EURL Training Course:
Methods for implementation of surveillance procedures for listed fish diseases

Copenhagen, 9th – 13th of October 2023

Hosted by the European Union Reference Laboratory
for Fish and Crustacean Diseases

Contents

General introduction

The training course was organized by the EURL for Fish and Crustacean Diseases located in Kgs. Lyngby at the National Institute of Aquatic Resources, Technical University of Denmark, Kemitorvet, building 202, 2800 Kgs. Lyngby, Denmark, from October the 9th to the 13th, 2023. The training course had 14 trainees and was entitled "Methods for implementation of surveillance procedures for listed fish diseases" and took place from 9th to 13th October.

The overall purpose of the training course was to provide an opportunity for the employees of NRLs to obtain training in techniques relevant when working with listed fish and crustacean diseases. The staff of the EURL and DTU Aqua provided this training together with teachers from the Danish Veterinary and Food Administration. Knowledge-sharing and discussions between participants and teachers were important parts of the course.

Course : Methods for implementation of surveillance procedures for listed fish diseases

The 5-day course in "Methods for implementation of surveillance procedures for listed fish diseases" was based on practical work (hands on) in combination with theoretical presentations.

Day 1 was dedicated to a visit to the Danish Veterinary and Food Administration (DVFA) and to a fish farm. The head of the EURL for fish and crustacean Niccolò Vendramin, a veterinarian Jonas Fabricius and five laboratory technicians participated from the EURL team**.** In the morning, the participants were picked up at the hotel in a bus and driven first to the DVFA offices in Vejen – a three-hour drive. Here, after a short introduction, Marco Magaletti from DVFA gave a presentation about Danish aquaculture and disease surveillance after which Niccoló Vendramin gave a presentation on the laboratory findings of IHNV detected in Denmark in 2021. After lunch at the DVFA, the participants were driven to Hesselho fish farm a 30 min drive from DVFA. The farm is a traditional earth pond farm fed by water from nearby Holme stream. The participants were shown around on the farm by Jesper Valbak and Marco Magaletti from DVFA. The owner of the farm, Jens Jensen, kindly explained the workflow at the farm and answered questions from the participants. During the visit, procedures for inspection and sample collection were demonstrated and diseased fish were caught and euthanized. Participants were taught fish necropsy techniques, and how these are performed in the field. All participants performed on site necropsy on diseased fish collected at the farm. They collected relevant samples, and the personally labelled samples were brought back to the laboratory in Lyngby for further examination the following days. After the return to Lyngby, participants were welcomed at the institute, where dinner was served.

On **day 2** an introduction and practicalities with a detailed description of the course programme was presented by Niccolò Vendramin and Argelia Cuenca and each participant presented their experience and expectations for the course. After the introduction, Niccolò Vendramin gave lectures on "Epidemiological concepts of sampling and testing", "the legislative basis for aquaculture animal health and the sampling and diagnostic procedures to use" as well as an overview of the methods for performing diagnostic and surveillance of listed fish diseases. In addition, all topics included in the compendium were presented as a preparation for the practical part of the course. In the afternoon, the

participants were brought to the teaching laboratory and after an initial demonstration they prepared and processed the samples they collected on Monday. These were samples for cell cultivation, PCR and bacteriology on samples they collected Monday. After a coffee break, all participants were introduced to cell culture techniques, and had the opportunity to prepare their own 24-well plates. In the evening, there was a social dinner in Lyngby.

Day 3 started by theoretical lectures on PCR and real time PCR laboratory- presented by the responsible for the molecular diagnostic of the EURL Dr. Argelia Cuenca. After coffee break all participants were involved in practical exercises and analysis of PCR results.
After lunch all participants were gathered again in the teaching laboratory and were involved in activities such as reading and inoculating the cells produced the day before with samples taken at the fish farm. The practical activities were followed by a presentation given by Niccoló Vendramin on "Use of cell culture in fish virology". After the coffee break practical demonstration of titration procedures, reading plates and calculating virus titres was conducted in the laboratory of DTU Aqua and supervised by Niccoló Vendramin.

Day 4 was tutored by Argelia Cuenca. The day was fully dedicated to PCR, sequencing and BLAST analysis. The day started going over the flow in the diagnostic lab, and the requirements and routines that need to be ensured to avoid (cross-) contamination when performing PCR. After that, we had a small lecture about Sanger sequencing and how it works. A session explaining how BLAST works and how to interpret BLAST results was conducted, followed by a practical exercise about using sequencing and BLAST searching for strain identification.

At **day 5** in the morning, the participants were divided into two groups. One group was shown diagnostics concerning bacterial diseases in fish and some examples of bacterial pathogens by senior researcher Lone Madsen, while the other group was reading their inoculated cell cultures and a number of cell lines inoculated with various fish viruses, including VHSV, IHNV, EHNV, IPNV, nodavirus with Niccoló Vendramin; afterwards the groups switched. After lunch all teams were given assignments on how to handle various cases. After one hour, each member should then present their results in new groups and finally all reports were presented and discussed in plenum; this session was supervised by Niccoló Vendramin. The course was closed by discussing both results obtained by the participants and different methods for diagnosis and performing surveillance of listed fish diseases in their countries of origin. Later on an online questionnaire was distributed.

The methods taught were primarily focused on the protocols given in the EU legislation and on the WOAH (OIE) guidelines from the Manual of Aquatic Animal Diseases, and included how to select proper controls, the typical pitfalls, troubleshooting, etc. Every activity had a team of tutors in order to provide an effective support to the trainees. For the practical activities Lise Christensen, Kristina Andkjær Andersen were assigned as tutors.

As get-together, a dinner event for all teachers and participants was held on day two.

Participant list

Name	Surname	Country	Affiliation
Justin Tze Ho	Chan	Austria	University of Veterinary Medicine Vienna
Amina	Jazic	Bosnia & Herzegovina	National reference laboratory for fish diseases, Veterinary faculty in Sarajevo
Pauline	Grippon	France	ANSES VIMEP Unit (Virology, Immunology and Ecotoxicology of Fish) of the National Agency for Food, Environmental and Occupational Health Safety (Ploufragan-Plouzané-Niort Laboratory)
Dhiraj	Krishna	Faroe Islands	Faroese Food and Veterinary Authority (and University of Copenhagen)
Vanessza	Matuz	Hungary	National Reference Department of Parasitology, Fish and Bee Diseases
Samuel Casás	Casal	Iceland	Institute for Pathology University of Iceland
Romy Lucon	Xiccato	Italy	Istituto Zooprofilattico Sperimentale delle Venezie
Ragnhild	Tønnessen	Norway	Norwegian Veterinary Institute
Danijela	Milosavljević	Serbia	Institute of Veterinary Medicine of Serbia
Leticia Hernández	Martínez	Spain	NRL of Spain
Ulrika Bratteby	Trolte	Sweden	Section for fish, Swedish National veterinary institute
Salvatore	Defilippo	Switzerland	Centre for Fish and Wildlife Health (FIWI)
Claudia Patricia Calderón	Parra	Colombia	Instituto Colombiano Agropecuario (ICA)
Despoina	Athena-Vasileiadi	Greece	Technical University of Denmark

Course description: Methods for implementation of surveillance procedures for listed fish diseases

Course content

This 5 day course is primarily based on practical work (hands on) in combination with theoretical presentations. The course will focus on the comparison between diagnostic techniques for listed fish diseases by evaluating pros and cons of cell culture and Real-Time PCR methods.

At the first day of the course, all participants will take part in a fish farm visit. The trip will be organized in collaboration with veterinary services and aquaculture association. Protocols for inspection, necropsy and sample collection will be demonstrated. Sample collection will involve mandatory sampling for testing listed disease (virology and molecular assay) as well as testing for differential diagnosis (bacteriology). Starting from day 2, theoretical teaching will be given on methodologies, pitfalls and troubleshooting. After the introduction, the participants will be divided into groups. Each group will start processing the samples collected at the farm. This process will include cell culture preparation, inoculation on monolayers, observation of cell culture and assessment of cytopathogenic effect. All cell cultures used for isolation of the listed viruses will be demonstrated and procedures will be conducted by the participants.

Participants will initially be introduced to basic cell culture work: 24-well plate preparation for diagnostic purpose as well as 96-well plate for titration and flask maintenance will be demonstrated and subsequently prepared by the participants. Inoculation of diagnostic samples on cell cultures will be practised. The CPE of different viruses will be shown and the participant will practise reading of diagnostic trays. Titration procedures will be demonstrated and afterwards participants will have the opportunity to practise by themselves. Finally, course participants will calculate virus titres.

The application of accredited Real-Time PCR protocols for surveillance will be presented and discussed with the participants. Furthemore, focus will be put on genetic characterization of listed fish viruses with theoretical lectures and practical exercises on sequencing, Blast tool and phylogenetic analysis. For this reason each participant is required to bring his/her own laptop.

The concept of test specificity and sensitivity will be explained, and the students will learn how this affects validity of surveillance systems.

The course is dialogue-based and sufficient time will be given for discussions throughout the course and for the evaluation of test results. Quality assurance, cleaning, disinfection, etc. will be an integral part of the practical demonstrations. The taught methods will primarily focus on the protocols given within the EU legislation and WOAH guidelines from the Manual of Aquatic Animal Diseases, and include how to select proper controls, the typical pitfalls and troubleshooting, etc. A social dinner will be organized on the second evening. Further details are provided in the invitation letter.

General course objectives

The course aims to provide the participants with knowledge on the most commonly used methods for diagnosis of important viral fish diseases. The course will focus on; 1) basic cell cultivation techniques,

production of cells for different purposes (IFAT, diagnostic trays, titration, etc.), cell susceptibility testing, inoculation of samples and sub-cultivation procedures, reading of cell cultures (including CPE) and virus titration, 2) providing the participants with knowledge on the most commonly used methods for diagnosis of important fish pathogens, 3) Real-Time PCR protocols validated for surveillance of listed fish diseases, 4) genotyping the most important viral pathogens by sequencing and blasting and 5) information on the underlying principles of the tests and how to critically review them in order to assess pitfalls and 6) epidemiological aspects to consider when designing surveillance for viral diseases in fish aquaculture.

Learning objectives
The participants that have followed all the course objectives will be able to;

- Explain the basic principles of the legislative framework for surveillance and control of listed fish disease in EU
- Describe basic principle of surveillance schemes or programs? for listed aquatic fish disease
- Sample and process material for diagnostic purpose
- Maintain, cultivate, inoculate and read most used cell lines (BF-2, EPC, CCB and ASK) for fish disease diagnostic purposes
- Prepare cell cultures for different purposes, e.g. diagnosis, IFAT and virus titration
- Inoculate and sub-cultivate diagnostic samples
- Read diagnostic trays
- Titrate virus
- understand basic principles of PCR and real time PCR techniques and their use in diagnostics and surveillance
- Genotype viral isolates by sequencing and blasting
- Troubleshoot test performances and designs.
- Demonstrate the implications of test sensitivity and specificity for surveillance programs

The major focus will be on the viral fish diseases using VHS as model. The course will provide a forum where pre-knowledge, experience and examples can be discussed between participants and teachers, and hereby raise the awareness of pitfalls when using the various techniques.

Intended learning outcomes
To increase the practical and theoretical knowledge of cell culture based and bio-molecular techniques used in fish virus diagnostics. The course also aims at providing a forum where (good and bad) experiences can be discussed among participants and teachers.

The core elements
Sampling and processing fish tissue for diagnostic purpose
Fish cell line cultivation
PCR / Real-Time PCR
Sequence analysis and use of BLAST tool
Identification and discussion of pitfalls and how to perform troubleshooting

Assessment
Each day will end with a short result and discussion follow-up in order to evaluate whether the participants picked up the treated core elements. Their results will be discussed. At the end of the course a questionnaire for course evaluation will be delivered to all participants.

The course material
Protocol for the hands-on exercises, PowerPoint presentations as well as the original scientific papers describing the applied assays/techniques is included in the course binder. The supervisors will collect the generated results and provide shared data overviews to be starting point of discussions.

The course participants
Since course attendants can come with very different backgrounds, during the general introduction (day 2), researchers and technicians will be asked to introduce themselves, their pre-experience in the laboratory and their expectations to the course in order to target the course content optimally, especially during the theoretical and discussion workshops. Their starting point will therefore be mixed as some may have limited theoretical or practical experience, while others may be highly experienced in some or all disciplines.

Course supervisors
Niccoló Vendramin (DVM, PhD), Fish virology and diagnostics
Argelia Cuenca Navarro (M.Sc., PhD): Molecular methods
Lone Madsen (DVM, PhD): Fish bacteriology and diagnostic

Technical help and assistance for running the laboratory courses will be given by
Kristina Andkjær Spencer (sample preparation and cell culture) Lise Christensen (cell culture)
Kári Karbech Mouritsen (bacteriology)

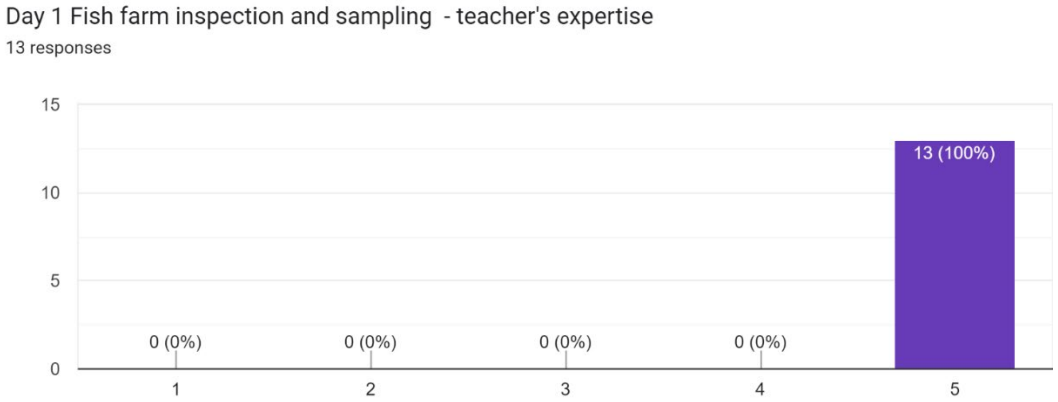
Programme: Methods for implementation of surveillance procedures for listed fish diseases

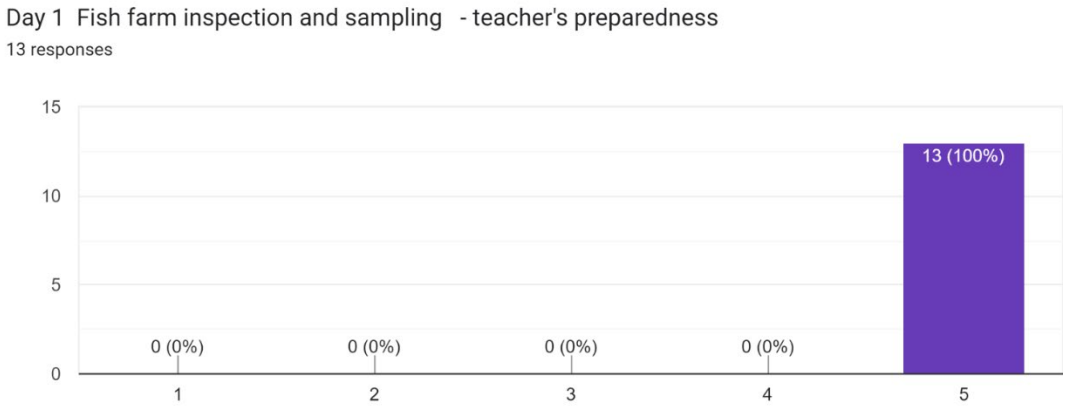
Day 1	Day 2	Day 3	Day 4	Day 5
Section 1 **Visit to fish farm and Veterinary sevices in Jutland**	**Section 2** **Laboratory introduction and sample preparation**	**Section 3** **PCR analysis and Cell culture methods**	**Section 4** **PCR, blast and phylogeny**	**Section 5** **Cell culture /bacteriology and evaluation**
8:00 – 11:00 **Transport by bus to Danish Veterinary and Food Administration, in Jutland.** **11:00 – 12:15** **Introduction to surveillance programs** **Aquaculture surveillance and sampling procedures in Denmark**	**9:00 – 10:30** **Introduction and practicalities. Participants experience and expectations** ***Coffee break 10:30 – 10:50*** **10:50 – 12:15** **Theoretical introduction to sample preparation, cell cultivation, virus ID and qPCR for surveillance programs for the non-exotic listed fish disease in Europe**	**9:00 – 10:30** **PCR and real time PCR theory.** ***Coffee break 10:30 – 10:50*** **10:50 – 12:15** **Result analysis** **Practical exercises.**	**9:00 – 10:30** **PCR and Real Time PCR Troubleshooting.** **The diagnostic laboratory – PCR flow.** ***Coffee break 10:30 – 10:50*** **Sequencing theory and practical exercises**	**9:00 – 10:30** **Cell culture observation with different reference viral isolates** ***Coffee break 10:30 – 10:50*** **10:50 – 12:15** **Fish bacteriology demonstration**
Lunch: 12:15 – 13:00	**Lunch: 12:15 – 13:00**	**Lunch: 12:15 – 13:00**	**Lunch: 12:15 – 13:00**	**Lunch: 12:15 – 13:00**
13:00 – 13.30 **Transport to fish farm** **13:30 – 15:30** **Inspection and sampling** **15:30 – 19:00** **Return to Hotel**	**13:00 – 14:30** **Sample preparation for cell culture, PCR and bacteriology on samples collected Monday** ***Coffee break 14:30 – 14:45*** **14:45 – 16.45** **Practical cell culture passaging and production of 24 well plates** **19:00 Social dinner**	**13:00 – 13:45** **Reading cells and inoculation of samples** **13:45 – 14:30** **Use of cell culture in fish virology** ***Coffee break 14:30 – 15:00*** **15:00-16:00 Titration procedure, viral titre calculation. Barcoding cell lines**	**13:00 – 17:00** **Blast analysis and practical exercise** ***Coffee break 14:30 – 15:00*** **Introduction to phylogenetic analysis**	**13:00 – 14:45** **Assignment + presentation and assessment of data obtained by each group** **Discussion and recommendations** **Conclusion** **14:45 – 15:00** **Course evaluation, coffee and goodbyes**

Evaluation: Methods for implementation of surveillance procedures for listed fish diseases

Participant satisfaction level for each respective section on a scale from 1 (very low) to 5 (very good). The calculations are based on returned evaluation schemes from 9 participants.

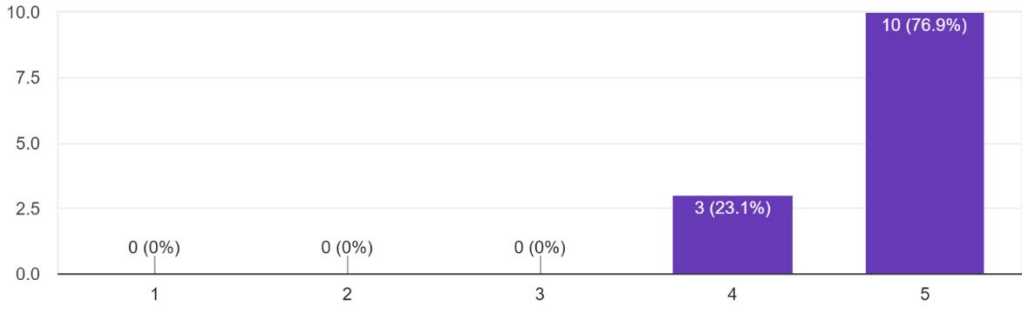
Day 1 Fish farm inspection and sampling





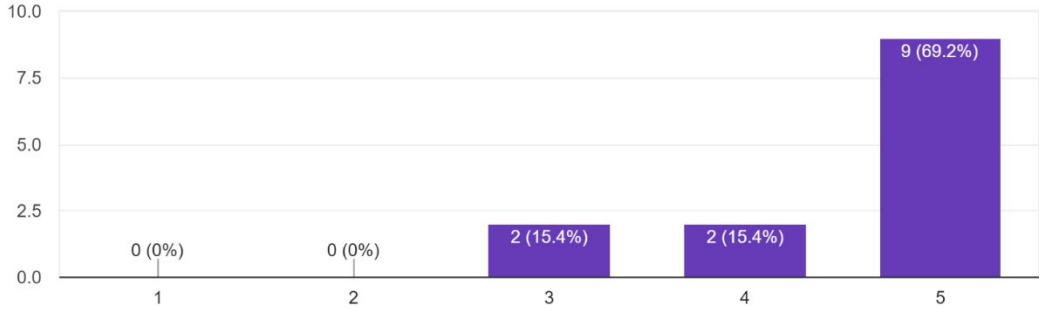
Day 1 Fish farm inspection and sampling - relevance for you

13 responses



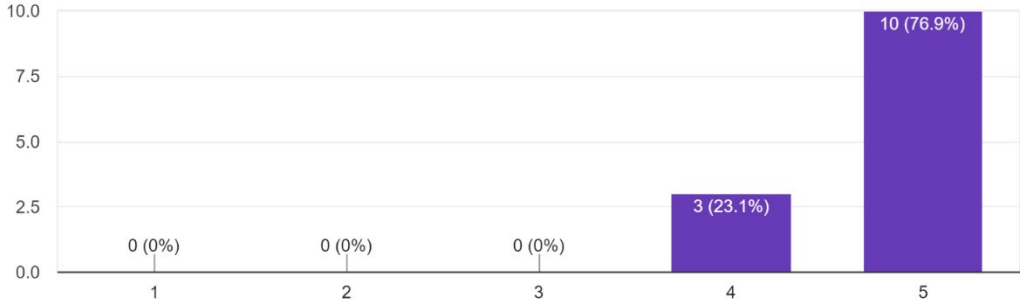
Day 1 Fish farm inspection and sampling - increase of your knowledge

13 responses



Day 1 Fish farm inspection and sampling - overall score

13 responses



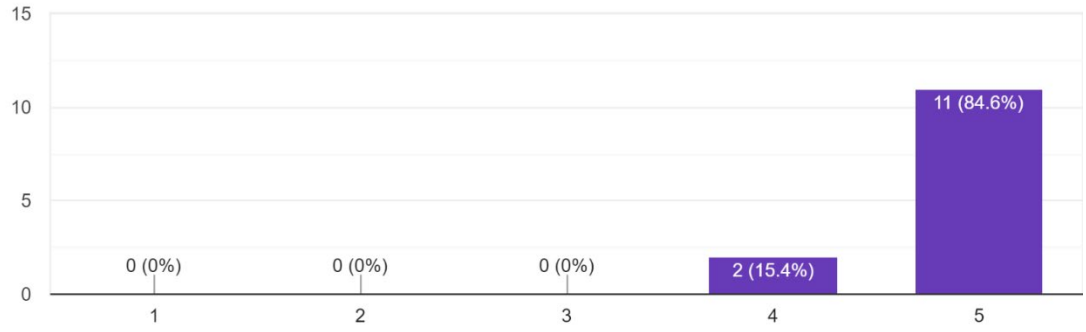
Comments (13 responses)

- Very interesting, if possible pick a closer farm
- It was a good insight to meet with the authority and see how the trout farm is set up. Also doing the sampling there in the facility.
- It was very interesting and increase my knowladge about it.
- Very nice to start out the course by visiting an actual farm, and to collect your own samples for the week. I had never seen any fish farm with earth pools before and it was a very nice experience. Long trip, but it was a nice day.
- For me it was a new experience and it was very well organized.
- Very good to have an overview of the farm and field sampling
- Interesting to see for the ones (like me) that never seen a farm sampling
- Interesting and useful experience
- It was an interesting activity, that otherwise it is difficult to do during the daily work of a NRL. The only drawback of this activity was the long distance and long time required to get there by bus
- The visit to the fish farm was a great experience. We learned a lot of useful information from both the owner and the teacher, with whom we practically completed all of the sampling steps.
- Very interesting
- Everything was thoroughly prepared and explained
- I enjoyed the visit to the fish farm. I think it is essential and probably and irreplaceable part of the course (cannot be done remotely or done elsewhere). For some of us that are less exposed to field work or not required to do field work, it provides context about where samples come from so we can correctly interpret results and trace them to their sources and appreciate the challenges and practices involved. I personally would have liked more time to practice dissecting more fish (whether at the farm or back at the DTU) and to learn through repetition. Regarding the visit to the DVFA, it felt like a stop or a venue but did not add enough value given the length of the trip there. As in, the presentations could have been held at the DTU and not change much for participants. However, I cannot imagine what other relevant activities could be organized there to make the visit more worthwhile, and the break was very appreciated.

Day 2 and 3 - legislative background for surveillance and control of listed fish diseases, use of cell culture for surveillance of listed fish diseases

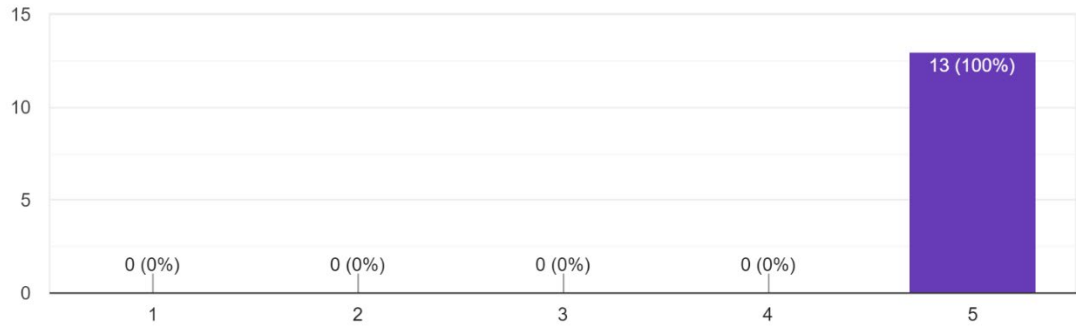
Day 2 and 3- legislative background for surveillance and control of listed fish diseases, use of cell culture for surveillance of listed fish diseases- teacher's expertise

13 responses



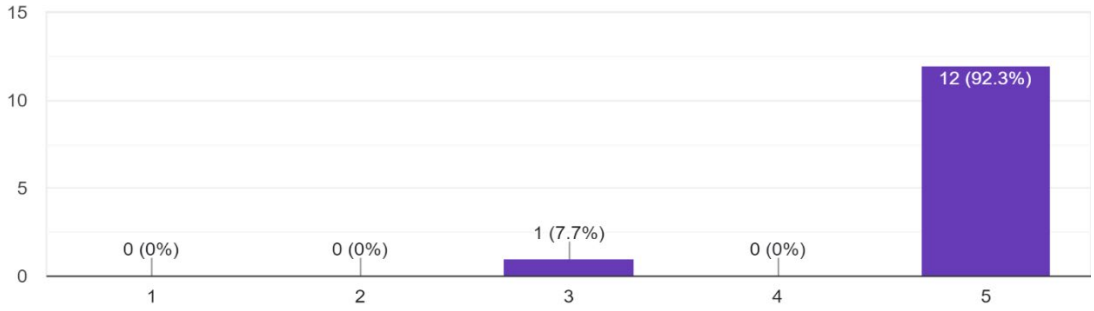
Day 2 and 3 - legislative background for surveillance and control of listed fish diseases, use of cell culture for surveillance of listed fish diseases - teacher's preparedness

13 responses



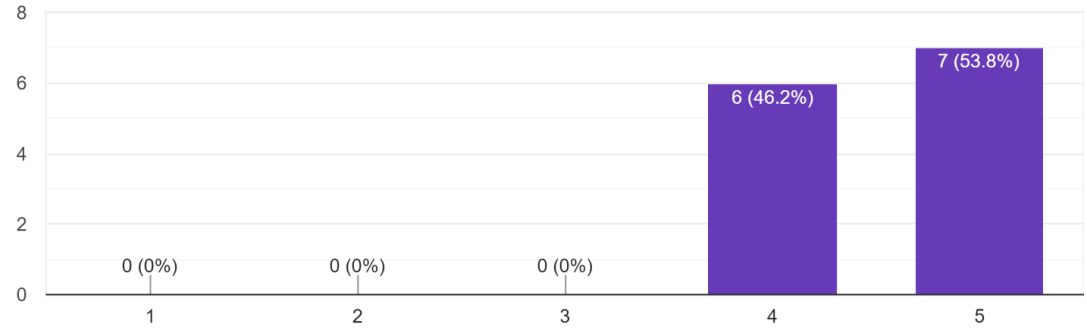
Day 2 and 3 - legislative background for surveillance and control of listed fish diseases, use of cell culture for surveillance of listed fish diseases - relevance for you

13 responses



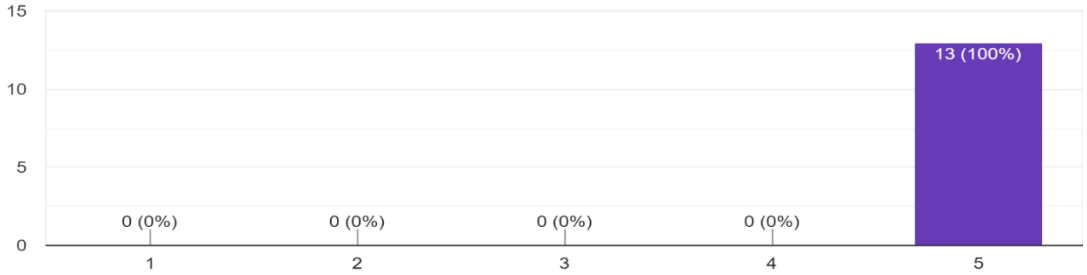
Day 2 and 3 - legislative background for surveillance and control of listed fish diseases, use of cell culture for surveillance of listed fish diseases - increase of your knowledge

13 responses



Day 2 and 3 - legislative background for surveillance and control of listed fish diseases, use of cell culture for surveillance of listed fish diseases overall score

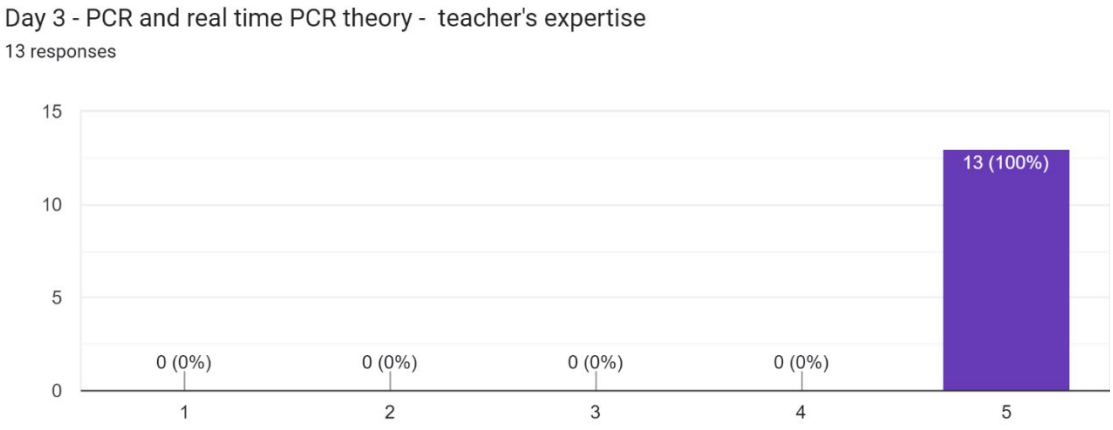
13 responses

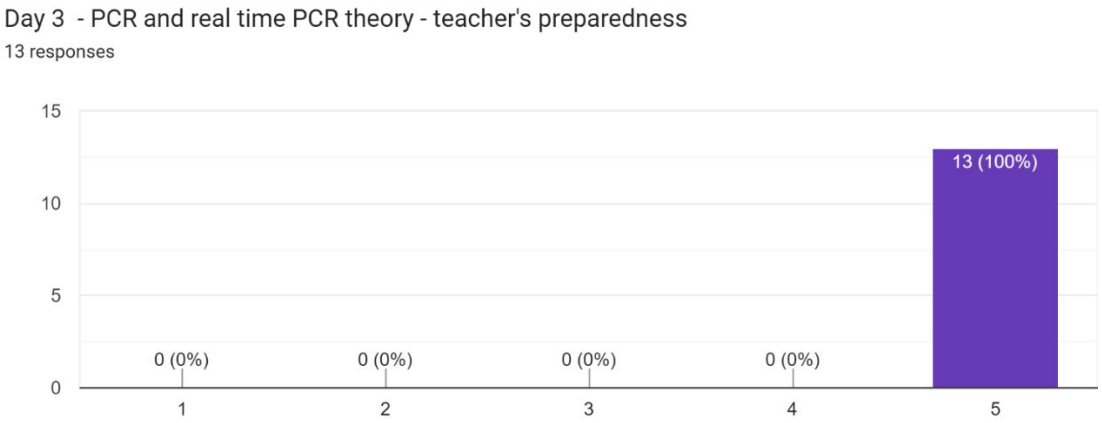


Comments (13 responses)

- Need More time dedicated to pratical exercise on legislation, the cell part was good
- It was a good chance to get a deeper view in the legislation. Usually the ones that we are in the lab we know what diseases are notifiable, but maybe we lack the whole picture. The cell part was nice in the sense that was very practical and allowed us to have hands on the lab. It was a good insight to learn a base of how to read and interpret results about infected cells with viruses.
- For the amount of information was to much for one day. Laboratory work was nice.
- Not having a lot of experience with legislation nor with the viruses etc, it sometimes was a bit confusing and hard to catch up for me. That being said, I enjoyed this section and would have liked to go more into this. Maybe have an exercise similar to the one we ended with on Friday to implement what we learned and to get familiar with WOHA's manuals etc. For the preparation of the cell cultures, I enjoyed the demonstration in the lab but it would have been helpful to have the different addatives and volumes written down somewhere (or, I should have taken notes!) - it was a lot to take in.
- For me it was a new experience to learn about legislative backgroud for surveillance and control fish disease in Europe and the use a cell culture for survellance and it was very well clear
- Good
- Important knowledge for all participants - essence of the day to day work
- It was very relevant and helped a lot to improve the quality of work after I got back to my homeland laboratory.
- It is very useful to remind the most important laws and surveillance programmes. I would dedicate a little more time on this
- Everything was thoroughly explained. Lots of useful information to "take home".
- Very interesting
- Instructor had thorough knowledge of the subject
- The legislature was the hardest for me to grasp and what I knew the least about. These days and lectures were very helpful and at least helped direct me to where I could find answers that sometimes even my laboratory does not have. In general and not limited to here, the introduction of new terms (scientific, legislative, virologic, etc.) was a bit overwhelming. A glossary of terms, keywords, and viruses would go a long way to help familiarize participants with words they will encounter again and again in the course. Especially for the different viruses, maybe a table summarizing all their important aspects and procedures to follow for each would be a valuable and readily accessible resource for a quick answer. Maybe you can build on the existing table provided to us with the disease categories and susceptible species. You can make participants create a table themselves as an exercise or task different groups with filling one part of such a table. It would really go a long way, having all the information in one place instead of scattered.

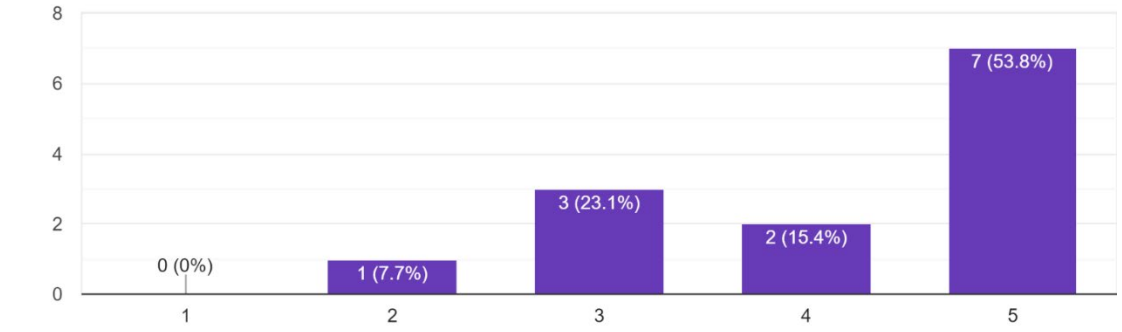
Day 3 - PCR and real time PCR theory





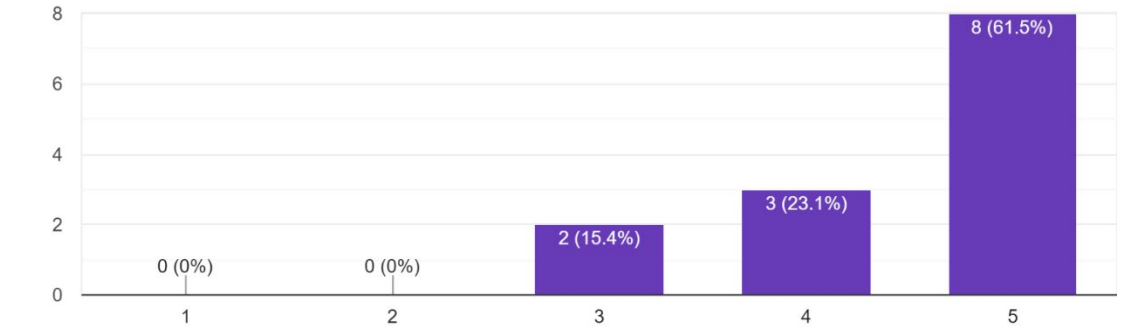
Day 3 - PCR and real time PCR theory - relevance for you

13 responses



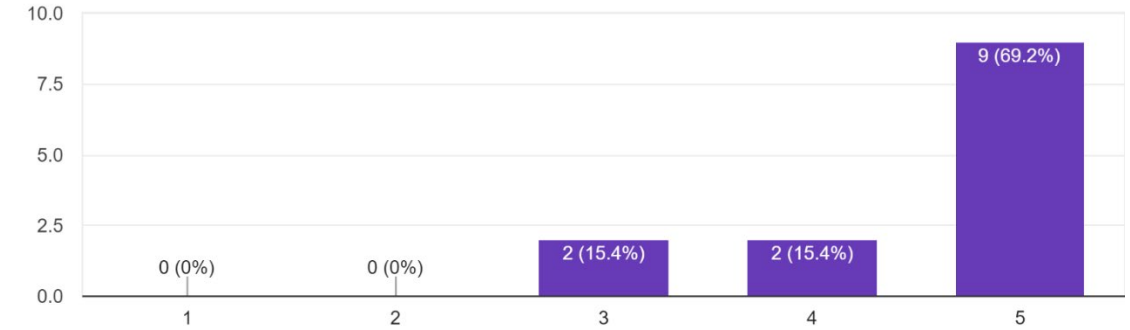
Day 3 - PCR and real time PCR theory - increase of your knowledge

13 responses



Day 3 - PCR and real time PCR theory - overall score

13 responses



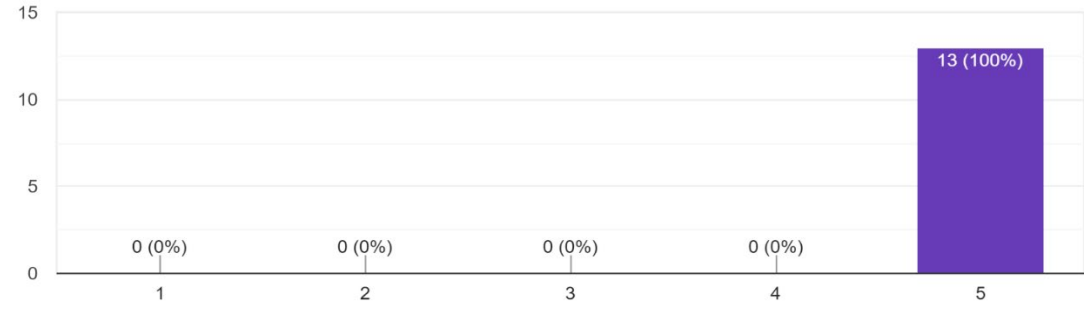
Comments (13 responses)

- This part was really great
- It was good to review concepts, but I miss a bit more practical aspects
- Everything was fine.
- For me, this was a heavy section since I have hardly any knowledge of the viruses (yet) and have not used PCR since during my time at uni.
- The practical part for people who do not know the subject would be good to introduce.
- Was a good session to refresh my understanding of PCR
- Good teaching covering basics till advanced topics
- It was very interesting and important, just less relevannt for me, I am not hte responsisble one in our lab for doing the PCR-s, we may consider to send next time my PCR collegue to the training.
- It is very intesting for NRL work, as it is one of the most important tests. The only thing is that there is too much information and not too much practical activities.
- The teacher is an excellent lecturer. The lectures are understandable even to those who are unfamiliar with PCR techniques.
- very relevant
- Instructor made sure to explain most of the theory aspects and applications from scratch, was a very helpful lecture
- I would not change anything for this series of lectures. Even as someone with some PCR experience, I still learned from these lectures and I felt they were suitable for all levels. Understanding PCR at a deeper level will help us troubleshoot and be certain of the conclusions that can be drawn from PCRs. I liked the real-world case study, an example of how a qPCR could be rendered non-specific by a mutation. More of this, please, which helps us learn, could help us in the future, and challenges us to think critically.

4 Validation of methods and molecular methods to detect listed pathogens in fish

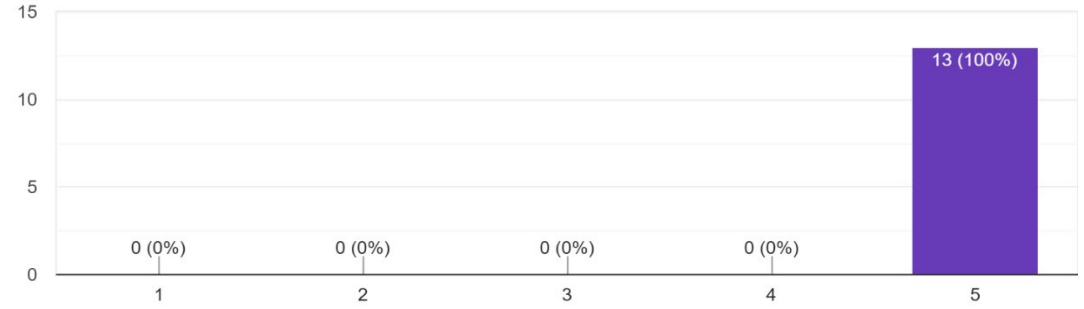
Day 4 -Validation of methods and molecular methods to detect listed pathogens in fish- teacher's expertise

13 responses



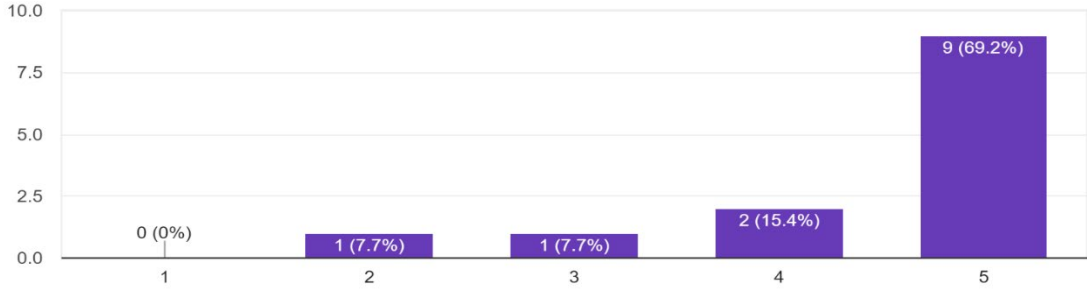
Day 4 - Validation of methods and molecular methods to detect listed pathogens in fish- - teacher's preparedness

13 responses



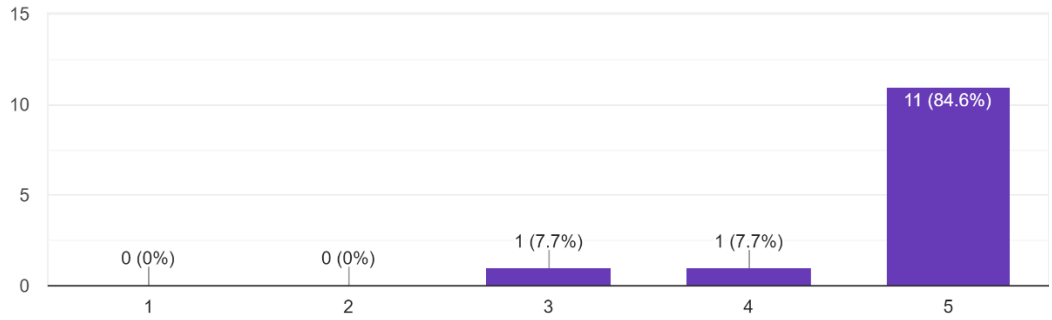
Day 4 - Validation of methods and molecular methods to detect listed pathogens in fish - relevance for you

13 responses



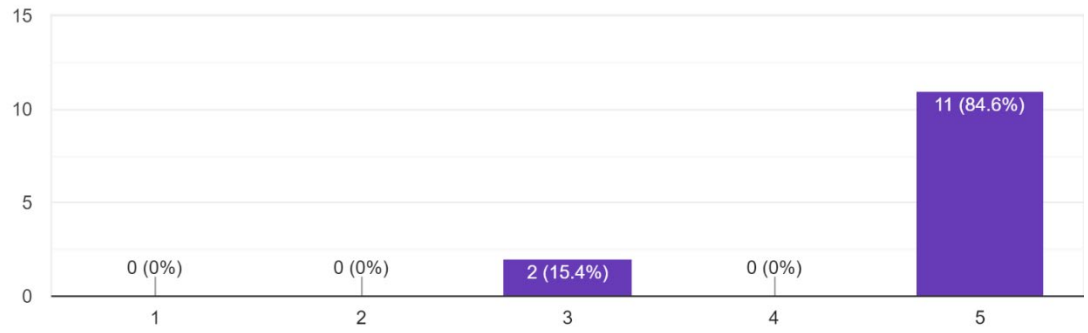
Day 4 -Validation of methods and molecular methods to detect listed pathogens in fish- increase of your knowledge

13 responses



Day 4 Validation of methods and molecular methods to detect listed pathogens in fish - overall score

13 responses



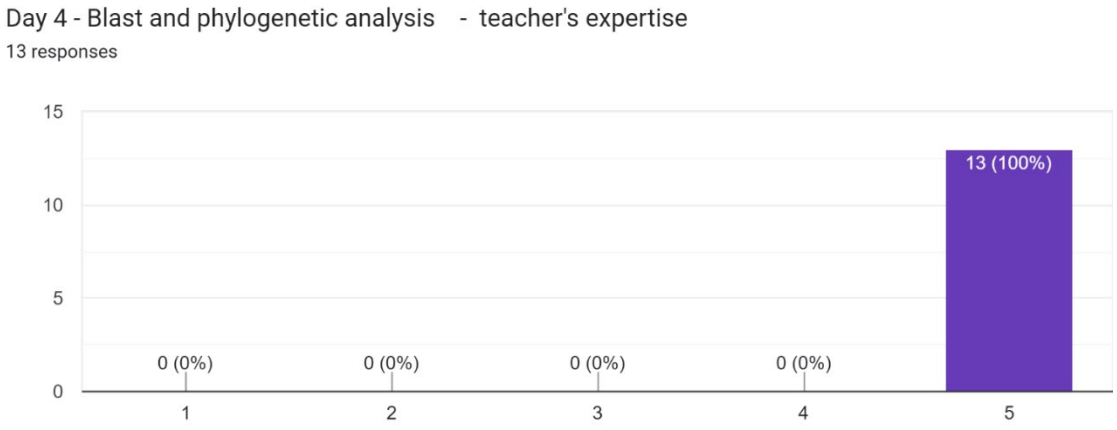
Day

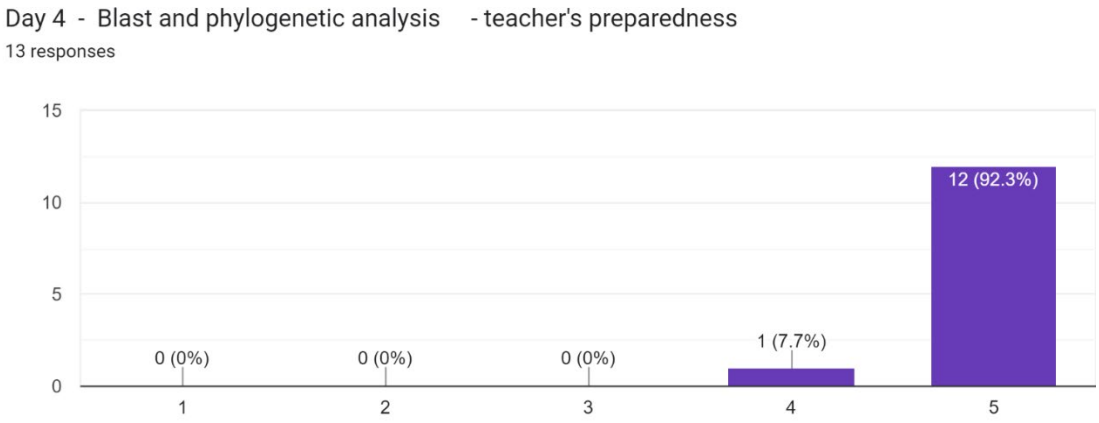
Comments (13 responses)

- This part was really great
- The part of notifiable diseases, method we use was very practical and handy to review-learn about it
- The part regarding validations was a bit too much. Everything else was fine.
- Not necessarily relevant for my position at work, but I am sure I will benefit from this section anyway.
- The explanation was very good
- None
- Liked the hands-on experience
- It was interesting and useful.
- I would dedicate more time to the validation of methods

- Everything is explained in detail. The lectures cover the most important aspects, and therefore the implementation of the methods is clear.
- very interesting
- Useful knowledge with regards to quality control aspects of the disease surveillance .
- No additional comments for this section. See comments for PCR and day 3.

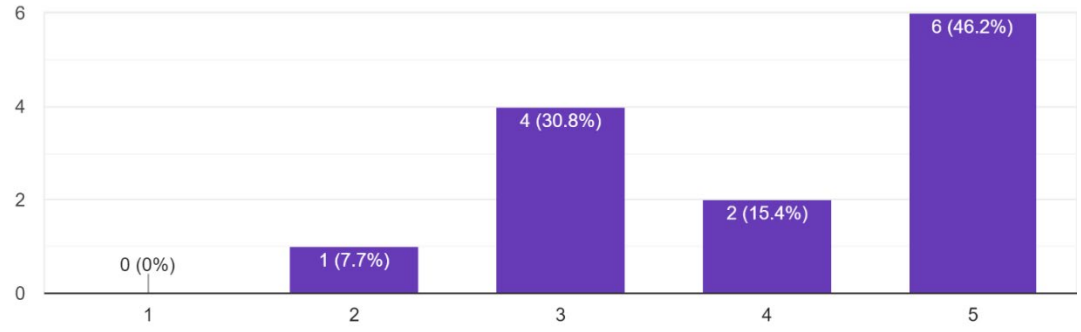
Day 4 - Blast and phylogenetic analysis





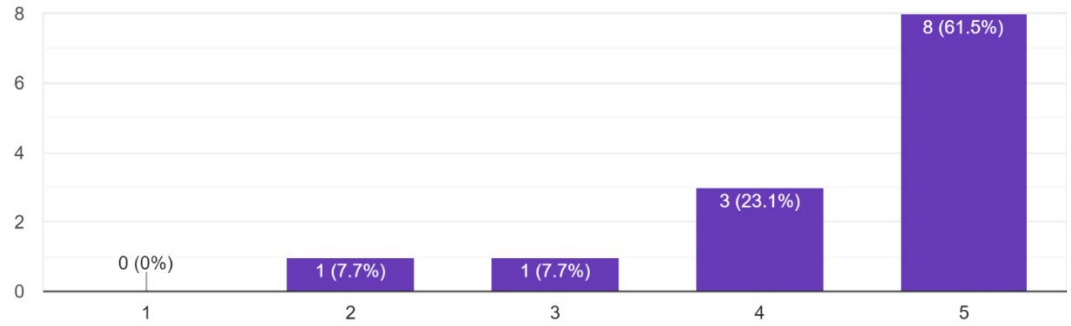
Day 4 - Blast and phylogenetic analysis - relevance for you

13 responses



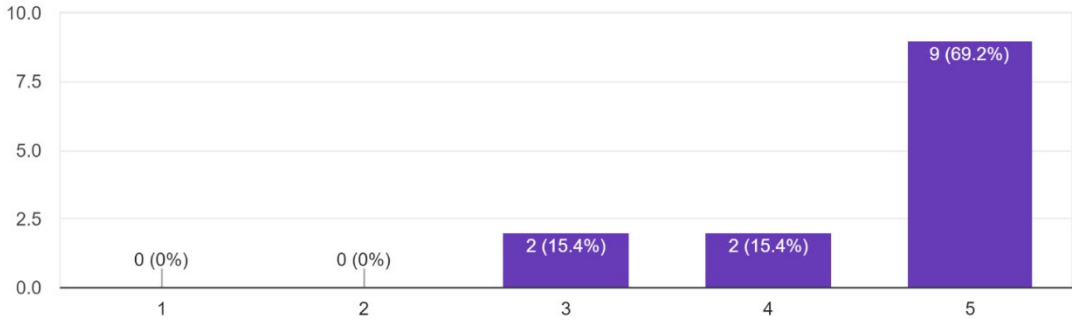
Day 4 - Blast and phylogenetic analysis - increase of your knowledge

13 responses



Day 4 Blast and phylogenetic analysis - overall score

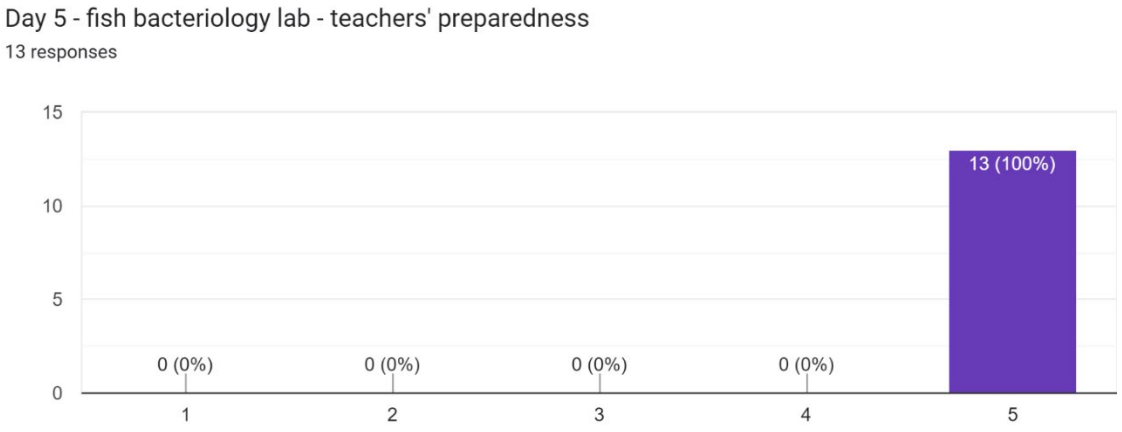
13 responses

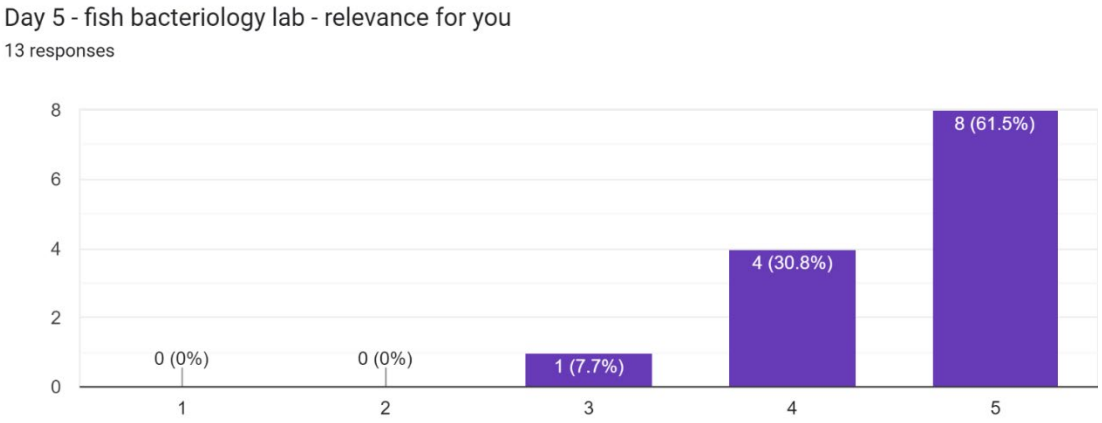


Comments (13 responses)

- If possible give us some exsercise to do by ourselves
- I did miss more practical aspect and maybe not going so much deep into concepts
- Possibly include a tad more practical work for all participants.
- Fascinating.
- I would think that more time would be required for this topic.
- It was a really good session on the theory behind phylogenetic analysis.
- For my background the topics became too complicated to follow very soon - still good to have heard it mention for further learning
- Phlygeny analysis also not belongs to my daily tasks, but I think it is important to know about.
- This part is more complicated, specially the phylogenetic, but the BLAST section was very interesting.
- Very useful! Everything explained. It may have been difficult for some participants to understand, especially if they do not have background knowledge.
- very interesting
- The entire pipeline of blast and phylogenetic analysis for disease surveillance was analyzed from scratch - the instructor was very helpful and made sure to level the content of the lecture so it would be fitting to everyone's knowledge.
- This was the most challenging section for me. The BLAST analysis was simplistic while the phylogenetic analysis in contrast was complicated. However, I think it is my lack of expertise that is to blame rather than the instructor's. In general, maybe we could be assigned light readings prior to attending the course so that the lectures will not be overwhelming. Personally, I could have used a little bit of guidance and some anticipation of what was to come; some 'homework' would be helpful and could free up more time for exercises or activities that we cannot do at home.

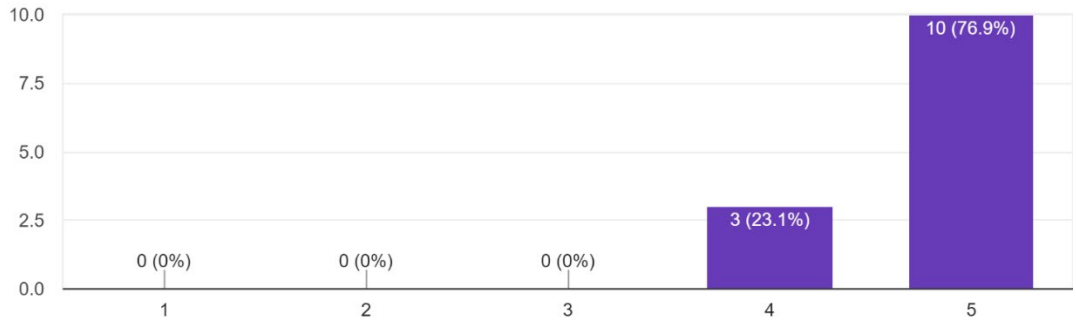
Day 5 - Fish bacteriology lab





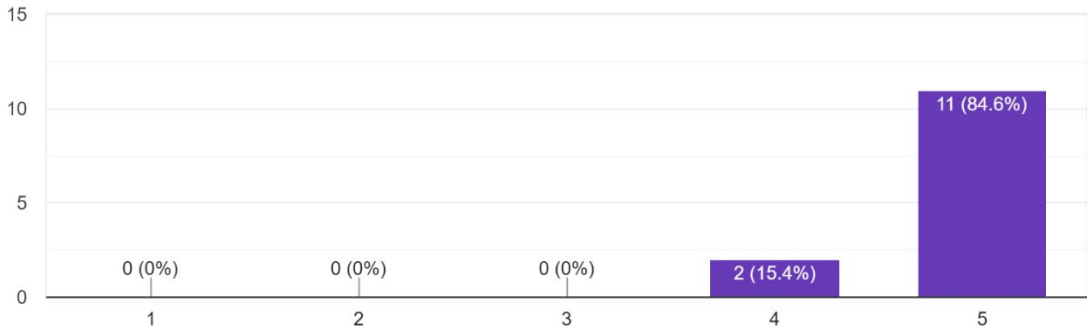
Day 5 - FIsh bacteriology lab - increase of your knowledge

13 responses



Day 5 - Fish bacteriology lab - overall score

13 responses

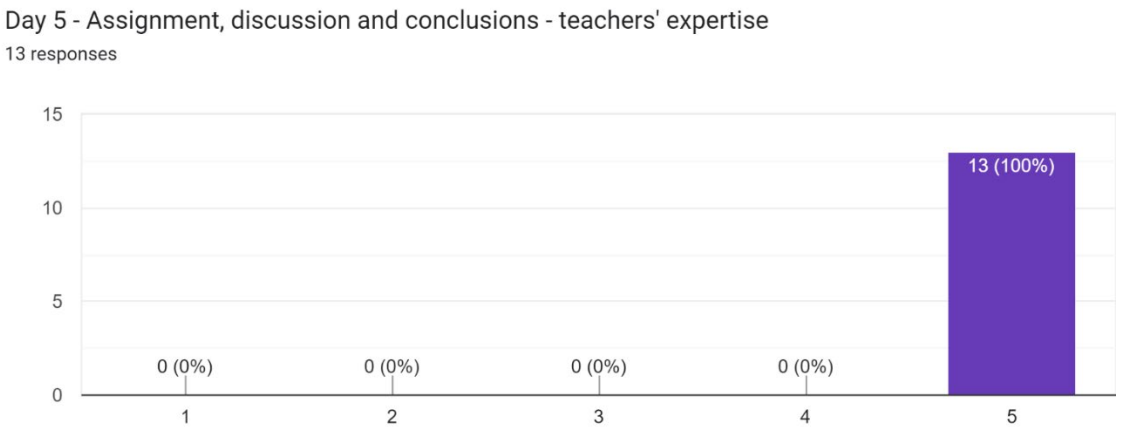


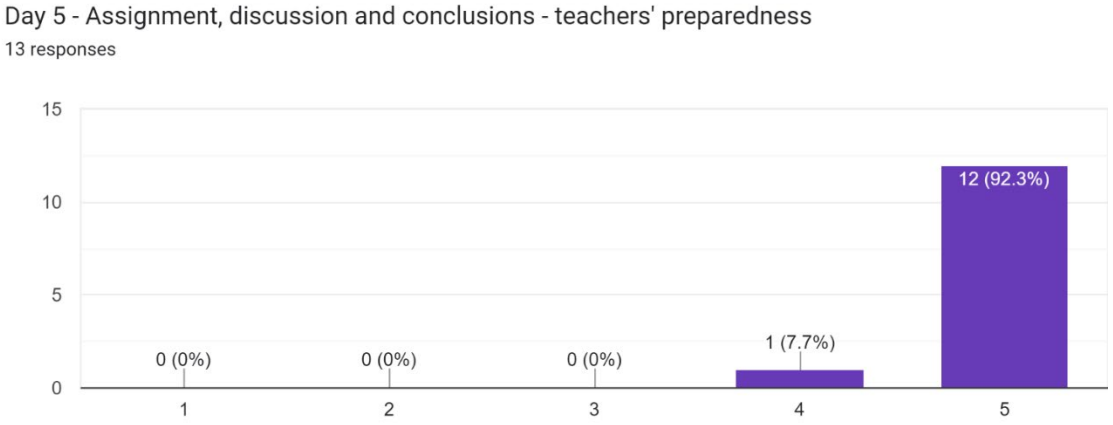
Comments (13 responses)

- need more practical example to distinguish different colonies, try to pick a colony, what to do if a culture is not pure
- It was really good to see the bacterial plates, have an insight of the form of the colonies. Also the mass spectrometer, how it works
- I enjoyed the inclusion of bacteriological part of the training.
- From my point of view, I would like to have spent som more time on bacteria, besides input on viruses.
- Very short time for this topic
- None
- Good demonstration of relevant bacteria and methods
- We also do bacteriology here so it was a useful knowledge for me.
- This section was too fast, spending less than one hour in the lab

- It was educational. Perhaps a special course should be organized just for the basics of fish bacteriology.
- very interesting
- The findings from the samplings were quite interesting and both the instructors (senior scientist and lab technician) were helpful in explaining
- I felt that this was the most exposure we got to the DTU facilities. It was the closest we got to a tour of the facilities which interests me, gives me an idea of the research and surveillance activities going on (how the whole institute functions), and is also an activity that makes the course worthwhile, the travel worthwhile, and cannot be done remotely or elsewhere. For example, I had no idea how simple MALDI was for bacterial identification. This can spark (research) ideas, resource sharing, and maybe collaborations. However, I understand that this is not the intended goal of the course.

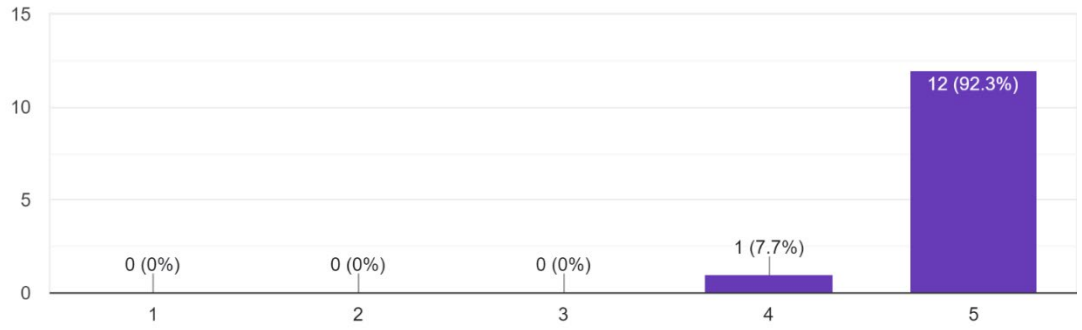
Day 5 - Assignment, discussion and conclusions





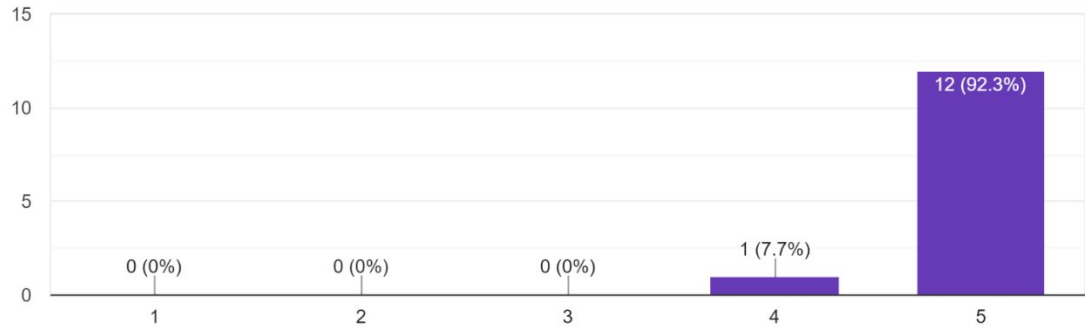
Day 5 - Assignment, discussion and conclusions - relevance for you

13 responses



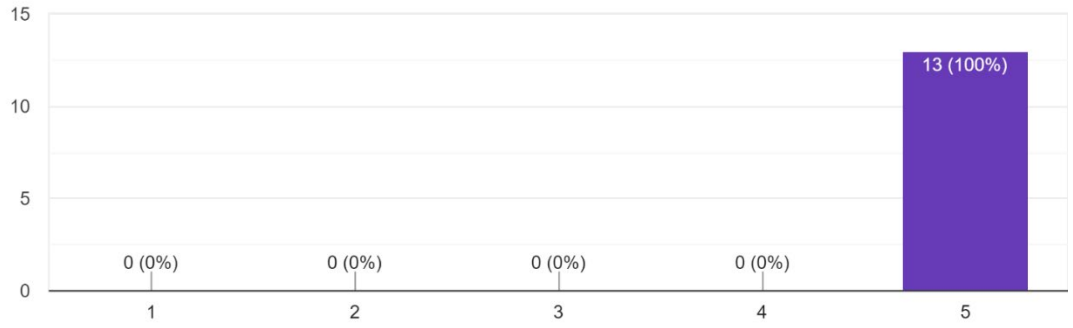
Day 5 - Assignment, discussion and conclusions - increase of your knowledge

13 responses



Day 5 - Assignment, discussion and conclusions - overall score

13 responses



Comments (13 responses)

- Need More time dedicated to pratical exercise on legislation
- I think the exercises gathered all the topics and aspects we saw in the course, from how to report and outbreak, how to categorize the disease, where in the legislation is listed and which methods to detect it and diagnose it we would have to use. It was very good to work in a team with the rest of participants and make the discussion later. It was a good way to end the course
- The assignment was very interesting, and I liked the presentation part of the discussion.
- I wish we would have had a littel more time on this assignment, since it was a really great learning experience. Also, I think the cours could benefit from having some similar exercise earlier in the week/e.g. on day 2.
- Everything that was shown was applied, I really liked the exercise that was carried out.
- A really good session. It would be interesting to have small discussions at the end of each day.
- The assignment was very good to review everything learned during the course. Sadly time for the assignment was rather short.
- I am thankful for the oppurtinity of discussions.
- This part is very useful to summarize all that we learnt during the course.
- It was a very fun part of the course. We worked as teams and summarized all the knowledge from the past week and from our work experience. It was a great way to exchange thoughts and evaluate everything learned on the course.
- very interesting
- The final exercise was very helpful in integrating all of the aspects of the knowledge presented in the course.
- I felt that this was a good way to test how much we can teach and by extension, how much we learned. It was a good exercise for us to later relay this information back home to our colleagues. Maybe a suggestion would be to scatter such exercises throughout the week to reinforce learning and help break the ice sooner rather than later.

Closing remarks

The EURL training course 2023 was - based on the feedback from the participants - considered a success. The evaluation schemes enabled the participants to evaluate each day and topic on the course. The majority of the participants evaluate the courses with the highest mark.

The possibility to provide financial support to participants made it possible to offer training to laboratories where the lack of funding usually makes it hard to find the resources to participate in such activities. This way of funding the training courses, therefore, holds the possibility to increase the expertise in all National Reference Laboratories within the EU.

Again, this year's course on "Methods for implementation of surveillance procedures for listed fish diseases", it was decided to include an inspection to a fish farm, to demonstrate the full process from sampling fish at a fish farm to final reading and interpretation of results, giving a holistic view and large span of topics that, according to the evaluation schemes, were well received.

DTU-Aqua is acknowledged for offering training course facilities for free. Jesper Valbak and Marco Magaletti from the Danish Veterinary and Food Administration is deeply acknowledged for organizing the office and field visit and for teaching how to organize and implement surveillance and eradication programmes and how to inspect and sample on fish farms. Hesselho Fish Farm and Mr. Jens Jensen are deeply acknowledged for great hospitality and for providing all information and facilities needed during the farm visit.

Finally, all laboratory technicians and scientists in the unit for fish and shellfish diseases at DTU Aqua are deeply acknowledged for delivering excellent teaching and training and help with practical issues.

Copenhagen, Monday, 27 November 2023

Niccoló Vendramin, Jonas Fabricius, Argelia Cuenca, Lone Madsen
EURL for Fish and Crustacean Diseases