

ECsafeSEAFOOD

Priority environmental contaminants in seafood: safety assessment, impact and public perception

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PP Restricted to other programme participants (including the Commission Services)	
RE Restricted to a group specified by the consortium (including the Commission Services)	
CO Confidential, only for members of the consortium (including the Commission Services)	

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1. Summary

The ECsafeSEAFOOD Seminar “Environmental Contaminants of Emerging Concern in Seafood: Are Producers, Processors, and Consumers on the Safe Side?” was hosted by the Norwegian Veterinary Institute, Blue Competence Center, Bridgehead Frøya (Technical University, Norway), and Frøya VGS (High School) within the framework of the ECsafeSEAFOOD project. The seminar took place on the 30th and 31st of May 2016. An excursion to the Blue Competence Center for discussions on further cooperation with the Frøya VGS was held afterward with the remaining participants.

The main objective of this seminar was to increase awareness within the aquaculture industry of the impacts of chemical contaminants on seafood safety, focusing on emerging contaminants in the marine environment. The seminar particularly targeted industry, students at Master’s level, and food safety authorities. Among the topics discussed were: the ECsafeSEAFOOD database tool, the case report: algae toxins found in crabs from Frøya, the ECsafeSEAFOOD consumer behaviour survey, and an online tool for personalising the intake of seafood to minimise health risks which is under development, as well as a description of new control systems for self-control of contaminants in the industry. Norwegian researchers and representatives from the Food Safety Authority provided feedback on the project outputs. Before the conclusion of the seminar, three students presented their master thesis work or plans and received feedback from the experts present.

The Norwegian Research Council and the Norwegian Veterinary Institute supported the seminar financially, including all the meals. Travel and hotel accommodation was covered by each participant. Bridgehead Frøya supported the students’ travel and accommodation.

2. Introduction

Recent information on new contaminants in the marine environment, gathered within the ECsafeSEAFOOD project, was the main topic of this seminar. The target group included producers, processors and scientists working with questions regarding seafood consumption. In addition, a group of MSc students from the Norwegian Technical University’s (NTNU) International Environmental Toxicology Programme were invited to attend the lectures, learn about risk evaluation, assessment and risk information, participate in the discussions, and present their own Master’s theses to the local Norwegian and international audience.

The seminar was held in Frøya, a small island in the Trondheim fjord. This area is central in Norwegian Seafood production, since 20% of the Norwegian farmed fish production is exported from this island and more than 90% of the Norwegian crab production is takes

place on the neighboring island of Hitra. The venue is not easily accessed (two hours by boat and one hour by bus from Trondheim, with only three departures a day). Therefore, the number of participants was smaller than it might have been, had it been held in a bigger city. However, the seminar was free of charge, and a smaller, but specialised, audience promoted the pro-active participation in discussions. Holding the event on Frøya meant that Norway's three largest producers of salmon, as well as the largest crab and shellfish producers, all located in close vicinity, had easy access to the seminar.



The Centre for Culture and Competence at Frøya, venue for the seminar.

Another reason for arranging the seminar in this relatively remote site was to underpin the prior and future collaboration with the secondary school on the island, Frøya VGS. Students and teachers from this school had participated in experiments performed within the project with the aim of studying the metabolism of emerging algal toxins in crabs. An international seminar on how to perform force-feeding of toxins in crabs was arranged three years earlier at this venue, with the support of the Norwegian Research Council, the Norwegian Veterinary Institute, and Frøya VGS. It was encouraging to the school and to the local community to receive the results of this seminar through a case report during this ECsafeSEAFOOD seminar. This especially because the results became a challenge to the Norwegian Food Authority (described in the case report). The students from the school also prepared a beautiful lunch and dinner at this seminar based on their own recipes and local seafood ingredients.

Another reason to arrange the seminar at this time of the year at Frøya was the opening of the Blue Competence Center, which took place on the 2nd of June 2016. The seminar became an opening event for the center, and was covered as such in the local press (Hitra – Frøya-posten). In this way, some of the partners of the Blue Competence Center, coming from quite far, arrived some days earlier and were able to participate in the ECsafeSEAFOOD seminar as well.



Sea view from the island of Frøya

The seminar site was not easily accessed for the students of NTNU. However, this also served as a screen to obtain only a selected group of the most interested students in environmental toxicology as participants.

3. Seminar programme and participation

A total of 40 people participated in the seminar, few of them for one day only. The participants included eight students from NTNU (from the Environmental Toxicology MSc program), 10 representatives from the EU-project ECsafeSEAFOOD, 13 representatives including the Norwegian Food safety Authority and the seafood industry, nine representatives from other Norwegian scientific institutions involved in seafood safety

(NIFES, and the Norwegian Scientific Committee for Food Safety) and host organisations. The programme and presentations were also available at the project website www.ecsafeSeafood.eu, although some with limited access only to project members.



www.ecsafeseafood.eu



ECsafeSEAFOOD Seminar

ENVIRONMENTAL CONTAMINANTS OF EMERGING CONCERN IN SEAFOOD: ARE PRODUCERS, PROCESSORS, AND CONSUMERS ON THE SAFE SIDE?

30 - 31 MAY 2016 **FRØYA, SØR-TRØNDELAG, NORWAY**

This seminar is hosted by the Norwegian Veterinary Institute, Blue Competence Center, Bridgehead Frøya, and Frøya VGS within the framework of the ECsafeSEAFOOD project. The Norwegian Research Council has given financial support.

Objective

The main objective of this seminar is to increase awareness within the aquaculture industry of the impacts of emerging chemical contaminants on seafood safety. The seminar will include the role of diet, xenobiotic contaminants, algal biotoxins, environmental factors, climate change, microplastics and other factors on the safety of different types of seafood. Public attitudes and consumer health effects will be discussed, as well as possible industry and policy responses, taking into account the development of mitigation strategies. The seminar will particularly target industry, students at Master's level, and food safety authorities. An excursion to a crab plant will be arranged upon arrival from Trondheim by boat on Monday morning.

Registration

The seminar will be free of charge. There is limited access to the field trips on Tuesday and Wednesday, so registration is mandatory.

For further information, see: www.ecsafeseafood.eu/ecsafeseafood-events/ecsafeseafood-seminars

To register or for more information, please contact **Eliann Egaas** (ellann.egaas@vetinst.no).

Seminar Programme

Monday 30 May

- 10.00 Arrival Hitra
- 10.10 Excursion to Hitramat
- Scientific programme:**
- 11.00 Lunch
- 12.30 Bus to Frøya
- 13.30 Arrival Frøya and check-in at the hotel
- 14.00 Welcome (Eliann Egaas, Asgeir Johansen, Lasse Kristoffersen and Bjørnar Johansen)
- 14.15 Challenges of the ECsafeSEAFOOD project: objectives, structure, European database and contaminant levels in seafood (Antonio Marques, Portuguese Institute for the Sea and Atmosphere, Portugal)
- 14.45 Risk assessment of contaminants from seafood consumption (Kit Granby, Technical University, Denmark)
- 15.15 Bioaccessibility, bioavailability, biotransformation and interactions between contaminants (Tomaz Langerholc, University of Maribor, Slovenia)
- 15.45 *Break*

Seminar programme and flyer

Seminar Programme (continued)

- 16.00 Case: The algae toxin Azaspiracid in crabs from Frøya (Chris Miles, Norwegian Veterinary Institute; Eva Karin Bergli, Hitramat crab products; and Merete Hestdal, Norwegian Food Safety Authorities)
Chair: Arne Flåoyen, Norwegian Veterinary Institute
- 17.00 *Break*
- 18.30 *Dinner*
- Tuesday 31 May**
- 08.30 From feed to fish: Effects of contaminant transfer from feed to fish and influence of microplastics (Kit Granby, Technical University, Denmark)
- 09.00 Will climate change have an impact on seafood safety? (António Marques, Portuguese Institute for the Sea and Atmosphere, Portugal)
- 09.30 The analysis of emerging marine toxins not presently considered by EU legislation (Maria Rambla, Institut d'investigació de la Generalitat de Catalunya, Spain)
Chair: Janneche Utne Skåre
- 10.00 *Break*
- 10.30 Public and consumer attitudes to seafood, interest in information and marketing implications: how to communicate (Christine Yung Hung, Ghent University, Belgium)
- 11.00 FishChoice: Personalising the intake of fish and seafood to minimise the health risks (Montse Marques, University of Virgili I Rovira, Spain)
- 11.30 New detection systems as self-control systems for the industry: An overview of the possibilities of these new tools. Demonstration of kits (Alex Barranco, AZTI-Tecnalia, Spain)
Chair: Antonio Marques
- 12.00 *Lunch*
- 13.30 Presentations and comments from Norwegian industry, nutritional advisers, and food authorities
- Contributing to the food security : How to communicate the risk and promote food safety at the same time (Gunn Knutsen, Norwegian Seafood Federation)
 - Contaminant monitoring for seafood safety (Amund Måge, National Institute for Nutrition and Seafood Research)
 - How safe is fish and fish products? Benefit - risk assessment of fish in the Norwegian diet (Janneche Utne Skåre, Norwegian Scientific Committee for Food Safety)
 - Risk management by the Norwegian Food Safety Authority (Lise Charlotte Rokkones, Norwegian Food Safety Authorities)
- Chair:** Amund Måge
- 15.15 Panel debate
- 15.45 Students' presentations
- On the regulation of genes in the diatoms *Phaeodactylum tricornutum* and *Seminavis robusta* on exposure to Cadmium (Anitha Msb, Norwegian University of Science and Technology)
 - Uptake, organ distribution and physiological effects of an anti diabetic II drug (metformin) in Atlantic Salmon (Thyphaine Le Doujet, Norwegian University of Science and Technology)
 - Understanding the role of microplastics in the bioavailability of persistent organic pollutants in plankton (Marion Olsen Hepsø, Norwegian University of Science and Technology)
- Chair:** Thomaz Langerholc
- 16.30 Seminar closed



Seminar programme and flyer

First day (30th May 2016)

The seminar opened on Monday 30th May at lunchtime with an excursion to HitraMat crab facility at Hitra as part of the transport from the boat arriving at Hitra by bus to Frøya. The participants were transported by bus to HitraMat where they had a tour of the facilities. A presentation of the company was made by the chief executive officer, an excursion was undertaken to the facilities and a lunch was served with local crab delicacies as the main

course. After lunch, the buses brought participants to the Centre for Culture and Competence at Frøya, where Frøya VGS is situated, which was the venue for the remainder of the programme.



Seminar participants arriving at Hitra from Trondheim, Monday morning, 30th of May



Tour to the facilities at HitraMat

On behalf of the Norwegian Veterinary Institute, Eliann Egaas officially opened the seminar and introduced her fellow hosts from Frøya VGS (Asgeir Johansen) Blue Competence Center (Bjørnar Johansen) and Bridgehead Frøya (Lasse Kristoffersen).

Antonio Marques (IPMA, Portugal), the coordinator of the EU-funded ECsafeSEAFOOD project, opened the scientific program with a presentation of the project. The main objectives of the project were highlighted, as well as the outputs most relevant to the audience. Also, the impacts of the project for further research were mentioned.

Kit Granby (DTU, Denmark) gave the students as well as the rest of the audience a lecture on “Risk assessment of contaminants from seafood consumption”, and Tomaz Langerholc (University of Maribor, Slovenia) lectured about bioaccessability, bioavailability, biotransformation and interactions between contaminants.



Informal discussion during a coffee break

After the coffee break, Ingunn Samdal (NVI, Norway) chaired the case study about the metabolism of the algae toxin Azaspiracid in crabs from Frøya.

Chris Miles (NVI, Norway) presented the results of experiments performed with brown crab at Frøya in the two previous years, stressing that the results showed a half-life of the azaspiracid toxins of more than a month. In addition, the azaspiracid toxin level varied more than 30-fold in the brown meat of individual crabs caught from the same area, and in some cases exceeded the suggested safety limits (set by the Norwegian Scientific Committee for Food Safety), even though the average level of azaspiracids in crab populations was well below the recommended limit. Chris suggested that to warn the local crab catchers, the Norwegian food safety authorities should start a monitoring programme on these toxins in the crab season (August-November). Since the preparation of commercial crab involves

mixing brown meat from many individual crabs, a similar program may not be necessary to them.

Eva Karin Bergli from the crab producer HitraMat explained the safety measures that producers take to avoid algal toxins in the crab brown meat. This usually consists of following Food Safety Authority's recommendations for blue mussels and mixing brown meat of crabs from different harvesting sites.

Merete Hestdal from the Norwegian Food Safety Authority presented some of the monitoring data related to the presence of algal toxins during the last ten years.

In the subsequent discussion, it was mentioned that algal toxins in the brown meat of crabs may not be a problem in EU-countries, since it is rarely consumed because of the Cd content, which may be quite high. However, other participants contradicted this statement.

Because of the discussion, the case report session needed more time than allocated, and the dinner became an hour delayed. The social dinner at Frøya Hotel was based on locally produced seafood.

Second day (31st May 2016)

Kit Granby (DTU, Denmark) opened the second day with a presentation of the project's results on effects of contaminant transfer from feed to fish, including a study on the influence of microplastics. The latter results were preliminary, as the statistical work on the data has not yet been completed.

Antonio Marques (IPMA, Portugal) discussed whether climate change will have an impact on seafood safety. He included examples of discoveries made by the project on algal toxins now appearing in new areas of the world.

Maria Rambla (IRTA, Spain) presented the results achieved so far concerning marine toxins in a presentation entitled "The analysis of emerging marine toxins not presently considered by the EU legislation" and Christine Yung Hung (Ghent University, Belgium) gave a presentation entitled "Public and consumer attitudes to seafood, interest in information and marketing implications: how to communicate".

Montse Marques' (UVR, Spain) presented the online tool "FishChoice", which allows users to balance the risks and benefits associated with seafood consumption while taking the exposure to contaminants into consideration. their intake of fish and seafood to minimize the health risk. This issue created a rather strong debate, and several suggestions for improving the tool were made.

Alex Barranco presented some new contaminant detection systems as self-control systems for the industry, including a video on ELISA as a detection method.



Maria Rambla (IRTA, Spain) and Christine Yung Hung (University of Ghent, Belgium)

Lunch was a part of the school’s contribution to the seminar, and consisted of baked salmon with a seaweed pesto and a dessert of rhubarb and seaweed (all locally produced). The young students from the school prepared the dish, which was especially rich in taste.

After lunch, the following presentations and comments came from the Norwegian industry, scientific advisers in seafood safety, and a representative from the Norwegian Food Safety Authority:

- “Contributing to the food security: How to communicate the risk and promote food safety at the same time”, by Gunn Knutsen, Norwegian Seafood Federation.
- “Contaminant monitoring for seafood safety”, by Amund Måge, from the National Institute for Nutrition and Seafood Research (NIFES, Norway). Furthermore, Amund Måge held an improvised lecture on the levels of cadmium in the Norwegian brown crab. This varies immensely, and without any obvious explanation. It was commented that, for this reason, the brown meat of crabs should not be eaten at all, in which case the problem with algal toxins would no longer be of concern. However, there is a market for brown meat not only in Norway, but also in several EU-member countries. Thus, regular monitoring of these toxins should at least be considered in the crab season by the Norwegian Food Safety authority. As mentioned, Måge also presented an earlier report from NIFES of cadmium levels in brown meat from brown crab caught along the Norwegian coast line.
- “How safe is fish and fish products? Benefit – risk assessment of fish in the Norwegian diet”, by Janneche Utne Skåre, from the Norwegian Scientific Committee

for Food Safety. Furthermore, Norwegian farmed fish documented with less contamination though an extensive literature study performed by the Norwegian scientific committee for food safety, headed by Janneche Utne Skåre

- “Risk management by the Norwegian Food Safety Authority”, by Lise Charlotte Rokkones from the Norwegian Food Safety Authority.

These sessions were followed by panel debate. During the debate, it was stressed that farmed fish contains less contaminants than wild fish, a fact that is often forgotten in debates on how healthy consumption of farmed fish is.



Alex Barranco (AZTI-Tecnalia, Spain) and Janneche Utne Skåre (Norwegian Scientific Committee for Food Safety)

The last session, chaired by Thomas Langerholc (University of Maribor, Slovenia), contained students’ presentations on the following themes and comments from the scientists:

“On the regulation of genes in the diatoms *Phaeodactylum tricornutum* and *Seminavis robusta* on exposure to cadmium”, by Anitha Msb from the Norwegian University of Science and Technology.

“Uptake, organ distribution and physiological effects of an anti-diabetic II drug (metformin) in Atlantic Salmon”, by Thyphaine Le Doujet from the Norwegian University of Science and Technology.

“Understanding the role of microplastics in the bioavailability of persistent organic pollutants in plankton”, by Marion Olsen Hepsø from the Norwegian University of Science

and Technology. This last presentation was mostly a review of the topic and a presentation of the plans for a MSc thesis.

After the closure of the students' presentations, some attendees participated in a boat trip to the small island of Mausund, where they were served a meal of traditional wild fish balls at a local restaurant.



From the boat trip to Mausund, Tuesday evening

The remaining participants left on the morning of Wednesday 1st of June, however, two organisers from the Norwegian Veterinary Institute remained another two days to represent the seminar at the opening of the Blue Competence Center, for interviews with the local press and closing discussions with the co-organisers.



Seminar co-organisers at the opening of the Blue Competence Center

5. General conclusions

The overall conclusion of the seminar was that the health benefits from eating fish that by far exceed the possible risks from ingesting contaminants, and that farmed fish generally contain less contaminants than wild fish.

The seminar was a success based on the following facts:

- The three largest salmon producers in Norway (one of which, Marine Harvest, is also the world's largest farmed salmon producer) attended the seminar
- The presence of the shellfish and crab industries from the largest producers in Norway
- The relevant stakeholders contributed with presentations and actively participated in discussions
- The students were actively involved in the discussions, and three of them presented their MSc theses, on which they all received valuable feedback
- The Frøya VGS students and their teachers will continue to seek scientific cooperation and collaboration when suitable projects appear

In general, the students expressed high overall satisfaction with the information received, the discussions, and the risk assessment lecture from Kit Granby. The responses from the industry were also only positive. In addition to the message that farmed fish have a lower contamination level than wild fish, the local shellfish industries were thankful for the information obtained about the levels and fate of algal toxins in shellfish and crabs in the area. The discussions with the Norwegian Food Authorities were useful and will hopefully bring some action from their side.

Another achievement was the confirmation of the feasibility of arranging such seminars in cooperation between academia, Frøya VGS and the Blue Competence Center, raising the prospect of similar meetings in the future.

6. Attendances list

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