

International Experience with Seafood Industry Education: Approaches, Challenges, and Lessons

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Over the past six months I have been working on a study of international experience with seafood industry education and training.

- The study is funded by a generous grant from the Rasmuson Foundation.
- The purpose of the project is to review international experience with seafood industry education and training for models and experience which might be relevant to Alaska.
- I have focused on places with fisheries similar to Alaska, and with programs which appeared potentially relevant, including Newfoundland, Iceland, Norway, Scotland, Australia and New Zealand.
- This presentation summarizes key findings from a report I am preparing for the Rasmuson Foundation.

Selected programs reviewed for this study

Country	Organization	Program
Norway	University of Tromsø	Master of International Fisheries Management
Iceland	University of Akureyri	Bsc in Fisheries Sciences
Scotland	University of Stirling	Master of Science in Aquaculture Business Management
	St. Andrews University	Certificate in Sustainable Aquaculture
Australia	Australian Maritime College	Bachelor of Applied Science (Marine Environment)
	University of Wollongong, Australian National Centre for Ocean Resources & Security (ANCORS)	Master of Fisheries Policy Professional short courses: Fisheries management
New Zealand	Seafood Industry Training Organization	Seafood ITO Training Programs

Outline

1. Definitions of terms
2. General observations
3. Seafood industry vocational training
4. Seafood industry academic or “higher” education (bachelors and masters programs)

1. Definitions of Terms

I use these terms to distinguish between seafood industry and fisheries.

- Seafood industry. Every part of the seafood value chain from the water to the consumer. In Alaska, the industry is dominated by commercial fishing and processing. (In many countries, it is dominated by aquaculture.)
- Seafood industry education. Education of training for jobs or careers in the seafood industry.
- Fisheries education. Education and training about fisheries science and fisheries management.
- Fisheries programs. Programs with the word “fisheries” in their title.
- Note that:
 - *Seafood industry education* overlaps with but is not identical to *fisheries education*.
 - *Fisheries programs* may, but don’t necessarily, engage in *seafood industry education*.

2. General Observations

What can Alaska learn from other places?

- No other place or program offers a perfect model for Alaska seafood industry education.
 - Different types of fisheries and seafood industries
 - Different educational systems
 - Different societies
- But Alaska can still learn a lot from other places:
 - Approaches to seafood industry workforce development
 - University program design
 - University course design
- Recommendations:
 - Alaskans involved in seafood industry education should visit selected international programs
 - We should invite people from selected programs to visit Alaska to talk about how they approach seafood education and training
 - We should consider hosting an international workshop on seafood industry education and training

Training and license requirements for seafood industry jobs greatly affect demand for formal seafood industry education and training.

- Many countries have far stricter requirements than Alaska for training and licenses in both commercial fishing and fish processing
- These requirements generate much higher demand for seafood industry education and training
- Differences in training and license requirements limit the relevance for Alaska seafood industry education of approaches to:
 - Seafood industry education in other countries
 - Education and training for other industries
- More training and license requirements are not necessarily the answer
 - The Alaska seafood industry is worried that *opportunities for training* (a good thing) can too easily turn into *requirements for training* (a bad thing).

Industry involvement is critical for effective seafood education industry education and training.

- Relevance of education and training
- Hands on experiences:
 - Field experiences
 - Facilities
 - Internships
- Accommodating needs of students working in industry
- Student recruitment
- Employment opportunities for graduates

Seafood industry workforce development faces significant challenges.


- Apparent worldwide decline in interest in fishing and processing careers, reflecting:
 - Relatively low pay, long hours, hard work, difficult work environment
 - Declining social status of seafood industry
- This decline is reflected in:
 - Growing dependence in developed countries on non-local and foreign workers
 - Declining enrollment in many seafood education and training programs
- Market research is critical for seafood education programs!
 - We can't assume that "if we offer it they will come"

Seafood industry education and training is changing.

- Changes reflect both changing demand and changing technologies
- Distance education is expanding and changing
 - Synchronous video-conferencing
 - Synchronous internet-based
 - ↓
 - Asynchronous internet-based
- Problems with distance education
 - Laboratory courses
 - Personal interactions with faculty and other students
- Advantages of distance education
 - Meets needs of mature, place-based and working students
- Modular education and short courses can also meet these needs

Seafood industry education and training is increasingly global.

- Both Auburn University and St. Andrews University offer distance education programs in *aquaculture* which are marketed globally
- Inevitably, similar programs will develop oriented towards seafood industries based on wild fisheries

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Careers

Aquaculture – For students interested in the farming of aquatic animals. Course offerings include: Principles of Aquaculture, Hatchery Management, Aquaculture Production, Introduction to Fish Health, Facilities for Aquaculture, Fisheries and Aquaculture Extension Methods, Seafood Processing, Water Sciences and Principles of Agribusiness.



Aquatic Resource Management – For students interested in assessment and management of the flora and fauna of aquatic environments. Course offerings include: Limnology, Ichthyology, Management of Small Impoundments, Fisheries Biology and Management, Genetics, Marine Ecology, Wetland Biology and Population Ecology.

Fisheries Management – For students interested in the management of fish populations in reservoirs, rivers and streams to improve recreational fishing. Course offerings include: Management of Small Impoundments, Genetics, Conservation Biology, Hatchery Management, and Fisheries Biology and Management.



Fisheries Pre-Professional – The Pre-Professional option provides students with a strong foundation in the biological and physical sciences as well as Fisheries Sciences and satisfies requirements for Auburn's College of Veterinary Medicine or other professional schools.

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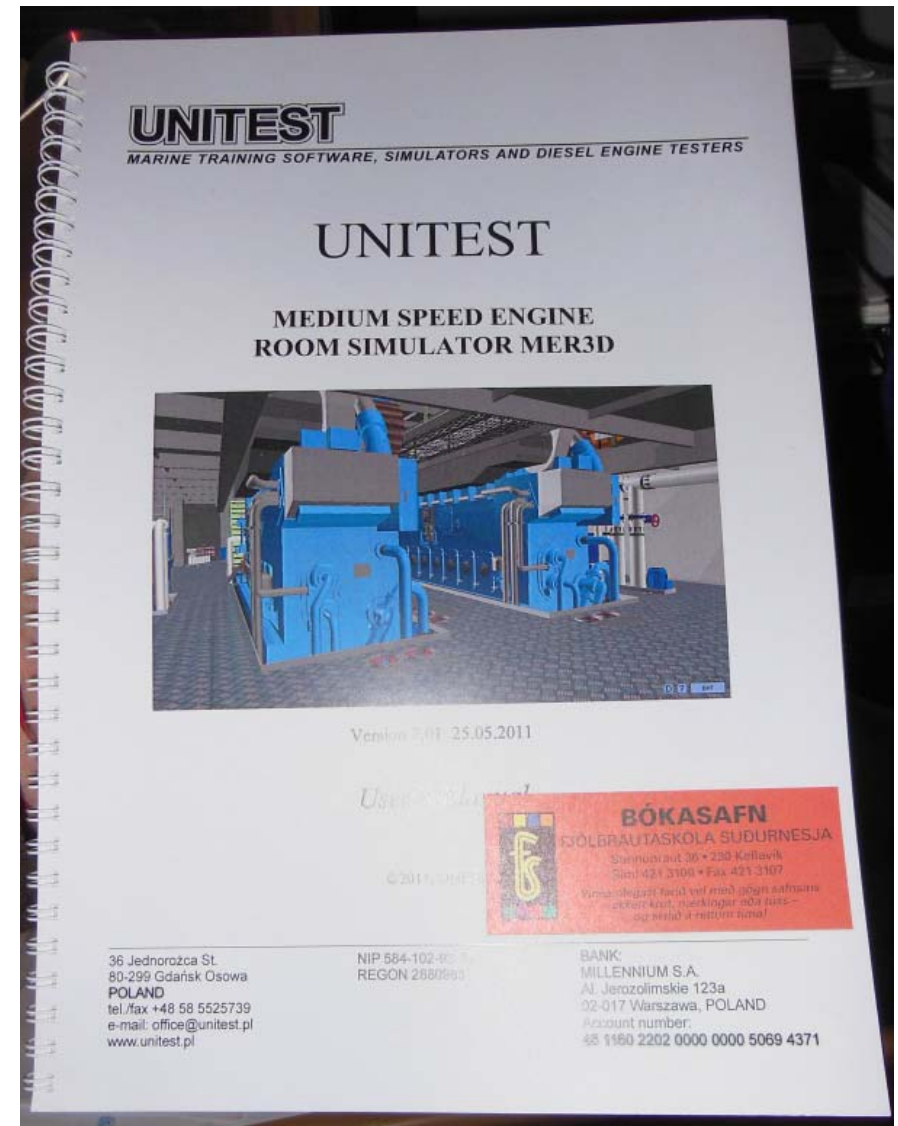
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3. Seafood industry vocational training

High school programs can work.



I visited a high school in Iceland with a popular vocational program in engine maintenance for fishing vessels.



Bridgeport Regional Aquaculture Science & Technology EDUCATION CENTER

BRIDGEPORT PUBLIC SCHOOLS

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Welcome To Aqua!



The Aquaculture Center serves a community of diverse students with a broad range of social, economic, cultural and ethnic backgrounds who bring to the school a variety of skills, talents and learning styles. We offer students from school systems in the greater Bridgeport region the opportunity to enhance the traditional academic high school curriculum with a specialized emphasis on science and technology instruction as related to the development of aquaculture in the State of Connecticut.

Countries such as Australia and New Zealand have very structured approaches to seafood industry vocational training.

- Industry, educational providers and government have worked together to define “*qualifications*”—what people in industry need to know as they advance in their careers, and what educational providers need to teach.
- Both employers and prospective and current employees have a clear understanding of this “qualification system.”
- Students have incentives to undertake training to advance through the qualification system—including opportunities for promotion and (sometimes) greater pay.
- *Trainers* provide training in the skills needed to meet unit standards.
- *Assessors* assess trainees' skills and knowledge against unit standards.
- Government reimburses students for all or part of the training towards qualifications provided by accredited providers—both public and private.

Website of the New Zealand Seafood Industry Training Organization



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Check out the career options
for trainees

There's a place for you in our industry

The stories you could tell!

assessors & training providers

Industry training is a great way to learn new skills while you are still working. You don't incur any student debt and you can be formally recognised for the skills you may already have, and gain new ones that are relevant to your job.

Seafood ITO can show you how to get the right industry training for your staff – in the workplace or at a training establishment. We provide all the support you need to do this and provide training for your workplace trainers and assessors too.

Ensuring people in the seafood industry have access to and consistently receive high-quality training is our top priority. We work in partnership with training providers and assessors as well as employers and trainees to achieve this.

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From the website of the
New Zealand Seafood Industry Training Organization . . .

Seafood Risk Management qualifications

Having a qualification in seafood risk management recognises the skill and knowledge of people who are engaged in day-to-day legislative compliance for seafood vessel operations.

The seafood risk management qualifications, which are nationally recognised, are based on unit standards which are the building blocks of the qualification. Each unit standard is specifically designed to recognise what you need to know and be able to do to support your role within the industry.

The following National Certificates (qualifications) are currently available in Seafood Risk Management:

- ✓ [National Certificate in Seafood Risk Management \(Processing Quality\) \(Level 3\)](#)
- ✓ [National Certificate in Seafood Risk Management \(Processing Quality\) \(Level 4\)](#)
- ✓ [National Certificate in Seafood Risk Management \(Vessel Operations Compliance\) \(Level 4\)](#)
- ✓ [National Certificate in Seafood Risk Management \(Vessel Operations Compliance\) \(Level 5\)](#)
- ✓ [National Certificate in Seafood Risk Management \(Vessel Operations Compliance\) \(Level 6\)](#)

National Certificate in Seafood Risk Management (Processing Quality) (Level 3)

Level 3

Credits 40

Purpose

The purpose of this qualification is to recognise the seafood risk management skills and knowledge of a person working in the seafood processing sector of the seafood industry. Holders of this qualification will also be able to demonstrate a range of processing quality skills and knowledge in seafood processing.

NZQF NQ Ref 1647

Version 1

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ID	Title	Level	Credit
21980	Demonstrate knowledge of the processing sector of the New Zealand seafood industry	3	5
25942	Carry out seafood product checks and complete the documentation required for receiving and dispatching product	3	5
25947	Describe micro-organisms, microbiological contamination, and cleaning and sanitation verification, in a seafood plant	3	10

Agriculture, Forestry and Fisheries > Seafood > Seafood Risk Management

ID	Title	Level	Credit
12315	Supervise a seafood processing operation under a Hazard Analysis Critical Control Point system	4	10

Studying seafood industry vocational training in countries such as New Zealand could be helpful in planning for Alaska seafood industry workforce development.

- It is unlikely the Alaska seafood industry would adopt such a highly structured approach to seafood industry vocational training
- But it could be useful to study:
 - how New Zealand and other countries have formally defined seafood industry occupational training needs
 - the training programs they have developed to meet these training needs
 - The system of separate *assessors* and *training providers*
- Extremely detailed information about these seafood industry training systems is available on the internet.

All is not well in seafood industry vocational training
in countries like New Zealand

ABOUT SEAFOOD ITO

As of 1 August 2012 the Seafood ITO has merged with the New Zealand Industry Training Organisation (Dairy Manufacturing and Meat Processing sectors). From this date the seafood industry will be served under the NZITO banner

This website (available either through www.sito.org.nz or www.seafoodito.co.nz) will continue to operate for the seafood industry until full integration can occur.

Training programs face significant challenges
due to lack of demand for training.

4. Seafood industry academic or
“higher” education (bachelors and
masters programs)

In the countries I studied, I did not find academic programs focused primarily on seafood industry education for wild fishery-based industries.

- Seafood industry professionals tend get their higher education from:
 - Fisheries and Marine Affairs programs
 - Programs teaching specific skills needed in the seafood industry
 - Business
 - Engineering
 - Food sciences
 - Law
 - Programs that have little or nothing to do with fisheries or the seafood industry
- Higher education is not a requirement for advancement in the seafood industry
 - What matters most is what you can do
 - On-the-job learning

Fisheries and Marine Affairs programs *can* educate people for seafood industry careers—but it's difficult.

- Orientation of most fisheries and marine affairs programs towards:
 - Fisheries science
 - Public policy
 - Preparing students for public sector and research careers
- Breadth of education needed by seafood industry professionals
 - Fisheries science
 - Fishing and processing technology
 - Business and marketing
- Difference in academic culture and orientation of fisheries scientists and seafood industry specialists
- Need for close industry connections for successful seafood industry education

Examples of fisheries programs which successfully train seafood industry professionals (or did so formerly)

- Norway--University of Tromsø
- Iceland—University of Akureyri
- Australia—Australian Maritime College
- But all of these programs face tensions and challenges in educating people for both fisheries science and seafood industry careers
 - Mix of program requirements and offerings
 - Mix of program faculty
 - Student recruitment
- The experience of all of these programs is worth studying
 - None are necessarily models for Alaska

University of Akureyri (Iceland)

B.S. Program in Fisheries Science

http://english.unak.is/business-and-science/page/sjavarut_forsida

- After completing their studies, students are to:
 - Be able to demonstrate a general understanding of the theories, premises, concepts and methods of general applied sciences, including those of mathematics, physics and chemistry
 - Be able to demonstrate a general understanding of the theories, premises, concepts and methods of disciplines relating to business administration and commerce, including economics, finance and management.
 - Be able to demonstrate a systematic knowledge and understanding of the theories, premises, concepts and methods which relate to the production chain of the fishing industry from the environment where the marine species is caught or cultivated until it has become a fully processed product on the market.

University of Akureyri selected courses: Fisheries biology

FIF1106	Fisheries biology	6 ECTS
	Course - Undergraduate	Core
Prerequisites:	Biology preferably	
Description:	The course offers a short history of fisheries in Icelandic waters. A detailed discussion on the biology, life history patterns, catches, and state of fish stocks around Iceland. Ecological interactions among species. A survey of some important fisheries in other regions.	
Learning outcome:	<p>Upon completion of this course, the student will be able to:</p> <ul style="list-style-type: none"> • Identify the commercially most important fish species in the northern North Atlantic • collect data and report results from a simple fishery survey, • explain the current stock status and landings of most fished species in Icelandic waters, • contrast and critically discuss the trends in stock status of the most important species in Icelandic waters based on their fisheries, life histories and distribution, • name the most important fisheries in the world and explain where they occur. 	
Assessment:	Written examination, short essays and a group-report on practical assignments.	

University of Akureyri selected courses: Fish stock assessment

FIF1203	Fish stock assessment	6 ECTS
	Course - Undergraduate	Core
Prerequisites:	Desirable precursors are STÆ3103 Mathematics I and STÆ3203 Mathematics II	
Description:	The course covers the quantitative analysis of fisheries: mathematical models, assessment methods relating to the size of stocks fished around Iceland. Definition of fish stocks, growth, mortality, stock size indexes, yield, recruitment, catch and stock size predictions. Fisheries management.	
Learning outcome:	<p>Upon completion of this course, the student will be able to:</p> <ul style="list-style-type: none"> • Discuss critically the fundamental concepts used in fish stock assessment • explain the biological basis of fisheries management • explain the data needed for stock assessment and identify sources of uncertainty, • construct a simple stock assessment model in a spreadsheet • use and interpret results from a more complex stock assessment model. 	
Assessment:	Written examination and reports from practical assignments	

University of Akureyri selected courses: Natural resource and fisheries economics

AUH1106	Natural resource and fisheries economics	6 ECTS
	Course - Undergraduate	Core
Prerequisites:	STÆ3103 Mathematics I og STÆ3203 Mathematics II. ÞJÓ2103 Macroeconomics, REK2103 Microeconomics, og FJÁ 2103 Finance I	
Description:	The course deals with the economics of renewable and non-renewable natural resources: Fish stocks, forests, energy, metals, water and air. Concepts, problems, models and methods to utilize resources in an efficient and sustainable way will be introduced. On the one hand fisheries economics will be especially emphasized, on the other hand environmental economics: Economic organization, resource management, cost/benefit analysis and environmental and social effects of industrialization: Pollution, toxic substances, population and climate. There will also be discussions of what should play a leading role, utilization of natural resources or environmental protection.	
Learning outcome:	<p>Upon completion of this module, the student will be able to:</p> <ul style="list-style-type: none"> • Describe the Earth's major natural resources and Iceland's in particular: their characteristics, importance and value, • define concepts, explain the subject matter and use the methodology of economics to manage, utilize or protect nature, • analyze the interaction between economic and ecological systems, • specify mathematical models of benefit and cost in resource utilization and abatement of environmental pollution, • calculate efficient solutions from mathematical equations, interpret and evaluate the results, • discuss and solve practical problems of resources and environment by acquired knowledge. 	
Assessment:	Written examination (50%) and assignments (50%).	

University of Akureyri selected courses: Fisheries and maritime issues

SKI1106	Fisheries and maritime issues	6 ECTS
	Course - Undergraduate	Core
Prerequisites: Engar		
Description:		
<p>In this course the learner will get overview of the main issues in operation of fishing companies and ships. The main topics are:</p> <p>Ships: Design, construction and operation of fishing vessels, energy and fuel consumption, the vessel's role in catching, handling and transporting fish, interaction between vessel and gear; development of the fleet and its technical level, regulations regarding safety of vessels and crews on international navigational routes, including pollution.</p> <p>Fisheries management: The ITQ system and other methods used to manage fisheries around Iceland e.g. effort control and fishing gear limitations, comparison to other countries</p> <p>Operation of fishing companies in Iceland: The working environment and financial status of fishing companies, marketing and sales of fish products, the international environment.</p> <p>Historical overview of Icelandic fisheries.</p> <p>Guest speakers from Icelandic fishing companies and institutions will give lectures on these topics.</p>		
Learning outcome:		
<p>On completion of this course, learners will be able to:</p> <ul style="list-style-type: none"> • Describe different types of fishing vessels, their main components like crew quarters, machinery, fish hold and fishing gear, • describe the operation of fishing vessels, with special attention to fuel consumption and international maritime regulations, • compare and discuss critically the different methods used to manage fisheries with special attention to the Icelandic one, • name the most important issues that have affected the history of fisheries in Iceland, • explain the main issues in the operation of Icelandic fishing companies and the importance of fisheries in the Icelandic economy. 		
Assessment:		
Thesis, written examination.		

University of Akureyri selected courses: Fish farming

FIE1103	Fish farming I	6 ECTS
	Course - Undergraduate	Core
Prerequisites: None		
<p>Description: The development of fish farming in Iceland. The most important species in farming and the methods used as well as administration, permits, environmental assessments, laws and regulations, companies and businesses involved in Icelandic fish farming. The most important species and methods used in fish farming on a world basis are discussed as well as fish farming, the fishing industry, environmental issues and international fish farming associations.</p> <p>Two projects constitute a part of this course. In the first one students are advised where and how to access computerized information on fish farming and then asked to collect specific information on a given species (10%). The second project involves writing an essay on a fish farming subject chosen by the student (20%).</p> <p>Field visit: Two fish farms.</p>		
<p>Learning outcome: The students will be familiar with the scope and status of aquaculture worldwide, laws surrounding Icelandic aquaculture, the environmental impact of aquaculture and factors that can threaten the health of fish in farming.</p>		
<p>Assessment: Assignments (30%) and written examination (70%)</p>		

University of Akureyri selected courses:

Food science: fish

MAT1106	Food science: Fish	6 ECTS
	Course - Undergraduate	Core
Prerequisites:	Recommended prerequisites are: Chemistry, organic chemistry and biochemistry, cell chemistry and microbiology	
Description:	The chemical- and morphological structure of fish as well as their microbiology and how fish processing affects these factors. Chemical composition, nutrition and microbiology of fish, with regard to microbes, which cause spoilage or disease. The effect of processing (e.g. cooling, freezing, salting, drying, smoking, fermentation/pickling and the use of chemical preservatives) on food quality. Comparison with other types of food. The course also deals with various aspects of regulations and legislation relating to fish and fish products in Iceland and abroad. Special emphasis will be placed on the HACCP system.	
Learning outcome:	<p>Upon completion of this module the student will be able to:</p> <ul style="list-style-type: none"> • Define important quality and safety features of seafood, • account for changes of these features during processing and storage, • perform measurements on quality and safety factors and describe such methods, • explain how quality and safety can be evaluated and controlled, • conduct a simple HACCP analysis. 	
Assessment:	Laboratory work and written examination	

University of Akureyri selected courses: Processing technology

VIN1103	Processing technology	6 ECTS
	Course - Undergraduate	Core
Prerequisites:	Recommended prerequisites are Physics I, Mathematics I and II and General Chemistry.	
Description:	The course covers basic theories in the major production units and processes relating to food and in particular the seafood industries, emphasising seafood processing in Iceland. The methods in food processing that will be addressed are among others canning, freezing, drying, salting, and smoking. The design of manufacturing processes in the seafood industry will be described, such as the processing of shrimp, fishmeal, fish oils and canning. Freezing plants both on board fishing vessels and ashore will be covered as well as the processes of salting and drying of fish. There will be on site visits after which the students are required to write a report. The students are also required to write a report on a topic selected in consultation with the teacher. Both reports are to be written on an individual student basis.	
Learning outcome:	<p>Upon completion of the module, the student will be able to:</p> <ul style="list-style-type: none"> • Describe mayor types of food processing units, technology and machinery, particularly in seafood processing, • define the impact of different processing units on food products • present arguments for selection of processing technology and conditions of a given process regarding production, storage or transport. • use measurements results of products and raw material to assess impact on chemical or physical properties, stability, quality and safety of products, • evaluate design and installation of processes with regard to optimal results, • perform important calculations regarding production such as mass- and energy balance and yield. 	
Assessment:	Fish factory visits followed up by reports. Individual written assignments on a topic chosen by the student in consultation with the teacher (25%).	

University of Akureyri selected courses: Annual financial statements

ÁRS2106	Annual Financial Statements	6 ECTS
	Course - Undergraduate	Core
Prerequisites: Financial Accounting		
<p>Description: The purpose of the course is to provide the students with an understanding of financial statements and generally accepted accounting principles. The main emphasis is placed on the presentation of financial statements and the interplay between the balance sheet, income statement and the statement of cash flow. The course also covers the following topics: The law relating to annual accounts and the role and responsibility of company directors and auditors. Reading, analysis and interpretation of financial reports, key figures in company operations.</p>		
<p>Learning outcome: Students are able to:</p> <ul style="list-style-type: none"> • describe laws and regulations relating to financial statements • explain generally accepted accounting principles and key figures • use accepted accounting principles in creating financial statements • use key figures when analyzing financial statements • interpret the financial statements and key figures 		
Assessment: Written examination, assignments and web quizzes		

Seafood industry professionals do not necessarily need or want “fisheries” or “seafood industry” degrees.



At North Pacific Fishery Management Council meetings you see almost every kind of person in professional careers related to the Alaska seafood industry—from both the public and private sector. What kinds of degrees do they have? Whose careers require degrees?

Seafood industry professionals do need and want education in a broad range of fields important for success in an increasingly modern, competitive and globalized seafood industry:

- Fisheries science, food science, processing technology, economics, business, marketing, law, etc.
- It is possible to meet these needs by:
 - Offering relevant courses
 - In ways that make them accessible to people working in the industry