)

"We develop ten new products a year but it is not all new products that are realised on the market."

(Male, BA in Food technology, Processing)

3.2.4. Sweden

The dominant perceptions of the seafood industry across all the Swedish interviews included four major themes. The first theme addressed the reputation of the industry. The second discussed many opportunities in the seafood industry and the third theme involved marketing issues. The final theme was about innovation in the sector.

The industry deserves a better reputation

The general public in Sweden has an inaccurate and rather outdated vision of the Swedish seafood industry according to many Swedish respondents. They thought that old views of the industry were still dominating where the fishermen did not follow proper laws and regulations.

"I think we deserve a little better reputation, because the old fisherman that sold things over from the boat or did not pay taxes and things like that, that does not exist anymore. The same applies when you go and buy fish, almost every kilo is registered and there is no more monkey business. That is my experience."

(Male, BA in Business, Processing)

A strong focus was on sustainability by many participants. Green business was highlighted along with the importance of cooperation between the stakeholders in the sector. Some respondents talked about a strategy made in spring 2013 which emphasised collaboration between stakeholders in forming mutual visions and goals and exploring means to reach them.

“If we want to keep eating fish in the same quantity as we do today we need to farm more of it. Farmed fish can be produced and it can be environmentally friendly. Especially if you compare it to conventional agricultural production fish farming can have less environmental impact. Moreover, we are really working on the feed and the disease control and this is really a safe production.”

(Female, MA in Biology, Authorities)

“I say sustainability of the fisheries, a green approach in the business and a more stable price on the market. The supply should be stabilised through stable fish quotas.” (Male, BA in Sales and marketing, Processing)

“Everybody needs to contribute to achieve the visions and the goals. That is really top priority during 2013. We also need to educate the local authorities, such as the county boards and the municipalities, in order for them to gain the capacity to take informed decisions in terms of fish farming investments and considering the environmental impact as well.” (Female, MA in Biology, Authorities)

Dissemination of information about the industry is the best way to inform the public and to improve its reputation according to most respondents.

“It’s necessary to disseminate information in schools at all educational levels. Students even at low level know something about agriculture. That is our starting point, to put information in newspapers and in media of all kind.”

(Male, BSc in Chemistry and Math, Fish production)

Many opportunities in the seafood industry

Despite this public vision most respondents were convinced that there were many opportunities in the seafood industry. They spoke about possibilities in terms of enlarging the sector, focusing on aquaculture and entrepreneurship.

“I see more possibilities than problems in the future. Firstly, I also want to say that the European commission is very clear when saying that we must cultivate a larger amount of fish in the future. If we continue to eat the same amount of fish in the future as we do today we must cultivate more.” (Male, MA in Biology, Aquaculture)

“This is a sector with big possibilities to grow in Sweden and with big possibilities in terms of recruitment and for entrepreneurs.” (Male, MA in Law, Association)

Focus on role models and the quality of the products in marketing

Food quality, sustainability and local production were often mentioned by respondents when they were discussing the sector in relation to marketing. One of the best ways to promote the industry to the general public is through role models and to introduce successful businesses.

"I think we need good examples; good companies and then you get interested. When our company started to expand, people came and asked me. They think our company is going well and we are successful and we have had a lot of people asking for jobs in our company right now, even highly educated people."
(Male, MA in Biology, Aquaculture)

"You need to focus on food. Food will be the first thing."
(Male, MA in Biology, Aquaculture)

"I believe it is vital to try to make people, the people buying fish for example, focus on quality. Focus on quality and taste. And also, it is very hard, to be environmentally aware of things. They should also look how far the fish they put in their mouth has travelled around the world."
(Male, BA in Water Science, Aquaculture)

"The vital story to tell is about the importance of the quality of the food. I think they take food for granted and do not think about how healthy fish is."
(Male, BA in Sales and marketing, Processing)

"In the end it must be good taste. If you want people to eat more fish it must taste good - always. And easy to buy and prepare. Story telling can be a very good way to make this area more popular. And the healthiness of the product compared to meat. And it is very important to make it in a sustainable way."
(Female, MS in Agriculture, Processing)

Low activities in terms of innovation

The innovation occurs mainly in the processing part of the Swedish marine industry according to many respondents. They did not experience any innovation in the fisheries and most of the respondents experienced no great innovation in the industry in general.

"Well, when it comes to the fishermen I haven't really heard about anything big and not more than you can expect from the big processing companies."
(Female, BA in Marketing, Association)

"I would say it is a little bit less than medium. We try a little bit more nowadays, we try to do something more." (Male, BA in Business, Processing)

"I would say the innovation is medium high but we work a lot and are very successful." (Female, MS in Agriculture, Processing)

"I think the innovation is quite high within machine development. The problem for us is to cope with the investment in new equipment and make it profitable."
(Male, BA in Sales and marketing, Processing)

Some of the respondents experienced innovation as an important and big part of their work. They believed the Swedish industry to be highly innovative but utilization of the innovation was lacking.

“We have to have the best technology we can. And of course you have to be innovative to do things in a practical and workable way.”

(Male, MA in Biology, Aquaculture)

“I think that Sweden has been one of the most innovative countries. Many of the developments have occurred in Sweden. The problem is that the Swedes haven't used this knowledge, others have picked up the knowledge and gone further.”

(Male, BSc in Chemistry and Math, Fish production)

The financial challenges the industry faces when it comes to innovation were considerable according to some of the respondents. It was costly to test new methods and not always easy to justify the expense.

“I would say that there is probably more new knowledge on the academic level, the farmers are having a hard time getting money to do this. If the cost is too high it is not feasible. So there is a sort of a leap between the academic know how and the farmers know how. And they are trying to get them to try out the different thesis. You need to be more innovative and I think that farmers are working at getting there, but slowly though.” (Female, MA in Biology, Authorities)

4. Views on image

4.1. Key findings

Majority of participants considered the image of the seafood industry to be rather negative. The participants believing that the general image was good were from Norway while the ones that perceived the general image to be bad were from Sweden. The participants were more positive towards the industry than the general public and believed that it deserved a better image. The main reason for the negative image was believed to be lack of effective dissemination of information about the activities of the industry.

The views expressed by the Danish participants about the public image of the industry were:

- The image of the industry is not good
- The image should be dynamic and global
- Ways to improve the image in Denmark

The main issues emphasised by the Icelandic participants when discussing the public image of the industry were:

- Industry with a negative image
- The image should be more positive
- Ways to improve the image in Iceland

The main issues put forward by the Norwegian participants when discussing the public image of the industry were:

- Good image in general
- The image could be even more positive
- Ways to improve the image in Norway

The Swedish participants talked about:

- Bad image
- Hard to explain this bad image
- Ways to improve the image in Sweden

4.2. Thoughts on the public image of the industry

The participants were asked to reflect on their view towards the public image of the industry. The purpose of this reflection, to gain insight from stakeholders on the image of the industry, was to discuss possible measures to improve the image in order to make the seafood industry more attractive for young people.

4.2.1. Denmark

The issues that were relatively consistent across all the Danish interviews regarding perceptions of the seafood industry included three major themes. The first theme focused on the image as not being good enough. The second reflected on the image as the participants thought it should be, dynamic and global and the last one addressed means to improve the image in Denmark.

The image of the industry is not good

The participants thought that the image of the industry was not good enough. Old ideas about its activities were still dominant and resulted in limited interest in working within the seafood industry. The industry was still seen as smelly and cold and the seafood industry appeared to be doing poorly in competition with other industries in Denmark according to the participants.

“The process industry has low status jobs. The seafood sector has a bad reputation. For a food safety expert who is looking for a job opportunity, the seafood is not the first choice.” (Male, M.A. in politics, Industry)

“The public opinion is still negative towards the aquaculture industry but it is less so than before because we have not had any big scandals recently. The green organisations are more positive and the politicians as well. We do not have people against us, but we still do not have the people with us.”
(Male, M.A. in chemical engineering, Industry)

“The fish farmers are seen as people in overalls, people that destroy the environment. Many have this view.” (Male, BS in biology and MBA, Aquaculture)

“The weakness is that fish smells and is not so attractive and hot as sun cells and wind turbines for instance.” (Male, MA in Fisheries technology, Processing)

“The products are cold, slimy and smelly and that does not help the image. Our image should be better.” (Female, MS in Economics, Processing)

“In general I think people think it is smelly and looking ugly.”
(Female, Industrial laboratory technologist, Processing)

The image should be dynamic and global

The industry was considered very fascinating and not in accordance with its general image by the participants. They perceived it as an exciting, dynamic and global industry.

“I would like people to think it is a very dynamic sector - because that is the truth. It is a global sector which is a good message to tell outside.”

(Male, M.A. in politics, Industry)

“For me it is the most interesting food production method in the world. It has the fastest growth and it is the most environmentally friendly production form.”

(Male, M.A. in chemical engineering, Industry)

“There are many good things to say about the business and people should listen more to facts than the negative media that looks for bad stories about us all the time.”

(Male, BS in biology and MBA, Aquaculture)

“Seafood industry is a highly international business. The shipping for instance is a very exciting work area. And young people should know that. I would like the image of the industry to be raw material turned into good end products.”

(Male, MA in Fisheries technology, Processing)

It was considered a big challenge to improve the image by some of the participants. They experienced a narrow understanding from public authorities and found themselves with limited resources to promote the activities of the industry.

“In Denmark many waterways have a lot of natural ochre in the water. Without the fish farmers many waterways could not have any fish because the fish farmers remove the ochre. But our politicians do not know about it and they cannot understand it. I do not think it is possible to deliver this message in Denmark.”

(Male, BS in biology and MBA, Aquaculture)

“I think it is very hard to change anything. We inform about our activities all the time, which is what we can do. The turnover of the whole aqua sector in Denmark is about one billion DKK; our sector is too small for campaigns.”

(Male, BA and Diploma in Business Administration, Aquaculture)

Ways to improve the image in Denmark

Disseminating information about the activities and possibilities in the industry is one of the most promising methods to improve the image and to attract young people into the industry according to participants. It is effective to hear stories from people working in the industry describing it as an exciting, dynamic, international and profitable sector.

“I think the image will improve gradually because the new young educated people will tell about their positive impression.” (Male, M.A. in politics, Industry)

“We need to continue to tell all the good stories about the fish as an exciting business with healthy products. Today no one has the seafood sector in mind when they look for job opportunities. When we do our company presentations for young people they are always excited to hear about the seafood sector.” (Female, MS in Economics, Processing)

“The seafood industry is an international business. The shipping for instance is a very exciting working area and young people should know that. It is very important to connect the students to the company. That is probably the best way, and that is how I started in this company.” (Male, MA in Fisheries technology, Processing)

“You can work in different parts of the world. There are so many exciting possibilities in the seafood industry.” (Female, Industrial laboratory technologist, Processing)

“You can earn money within this business and we are trend setters compared with the other food businesses. I think after so many years in the business that I would never like to be in another business than the fisheries sector.”
(Male, BCom in Economics and business administration, Technical company)

What the industry needed was growth, a certain stability and trust in order to be interesting for young people according to some participants.

“If there is growth within the sector, it is no problem to attract young people. If people believe that things will be good then they will get into the business.”
(Male, M.A. in chemical engineering, Industry)

The seafood industry was connected with rural areas and that also affected the image of the industry in a negative way according to the participants. They mentioned that young educated people preferred to work in urban areas because there they experienced a greater quality of life. The participants considered it difficult to improve the image in this regard.

“The major barrier is that companies are positioned in the country side. People do not want to move away from the larger cities.” (Male, M.A. in politics, Industry)

“The distance from large cities can be a problem.”
(Male, BS in biology and MBA, Aquaculture)

“It is also a very international environment and you can travel in your job if you like it. But you do not go to the large cities; you go to the country side.”
(Male, BA in Business Administration, Processing)

4.2.2. Iceland

The issues that were relatively consistent across all the Icelandic interviews regarding perceptions of the seafood industry included three major themes. The first theme focused on its negative image. The second theme addressed the image as the participants thought it should be, exciting and dynamic. The last one reflected on means to improve the image in Iceland

Industry with a negative image

The participants considered the image of the Icelandic seafood industry rather negative in general and thought it seemed uninteresting to the public in Iceland. The industry was still considered old fashioned and it had a bad reputation according to many participants.

“People often see this industry as a working place with no opportunities for people with higher education, no expertise and work that involves no research and development. They see it more as a work that will be carried out by machines in the future. It is kind of a sad attitude.” (Female, MA in mechanical engineering from Iceland, Technology in processing equipment)

“The image is still fishing and processing and clearly the industry still has a bad reputation in the society.”
(Female, BSc in Economics, Fisheries, processing, marketing and sales)

However, the image seemed to be better than it was before and the participants believed it was gradually improving.

“The image of the seafood industry has improved in the wake of the financial crisis. That is one of the positive things that came out of the crisis. I just hope that we will reach some kind of consensus soon in the society because the sector needs positive coverage and an improved image.”
(Male, B.S. in food science and MBA, Sales and marketing / Export-Import)

“I think the image is improving. I sense an understanding in the society that this industry is one of the main pillars of the Icelandic economy and that the seafood industry is gaining respect again. And no matter what, this industry is providing income.” (Female, MA in mechanical engineering from Iceland, Technology in processing equipment)

The image should be much more positive

The respondents thought the industry deserved a much more positive image. They perceived the industry as exciting, dynamic, and global and they were proud of working there. Their perspective on the industry was more like the image it had abroad according to the respondents.

“Now I am able to make improvements in the seafood industry and that is something that I am proud of and I think ‘Great, now my education has a higher meaning!’ ‘We only need to open the window to show people how exciting this industry is, it should be obvious to everyone, I find it so exciting!’” (Female, MA in mechanical engineering from Iceland, Technology in processing equipment)

“Everyone abroad pays attention to us when we address any subjects that are linked to this industry.” (Male, Cand. Oecon., Logistics)

Despite this negative image on the industry almost all participants agreed that the products had a strong positive image.

“Regardless of the domestic image towards the industry, the products have a very good reputation.” (Male, Cand. Oecon., Logistics)

“Our products are of good quality and our marketing share is constant.”
(Female, BSc in Economics, Fisheries, processing, marketing and sales)

“People abroad know that fish from Iceland is of very good quality and Icelandic products have a very good reputation.” (Male, B.S. in food science and MBA, Sales and marketing / Export-Import)

Ways to improve the image in Iceland

The lack of information to the public was one of the main obstacles in relation to improving the image according to the participants. It was quite clear to the participants that the most effective method to improve the image and to attract young people into the industry was to disseminate information about its activities and possibilities. It is effective to hear stories from people working in the industry describing it as an exciting, dynamic, international sector.

“It is primarily a lack of knowledge; I think it is quite obvious.”

(Male, MBA, Insurance company)

“The most important thing is to promote the industry and have good role models so people could think ‘Yes, I could work there’.”

(Female, BSc in Economics, Fisheries, processing, marketing and sales)

“There is nothing ‘fishy’ about the seafood industry. It is exciting, dynamic and full of variety! We are known for knowing everything about fish. The activities are interesting, the marketing and there is so much going on. We are a role model in the global environment and the environment is collaborative. This is what we need to promote!” (Male, MSc in industrial engineering, Aquaculture association)

“Perhaps no one aims specifically to work as a manager in the seafood industry, but wants to work as a bank manager or auditor. We have to find a way to promote the industry in schools and present the seafood industry as a part of the package when it comes to employment opportunities.” (Male, Cand. Oecon., Logistics)

“People should be encouraged to participate because there are so many opportunities in this industry. In this we are strong and we have almost everything to make ideas happen. So just join us in this expansion!” (Female, MA in mechanical engineering from Iceland, Technology in processing equipment)

“This industry should be promoted as high-tech, ambitious, eco-friendly and productive, that attracts people.” (Male, MSc in electrical and computer engineering, Technical company)

4.2.3. Norway

The issues that were relatively consistent across all the Norwegian interviews regarding perceptions of the seafood industry included three major themes. The first theme addressed its generally good image. The second theme addressed possibilities relating to improvements on the image and the last one reflected on means to improve the image in Norway.

Good image in general

The participants considered the image of the Norwegian seafood industry in general positive and they mainly associated it with good, healthy products.

"In general the image is positive and it is more positive today than it was five years ago. The sector has been able to handle a lot of issues in a good way."
(Male, Cand. Oecon., Association)

"I think the image is very good in Norway. I find it an innovative sector also within technical development." (Male, MA in Chemistry and Biotechnology, Fish oil)

"I connect the image to the products, like food. It has a very good image. You know it is healthy, it tastes good and you can cook the fish in many different ways." (Male, Ph.D. in Fish nutrition, Fish production)

"I think people have a positive impression of the sector, because they know about omega 3 and the positive impact it has on your health to eat seafood."
(Female, MA in Biology, Processing)

Despite this overall positive image a few participants believed that the industry had a negative image, especially among young people. They considered the public perceptions of the industry to be characterized by manual work, low educational level and stagnation. They often compared the industry with the oil industry which had a more positive image and was more attractive to young people according to the participants.

"I think it has the image of being old fashioned and stagnant with little emphasis on educated people but great emphasis on production."
(Female, Ph.D. in Biotechnology, Fish Oil)

"I think many young people have a negative image of the sector and too few young people see the aquaculture business as an interesting work area. I think it is because of the same image over 25 years and the sector does not deserve it"
(Male, Ph.D. in Fish nutrition, Fish production)

"It is a problem to convince the students to choose a seafood related education in the first place. The status is not so high compared to other sectors, the oil business for instance." (Male, Cand. Oecon., Association)

"We do have a lower status compared with the oil industry for instance. The image is that the industry mainly consists of manual work and operations of a number of companies are poor. But the salmon industry has developed a lot with large plans and hygienic standard and it has a good image today."
(Male, BA in Food technology, Processing)

"The oil business takes a lot of good candidates especially within process chemistry."
(Female, Ph.D. in Biotechnology, Fish Oil)

Room for improvement on the image

The industry could have a better image according to many respondents and they believed it consisted of a variety of strengths that were unknown to the general public. The industry was sustainable, put emphasis on quality and produced healthy food.

"The industry is environmentally friendly and we are facing fewer problems than before. Fishermen today are interested in sustainability and everyone in the industry is working together in this positive direction." (Male, Cand. Oecon., Association)

"The business is healthy and a sustainable producer of food. That should be the image." (Male, Ph.D. in Fish physiology, Fish feed)

"The aquaculture business is a modern business. The fishery business is seen by many people as a very traditional business. But that is not the reality today." (Male, MA in Society Planning, Association)

"The people should think about the sector as a producer of a clean product." (Female, MA in Biology, Processing)

"What people do not know is how large the aquaculture sector in Norway actually is and that we are working on environmental and sustainability issues. We face challenges but there are also myths about the environmental effects of aquaculture production."

During the discussion about the image, the oil industry was repeatedly compared with the seafood industry. Some of the participants mentioned the difference between these industries and referred to the seafood industry as the sustainable one.

"We are a sustainable sector. When the oil is over the seafood sector is the future." (Male, BA in Food technology, Processing)

Many participants mentioned the location of the industry as an obstacle when trying to attract young people to the industry. The industry was mainly situated in rural areas and young educated people preferred to live near cities according to participants.

"The location of the industry is a barrier. I did not apply for a job because it was on the country side. If the business was closer to cities it would be good, but that is probably not possible." (Female, Ph.D. in Food Science, Processing)

"I think the major barrier is that they are not willing to move out of the big cities." (Male, MA in Chemistry and Biotechnology, Fish oil)

"It is a challenge to recruit people because we are in a very small city in the countryside." (Male, BA in Food technology, Processing)

Ways to improve the image in Norway

Dissemination of information to the general public about the sector was repeatedly mentioned by the participants. The emphasis should be on sustainability and high quality products that are in great demand around the world.

"The industry consists of an effective and sustainable production. You use fewer resources for one kg of fish compared to one kg of meat. This is something the sector should inform to the general public in a more sufficient way. It is a high quality food." (Female, MA in Veterinary, Processing)

“It is a sector that produces a product that the whole world demands. The most important messages to tell the public about the industry are the massive health benefits of the products and its strong position internationally.”

(Male, Ph.D. in Fish physiology, Fish feed)

4.2.4. Sweden

The issues that were relatively consistent across all the Swedish interviews regarding perceptions of the seafood industry included three major themes. The first theme addressed bad image. The second theme addressed the difficulties in explaining the bad image in Sweden and the last one reflected on means to improve the image.

Bad image

The Swedish public was in general negative towards the seafood industry; people were suspicious of its sustainability and only approved of its activities as long as they were situated in a great distance according to participants. The issues often mentioned by the participants were lack of trust towards the industry in variety of contexts. The general public and other stakeholders did not trust the information they received about the activities of the seafood industry, if the industry complied with rules and regulations and if it took environmental issues into consideration.

“How do we treat our sources? And are we doing it in a smart way? That is the subject that is repeated in media all the time. There is so much fish in the sea, or is it or isn't it? This is all very confusing for the consumer. What is right and what is wrong? What information is relevant and what is not? That is a problem for the image.”

(Female, BA in Marketing, Association)

“Unfortunately Sweden is very negative to aquaculture, it is a kind of not in my backyard attitude.” (Male, BA in Water Science, Aquaculture)

“Too many organisations in Sweden see more problems than possibilities.”

(Male, MA in Law, Association)

“The authorities dealing with the environment are very negative towards the aquaculture business while our customers are very positive. I think the general public is very mixed in its attitude towards the business. Sometimes the media run very negative campaigns against us. Some claim that the aquaculture business is polluting the environment. Sometimes the surface of lakes can become oily because of the feeding of fish. When it approaches bathing bridges it becomes a big problem in the press.” (Male, Degree in Horticulture, Association)

Hard to explain this bad image

Many participants found it hard to explain this bad image. They could explain it to some extent but the image was far too negative according to most participants.

“It's very unfortunate, that the image is so bad. And I really don't understand why. We just notice this pressure from people claiming that fish farming is by far the most environmentally unfriendly production.”

"It's worse than the atomic power stations and so on; I don't know why the sector has this image. I think it is quite the opposite, producing fish is more efficient than producing cattle or pigs. And we haven't had any problems in the industry from an ecological point of view, but still. It's very strange"

(Male, BSc in Chemistry and Math, Fish production)

"I think the industry has a bad image partly because fish salesmen have not been completely honest. We have had some problems in the past when we didn't have transparency in the market." (Male, BA in Business, Processing)

"I think the industry has a bad image from the past. They fished too much and cheated with it. Today the situation is totally different."

(Male, BA in Sales and marketing, Processing)

Despite this situation most of the participant perceived the industry delivering good healthy products.

"The situation today is totally different, things have improved and now it is a real business." (Male, BA in Sales and marketing, Processing)

"The image should be good because the products are healthy. We are proud."

(Female, MS in Agriculture, Processing)

Ways to improve the image in Sweden

The right information needed to reach the general public according to most participants. Emphasis on responsibility sustainability, marketing and role models in the industry were factors that were often mentioned in the discussion on improved image in relation to the Swedish seafood industry.

"We need to emphasise responsibility in relation to the image so there will be no more debates on the existence of the products. I would like to have the consumers feeling confident when they purchase the products. Everyone in this food chain will have to agree on this, that this is the right way to do it."

(Female, BA in Marketing, Association)

"We definitely need to work on the image and need to work on the environmental issues. People are really scared, but what people don't know is that every second fish they eat is probably farmed somewhere." (Female, MA in Biology, Authorities)

"I do not know if the cage systems pollute the lakes and we need to prove that they do not and prove at the same time that we can produce fish without polluting the environment." (Male, Degree in Horticulture, Association)

"We need to emphasise green thinking, sustainability. If there is no fish, there will be no business." (Male, BA in Business, Processing)

"The end product will always be on somebody's plate or in the storehouse. When I talk to the people that grow mussels they keep forgetting that the products need marketing. It is not enough to want to grow mussels you need to know how to sell

them. We have to focus on marketing because there is a long way from being a producer to presenting quality products.” (Female, MS in Agriculture, Processing)

“It is always more interesting to read about the person behind the product. Story telling is effective, connecting a person to the product. The fisherman is still perceived as a complainer, someone who complains about everything. The industry should focus on positive factors and take away this complaining factor.” (Female, MS in Agriculture, Processing)

5. Views on education

5.1. Key findings

Overall, participants were positive towards the interaction of education and the seafood industry. Participants in most countries thought that the educational level of the industry needed to be improved and considered increased cooperation with the academic sector an effective approach in order to achieve that goal. They were generally confident that the seafood industry was full of opportunities for educated people but knowledge of the industry was also important. The seafood industry in the Nordic countries had gained great expertise and this knowledge must be attractive for foreign students who want to specialize in the seafood industry.

The main issues put forward by the Danish participants when they discussed interaction of education and the seafood industry were:

- Low levels of education
- Variety of opportunities for people with different background
- Education is only a part of the qualification requirements
- High level of expertise on fisheries in Denmark and the Nordic countries
- Much cooperation with the academic sector

The main concerns of the Icelandic participants when they discussed interaction of education and the seafood industry were:

- Educational level can be improved
- Job opportunities for people with higher education
- Important to know the industry
- Unexplored opportunities in the research cooperation

The main issues, put forward by the Norwegian participants when they discussed interaction of education and the seafood industry, were:

- High educational level
- The industry needs diverse education
- A sea of opportunities
- High activity in innovation

The main issues, put forward by the Swedish participants when they discussed interaction of education and the seafood industry, were:

- A self-taught industry
- Different perspectives on educational needs
- Some innovation and research collaboration

5.2. The interaction of education and the seafood industry

The participants were asked to describe the educational level in the seafood industry. They were also asked to discuss job opportunities for people with higher education, assess how their own education had helped in their work and collaboration with educational institutions was also addressed. This was followed by further discussions of the value of higher education in the seafood industry.

5.2.1. Denmark

The issues that were repeatedly discussed across all the Danish interviews in terms of the interaction of education and seafood industry included five major themes. The first one focused on the low levels of education within the sector. The second addressed the numerous opportunities in this sector for people with higher education. The third theme included other qualification requirements besides education that are important to stakeholders in the industry. The fourth approached the high level of expertise on fisheries in Denmark and the Nordic countries while the final theme addressed cooperation with the academic sector.

Low levels of education

Most of the respondents claimed that the seafood industry was characterized by low levels of education. According to them many people in the sector have only completed compulsory education and learned the business by working in the sector.

“The education level is very low. In general the process industry is a place where you get employed without any education. It is not attractive to be employed in the process industry. It is a low prestige job.” (Male, M.A. in politics, Industry)

“The people with the highest education in the industry are primarily with a Bachelor of Science education, for instance with a laboratory technician or food technician background. It is learning by doing within this business.” (Female, Industrial laboratory technologist, Processing)

Learning resources in terms of non-academic vocational education appeared to be limited according to some respondents. A few of them claimed it to be difficult to retain those employees who finish this type of education while others experienced an increase of educated people in the sector. A number of respondents mentioned the small size of the companies as a barrier in terms of hiring specialized personnel with academic education.

“Most of the people in fish farming have started with no education and have learnt the business by craft apprenticeship. Often it is a family business and training is conducted by family members. There is very limited formal education available today. There are also very few people with higher education in the business; there are about 20 people with an academic degree in the business as a whole to my knowledge. A few top managers are well educated today.” (Male, M.A. in chemical engineering, Industry)

“There is no formal education available for lower lever aquaculture plant managers today in Denmark but we are planning that together with the agriculture sector.” (Male, M.A. in chemical engineering, Industry)

"We are so large that we can hire specialists within product development, quality etc. The small companies do not have the same options but they of course have to hire more educated people, but then they have to manage several functions at the same time. The trend is clearly towards higher educated people in the business."

(Male, Ph.D. in fisheries technology, Processor)

"On the production level we have a lot of people that work themselves up from the floor and eventually become production managers without any education. Then they often start studying and we never see them again in the seafood business when they are finished. We are not good in keeping people in the company. We really need these people in order to become successful in the future."

(Male, Ph.D. in fisheries technology, Processor)

Numerous opportunities for people with a higher education

Participants claimed that the seafood industry offered a variety of possibilities for people with different university education. While some saw opportunities for people with education in physical sciences, others put emphasis on education in law or marketing for instance.

"This sector is good for people with a higher education within fishery, food technology and engineering. The production process in the seafood sector in Denmark becomes more and more advanced and there is a clear need for engineers." (Male, M.A. in politics, Industry)

"Within our sector there are many possibilities for people with a higher education within the area of research and development."

(Male, BS in biology and MBA, Aquaculture)

"What we need are people that have a general food education in a combination with education in economics. We need flexible people that can work with lists of ingredients, EU demands and economics as well."

(Female, Master of Science in Economics, Processing)

"Biology, water treatment and technical equipment are very important qualifications. International trade (business) is also very important."

(Male, BA in Danish and Graduate Diploma in Business Administration, Aquaculture)

"The companies need a boost within marketing. The companies need to make a sales and marketing strategy that includes labelling, branding and marketing. There is also a need within law and contracts. Both specialized knowledge within company law and on public regulation. Trade companies need this expertise because international trade has become much more complicated."

(Male, M.A. in politics, Industry)

"There are increasing demands for certification, audit, legislation and quality management. People with a higher education are needed for those jobs. The business becomes more and more complicated and we need people with a higher education." (Male, Ph.D. in fisheries technology, Processor)

"I would think that we need high level expertise within environmental law. That is the biggest challenge within the aquaculture industry."
(Male, BA in Danish and Graduate Diploma in Business Administration, Aquaculture)

A few participants discussed the need to increase the variety of study programmes in order to enhance the knowledge in the sector.

"We need people with education in nutrition sciences on fish. Such education is not available today. Education in nutrition sciences is available for human health but not for animal health." (Male, BS in biology and MBA, Aquaculture)

A number of respondents noted the importance of having completed higher education regardless of the subject. The studies train people in a set of skills which increase their ability to do well at work.

"The most important thing is interest for the working area and openness for changes and new ideas. People that are open and have the skills and the ability to think in new ways are in high demand. We of course need certain basic knowledge but it is not so important what kind of specialisation they have when they have a master's degree." (Male, BS in biology and MBA, Aquaculture)

Education is only a part of the qualification requirements

Despite the fact that most of the respondents consider the industry characterized by low levels of education and claimed that this industry offered a variety of possibilities for people with different university education, personal characteristics and values are of great importance as well. Emphasis was put on factors such as broad-mindedness, work experience and practicality.

"For us higher education is not a must to be employed. For us it is just as important to have the right attitude to the work - that is much more important than the education. In principle all positions are open for people with a master's education but it is not a must." (Male, BA in Danish and Graduate Diploma in Business Administration, Aquaculture)

"But education is actually not so important. Experience is more important."
(Female, Industrial laboratory technologist, Processing)

"What we are mostly discussing is product development and a person working there needs great knowledge about fish. What the fish can or cannot be used for. We need people with great knowledge about the fish as a product regardless of their education." (Female, Industrial laboratory technologist, Processing)

"We can definitely use higher educated people, but education is not enough. It is also necessary for the person to be able to transfer the knowledge into products that can be sold. A person with master's education can be too theoretical for us to use. It is important that the person has a practically oriented way of thinking."
(Male, BCom in Economics and business administration, Technical company)

High level of expertise on fisheries in Denmark and the Nordic countries

During the discussion on education and the seafood industry a few of the respondents mentioned the great knowledge that has been gained in the Nordic countries over the years. This knowledge must be attractive for foreign students who want to specialize in the seafood industry according to the respondents.

“We are also an attractive country to students from outside as well. We have a very high aquaculture education level in Denmark and Norway compared to the rest of the world. Norway are experts on sea based aquaculture and Denmark on recirculation aquaculture, the best in the world.” (Male, MA in chemical engineering, Industry)

“I think it is very positive that they started this AQFood study programme and it is very important that many universities in Scandinavia are involved. The aquaculture sector is in global growth and it is a sensible way to feed the population. I am certain there will be a plenty of work within this sector in the future.”
(Male, BS in biology and MBA, Aquaculture)

Cooperation with the academic sector

Nearly all participants were cooperating with the academic sector and experienced successful collaboration with educational institutions. They mentioned domestic and international projects they were participating in with educational institutions. Many respondents mentioned the advantage of this cooperation instead of trying to build up scientific knowledge within the businesses which is very expensive.

“We cooperate a lot with DTU-Aqua and DTU-Food in a number of projects.”
(Male, MA in politics, Industry)

“Our research and development strategy has been made together with the universities, all Danish universities that are interested.”
(Male, MA in chemical engineering, Industry)

“We do a lot of projects and usually we get the knowledge from the universities. For us it is perfect to get the knowledge from universities when needed and pay for that service.” (Male, BCom in Economics and business administration, Technical company)

“We have had some projects with DTU. We do not have any internal knowledge when it comes to scientific knowledge.” (Female, Industrial laboratory technologist, Processing)

5.2.2. Iceland

The issues relatively consistent across all the Icelandic interviews regarding education and the industry included four major themes. The first one addressed the educational level in the sector. The second theme focused on job opportunities for people with higher education. The third theme reflected on the importance to know the industry. The final theme discussed the cooperation between the industry and the academic sector.

The educational level can be improved

Most respondents found it difficult to generalize about the educational level of the industry because they experienced a big difference in terms of occupation. In general, they believed that the sector needed educated people, both with vocational education and university education. Managers had far more often proper education while other personnel quite often lacked vocational education. However, the educational level seemed to be rising gradually according to many participants.

“The educational level is fine on the executive level [...] we need education for the middle-management.”

(Female, BSc in Economics, Fisheries, processing, marketing and sales)

“The educational level has risen; managers are more or less all with higher education and then it just moves down. [...] This is a serious industry in a global competitive environment which requires people with quality education.

(Male, B.S. in fisheries technology, Fisheries, processing, marketing and sale)

“[...] you notice a change; gradually more people are educated, so it will be interesting to see how this will be after 20 years.”

(Female, MA in mechanical engineering, Technical company)

“Actually I find the educational level shamefully low. You see, if you decide to work in the meat processing you need to be educated as such [...] but if you enter the fish industry you get rubber gloves on your hands and you are self-educated [...] you are not educated in handling the fish, you just learn it by doing.”

(Male, Diploma in business administration, Sales and marketing/Export-Import)

“We need people with vocational education; we must not forget that people with higher education in this sector do not replace them. We need both people with vocational education and people with university education.”

(Male, Diploma in business administration, Sales and marketing / Export-Import)

A few participants experienced the proportion of people with higher education, greater in larger firms.

“Regarding larger companies, I would say in general that there are educated people with strong and solid knowledge, expertise and experience, many people with higher education that you come across.”

(Male, MSc in electrical and computer engineering, Technical company)

A lack of knowledge about the whole process in the value chain was repeatedly brought up by many respondents. They sometimes experienced the employees only having knowledge about their work in the value chain but not about the whole process which resulted in less respect for the job and poorer products. The reason for this is considered to be a shortage of basic education in fish processing and a poor presentation of this industry at all levels in the national education system.

“Where is this type of education in our education system, where do they teach fishing techniques?” (Male, MBA, Insurance company)

“There is a lack of expertise in fish processing to some extent and that is a serious business because if the product doesn’t remain as such it affects the buyers. One inadequate fish processor can damage greatly. It is perhaps that kind of education that is missing on all levels. The understanding of the whole process is lacking in this industry.” (Male, Cand. Oecon., Logistics)

“There is a great need for people with a comprehensive education in food and the marine and aquaculture value chain in combination with courses in business administration.” (Male, B.S. in food science and MBA, Sales and marketing / Export-Import)

“In general, high schools and universities lack education about the seafood industry. What this sector needs is people educated in biology to assess catch predictions, in business administration for business operations, in technology because of all the innovation and because the value chain is very high-tech. We also need people that speak Spanish and Portuguese.” (Male, MSc in industrial engineering, Aquaculture association)

“At the tertiary level, where they are producing the executives, they have no courses or incentives that urge students to explore this sector. They should have a study programme in business administration about fisheries because this sector is full of diversity like marketing, manufacturing, finance, quality control and personnel management. This sector and geothermal energy is what the University of Iceland should have ambition for.” (Male, Cand. Oecon., Logistics)

Some of the respondents mentioned the importance of having a background in the industry, that is being raised by people within in the sector or having a background in rural areas. Focusing on the education isn't always enough.

“I think it is very important and the best choice to have people with a background in the industry, that is people from rural areas and educate them. They are the people that will last in the industry; we need people with the right attitude towards the rural areas.” (Male, Diploma in business administration, Sales and marketing / Export-Import)

“It is important that you have worked in the seafood industry [...].”
(Female, BSc in Economics, Fisheries, processing, marketing and sales)

Job opportunities for people with higher education

The respondents considered their education to be very useful in their current job and saw many opportunities for people with higher education in the sector.

“I think that my education in engineering has been my ticket to this job.”
(Female, MA in mechanical engineering, Technology in processing equipment)

Actually, my job is more in business and marketing activities and in the business environment, but nevertheless this education [Food science] is very useful in my profession. Adding MBA to my education turned out to be very prosperous and profitable for me. It is such a good combination.” (Male, B.S. in food science and MBA, Sales and marketing / Export-Import)

During the discussion about education in the sector some of the respondents talked about the importance of higher education in general, that is how important it is to recruit people with higher education because they are trained in specific work procedures and possess the technical knowledge needed.

”It is so important, especially in terms of all the technique nowadays, to recruit people with higher education. People with university education do their work methodically.” (Male, BS in Fisheries technology, Fisheries, processing, marketing and sales)

“We believe that education in general is very important, more important than exactly what you have learned. That is our experience at least. People with university education have met specific requirements, they have learned to cooperate and you realize that all this group work at school is just to prepare you for your work in the labour market.” (Female, BSc in Economics, Fisheries, processing, marketing and sales)

”Education improves you as an employee. I emphasize that education is not everything but it certainly enhances your skills.” (Male, Cand. Oecon., Logistics)

Important to know the industry

Emphasis on experience and background in the seafood industry came up repeatedly in conversations about education. Many respondents underlined the importance of knowing the industry, either through work or having been connected to the industry in childhood.

”I contacted the company and it was an obvious advantage that I had an experience in the fish processing industry, that I was a ‘fish girl’, so they wanted me to be a part of their research team.” (Female, MA in mechanical engineering from Iceland, Technology in processing equipment)

”It was valuable that I had work experience in the sector, which made me a much better alternative than someone who hasn’t. When we are hiring people and the work is related to seafood industry, it is a great advantage to have work experience in the sector.” (Male, MBA, Insurance Company)

”I think that I was chosen for this job because of my background in the seafood industry, I know it inside out.” (Male, Cand. Oecon., Logistics)

Unexplored opportunities in academic cooperation

The attitude towards higher education within the sector was gradually improving according to many respondents. Those with contact with the sector in childhood have seen improvements over the years even though older stakeholders were less convinced.

"It depends on age, my grandfather for example started this company and he looks at the personnel and says that they are never doing anything just because they sit all day in front of the computer." (Female, BSc in Economics, Fisheries, processing, marketing and sales)

"There may have been some prejudices in the old days but they don't exist anymore. I believe that everyone today realizes that education in general is beneficial and especially if it is adapted to this industry, an industry that we excel in." (Male, Cand. Oecon., Logistics)

"Now and then you hear comments about experts from the city but I think that people in general recognize the benefits of having educated people working in the sector." (Male, MSc in electrical and computer engineering, Technical company)

Despite this increased positive attitude, there was not much collaboration between the industry and the academic sector according to many respondents. Those who have been cooperating with the academic sector were satisfied and were certain that the industry was interested in further collaboration. It was more a question of being active in introducing the industry to the academic sector and many respondents felt the need for more formal interaction between parties.

"We discussed this during the seafood conference last year and we all agreed that the collaboration between the industry and the academia was very limited. We want educated people but they don't know anything about us. We just have to be more proactive. We can build bridges; it is beneficial to us all. It just needs formal structure." (Female, BSc in Economics, Fisheries, processing, marketing and sales)

"The collaboration with the universities has been rather limited and is mainly through the Icelandic Centre for Research. It could be promoted in many ways, model designing, doing research on operation, sustainability, green economy, certification etc." (Male, MSc in industrial engineering, Aquaculture association)

"It is very important for the universities to be able to work with some real tasks related to the industry. It was much more fun to work on tasks that were based on reality and in collaboration with companies when I was a student." (Male, MSc in electrical and computer engineering, Technical company)

"We have been cooperating with the university and it is very positive." (Male, BS in Fisheries technology, Fisheries, processing, marketing and sales)

5.2.3. Norway

The issues discussed in interviews with the Norwegians regarding the interaction of education and the seafood industry could be sorted into four major themes. The first one focused on the high educational level within the sector. The second addressed the diverse needs for education within the industry. The third theme reflected on the numerous opportunities related to working in the sector and the final theme was about innovation and research.

High educational level

The industry consists of well-educated people according to most of the respondents, both with respect to higher education and vocational training.

“Most of the people that work with the development of the aquaculture business today have finished higher education. In the primary production, people that work with the fish every day in the production, have a bachelor education or a vocational training.” (Female, MA in Veterinary, Processing)

“I think that the educational level in Norway is high and there are many possibilities for employment.” (Male, Cand. Oecon., Association)

Many respondents described the industry as constantly evolving and in need for educated people.

“I know a lot of people in the industry with similar job titles as me [quality manager]. They often have a higher education such as a master's degree or at least a bachelor degree.” (Female, MA in Veterinary, Processing)

“There is an increased need for quality assurance, inspection and food safety. The ISO certifications and focus on good working environment increases the need for educated employees that are able to work in a structured way.” (Female, Ph.D. in Biotechnology, Fish Oil)

“The people that are employed in the feed development for aquaculture are nearly all people with a PhD and some experience. The tendency is the same in the large aquaculture business as well, most people in marketing, sales and purchasing have a master's degree.” (Male, Ph.D. in Fish physiology, Fish feed)

The industry needs diverse education

Most of the participants believed the industry needed people with higher education.

“It is only about higher education on the master level. It does not matter so much what the education is as long as you are able to understand the sector and adapt to new situations. The primary focus point is to combine specialised theoretical and practical knowledge in my opinion.” (Male, Cand. Oecon., Association)

“We actually have what we need today, people on a bachelor level.” (Male, MA in Chemistry and Biotechnology, Fish oil)

“They must be independent and have a relevant education within chemistry or food on a master or bachelor level.” (Male, BA in Food technology, Processing)

The education that participants mentioned and what they considered necessary for the industry was of various kinds. Physical sciences were often mentioned but due to the diversity of the industry the participants found it necessary to have people educated for example in technology, marketing, economy, quality and research.

“I think there is a need for machine technology within the fishing industry. Many are strong in quality, functional characteristics and microbiology but they are not strong when it comes to automation and machinery.”
(Female, Ph.D. in Food Science, Processing)

“Veterinarian and marine biological competences are the most important ones.”
(Male, MA in Society Planning, Association)

“We need people in economics, marketing and quality.”
(Male, BA in Food technology, Processing)

“Good competences within organic and process chemistry, quality assurance, nutrition, analytical and food safety are needed.”
(Female, Ph.D. in Biotechnology, Fish Oil)

“We need people within fish health, nutrition and feed, genetics, quality, environment, sustainability and management of aquaculture plants.”
(Male, Ph.D. in Fish nutrition, Fish production)

“Good sound mathematics, chemistry and IT knowledge. It is important to have a basic sound knowledge from the start. And maths is the most important one.”
(Male, Ph.D. in Fish physiology, Fish feed)

Great knowledge in languages was considered very important in this industry by many respondents.

“Language abilities are important within trade.”
(Male, MA in Society Planning, Association)

“Language is also very important. English is crucial but a second language would be good as well.” (Male, Ph.D. in Fish physiology, Fish feed)

Some of the participants talked about the importance of skills in cooperation with Government services and connected this discussion with rural issues, i.e. the need to make it feasible for educated people to live in rural areas.

“There is also a need for people with higher education that can work with government services. I think the industry along the coast, in the country side, has a need for all kinds of people with higher education.”
(Male, MA in Society Planning, Association)

A sea of opportunities

The industry is diverse, dynamic and offers a broad range of possibilities in relation to work according to many respondents.

“There are possibilities to work in a salmon aquaculture plant, also for educated people within ecology, economics, fish nutrition, logistics and fish handling, weighing etc. In a technical department you can work with fish quality, nutrition, there is a sea of opportunities as we usually say.” (Male, Ph.D. in Fish nutrition, Fish production)

According to some of the participants the opportunities for people with education in biology have decreased, but opportunities are nevertheless there for people with this kind of education.

"I think there are many opportunities within machine technology and electronics. Also quality assurance, quality inspection and research and development have also good job opportunities."

"If you have a master in biology I think it is hard to get an interesting job within your area of expertise today. But biologists can also be used within quality assurance." (Female, Ph.D. in Biotechnology, Fish Oil)

"Within biology we have covered our needs today. In the intersection between biology and machine engineering there are good job opportunities. Then there is this whole area of expertise within environment and sustainability that has become more into focus and where you need qualified people."
(Male, Ph.D. in Fish nutrition, Fish production)

"It is more common now that biologists work in aquaculture plants. The large companies employ biologists. Within quality assurance and fish nutrition there are many opportunities to get employment for people with higher education."
(Female, MA in Biology, Processing)

Considerable research cooperation

Most of the participants engaged in some form of research cooperation with educational institutions. They considered the cooperation with universities to be an important part of their operations and a valuable access to expertise and facilities that would be otherwise difficult and expensive to obtain. Most of the companies in this industry in Norway were not big enough to operate a special department for research according to the participants.

"We have many types of collaboration with educational institutions and it all depends on the projects we collaborate in. We have for instance a project within quality of seafood where we develop a tool to assess the taste."
(Male, Cand. Oecon., Association)

"We do not have any testing facilities in house. All our projects are made with the research institutes or universities. We have many ongoing projects. We cooperate with people in Denmark and in many other countries in the world."
(Male, Ph.D. in Fish physiology, Fish feed)

5.2.4. Sweden

The issues discussed across all the Swedish interviews regarding the interaction of education and the seafood industry could be divided into three major themes. The first one focused on the educational level and the industry described as a self-taught industry. The second addressed the different perspectives of the participants towards educational needs and the final theme reflected on innovation and research collaboration.

A self-taught industry

The seafood industry in Sweden was not considered to consist of people with higher education by most of the participants. According to them few people had degrees from universities and they were mostly working in research. The majority however, were self-taught and used similar work methods as previous generations. The recruitment was not high and it was considered a challenge to get young people to work in the industry.

“The fishermen, the fish retailers, they don't usually have any education at all. I think that the fishermen probably have the same problem as the farmers, they live pretty isolated, not all of them of course, but a lot of them do. And they do things like they have always been done and the way their parents did.”

(Female, BA in Marketing, Association)

“I would say that most people have learned the business by themselves, sort of by trial and error.” (Female, MA in Biology, Authorities)

“I think most people are self-taught, and are growing older. The sector will have some problems in the future I guess, with many that are fairly old.”

(Male, BSc in Chemistry and Math, Fish production)

Different perspectives on educational needs

The participants had different perspectives on the educational needs of the industry. Several felt no need for people with higher education and considered suitable experience more important. The industry consisted of many small businesses that were not in a position to recruit people with higher education according to several respondents.

“I don't know anyone who has got a PhD or something like that and I wouldn't find it necessary for the business.” (Male, BA in Water Science, Aquaculture)

“We mostly have people who are self-taught and you go for the skills and not for the education.” (Male, BA in Business, Processing)

“My small company cannot use a person with higher education or an academic person.” (Male, Degree in Horticulture, Association)

Other respondents found higher education very important for the industry and a key factor for a future success of the Swedish seafood industry.

“We need more knowledge about entrepreneurship and sustainable aquaculture.” (Male, MA in Law, Association)

“If we want to be serious about enhancing the Swedish aquaculture we need well educated people to help us with that.” (Female, MA in Biology, Authorities)

“I think in some cases the business is not mature enough to understand its needs. In the future there will be a need for educated people. If you want to be a frontrunner in the business you need educated people.”

(Male, BA in Sales and marketing, Processing)

Variety of cooperation with the academic sector

Collaborative research between the academic sector and the industry exists according to most of the respondents. Several respondents talked about cooperation with universities, both domestically and abroad. They found this cooperation very valuable and respondents working in smaller units saw it as their only possibility to work in research.

“We do projects, some of them together with Norway, Iceland and Sweden.”

(Male, MA in Biology, Aquaculture)

“We are collaborating with universities.”

(Male, BA in Water Science, Aquaculture)

“We have had several projects about quality of seafood.”

(Female, MS in Agriculture, Processing)

The participants were in general positive towards cooperation with the academic sector. It consisted of valuable knowledge and young people who had a positive impact on their working environment.

“They are young and full of ideas, have new information and energy. It is a good motivation for the staff and for the company to have young people. Even if they stay just for a short time, the right people will do good work.”

(Male, MA in Biology, Aquaculture)

The collaboration with the academic sector is not purely in research according to participants.

“We have had all kinds of activities in schools. Both in elementary schools and at higher levels, that is in Swedish universities. Also when we have seminars we invite them to talk and if we write something in a brochure we talk to them and discuss things and what are you allowed to say about certain things.”

(Female, BA in Marketing, Association)

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Part 3

The view of the general public and students / on-line surveys

External Image of the Nordic Seafood Industry

InTerAct P11073

External Image of the
North Atlantic Seafood Industry

Publisher:

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Main Authors:

Guðbjörg Andrea Jónsdóttir
Guðrún Ólafsdóttir
Guðný Bergþóra Tryggvadóttir
Ingibjörg Lilja Ómarsdóttir
Hafsteinn Einarsson

InTerAct project partners:

Technical University of Denmark (DTU)
University of Iceland (UoI)
Norwegian University
of Life Science (NUMB)
Norwegian University
of Science and Technology (NTNU)
Swedish University
of Agricultural Sciences (SLU)
Eurofish
UMANO

Objective:

To explore the image
of the seafood industry

Administration:

Social Science Research Institute

Preparation and data collection:

Guðbjörg Andrea Jónsdóttir
Ingibjörg Lilja Ómarsdóttir
Guðrún Ólafsdóttir

Data analysis:

Guðbjörg Andrea Jónsdóttir
Guðný Bergþóra Tryggvadóttir
Hafsteinn Einarsson

Report:

Guðbjörg Andrea Jónsdóttir
Guðný Bergþóra Tryggvadóttir
Ingibjörg Lilja Ómarsdóttir

Summary

This study is a part of the InTerAct project which aims at linking industries to an interdisciplinary educational programme, the AQFood programme. The primary objective of the project is to improve communication and provide better understanding of the role of qualified staff with higher education as well as introducing the seafood industry as an attractive career opportunity to students. It is important to attract students to the AQFood programme to secure a high level of knowledge and expertise for targeting the future needs of the industry. For this purpose there is a need to boost the image of the seafood industry as an attractive working environment for young people.

The study attempts to discover the most important influential factors that explain young people's choice of field of study in higher education. Special emphasis is placed on exploring students' attitudes towards the image they have of the seafood and related industries. As family and friends often play a major role in decisions about the future choices of young people, the study also explores the image of the seafood industry among the general population in Denmark, Iceland, Norway Sweden and Canada.

The aim of the image analysis in the InTerAct project was to apply a multi-level approach to obtain an overview of the position and status of the marine sector.

- Internal image. A part of the qualitative interviews in WP2 were devoted to the internal image of the industry to reflect the view within the enterprises, which has a substantial effect on corporate image and reputation.
- External image. An internet survey was conducted among the students representing the target group of the AQFood programme in the different countries, to assess the demand for the programme and the interest of prospective students in the area of natural sciences and engineering
- External image - general image. A survey on the image of the marine sector as a working environment was conducted among the general public in the relevant countries. Data was collected through online web panels.

Main Results

Respondents among the Icelandic population were most likely to be positive towards capture fishing but respondents among the Swedish and Canadian populations were the least likely to be very positive towards it. The same is the case when it comes to fish farming, 80% of the Icelandic population finds it very or rather positive compared to 44-54% of the Canadian, Danish, Norwegian and Swedish populations.

Image of the seafood industry differs between countries. When asked to state the first thing that came to mind when respondents heard the term seafood industry, words related to food were most likely to come to respondents' mind in Denmark, Sweden and Canada. In Norway food and fish farming were mentioned more frequently and fishing quotas and main industry in Iceland.

When respondents in the general population were asked to rate the seafood industry on eight scales they were most likely on the whole to rate it as high quality, international, competitive and high tech. However, there was some variability between countries, the Icelandic respondents scored highest on most of the scales. The students were most likely to rate the seafood industry as big scale, international and wholesome. As with the general population there were some differences between countries.

Between 34-55% students believed it would hinder somewhat or a lot that the seafood industry companies are often located in rural areas. In Sweden almost half of the students responding to the survey believed it would encourage them somewhat or a lot that the companies are often located in rural areas compared to 10-21% in the other countries.

Students were asked how interested they would be to work in certain areas related to the aquatic food industry. On the whole students were most likely to be interested in working in innovative technology, innovation, product development and laboratory research. However, it differed between countries.

The vast majority of students chose their subject of degree because they were interested in the content of the subject and thought it would lead to good employment opportunities in general.

Students' intention to take another study or qualification after their graduation depended on which country they lived in. The Icelandic students were most likely to intend to take another study (65%) but the Swedish students were the least likely (11%). Around 45% of the Danish and Icelandic students had a very or somewhat clear idea of their long term career plan, almost 40% of the Norwegian students and 20% of the Swedish students. When asked what motivated them in terms of choosing their future professional career, the vast majority stated they had interest in the subject matter and more than two thirds of students stated job security.

Between 12-14% of students in Denmark, Iceland and Norway and 5% in Sweden had heard about the AQFood programme. When asked if they would consider enrolling in the programme almost half of the Norwegian students, 41-42% of the Icelandic and Swedish students and 19% of the Danish students said they would consider enrolling in it.

Students were asked to assess statements about the programme, what would make the programme more or less interesting. Overall, students believed it would make the programme much more interesting if it emphasized how to enhance sustainability and minimizing waste, if it was about full utilization of valuable natural resources and if it was about sustainability.

Methodology

Students

An online survey was conducted in six universities located in Denmark, Iceland, Norway and Sweden: Technical University of Denmark (DTU), The University of Iceland (UoI), Norwegian University of Life Science (UMB), Norwegian University of Science and Technology (NTNU), Sør-Trøndelag University College (HiST) and

Swedish University of Agricultural Sciences (SLU). The focus of the questionnaire was on what lies behind student's choice of field of study in higher education. Furthermore, it explored students' attitudes towards the seafood industry and their general image of the industry. Students were for example asked to rank the seafood industry on 21 descriptive scales, state how interested they were to work in certain areas related to the seafood industry and asked about what motivates them in choosing their future career (see the questionnaire in Appendix C).

The sample consisted of students who were considered to be qualified for the AQFood programme. Students were therefore selected by the subjects they were enrolled in such as Natural Sciences, Physics, Aquaculture and Engineering (see Table 63 in Appendix A). A link to an online questionnaire was sent by e-mail to the students by a staff member in each university. The survey was conducted from 7th of June until 28th of June and 360 students from the four countries answered the survey (see Table 1). The response rate was generally low, particularly in Sweden and therefore it is difficult to generalize the results and inferences need to be drawn with caution.

Table 2. Method and response rate. Students

Data collection	07.06.13 - 28.06.13
Type of survey	Web survey
Number of respondents	360
Denmark	160
Iceland	110
Norway	70
Sweden	20

General public

An online survey was conducted in five countries: Canada, Denmark, Iceland, Norway and Sweden. The focus of the questionnaire was on the general public's views of the seafood industry. Respondents were asked to rank the seafood industry on eight descriptive scales. Respondents were also asked a top of mind question about the first thing that came to mind when the seafood industry was mentioned and questions about the most positive/strong and the most negative/weak aspects of the seafood industry (see the questionnaire in Appendix D).

In Canada, Denmark, Norway and Sweden the survey was conducted by GMI using their Global Panel. The survey was sent to a sample of the general population and responses from 800 persons were gathered in each of the four countries. In Iceland a stratified random sample of 1200 persons aged 18 years and older, was drawn from the SSRI's Internet Panel. The sample was stratified by gender and age in order to establish groups proportional to the characteristics of the Icelandic population. A link to an online questionnaire was sent by e-mail to sampled panel members. Data collection took place between June 13th and June 24th 2013. The total number of respondents in Iceland was 717 (60% response rate) (see Table 2).

Table 3. Method and response rate. General public

Data collection	07.06.13 - 28.06.13
Type of survey	Web survey
Number of respondents	3917
Canada	800
Denmark	800
Iceland	717
Norway	800
Sweden	800

Results

Views on seafood industry

Views of the general populations differed between countries when asked how positive or negative they were towards capture fishing, only 10% of the Swedish respondents felt they were very positive towards capture fishing compared with 63% of the Icelandic respondents. Around 17% of The Swedish and 15% of the Canadian respondents were rather or very negative towards capture fishing compared to 1% of the Icelandic respondents and 5% of the Danish and Norwegian respondents (see Figure 13 and Appendix B Table 1).

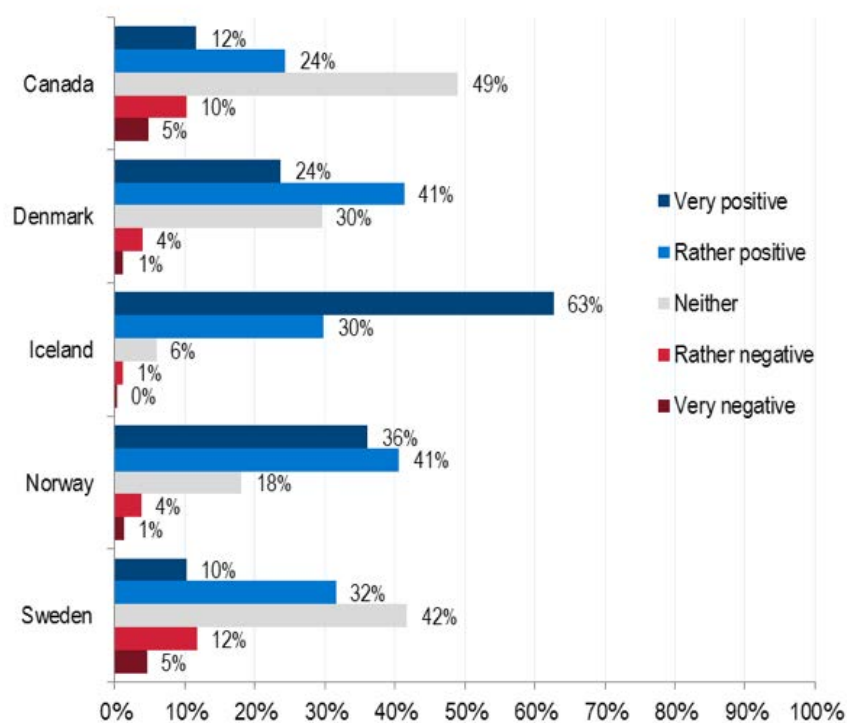


Figure 13. How positive or negative are you towards capture fishing? Comparison between countries, general population

When respondents in the general population were asked about fish farming around 40% of the Icelandic respondents were very positive compared to 11-16% of respondents in the other four countries. More than 20% of the Norwegian and Canadian respondents were rather or very negative towards fish farming, 16% of the Swedish, 9% of the Danish and only 5% of the Icelandic respondents (see Figure 14 and Appendix B Table 2).

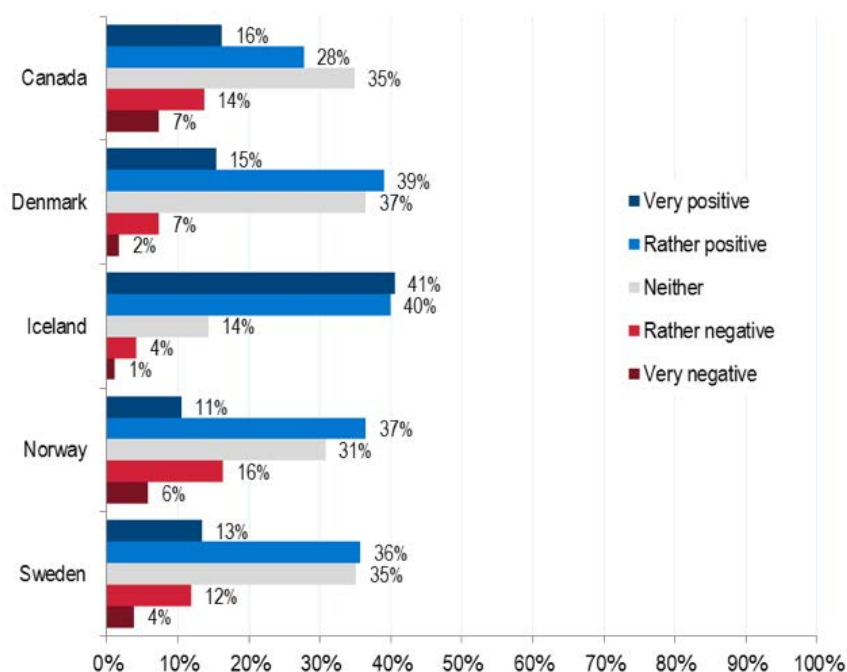


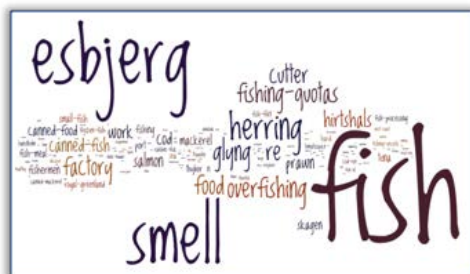
Figure 14. How positive or negative are you towards fish farming? Comparison between countries, general population

Image of the seafood industry

In order to obtain a general image of the seafood industry the respondents were asked to state the first thing that came to mind when they heard the term seafood industry. Respondents were supposed to mention one aspect only to obtain the most important ones. As can be seen in Figure 15 it was different between countries what things came up in people's mind. As the words get bigger in Figure 15 more respondents have mentioned it as the first thing that comes to mind.

In Denmark respondents mentioned fish most often, then Esbjerg and smell. In Iceland completely different things came to mind such as fishing quotas, main industry, fishing fees and fishing. Respondents in Norway most commonly came up with salmon, fish, salmon farming and fish farming. In Sweden fish was the most common thing that came to mind, then food, Abba seafood and prawn. Lobster, fish, shrimp and fishing were the most common things in Canada.

Denmark:



Iceland:



Norway:



Sweden:

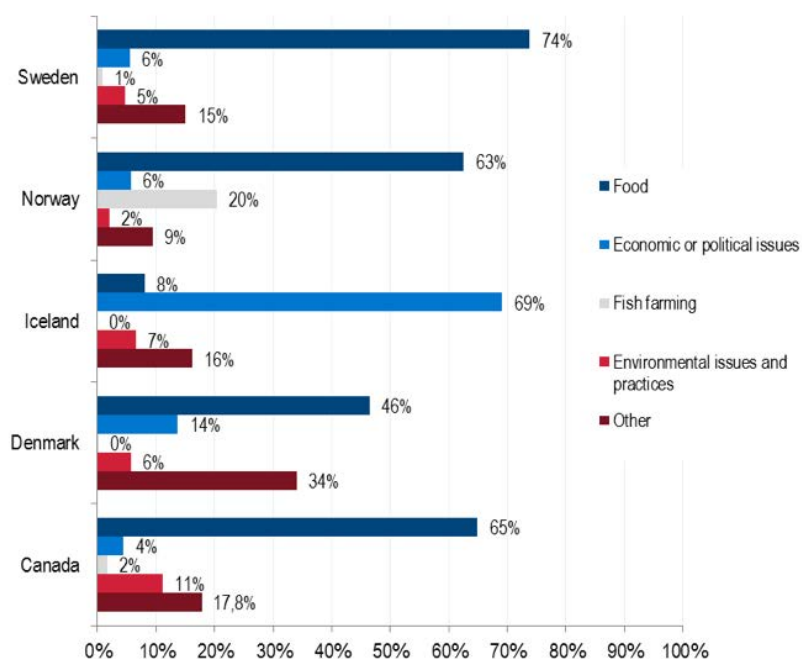


Canada:



Figure 15. What comes into mind when you hear the term seafood industry?

The attributes that came to people's minds were classified into five categories, food, economic or political issues, fish farming, environmental issues and practices and other (see Figure 16 and Appendix B Table 3). Attributes included in the food category were most common in Sweden, Norway, Denmark and Canada, but in Iceland the aspects included in economic or political issues were the most frequently mentioned. Things related to fish farming seemed to come often to mind in Norway but not in the other countries.



**Figure 16. What comes into mind when you hear the term seafood industry?
Comparison between countries, general population**

Respondents in the general population were also asked to state one positive aspect of the seafood industry and one negative aspect (see Figure 17 and Appendix B Table 4 and 5). Note that since respondents were asked to name ONE aspect only, the most important aspect was obtained. More than half of the Swedish population mentioned food or taste as a positive aspect and 18% of them mentioned food or taste as negative aspect. Around two thirds of the Danish population mentioned food or taste as a positive aspect as well as a negative aspect. In Iceland more than half of the population stated economic or political issues as a positive aspect but an even higher number, 76%, stated the same topic as a negative aspect.

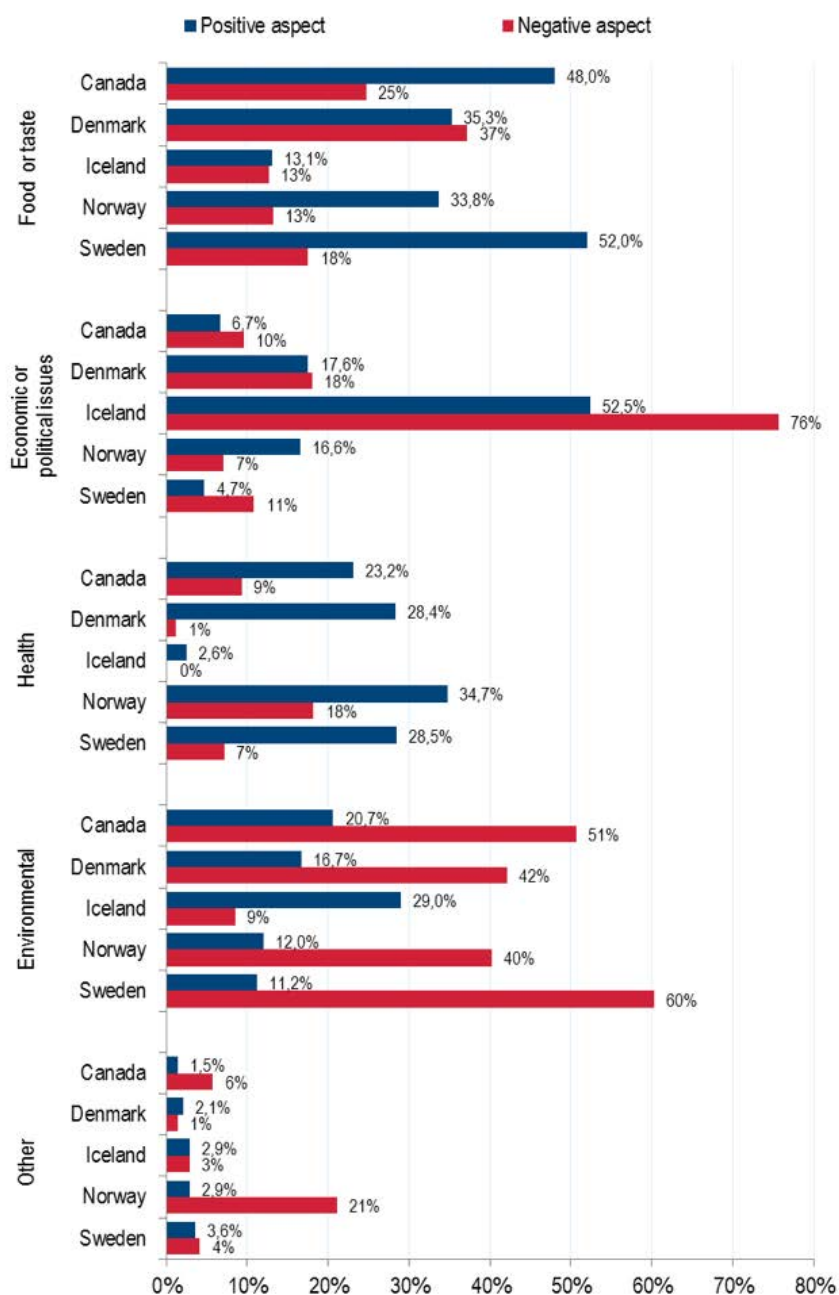


Figure 17. Positive and negative aspects when people were asked to state one positive and one negative aspect of the seafood industry. Comparison between countries, general population

Respondents in the general population were asked to rate the seafood industry on eight different dimension scales from 1 to 7 where 1 indicates a more negative view and 7 a more positive view. One third of respondents rated the seafood industry as high quality (6 or 7), 31% as international, 29% as competitive and 28% as high tech (see Figure 18 and Appendix B Table 6-13). Around 14% rated the seafood industry as uneducated and 13% rated it as old fashioned and unsustainable.

Students were asked to rate the seafood industry on 21 different dimension scales from 1 to 7. As in the survey among the general public, 1 indicates a more negative view and 7 a more positive view. More than half of the students rated the seafood industry as international compared to one third of the general population. Almost 60% rated the industry as big scale and 37% as wholesome (see Figure 19). Around 28% of the students rated the industry as cold, 25% as rural and 24% as uninteresting.

Females were more likely to have positive views than males on some scales, they were more likely to rate the industry as interesting, high tech and scientific than males (see Appendix A Table 1-21)

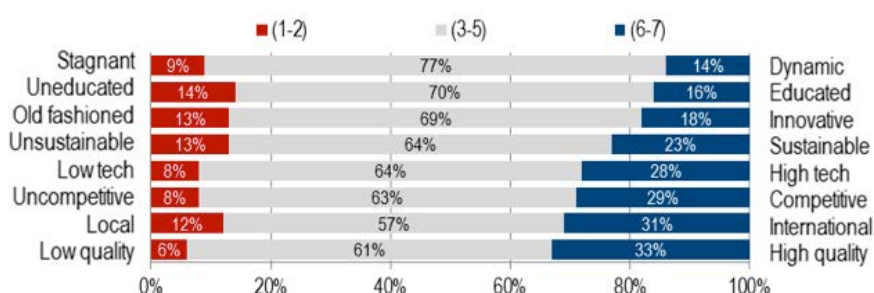


Figure 18. How would you rate the seafood industry? (8 scales)
All countries, general population

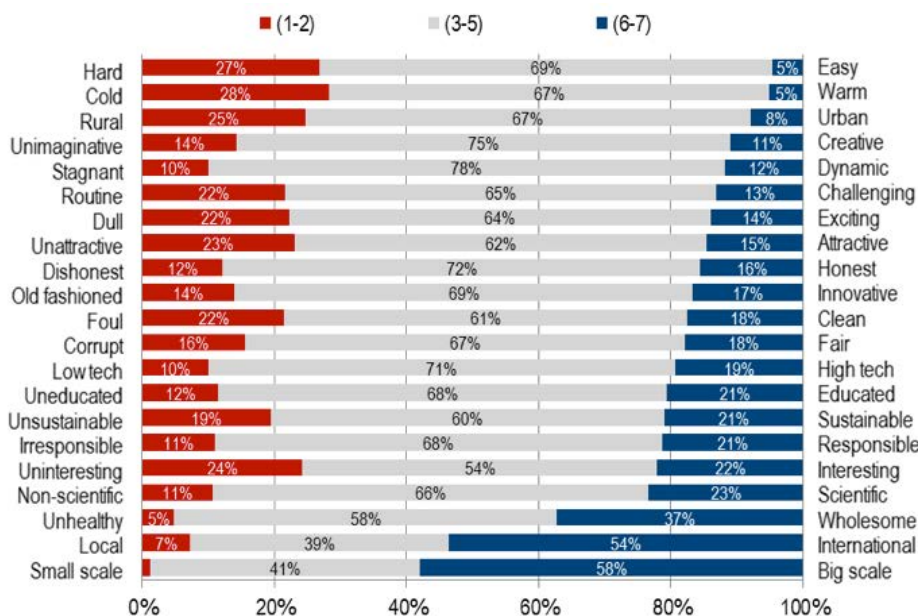


Figure 19. How would you rate the seafood industry? (21 scale)
All countries, students

Canada

In Canada, 35% of respondents in the general population rated the seafood industry as competitive, 30% as international and 24% as high quality (see Figure 20). One fifth of respondents rated the seafood industry as unsustainable.

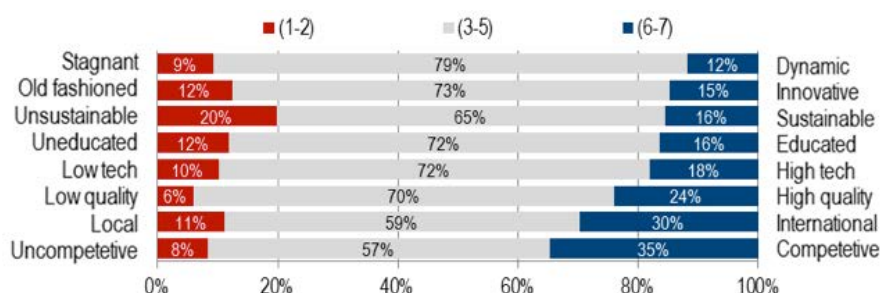


Figure 20. How would you rate the seafood industry? (8 scales)
Canada, general population

Denmark

Figure 21 shows that 31% of the general population in Denmark rated the seafood industry as international and 25% rated it as high quality. Almost one of every four respondents rated the industry as uneducated. Among the students more than half of them rated the industry as big scale and 44% as international (see Figure 21). Around 38% of the students rated the industry as uninteresting and around 30% as unattractive, dull and cold.

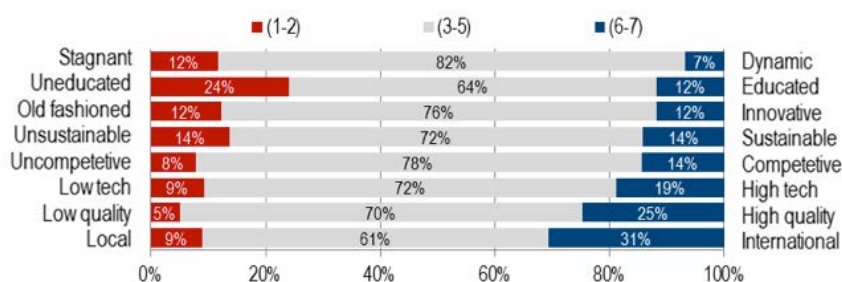


Figure 21. How would you rate the seafood industry? (8 scales)
Denmark, general population

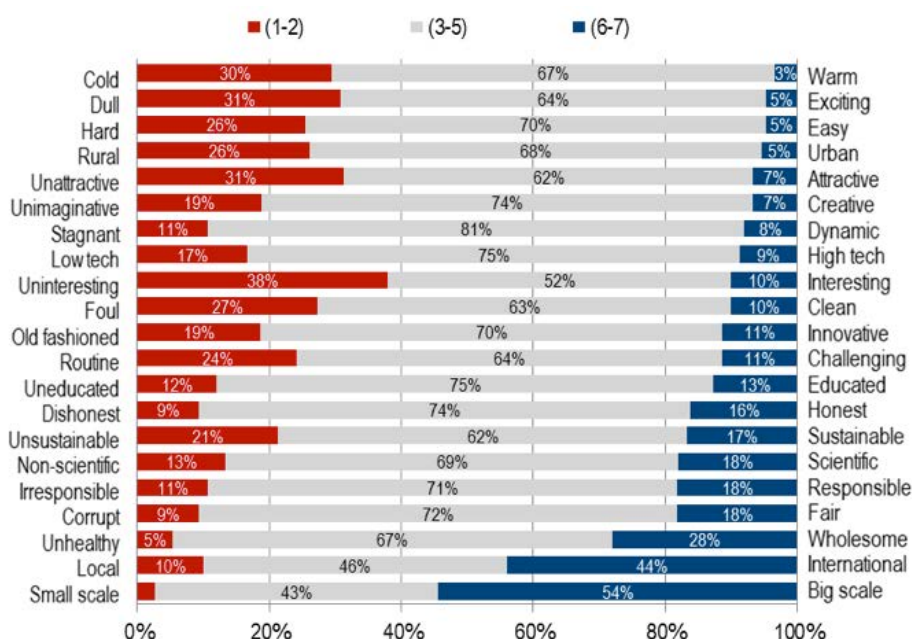


Figure 22. How would you rate the seafood industry? (21 scales)
Denmark, students

Iceland

The vast majority of respondents among the general population in Iceland rated the seafood industry as high tech and high quality (68-72%) and more than half of respondents rated the industry as competitive (see Figure 23). Around 17% rated the industry as local and old fashioned. Among the students in Iceland 56-57% rated the industry as international and big scale and 47% as wholesome (see Figure 24). More than one of every four students in Iceland rated the industry as corrupt and between 22-23% as routine and cold.

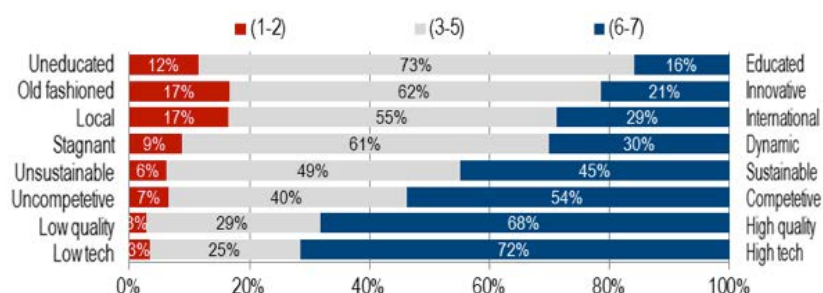


Figure 23. How would you rate the seafood industry? (8 scales)
Iceland, general population

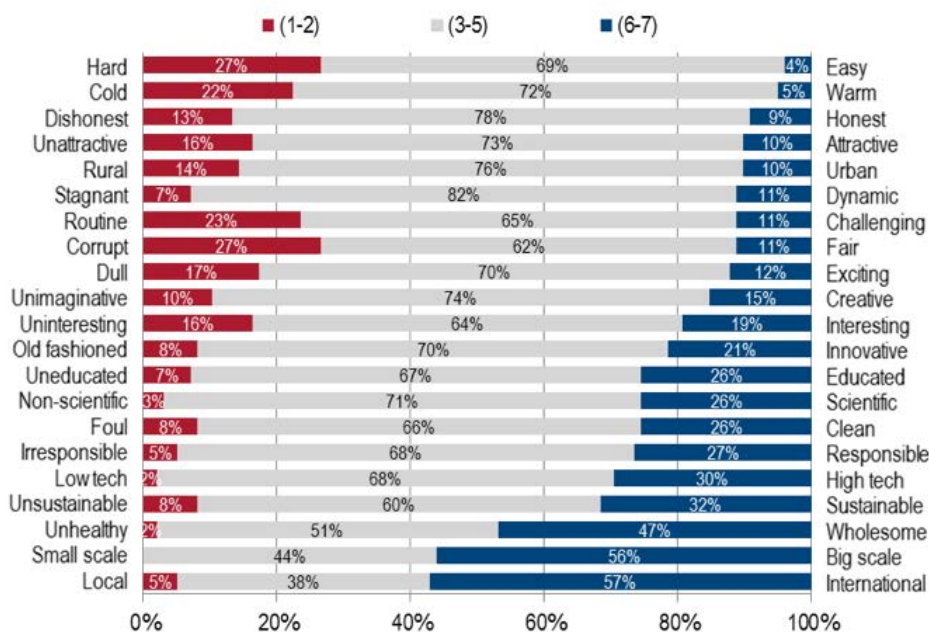


Figure 24. How would you rate the seafood industry? (21 scales)
Iceland, students

Norway

Around 37% of respondents in the general population in Norway rated the seafood industry in Norway as high quality, between 30 and 32% rated it as competitive, innovative and international (see Figure 25). Around 16% of respondents evaluated the industry as local. When the students were asked to evaluate the seafood industry on 21 scales, the vast majority rated the industry as big scale, 61% as international and 52% as wholesome (see Figure 26). More than one of every third student rated the industry as rural and 29% as cold.

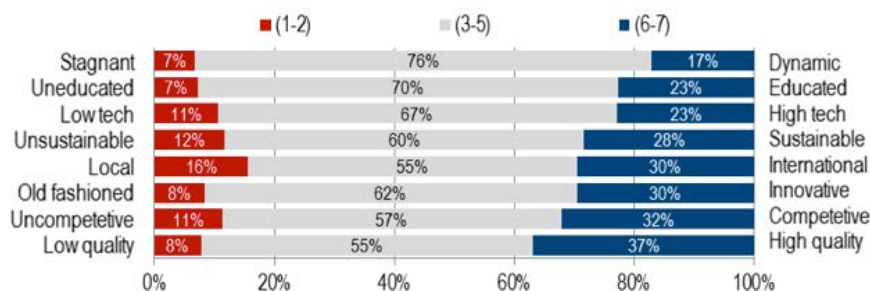


Figure 25. How would you rate the seafood industry? (8 scales)
Norway, general population

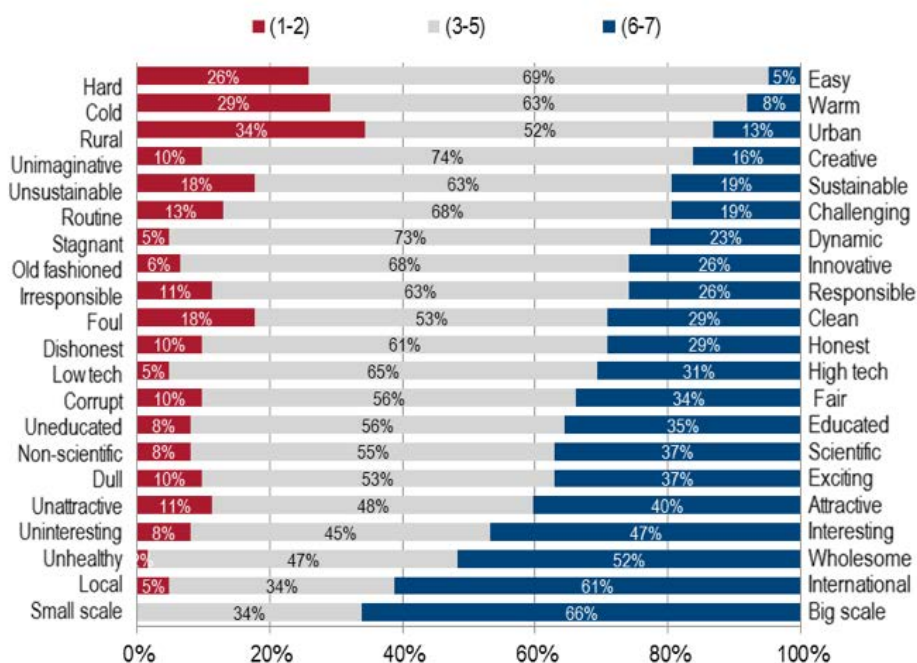


Figure 26. How would you rate the seafood industry? (21 scales)
Norway, students

Sweden

As Figure 27 shows, in Sweden 38% of the general population rated the industry as international but less than 20% rated the industry as high quality, high tech and sustainable. Between 14 and 16% rated the industry as old fashioned, uneducated and unsustainable. Among students a vast majority or four out of every five rated the industry as international, two thirds as big scale and more than half as interesting (see Figure 28). The majority of the Swedish students rated the industry as unsustainable and more than half as foul.

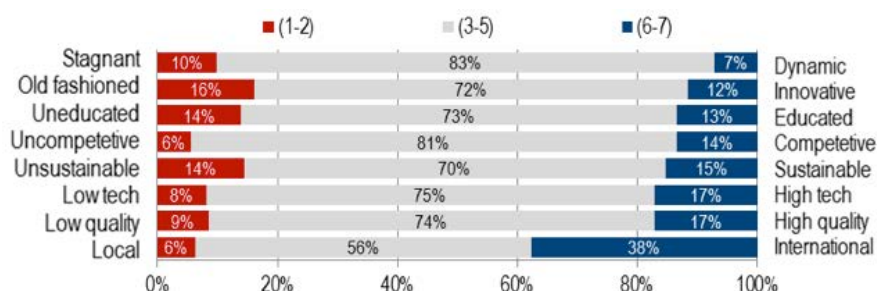


Figure 27. How would you rate the seafood industry? (8 scales)
Sweden, general population

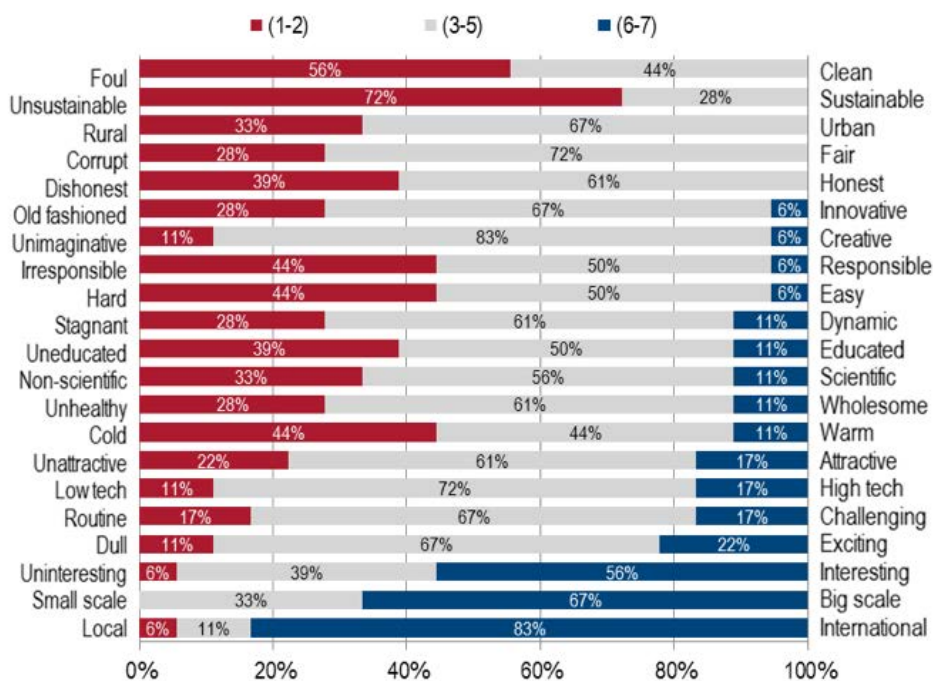
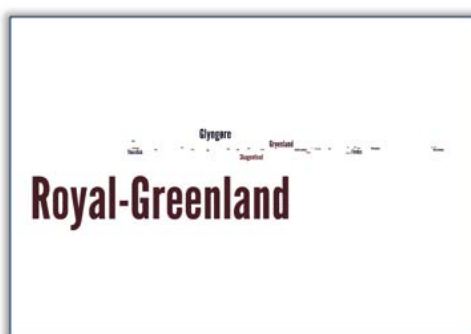


Figure 28. How would you rate the seafood industry? (20 scales)
Sweden, students

Views on career opportunities in the seafood industry

Students were asked to state the companies that came to mind when they heard the term seafood industry. Figure 29 shows the companies the students came up with in each country, as the size of the letters gets larger more students have mentioned it. The vast majority of students in Denmark thought of Royal Greenland and some mentioned Glyngøre, in Iceland Marel was the company most often mentioned followed by Matís, Hb-Grandi and Samherji. In Norway students were most likely to mention Marine-Harvest and then Salma, Findus, Lerøy and Salmar. Only 12 students in Sweden answered the question and most of them thought of Abba and Findus.

Denmark (n=72)



Iceland (n=59)



Norway (n=43)



Sweden (n=12)

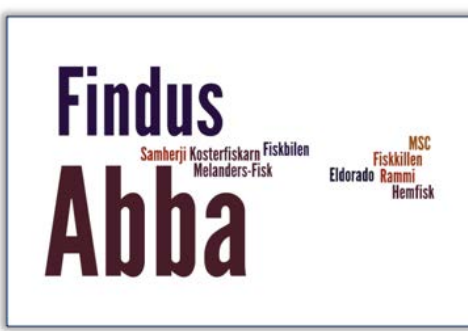


Figure 29. What kind of companies come into your mind when you hear the term seafood industry? Comparison between countries, students

Students were asked if the location of the seafood industry would hinder or encourage them to work in the sector (see Figure 31 and Appendix A Table 22). More than half of the students in Denmark did find the location hinder somewhat or a lot (55%), compared to 43% in Norway, 39% in Iceland and only 33% in Sweden. Almost 30% of respondents in Sweden believed the rural location would encourage them a lot to seek work in the seafood industry.

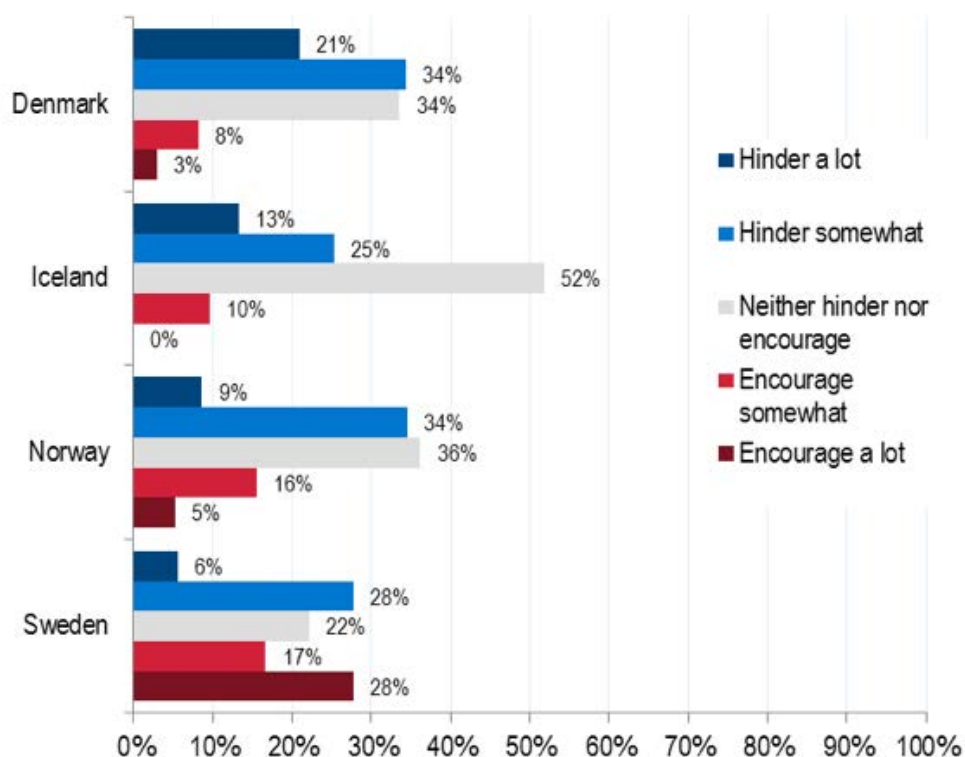


Figure 31. Seafood industries are often located in rural areas.
Would that hinder or encourage you to work in the seafood industry?
Comparison between countries, students

Students were asked about their employment and their family employment in the seafood/aquatic industry (see Figure 32 and Appendix A Table 23). The majority of students from Denmark, Norway and Sweden (between 79 and 88%) had neither worked themselves in the seafood industry nor someone in their family. Nearly 68% of the Icelandic students have personal experience of the seafood industry, either having worked in the seafood industry themselves (16.9%) or some of their family members have worked in the industry (50.6%). Around 17% of the Icelandic students had worked themselves in the seafood industry and more than half of them said someone in their family has worked in the sector.

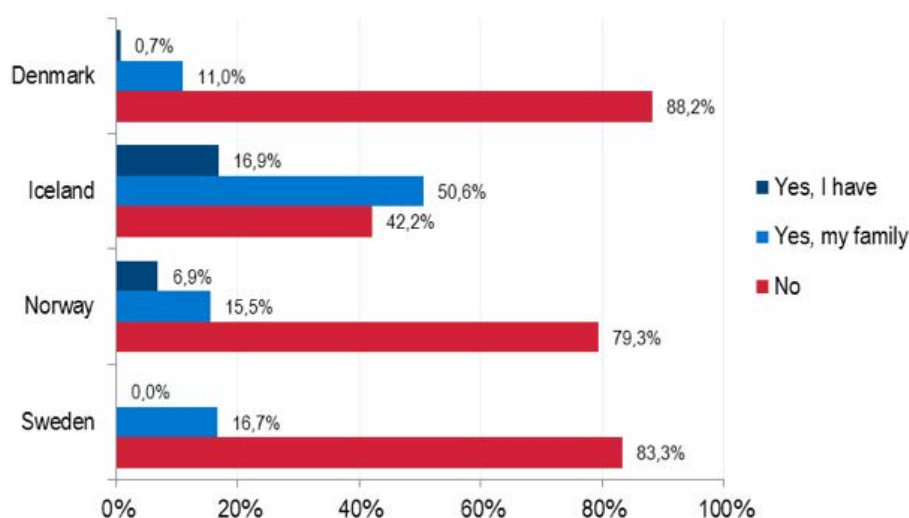


Figure 32. Have you or someone in your family ever worked in the seafood/aquatic food industry? (Students could tick all that applied to them, therefore the sum of percentage exceeds 100%)

Students were asked how interested they would be to work in certain areas related to the aquatic food industries. On the whole students were most likely to be interested in working in innovative technology, innovation, product development and laboratory research (see Appendix A Table 24-42).

Denmark

Table 2 shows that the Danish students were very or somewhat interested in working in innovative technologies (72%), innovation (64%), product development (59%) and laboratory and research on aquatic food (54%). More than 80% of the Danish students were not very interested or not at all interested in working in operation of fisheries, production in an aquaculture farm or fish inspection.

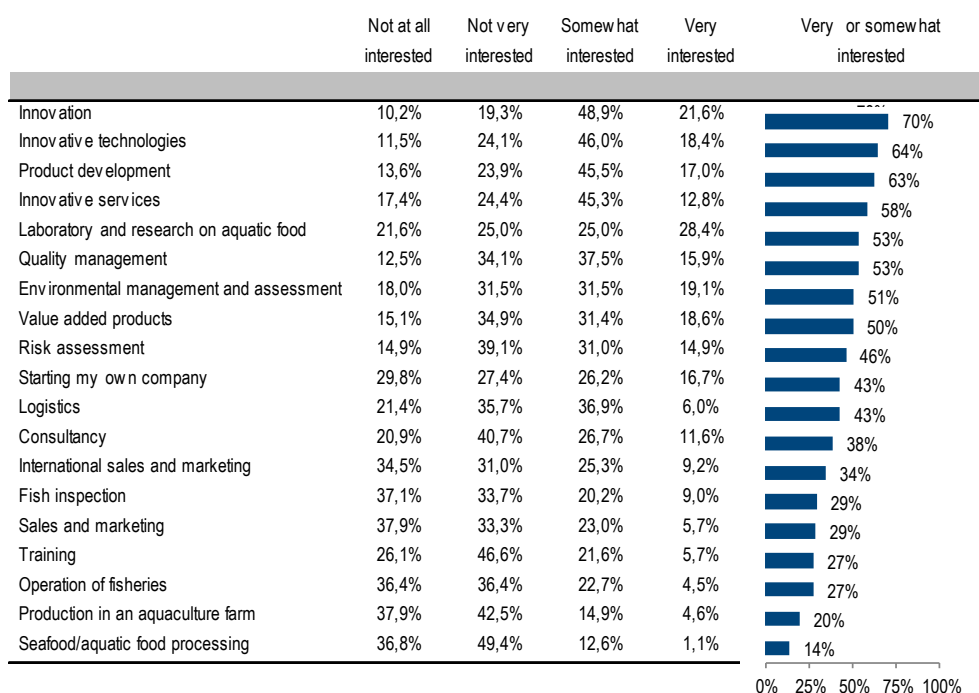
**Table 4. How interested would you be to work in...?
Answers from students in Denmark**

	Not at all interested	Not very interested	Somewhat interested	Very interested	Very or somewhat interested
Innovative technologies	10,8%	17,3%	56,1%	15,8%	72%
Innovation	15,2%	20,3%	43,5%	21,0%	64%
Product development	20,1%	20,9%	38,8%	20,1%	59%
Laboratory and research on aquatic food	27,5%	18,8%	36,2%	17,4%	54%
Innovative services	19,4%	27,3%	42,4%	10,8%	53%
Consultancy	21,9%	26,3%	36,5%	15,3%	52%
Environmental management and assessment	23,2%	28,3%	37,0%	11,6%	49%
Value added products	20,1%	32,4%	28,1%	19,4%	47%
Quality management	25,9%	27,3%	35,3%	11,5%	47%
Risk assessment	29,0%	26,1%	25,4%	19,6%	45%
International sales and marketing	31,4%	27,9%	29,3%	11,4%	41%
Sales and marketing	35,0%	27,1%	30,0%	7,9%	38%
Logistics	32,4%	33,1%	27,3%	7,2%	35%
Seafood/aquatic food processing	44,2%	28,3%	18,8%	8,7%	28%
Starting my own company	46,4%	26,1%	21,7%	5,8%	28%
Training	33,1%	39,7%	19,1%	8,1%	27%
Fish inspection	56,5%	27,5%	10,9%	5,1%	16%
Production in an aquaculture farm	51,4%	33,3%	13,0%	2,2%	15%
Operation of fisheries	54,3%	30,4%	13,8%	1,4%	15%

Iceland

In Iceland students were very or somewhat interested in working in innovation (70%), innovative technologies (64%), product development (63%) and innovative services (58%) (See Table 4). Almost 90% of the Icelandic students were not very interested or not at all interested in working in seafood or aquatic food processing, 80% in production in an aquaculture farm or fish inspection and more than 70% in operation of fisheries

Table 5. How interested would you be to work in...?
Answers from students in Iceland.

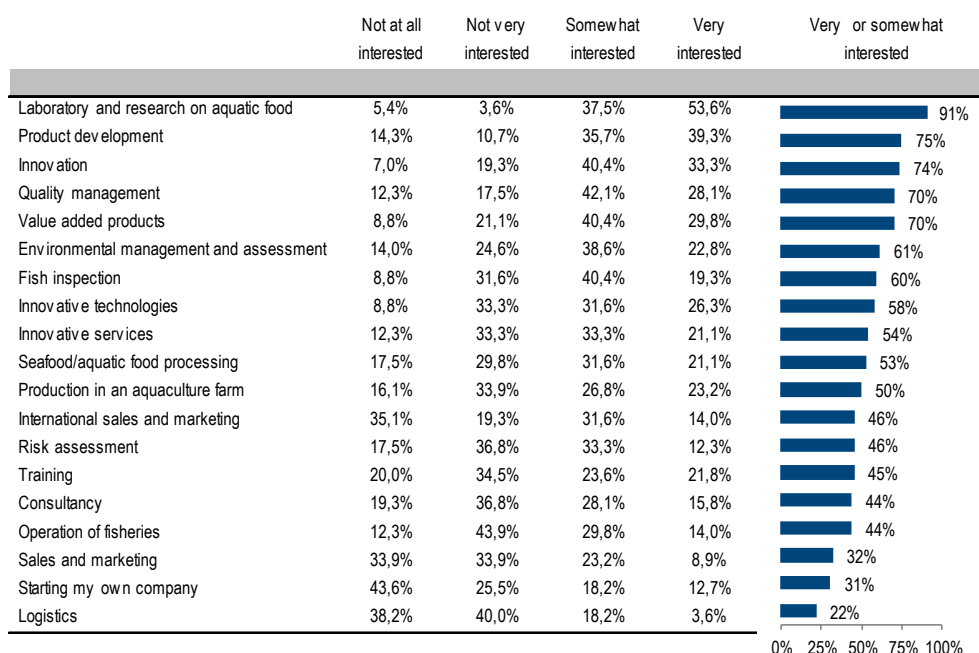


Norway

Table 5 shows that the vast majority of the Norwegian students were very or somewhat interested in working in laboratory and research on aquatic food (91%), three out of four in product development and innovation and 70% in quality management and value added products.

Almost 80% of the Norwegian students were not very interested or not at all interested in working in logistic, 68% in starting their own company and 67% in sales and marketing.

**Table 6. How interested would you be to work in...?
Answers from students in Norway**

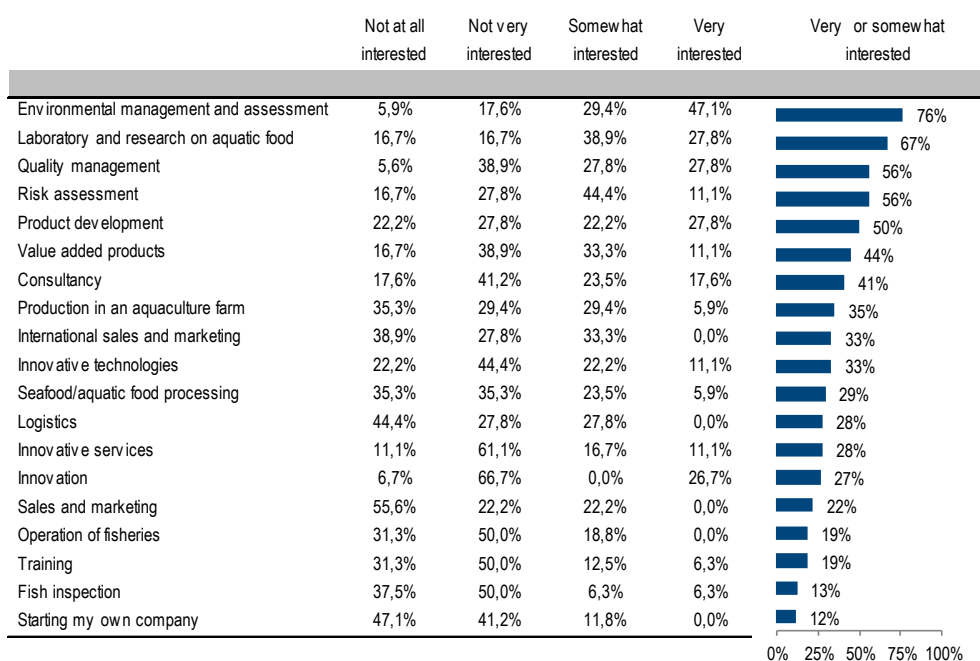


Sweden

One out of four Swedish students is very or somewhat interested in working in environmental management and assessment and two thirds in laboratory and research on aquatic food (see Table 6).

Almost 90% of the Swedish students were not very interested or not at all interested in starting their own company or working in fish inspection.

Table 7. How interested would you be to work in...?
Answers from students in Sweden



Views on education

To obtain students' views on education they were asked why they chose their subject, if they had career plans and if they were interested in taking another study when they had finished their current programme. Furthermore they were asked if they had heard about the AQFood programme, if they were interested in enrolling in the programme and what would make the programme more or less interesting.

Subjects of interest

Students were asked to assess 13 statements about why they had chosen the subject of degree they were enrolled in as true or false. Most of the students (93-95%) in all countries said they were interested in the content of the subject (see Figure 33 and Appendix A Table 43). Between 61 and 65% of students in Denmark and Iceland said that it would lead to good employment opportunities in general and between 40 and 45% of students in Norway and Sweden shared that view.

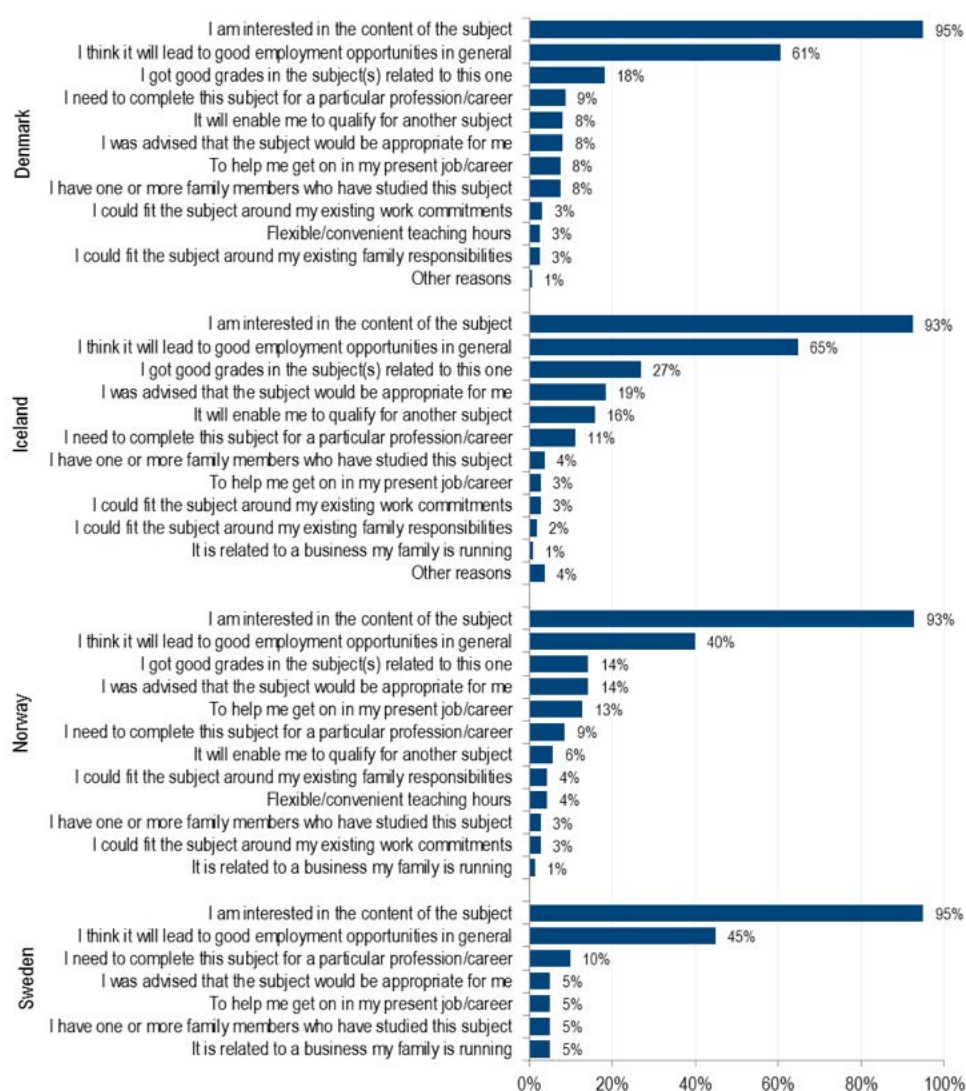


Figure 33. Why did you choose the subject of the degree you are currently enrolled in? (Students could tick everything that applied to them)

It differed between countries whether students intended to take another study or qualification after graduation (see Figure 34 and Appendix A Table 45). Almost two thirds (65%) of the Icelandic students stated they would definitely take another study or qualification compared to only 30% of the Norwegian students, 20% of the Danish students and only 11% of the Swedish students.

On the other hand, half of the Swedish students, almost 40% of the Danish and almost 30% of the Norwegian students felt they would not take another study compared to 7% of the Icelandic students.

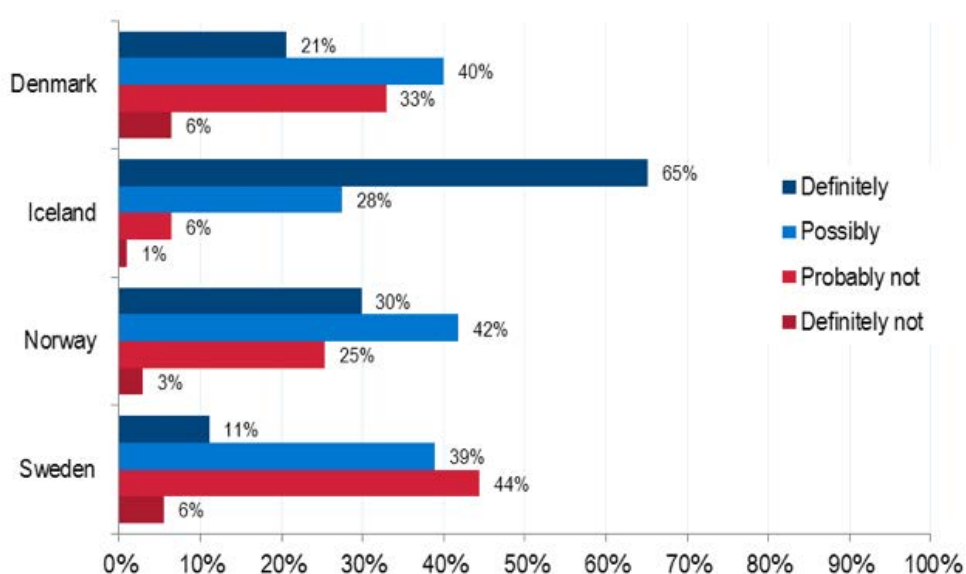
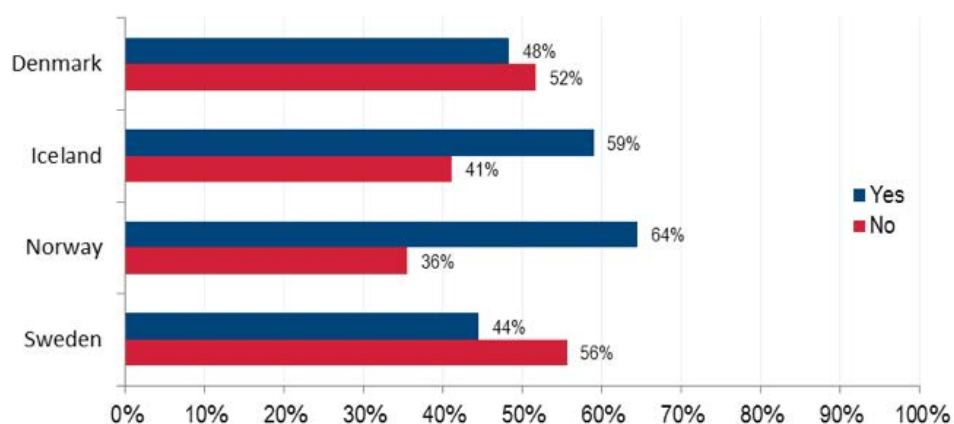


Figure 34. Do you intend to take another study or qualification after you graduate from your current study? Comparison between countries, students

The students who stated they would definitely or possibly take another study or qualification were asked if they had decided what they were going to study. Almost two thirds of students in Norway had decided what to study, 60% of students in Iceland and nearly half of the students in Denmark. Only 44% of students in Sweden had decided what to study (see Figure 35 and Appendix A Table 46).



**Figure 35. Have you decided what you are going to study?
Comparison between countries, students**

As Table 7 displays it was varied between countries what subject students were going to study. In Denmark 20% of students planned to study Biotechnology, in Iceland 26% of students wanted to study Electrical and Computer Engineering and 35% of the Norwegian students planned to study Food science/technology. Only two Swedish students answered this question. This difference can to a large extent be explained with reference to the students' present subject of study that differs from one country to the other.

Table 7. What are you going to study? Students

	Number of students	Percent
Denmark	35	
Aquaculture	1	3%
Biology and Environmental Science	3	9%
Biotechnology	7	20%
Economy	1	3%
Civil and Environmental Engineering	4	11%
Chemistry	2	6%
Electrical and Computer Engineering	5	14%
Mathematics	1	3%
MBA	4	11%
Pharmatechnology	4	11%
Physical sciences	1	3%
Technical biomedicine	2	6%
Wind energy	1	3%
Iceland	43	
Biology and Environmental Science	5	12%
Chemistry	1	2%
Civil and Environmental Engineering	4	9%
Ecology	1	2%
Electrical and Computer Engineering	11	26%
Geography	3	7%
Ichthyology	1	2%
Industrial Engineering, Mechanical Engineering and Computer Science	2	5%
Marketing	2	5%
Mathematics	2	5%
Medicine	3	7%
Pedagogy	1	2%
Physical Sciences	3	7%
Technical biomedicine	2	5%
Technical Biomedicine	2	5%
Norway	20	
Aquaculture	1	5%
Biology and Environmental Science	2	10%
Biotechnology	1	5%
Biotechnology	2	10%
Chemistry	2	10%
Economy	1	5%
Food science/technology	7	35%
Pedagogy	3	15%
Technical Biomedicine	1	5%
Sweden	2	
Economy	1	50%
Ecology	1	50%

Students were asked how clear or unclear an idea they had of their long-term career plan. Around 45% of students in Denmark and Iceland had a very or somewhat clear idea of their career plan compared to only 20% of students in Sweden (see Figure 36 and Appendix A Table 44). Between 19 and 24% of students all over stated they had neither a clear nor an unclear idea about their career plans.

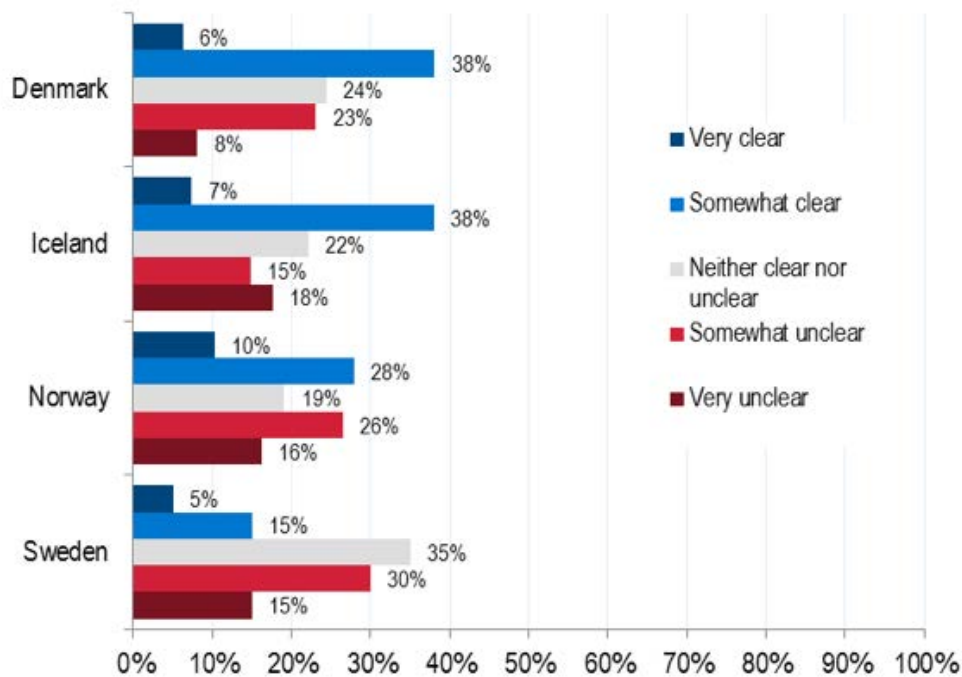


Figure 36. How clear or unclear an idea do you have of your long term career plan? Comparison between countries, students

Students were asked to assess 17 statements regarding motivation in choosing their professional career. In Figure 37 the eight most common statements are listed by country. The vast majority of students in all countries is motivated by their interest in the subject matter (90-95%) and between 61-70% is motivated by job security. Around 67% of students in Denmark and 61% in Iceland are motivated by tasks that challenge their abilities compared to 53% in Norway and 45% in Sweden. In Iceland and Sweden 60-63% of respondents are motivated by being able to work globally compared to around half of the students in Norway and Denmark (Figure 37 and Appendix A Table 47).

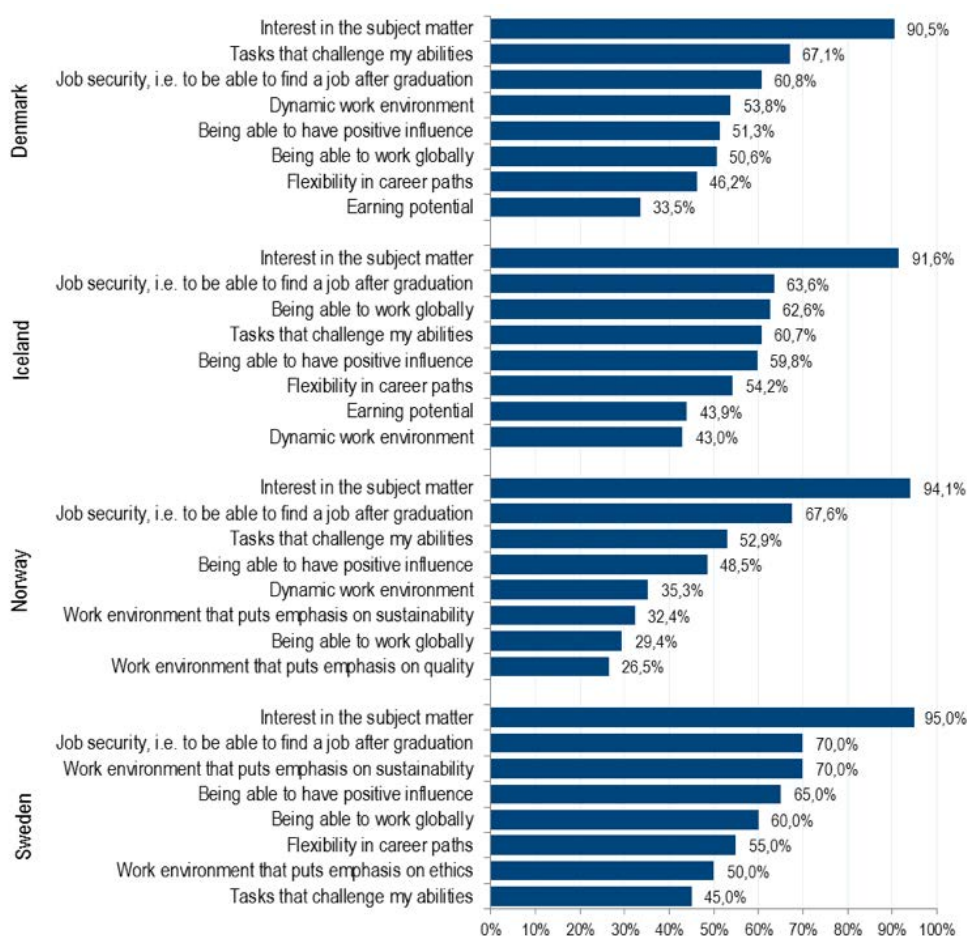


Figure 37. What motivates you in terms of choosing your future professional career? Eight most common statements en each country

AQFood programme

Figure 38 shows that the majority of students in the four countries had not heard about the AQFood programme. Between 12 and 14% of students in Iceland, Norway and Denmark had heard about it but only 5% of students in Sweden (see Appendix A Table 48). Students who had heard about the programme were also asked where they heard about it. Usually students heard about it in the university, from friends or family or somebody who was enrolled in the programme. Some found out on the internet or by posters or flyers.

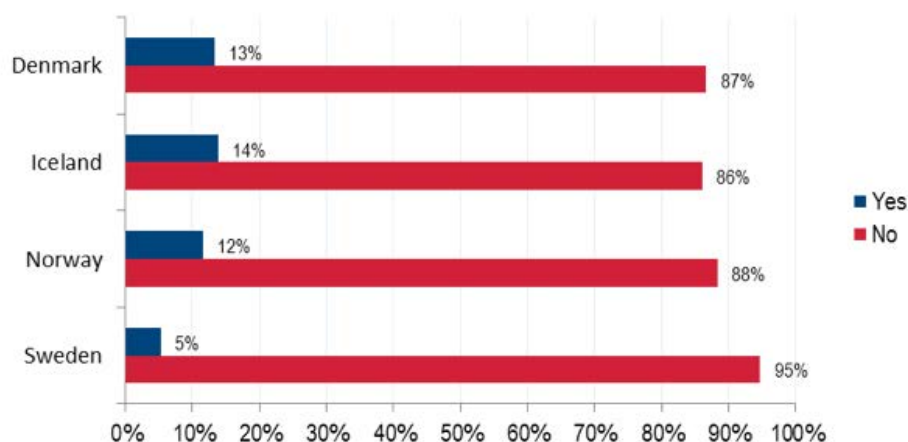


Figure 38. Have you heard about this programme?
Comparison between countries, students

Students were asked if they would consider enrolling in the programme and 8% of the Norwegian students stated they would definitely consider enrolling in this programme, around 6% of the Swedish students and 2% of the Icelandic students. About 80% of the Danish students stated they would probably not or definitely not consider enrolling in this programme (see Figure 39 and Appendix A Table 49).

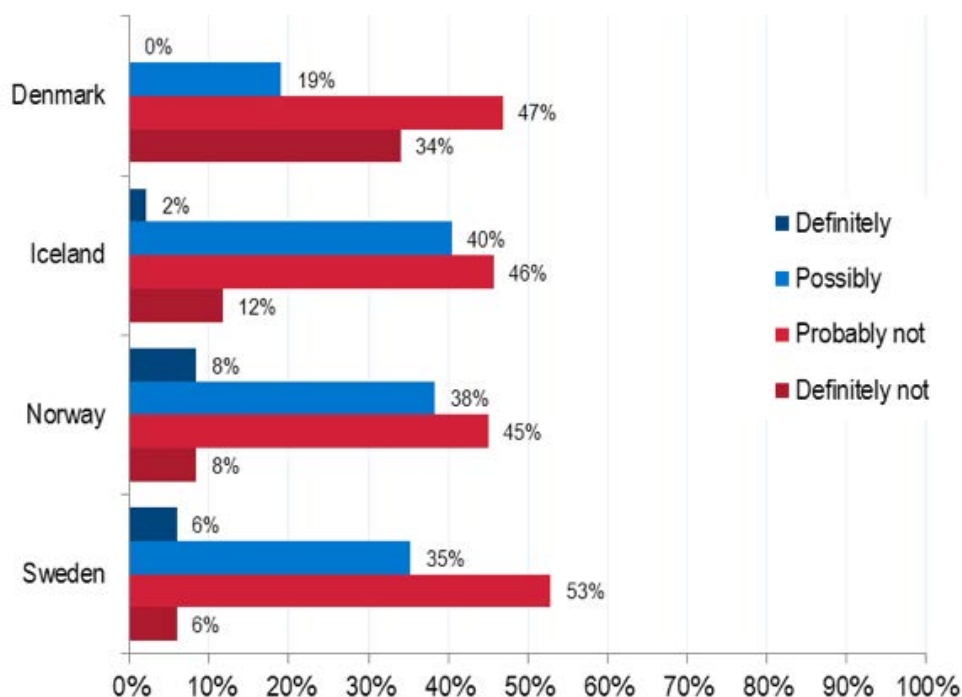


Figure 39. Would you consider enrolling in this programme?
Comparison between countries, students.

Students were asked to rate the programme on thirteen statements whether they made the programme more or less interesting (see Figures 26-29 and Appendix A Table 50-62). Most students thought that it makes the programme much more interesting if it emphasizes how to enhance sustainability and minimize waste, if it is about full utilization of valuable natural resources and if it is about sustainability.

Denmark

The majority of students in Denmark (76%) thought that it makes the programme somewhat or much more interesting that it requires mobility (i.e. have to study in two Nordic countries) and 65% that it emphasizes how to enhance sustainability and minimize waste (see Figure 40). More than half of the Danish students find it interesting that the programme is about full utilization of valuable natural resources, sustainability and deals with the impact of food production on the environment.

Almost 60% of the Danish students thought that it makes the programme somewhat or much less interesting that it is about fisheries and half of them find it less interesting that it prepares for a career in the seafood/aquatic food industry.

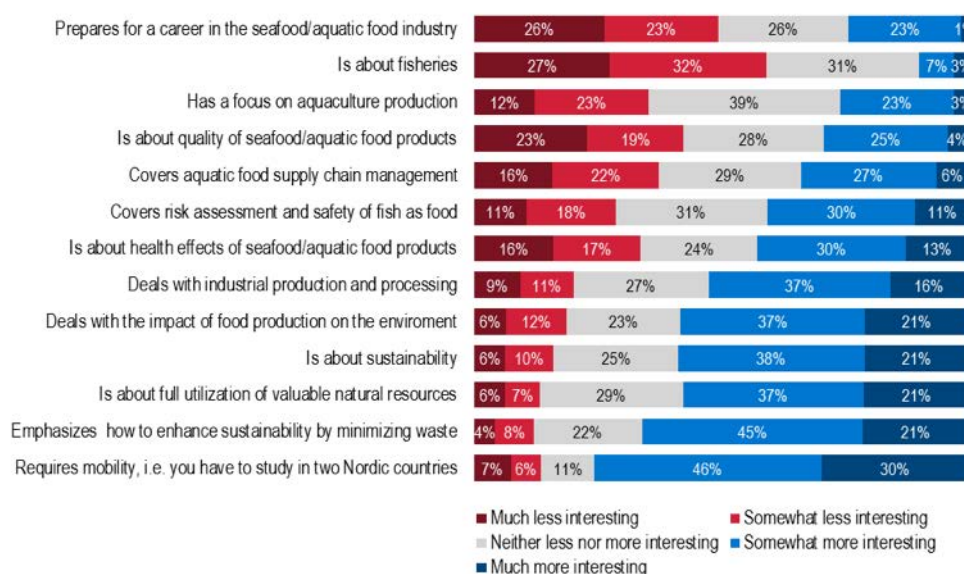


Figure 40. Do you think that it makes the programme more or less interesting that it....? (13 statements) Denmark

Iceland

Figure 41 shows that more than one third of the Icelandic students thought it makes the programme much more interesting that it emphasizes how to enhance sustainability by minimizing waste and about one third that it is about full utilization. About 77% of the Icelandic students found it interesting that the programme requires mobility (i.e. have to study in two Nordic countries).

More than 40% of the Icelandic students thought that it makes the programme somewhat or much less interesting that it prepares for a career in the seafood/aquatic food industry and 30% of them found it less interesting that it is about fisheries.

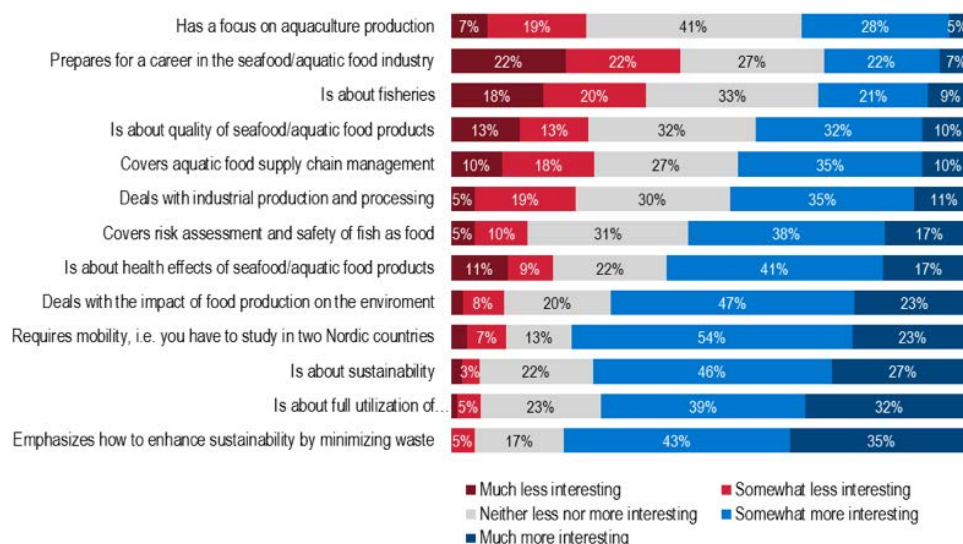


Figure 41. Do you think that it makes the programme more or less interesting that it....? (13 statements) Iceland

Norway

In Norway more than two fifths of the students (42%) thought it makes the programme much more interesting that it emphasizes how to enhance sustainability by minimizing waste and 36% that it is about health effects of seafood/aquatic products (see Figure 42). Around one third found that it made the programme much more interesting that it is about full utilization and it deals with the impact of food production on the environment.

Less than 30% of the Norwegian students thought that it makes the programme somewhat or much less interesting that it deals with industrial production and processing (still half of the students find it more interesting)

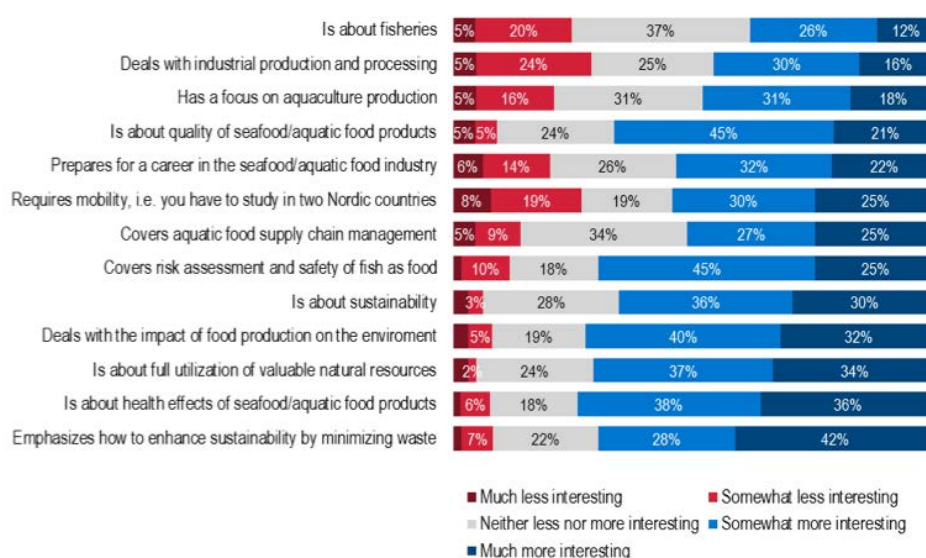


Figure 42. Do you think that it makes the programme more or less interesting that it....? (13 statements) Norway

Sweden

In Sweden the majority of the students (70-72%) thought it makes the programme much more interesting that it is about full utilization and sustainability (see Figure 43). Two thirds found it much more interesting that the programme deals with the impact of food production on the environment and 61% that it emphasizes how to enhance sustainability by minimizing waste.

Around 30% of the Swedish students thought it makes the programme somewhat or much less interesting that it prepares for a career in the seafood industry and 25% that it requires mobility (still more than half of the students found it more interesting).

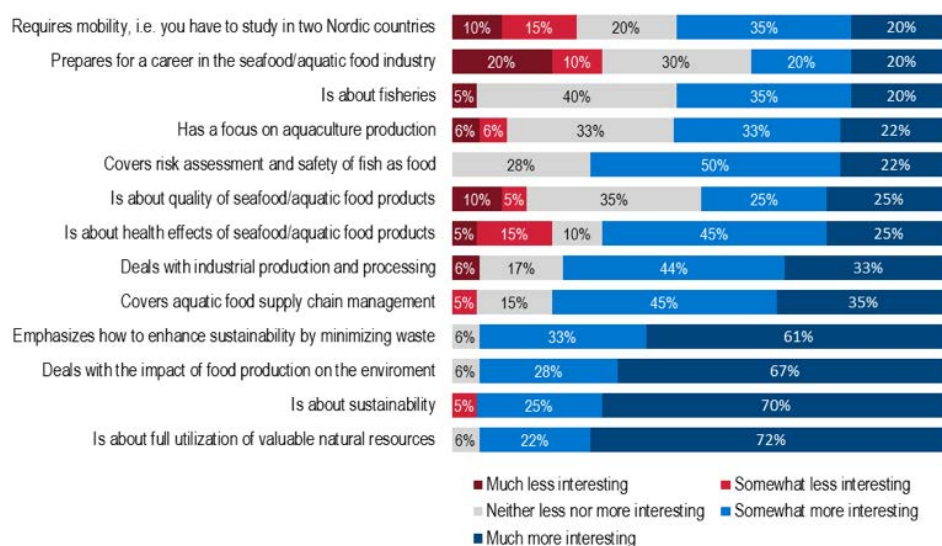


Figure 43. Do you think that it makes the programme more or less interesting that it....? (13 statements) Sweden

InTerAct

Industry - Academia

Interaction in the Marine Sector

Appendix

Appendix A	Questionnaire – Students - Results
Appendix B	Survey – General population – Results
Appendix C	Questionnaire - Students
Appendix D	Survey – General public
Appendix E	Topic guide – Stakeholder interviews

Appendix A Questionnaire – Students - Results

A separate document containing analysis of all data

Available upon request from the Social Science Research Institute at University of Iceland

Contact:

Guðbjörg Andrea Jonsdóttir

e-mail: gudbjorg@hi.is

Appendix B Survey – General population - Results

A separate document containing analysis of all data

Available upon request from the Social Science Research Institute at University of Iceland

Contact:

Guðbjörg Andrea Jonsdóttir

e-mail: gudbjorg@hi.is

Appendix C Questionnaire - Students

The answers you give will be treated as confidential but as with all forms of marketing and opinion research, your co-operation is voluntary at all times. No personal information is sought from or about you, without your prior knowledge and agreement.

[All –single choice]

1. Which university do you study at?

1. Technical University of Denmark (DTU)
2. Norwegian University of Life Science (UMB)
3. Norwegian University of Science and Technology (NTNU)
4. Sør-Trøndelag University of Science and Technology (HiST)
5. Swedish University of Agricultural Sciences (SLU)
6. Other university: _____
8. Do not want to answer
9. Don't know

2. What is your main subject of study? _____

3. Why did you choose the subject you are currently enrolled in?

1. I am interested in the content of the subject
2. I think it will lead to good employment opportunities in general
3. I need to complete this subject for a particular profession/career
4. To help me get on in my present job/career
5. I could fit the subject around my existing work commitments
6. It will enable me to qualify for another subject
7. I got good grades in the subject(s) related to this one
8. I was advised that the subject would be appropriate for me
9. Flexible/convenient teaching hours

10. I could fit the subject around my existing family responsibilities

11. Other reasons: _____

98. Do not want to answer

99. Don't know

[All – single choice]

4. How clear or unclear an idea do you have of your long-term career plan?

1. Very clear

2. Somewhat clear

3. Neither clear nor unclear

4. Somewhat unclear

5. Very unclear

8. Do not want to answer

9. Don't know

[All – single choice]

5. Do you intend to take another study or qualification after you graduate from your current study?

1. Definitely

2. Possibly

3. Probably not

4. Definitely not

8. Do not want to answer

9. Don't know

[If 1 or 2 in question 6 – single choice]

6. Have you decided what you are going to study?

1. Yes, what:
2. No
8. Do not want to answer
9. Don't know

[All – multi]

7. What motivates you in terms of choosing your future professional career?

1. Job security, i.e. to be able to find a job after graduation
2. Interest in the subject matter
3. Tasks that challenge my abilities
4. Family members
5. The business my family is running
6. Gaining reputation
7. Communicating with people
8. Dynamic work environment
9. Work environment that puts emphasis on sustainability
10. Being able to have positive influence
11. Being able to work globally
12. Work environment that puts emphasis on quality
13. Earning potential
14. Flexibility in career paths
15. Work environment that puts emphasis on ethics
16. Personal strengths

17. Other, what _____

An international master programme AQFood (<http://www.aqfood.org/>) was recently launched in cooperation between five Nordic universities. AQFood focuses on the quality, safety and sustainability of aquatic food throughout the entire production and food supply chain, linking primary production including aquaculture and wild catch with processing and distribution to the consumers.

The programme requires mobility between the participating universities, Technical University of Denmark (DTU), Norwegian University of Science and Technology (NTNU), Norwegian University of Life Science (UMB), Swedish University of Agricultural Sciences (SLU) and University of Iceland (UoI).

[All – single choice]

8. Have you heard about this programme?

1. Yes
2. No
8. Do not want to answer
9. Don't know

[All – single choice]

9. Would you consider enrolling in this programme?

1. Definitely
2. Possibly
3. Probably not
4. Definitely not
8. Do not want to answer
9. Don't know

10. Do you think that it makes the programme more or less interesting that it:

	Much more interesting	Somewhat more interesting	Neither more nor less interesting	Somewhat less interesting	Much more interesting	Do not want to answer	Don't know
Requires mobility, i.e. you have to study in two Nordic countries							
Prepares for a career in the seafood industry							
Is about quality of fish products							
Is about health effects of fish products							
Is about fisheries							
Is about sustainability							
Covers aquatic food supply chain management							
Deals with industrial production and processing							
Has a focus on aquaculture production							
Deals with the impact of food production on the environment							
Covers risk assessment and safety of fish as food							
Is about full utilisation of valuable natural resources							
Emphasises how to enhance sustainability by minimising waste							

11. What kind of companies come to your mind when you hear the term seafood industry?

12. How would you rate the seafood industry on the following scales? (7 p scale)

Interesting	-	-	-	-	-	Uninteresting
Attractive	-	-	-	-	-	Unattractive
Old fashioned	-	-	-	-	-	Innovative
Dynamic	-	-	-	-	-	Stagnant
High tech	-	-	-	-	-	Low tech
Educated	-	-	-	-	-	Uneducated
Scientific	-	-	-	-	-	Non-scientific
International	-	-	-	-	-	Local
Clean	-	-	-	-	-	Foul
Rural	-	-	-	-	-	Urban
Wholesome	-	-	-	-	-	Unhealthy
Irresponsible	-	-	-	-	-	Responsible
Fair	-	-	-	-	-	Corrupt
Fraudulent	-	-	-	-	-	Honest
Sustainable	-	-	-	-	-	Unsustainable
Stinking	-	-	-	-	-	Clean
Cold	-	-	-	-	-	Warm
Hard	-	-	-	-	-	Easy
Exciting	-	-	-	-	-	Dull
Routine	-	-	-	-	-	Challenging
Creative	-	-	-	-	-	Unimaginative
Big scale	-	-	-	-	-	Small scale

Career opportunities in the seafood industry include various jobs in the overall aquatic food value chain and related services (see below).



13. How interested would you be to work in:

	Very interested	Somewhat interested	Not very interested	Not at all interested	Do not want to answer	Don't know	Don't know
Production in an aquaculture farm							
Operation of fisheries							
Seafood processing							
Local sales and marketing							
International sales and marketing							
Logistics in the aquatic food value chain							
Product development							
Laboratory and research on aquatic food							
Innovation							
Entrepreneurship							
Fish inspection							
Innovative services for the aquatic food value chain							
Innovative technologies for the aquatic food value chain							
Value added products (health food and pharmaceuticals and nutraceuticals)							
Training in the aquatic food value chain							
Environmental management							
Environmental assessment							
Consultancy for the aquatic food value chain							
Quality management							
Risk assessment							

[All – single choice]

14. Seafood industries are often located in rural areas. Would that hinder or encourage you to work in the seafood industry?

1. Hinder a lot
2. Hinder somewhat
3. Neither hinder nor encourage
4. Encourage somewhat
5. Encourage a lot
8. Do not want to answer
9. Don't know

[All – multiple choice]

15. Have you or someone in your family ever worked in the seafood industry?

1. Yes, I work or have worked in the seafood industry
2. Yes, my family has worked or works in the seafood industry
3. No
8. Do not want to answer
9. Don't know

Background variables: gender, age, nationality, marital status, no of children etc.

Appendix D Survey – General population

1. What is the first thing that comes to mind when you hear the term seafood industry? (Please, state only one topic) [Open answer]

2. Please, state one positive aspect of the seafood industry
(Please, be as specific as possible)

[Open answer]

3. Please, state one negative aspect of the seafood industry
(Please, be as specific as possible)

[Open answer]

4. How positive or negative are you towards capture fishing?

- I. Very positive
- II. Rather positive
- III. Neither positive nor negative
- IV. Rather negative
- V. Very negative

5. How positive or negative are you towards fish farming?

- I. Very positive
- II. Rather positive
- III. Neither positive nor negative
- IV. Rather negative
- V. Very negative

**6. How would you rate the seafood industry on the following scales?
(Please, select one in each row)**

	1	2	3	4	5	6	7	
Global								Local
Uneducated								Educated
Sustainable								Unsustainable
Stagnant								Dynamic
Old-fashioned								Innovative
Competitive								Uncompetitive
High tech								Low tech
Low quality								High quality

Appendix E Topic guide – Stakeholder interviews

Aim: To gather personal histories from people with certain educational background on their experiences and career. Focus on how their education has been useful and on how they perceive the need by the sector for higher education.

The interviews are semi-structured, i.e. it is more like a structured conversation with open-ended questions that the interviewer is able to follow up on or probe into in more depth if applicable. The sub-questions under each theme are examples of possible questions to cover each theme but should not (necessarily) be read out in full detail. THIS IS NOT A SURVEY INTERVIEW.

Each interview will be transcribed and analysed with a grounded theory approach, which includes rounds of open- and axial coding. This produces storylines about personal careers of people with higher education of particular sort, their experiences and attitudes when it comes to educational demands and needs of the sector, its image as well as attitudes toward industry-academia interaction. The interview material will be useful to further develop the AQFood and give potential students concrete examples of career opportunities. We will not discuss AQFood directly in the interview but present the programme shortly at the end.

INTERVIEW GUIDE

Instructions	Theme/questions	Result
Ca 10 min	1. Introduction Interviewer • Name • Organisation The procedure • Anonymity discussed – if the interviewee wishes to remain anonymous it is possible but we would like to get personal histories that may be „stronger“ if not anonymous. • No right or wrong answers • The discussion is recorded • Focus on the personal history, how the interviewee got involved in the aquatic value chain.	Introduction about the project and the procedure
Ca 15 min.	2. The interviewee • Please tell me a little about your role within the company • What is your job title? • What is your professional career within the company?> how did you get involved in this business • Could you please tell me about the operation/daily activities in your company?	To get an account of personal experience within the aquatic value chain.
Ca 15 min.	3. Education and innovation • We are interested in how your educational background has been of use for your career in the sector. Could you tell me a bit about that? • Could you describe some job opportunities for people with higher education similar to you (engineering, biotechnology etc.)? • How would you describe the educational level in the marine and aquaculture industry in general? • Is the industry (your company represents) in need of some particular type of knowledge/education? • Has your company had any collaboration with educational institutes? • What would you pinpoint as the most important educational qualifications for young people to have for entering/ being a part of this sector/your company? Innovation • How would you describe the level of innovation in the industry your company represents? • Could you name a particular company that sets the example in term of innovation/value creation? How do you think they achieve it?	To get reflections on the value or usefulness of higher education in the aquatic value chain

Interview guide

Instructions	Theme/questions	Result
Ca 10 min	4. The image of marine and aquaculture industry When I mention image associated with marine and aquaculture industry, what is the first thing that comes to your mind? • Why do you think that those issues are the ones that you first think of? • What are the strengths of the industry in terms of image? • What are the weaknesses of the industry in terms of image? • What kind of image would you want for the marine and aquaculture industry? • What measures do you think are necessary to achieve that image and which parties should be involved? • What kind of image do you think your company has in the society? >What kind of image would you want for your company? • Are there any organised activities within your company that promote its good image? • Are there any barriers for young people (with higher education) to apply for a job in the marine and aquaculture sector? • What drives/motivates people in this sector? • Which messages/stories are vital to tell people outside this sector	Image of the industry, personal perception.
Ca 10 min. Give thanks for the interview	7. Summary Presenting AQFood in general terms, leaving information material about the programme. Is there something that you would like to add in relation to what we have been talking about today? Of the things mentioned today, what are the top 3 most important things to focus on in the future – in relation to the interplay between education – image and the industry? - Why is that?	Give participants an opportunity to collect their thoughts

Table of abstract

Title: InTerAct - Industry Academia Interaction in the Marine Sector		
Nordic Innovation project number: P11073		
Author(s): Ólafsdóttir, G., Jónsdóttir, G.A., Ómarsdóttir, I.L., Tryggvadóttir, G.B., Kirkegaard, H.P., Fredriksen, M., Baron, C.P., Lekang, O.I., Rustad, T., Kiessling, A., and Bogason, S.G.		
Institutes/Companies: University of Iceland, Technical University of Denmark, Norwegian University of Science & Technology, Norwegian University of Life Science, Swedish University of Agricultural Science, EUROFISH, UMANO		
Abstract: Activities in the InTerAct project were aimed at positioning higher education with a focus on the needs of the aquatic food sector and using as a case study the new international master programme AQFood - Aquatic Food Production - Safety and Quality (www.aqfood.org). The project work included analysis of industry stakeholders to obtain their attitude towards higher education and job opportunities. Additionally, the attitude of the general public towards the seafood industry and students' views on higher education and the seafood business were explored. Methodologies of social sciences (focus groups, interviews and surveys) were applied to obtain perceptions of the position of the industry and higher education. Based on the findings an image film for the higher education was created and linked to prospects for interesting job opportunities in the aquatic food sector for students graduating from master programmes such as the AQFood (See AQFood Image Film). The research created a benchmark for the Nordic marine sector and suggested how the perceived negative external image of the sector could be improved. In contrast to the image perceived by the general public and students, the industry stakeholders described a more positive internal image. They perceived their own industry as dynamic and highly innovative with a lot of interesting job opportunities. This image should be communicated to attract young educated people to work in the sector. The results of the project are important to understand better the challenges when establishing collaboration between industry and higher education and what factors influence students' choices regarding education and future careers. In particular the results of the surveys among students in the Nordic countries indicate that their interest areas are linked to e.g. innovation, product development and sustainability, which are potential areas for collaboration between higher education programmes and the seafood industries to enhance their competitiveness. Such collaboration is an important step towards the mission to enhance innovation in the marine sector which can be realised through students' projects and the numerous opportunities that have been identified for industry and academia collaboration.		
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