



European Union Reference Laboratory for Fish and Crustacean Diseases
NATIONAL INSTITUTE OF AQUATIC RESOURCES, TECHNICAL UNIVERSITY OF DENMARK

EURL Training Course on Introduction to histopathology in fish and crustacean diseases

Copenhagen, October 18th - 22th 2021

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

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General introduction

The training course on “Introduction to histopathology in fish and crustacean diseases” was organized by the EURL for Fish and Crustacean Diseases located in Kgs. Lyngby at DTU Aqua, Denmark, from October 18th to 22nd, 2021. This year due to the Covid-19 pandemic and related travel restrictions it was only possible to organize a virtual course based on the Zoom platform. 26 participants attended the course. Thanks to the organization on a virtual platform we could allow the participation of more than twice the number of participants compared to when the course is organized physically.

The overall purpose of the training courses was to provide an opportunity for people at the NRLs to be trained in techniques relevant for working with listed fish diseases. Staff from the EURL and DTU Aqua, in cooperation with colleagues from NVI-Oslo and Cefas (UK), constituted the teacher team. Knowledge-sharing and discussions between participants and teachers were important parts of the course.

Course description

The five-day course was divided into two parts; a three and a half-day part on histopathology of fish and a one and a half day part on histopathology of crustaceans. In both parts, theoretical lectures on relevant topics alternated with group activities based on virtual access to digital collections of scanned histological material, conducted using the breakout room function of zoom.

Day 1 started with an introduction to the course and practical information. Each participant had the opportunity to present themselves to the teachers and the other trainees. This was followed by lectures given by Ole Bendik Dale from NVI-Oslo on fish anatomy, histological sampling methods and histopathology of fish.

Day 2 followed up on day 1, with Ole Bendik Dale giving lectures on IHN and VHS histopathology and on the Norwegian approach to fish disease diagnostics. A large part of the day was also set aside for the students to work with the digital collection of scanned histological material in order to get familiar with histological diagnostics of listed fish diseases.

Day 3 was dedicated to Immunohistochemistry (IHC), with Tine Moesgaard Iburg giving lectures on the different phases of sample preparation for staining techniques, and troubleshooting and pitfalls during the process were discussed. This was followed up by theoretical exercises on IHC, which the students worked with in groups.

Day 4 The morning was dedicated to show-and-tell cases by Ole Bendik Dale in discussion with the course participants, this year the show and tell was possible thanks to scanned slides that were made available online. In the afternoon Kelly Bateman from Cefas (UK) gave a lecture on the anatomy of crustaceans. This was followed by a session in which the participants in groups looked at scanned histological material of healthy shrimp provided by Cefas, in order to be able to identify organs and tissues relevant for disease diagnostics.

Day 5 continued the crustacean session with Kelly Bateman giving lectures on sampling methods for crustacean histopathology, and on the pathology of listed crustacean diseases. In-between lectures, the participants did group work on scanned histological material of diseased shrimp, in order for them to be familiar with the most prominent histopathological signs of microbial infections in shrimp. The course was concluded by an evaluation session where each participant was asked to give his or hers impression of the course and what could be made different next time. The participants were also asked to fill a google form for evaluating the course and provide inputs for improvement.



European Union Reference Laboratory for Fish and Crustacean Diseases

NATIONAL INSTITUTE OF AQUATIC RESOURCES, TECHNICAL UNIVERSITY OF DENMARK

List of participants

Training course 2021 : Introduction to histopathology in fish and crustacean diseases				
Name	Surname	Email	Country	Institution
Miriam	Macekova	miriam.macekova@svpu.sk	Slovakia	State Veterinary and Food Institute
Katarina	Pavlin	katarina.pavlin@vf.uni-lj.si	Slovakia	Faculty of Veterinary Medicine, Institute of Pathology, Wild Animals, Fish and Bees
Zeren Gamze	Erol	zerengamze.erol@tarimorman.gov.tr	Turkey	Republic of Turkey Ministry of Agriculture and Forestry Izmir Veterinary Control Institute
Bülent	Kafa	bulent.kafa@tarimorman.gov.tr	Turkey	Directorate of İzmir - Bornova Veterinary Control Institute / Virology Department / Fisheries Diseases National Reference Laboratory
Sabina	Šturm	sabina.sturm@vf.uni-lj.si	Slovenia	Institute for Pathology, Wild Animals, Fish and Bees, Veterinary faculty of the University of Ljubljana
Thorbjorg	Einarsdottir	thorbje@hi.is	Island	Institute for Experimental Pathology
Dimitrije	Glišić	dimitrije.glisic@nivs.rs	Serbia	Institute of Veterinary Medicine of Serbia_(IVMS)
Bogna	Griffin	bogna.griffin@marine.ie	Ireland	: Fish Health Unit, Marine Institute
Elif	Eker	ekernisaelif@gmail.com	Turkey	Ankara University Faculty of Veterinary Medicine
Hampus	Hällbom	hampus.hallbom@sva.se	Sweden	National Veterinary Institute
Sultan Nurhan	Ajikel	nurhanayikol@gmail.com	Turkey	Ankara University Faculty of Veterinary Medicine
Hildur	Magnusdottir	magnusdottir@hi.is	Iceland	Department of Fish Diseases, Keldur – Institute of Experimental Pathology, University of Iceland
Synne	Grønbech	synne.gronbech@vetinst.no	Norway	Norwegian Veterinary Institute
Agnieszka	Troszok	agnieszka.troszok@golysz.pan.pl	Poland	Polish Academy of Sciences, Institute of Ichthyobiology and Aquaculture in Golysz
Bartosz	Bojarski	Bartosz.Bojarski@golysz.pan.pl	Poland	Polish Academy of Sciences, Institute of Ichthyobiology and Aquaculture in Golysz
Richard William	Doughty	dr.rwdoughty@yahoo.co.uk	Norway	Private consulting fish histopathology

Marjukka	Rask	marjukka.rask@ruokavirasto.fi	Finnish	Finnish Food Authority
Liga	Ansonska	liga.ansonska@bior.lv	Latvia	Microbiology and Pathology laboratory, Institute of Food Safety, Animal health and Environment "BIOR", Latvia, NRL for Fish and Crustacean Diseases
Julie	Hansen Bergstedt	juhala@aqua.dtu.dk	Denmark	DTU Aqua
Münevver Ziyet	Günen	munevverziynet.gunen@tarimorman.gov.tr	Turkey	İzmir-Bornova Veterinary Control Institute/National Reference Laboratory for fish and crustacean diseases
Sotiria	Georgiadou	sgeorgiadou@vs.moa.gov.cy	Cyprus	Histopathology Laboratory, Veterinary Services of Cyprus
František	Kostka	kostka@svujihlava.cz		Department of pathology and parasitology, State Veterinary Institute Jihlava
Erdoğan	Güner	eguner35.5@gmail.com	Turkey	İzmir-Bornova Veterinary Control Institute/National Reference Laboratory for fish and crustacean diseases
Richard	Hazelgrove	Richard.Hazelgrove@cefas.co.uk	UK	CEFAS
Julie Christine	Svendsen	julie.svendsen@vetinst.no	Norway	The Norwegian Veterinary Institute
Caroline	Daumich	caroline.daumich@cefas.co.uk	UK	CEFAS



Course Announcement: Introduction to histopathology in fish and crustacean diseases

Lyngby 13.07.2021

Dear colleagues,

As announced at the last Annual workshop for national reference laboratories for fish and crustacean diseases, the travelling uncertainties related to the Covid-19 pandemic have led us to convert the EURL training courses in week 41 and 42 as online courses.

This year we will organize two courses

- “Methods for implementation of surveillance procedures for listed fish diseases”
and will be held in week 41 from **Monday the 11th to Friday the 15th of October 2021**
- “Introduction to histopathology in fish and crustacean diseases”
and will be held in week 42 from **Monday the 18th to Friday the 22nd of October 2021**

Programme

The preliminary course programs foresee daily sessions, each session will include lectures, as well as quiz, tasks and work in small groups organized in separate online rooms.

The course contents will reflect the structure of the live courses held in 2019, with the necessary updates for the changes occurred in the legislative framework (new animal health law implemented on 21st of april 2021) and with the changes necessary to hold the courses online.

For the course in week 41, the topics of the 5 sessions will cover the topics normally included in the program for the training course in week 41 :

1. Listed fish disease in Europe: Legislation and implementation of surveillance plans.
2. Sampling procedures for surveying listed fish diseases
3. The use of cell culture for surveying listed fish diseases
4. qPCR methods, sequencing and bioinformatics for surveying listed fish diseases
5. Wrap up session, evaluation of the course and general recommendations

For the course in week 42, the topics of the sessions will cover the topics normally included in the program for the training course in week 42:

1. principles of normal anatomy of fish and crustaceans
2. pathology and histopathology
3. development and assessment of protocols for special staining (IHC and ISH)
4. show and tell of diagnostic cases of fish and crustacean diseases from invited speakers.

By attending the entire course, participants will receive a course certificate.

Teaching platform and course material

The course will be organized by zoom platform.

Personal invitation to the training course will be send to participants via Outlook calendar, the link should not be shared with others; it is unique to each participant.

A compendium covering the topic of the course will be made available to the participants prior to the course start.

Course fee

The course is for free for NRL representatives in EU member states as well for members of governmental institutions, such as universities and veterinary institutes.

Employees of private companies are welcome to attend the course as well, for them a participating fee of 200 euros is requested.

Please note for all participants, there is cancellation fee of 100 euros if a participation is cancelled less than a week before the course begins.

Registration

Please use the registration form attached to this email.

The registration form has to be followed by a letter of motivation, where your background and working experience are briefly described.

The use of online platform allow us to expand the number of participants to the course to 20.

To properly plan and organize the course online, you will be asked to apply to participate to the course, by sending an email to Lis Vinther Elmsted lvi@aqua.dtu.dk ; Linda Stuhr Christensen lschr@aqua.dtu.dk. The information obtained will solely be used to evaluate participants according to the foreseen activities.

Deadline for application is **September 6th**.

By September 21st we will communicate to you if the application has been accepted.

We look forward to receive your application, do not hesitate to contact us for further information.

Best regards

The EURL team



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Programme: Introduction to histopathology in fish and crustacean diseases

Day 1	Day 2	Day 3	Day 4	Day 5
Monday	Tuesday	Wednesday	Thursday	Friday
<p>9:00-10:30 Course introduction Participants will present themselves</p> <p><u>Coffee Break 10:30-11:00</u></p> <p>11:00-12:30 Fish Anatomy</p>	<p>9:00-9:30 Self-study of case 1-2</p> <p>9:30 – 10:30 Pathology of VHS and IHN</p> <p><u>Coffee Break 10:30-11:00</u></p> <p>11:00-12:45 Practical exercise with slides</p>	<p>9:00-10:00 Lecture on IHC I</p> <p><u>Coffee Break 10:00-10:30</u></p> <p>10:30-12:00 Lecture on IHC II</p>	<p>9:00 - 10:00</p> <p>Show and tell of cases by Ole Bendik Dale with discussion and participation of course participants</p> <p><u>Coffee Break 10:00-10:30</u></p> <p>10:30- 12:00 More show and tell</p>	<p>9:00 – 9:30 Overview of WSSV</p> <p>9:30 – 10:30 Microscopy practicals (scanned slides)</p> <p><u>Coffee Break 10:30-11:00</u></p> <p>11:00 – 12:00 Overview of TSV and YHV</p> <p>Microscopy practicals (scanned slides)</p>
Lunch 12:30 -13:00	Lunch 12:45-13:15	Lunch 12:00 -12:30	Lunch 12:00 -12:30	Lunch 12:00-12:30
<p>13:00 – 14:30 Sampling is Queen, Context is King</p> <p><u>Coffee Break 14:30-15:00</u></p> <p>15:00 – 16:00 General Pathology I</p>	<p>13:15 – 14:30 Norwegian approaches and experiences in fish disease diagnostics</p> <p><u>Coffee Break 14:30-15:00</u></p> <p>15:00-16:30 Practical exercise with scanned slides</p>	<p>12:30-13:30 Theoretical exercise IHC I In groups</p> <p><u>Coffee Break 13:30 – 14:00</u></p> <p>14:00-15:30 Practical exercise with scanned slides</p> <p>15:30 – 16:15 Theoretical exercise IHC II in groups</p>	<p>12:30-14:30 Crustacean Dissection and Sampling</p> <p>Overview of Crustacean Tissues - Structure and Function Part I</p> <p><u>Coffee Break 14:30 – 15:00</u></p> <p>15:00-16:00 Overview of Crustacean Tissues - Structure and Function Part II Slide session</p>	<p>12:30-14:30 OIE listed diseases and Emerging Pathogens</p> <p>Microscopy Practicals (scanned slides)</p> <p>14:30 Course evaluation</p>



Evaluation: Introduction to histopathology in fish and crustacean diseases

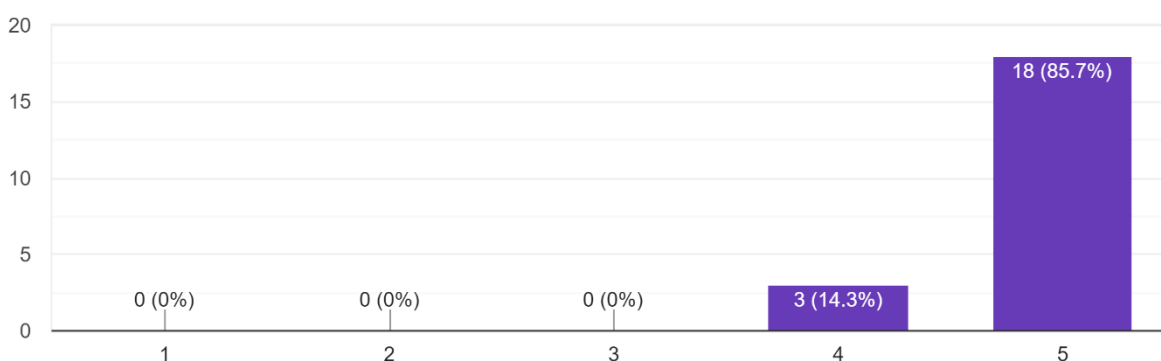
Participant satisfaction level for each respective section was assessed, each aspect of each session was scored on a scale from 1 to 5. Score 1 corresponded to very low, 2 to low, 3 to average, 4 to good, and 5 to excellent. The calculations are based on returned evaluation schemes from 21 participants.

Course evaluation by session

More than 98% of the students scored each of the session as excellent (85% in average) or good (12 % in average).

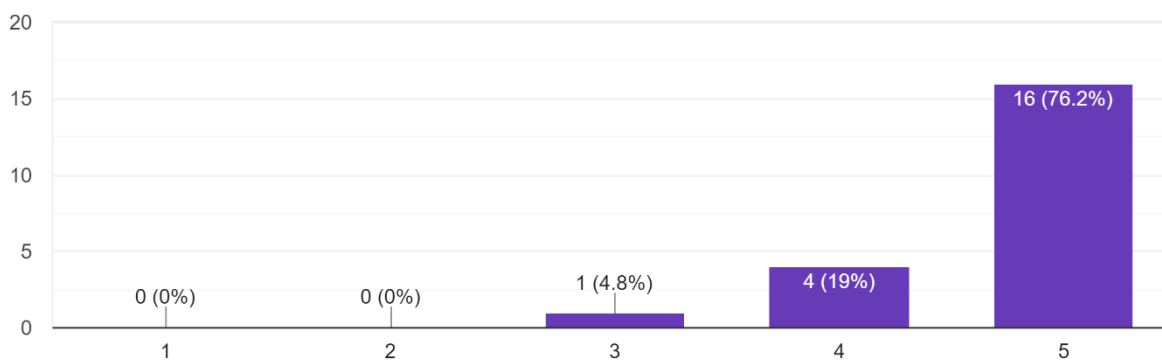
Day 1 Fish anatomy and General pathology - overall score

21 responses



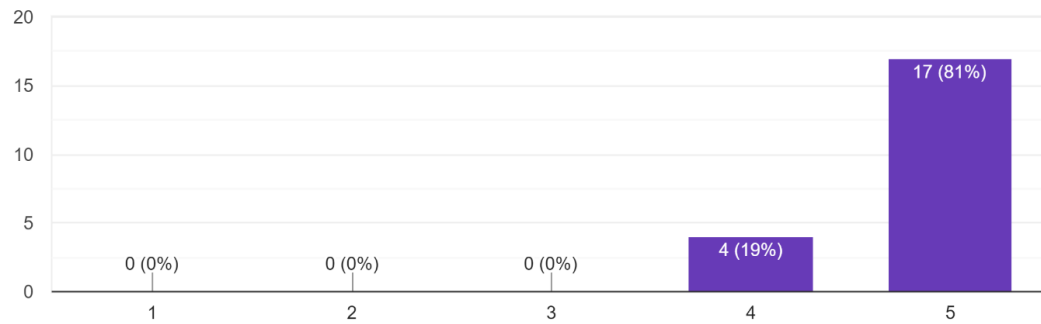
Day 2 Fish disease diagnostics and Pathology of VHS and IHN- overall score

21 responses



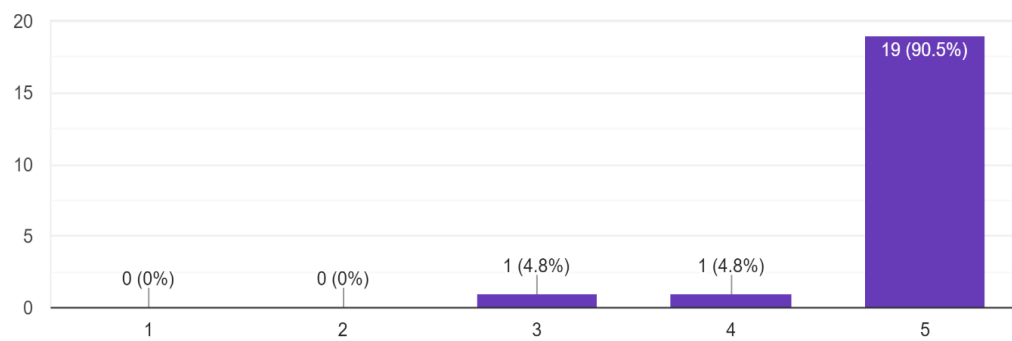
Day 3- Immunohistochemistry IHC- overall score

21 responses



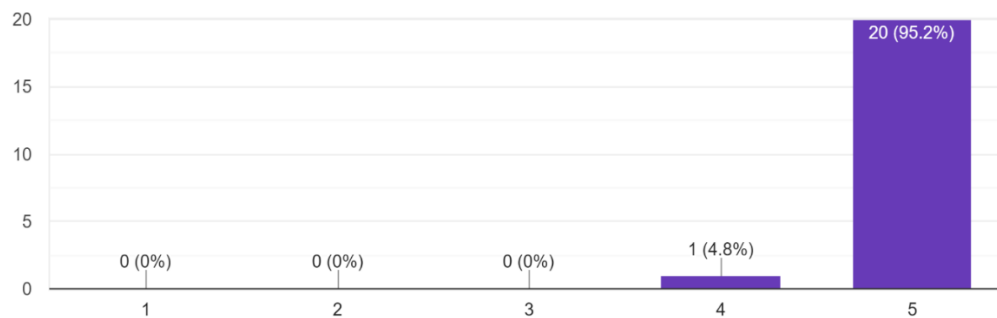
Day 4 - Show and tell of cases- overall score

21 responses



Day 4 and 5 - Crustacean diseases - teachers' expertise - overall score

21 responses

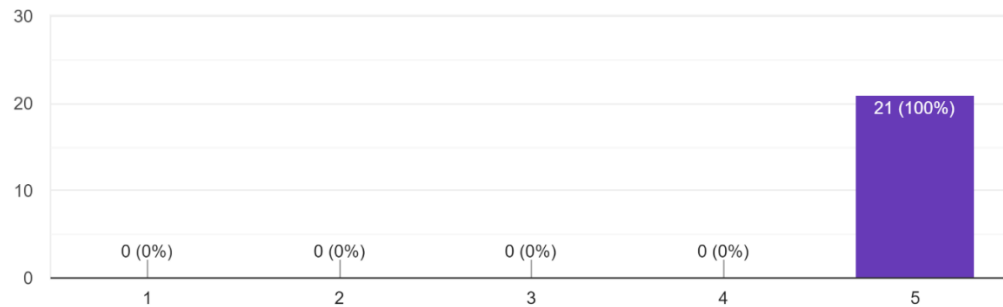


Detailed course evaluation per session

Course evaluation of Day 1

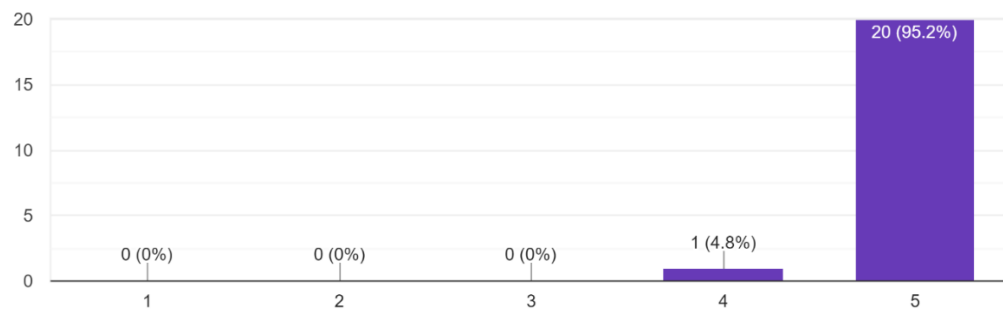
Day 1 Fish anatomy and General pathology - teacher's expertise

21 responses



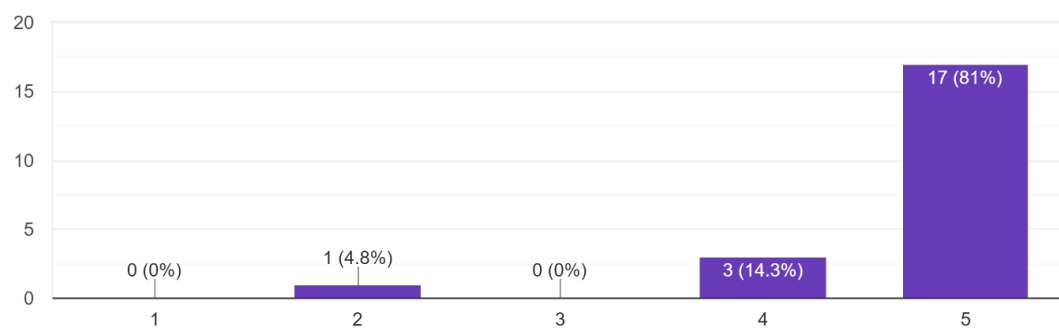
Day 1 Fish anatomy and General pathology - teacher's preparedness

21 responses



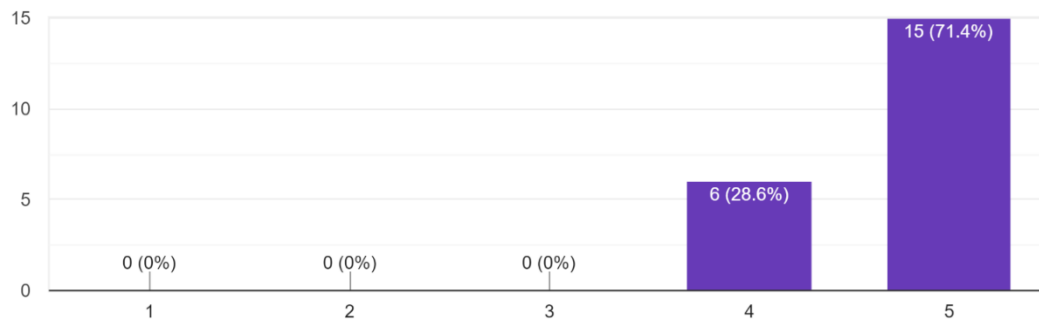
Day 1 Fish anatomy and General pathology - relevance for you

21 responses



Day 1 Fish anatomy and General pathologys - increase of your knowledge

21 responses



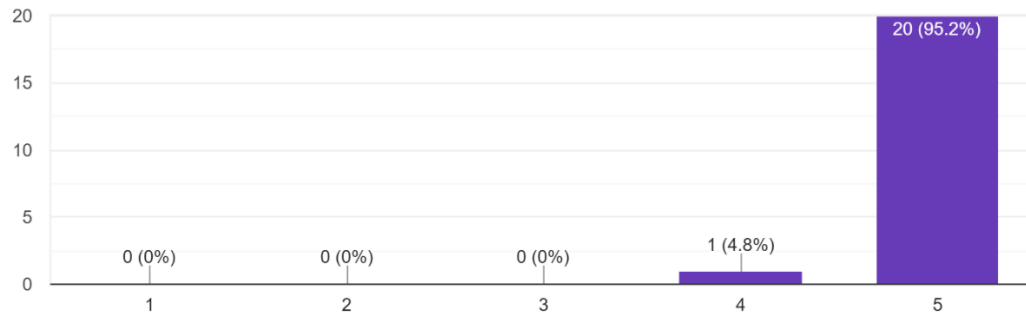
Day 1 Fish anatomy and General pathology - general comments

- very clear
- it was useful
- Very useful
- This has been my first experience on anatomy and pathology on fish. Thank you for this education and opportunity.
- very good impact for me
- It was great
- Good overall introduction. Good that pitfalls for assessing histological slides was highlighted, exemplified with sampling, processing- fixation and autolytic artefacts was brought up.
- Would be great if we had break out in small groups and study histological slides on normal fish tissues as we did in crustacean before starting the pathology.
- This was a very good start of the course
- Good information, good lecturer.
- very good, maybe more information on what a healthy organ looks like
- Good job
- It was very beneficial.
- Excellent presentations
- Excellent lectures.
- Very good experience
- The lecturers shared a great amount of knowledge and experiences.
- All information was very interesting for me
- Video of sampling would be excellent addition

Course evaluation of Day 2

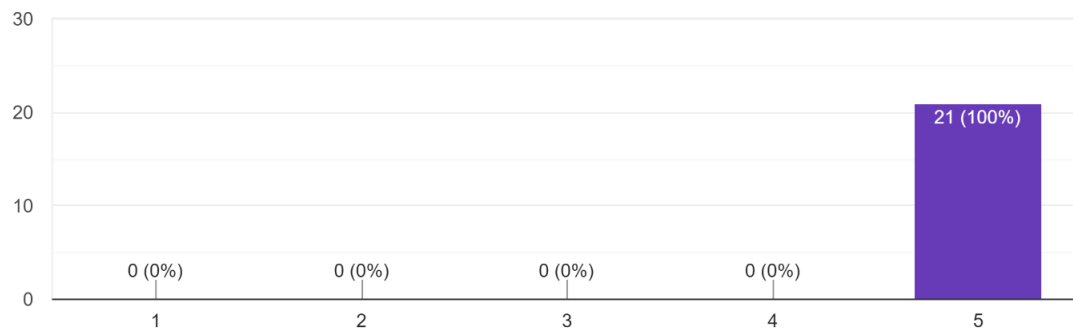
Day 2 Fish disease diagnostics and Pathology of VHS and IHN- teacher's expertise

21 responses



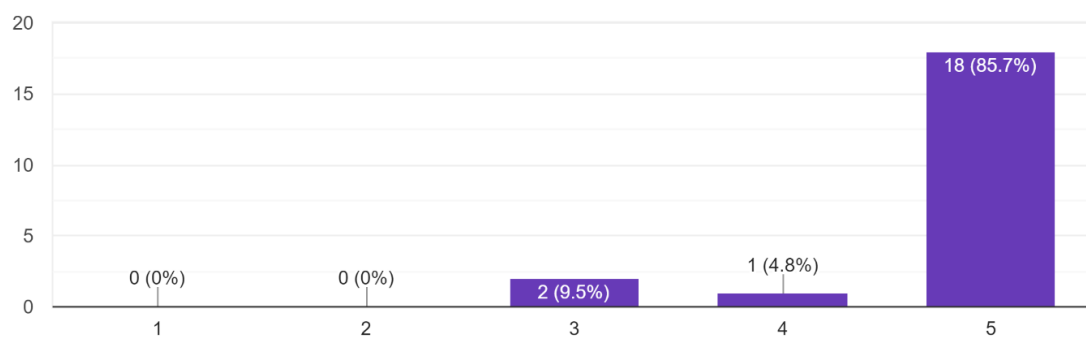
Day 2 Fish disease diagnostics and Pathology of VHS and IHN- teacher's preparedness

21 responses



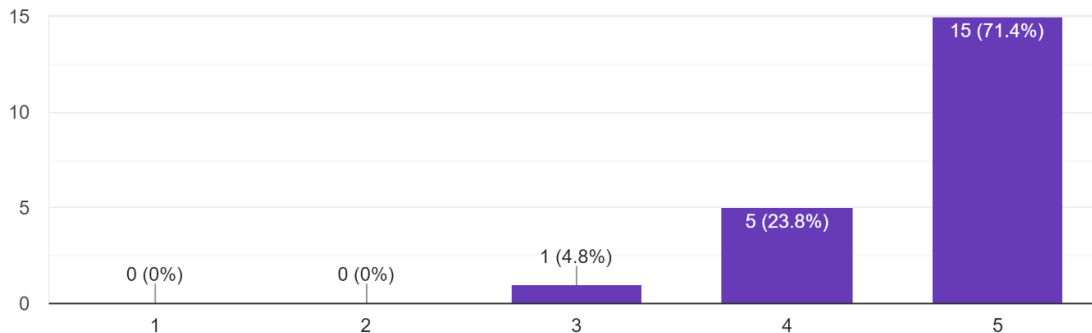
Day 2 Fish disease diagnostics and Pathology of VHS and IHN- relevance for you

21 responses



Day 2 Fish disease diagnostics and Pathology of VHS and IHN- increase of your knowledge

21 responses



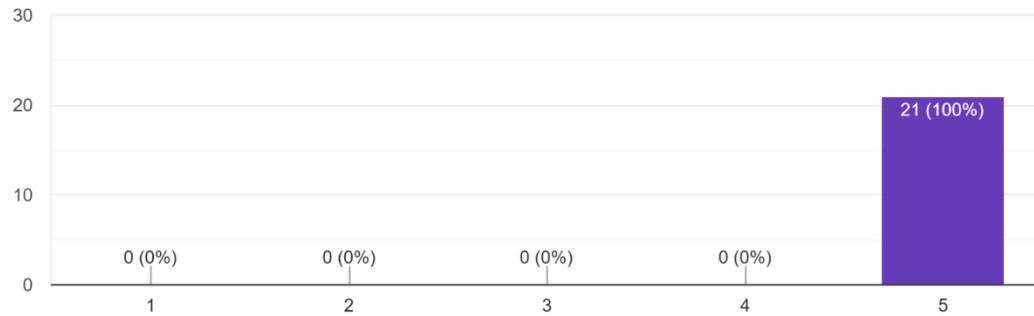
Day 2 Fish disease diagnostics and Pathology of VHS and IHN - general comments

- None
- set at the right level of complexity
- Very useful
- Detailed slides have been helpful
- Practical format for me.
- It was great
- Excellent lecture. Very good that the handout has a lot of pictures, might be beneficial to include slightly more text or arrows etc to highlight what is seen especially in some of the histological pictures.
- It was very good to hear in detail about these important diseases and the slide practicals were good.
- Good information, good lecturer
- All very good
- informative
- It would have been good to have some of the lectures before the histological exercises
- Differentiation and diagnosis of these diseases are great
- Excellent presentations
- Excellent lectures.
- Need more histology slides for differentiation
- Great lectures and practical exercises.
- All is new for me, but very interesting.
- more time with practical exercise with online slides

Course evaluation of Day 3

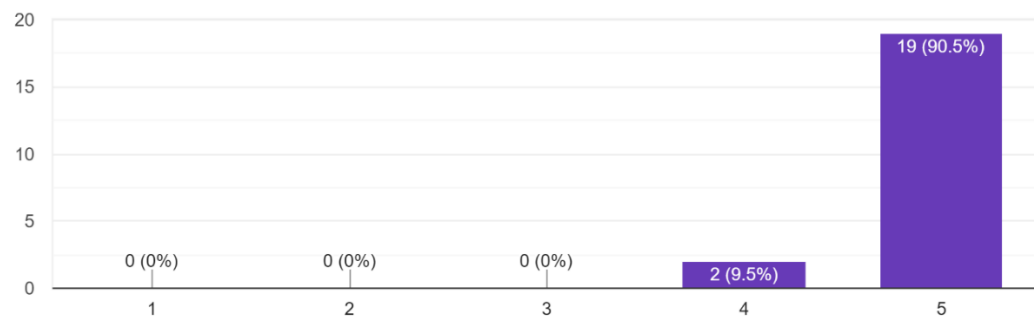
Day 3- Immunohistochemistry IHC - teacher's expertise

21 responses



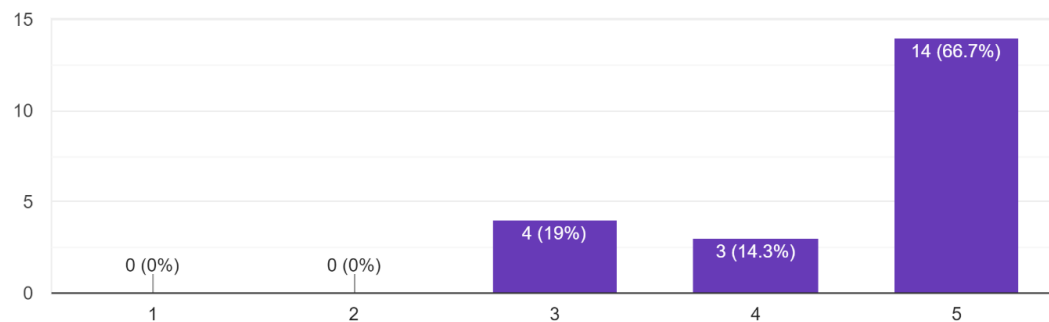
Day 3- Immunohistochemistry IHC- teacher's preparedness

21 responses



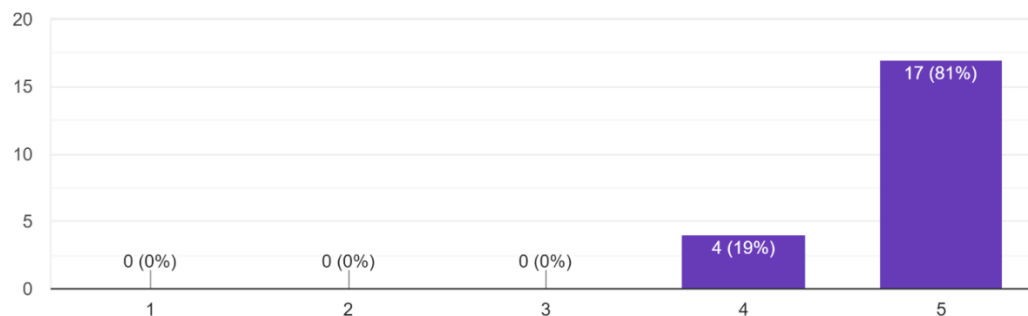
Day 3- Immunohistochemistry IHC- relevance for you

21 responses



Day 3- Immunohistochemistry IHC- increase of your knowledge

21 responses



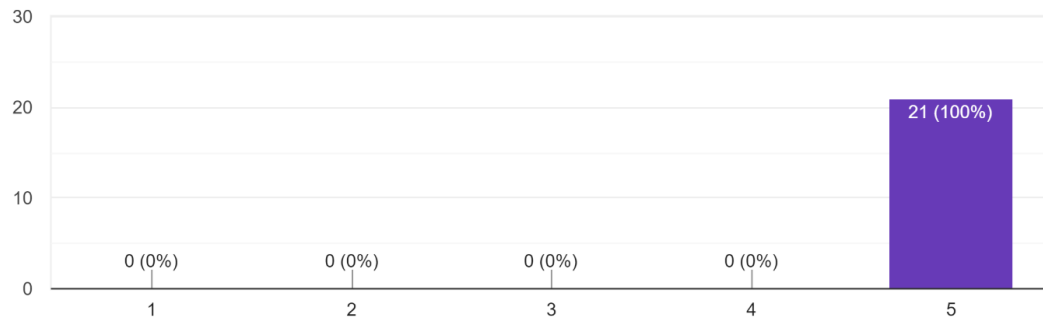
Day 3 – Immunohistochemistry IHC – increase of your knowledge

- new to my learning
- More visual material could be shown on how IHC staining is done
- Very useful, especially for those not so experienced with IHC
- It was the most detailed training that i've get on ihc
- Good practical trables shooting.
- It was great
- Very good lecture in order to build my knowledge. The theoretical examples were good in order to make one think in how one should go about in planning a set up and troubleshooting.
- I wish this part was not only on-line and sould attend the course and spend a few days working and practising in the laboratory.
- I think this is a very important part of the course and I liked the two theoretical sessions, they were very relevant.
- Good information, good lecturer
- Excellent
- Exciting, but the exercises were quite difficult(too difficult for my level of prior knowledge).
- Not the most relevant part for me, but good lectures and exercise
- Now I have the information how I do it this method.
- Excellent presentations
- Excellent lectures.
- Thorough, very good explanation!!
- Great lectures and practical exercises.
- All is new for me, but very interesting.
- more time with practical exercises

Course evaluation of Day 4

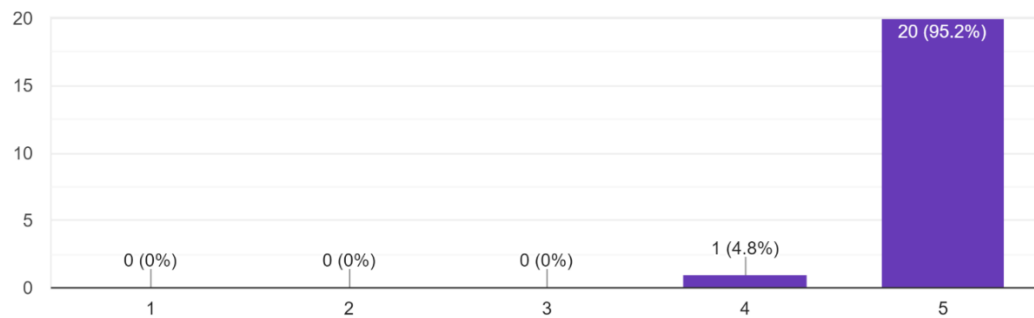
Day 4 - Show and tell of cases teacher's expertise

21 responses



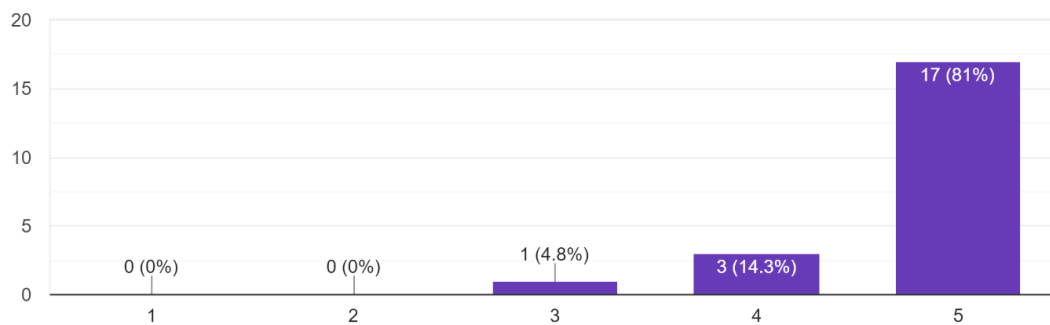
Day 4 - Show and tell of cases- teacher's preparedness

21 responses



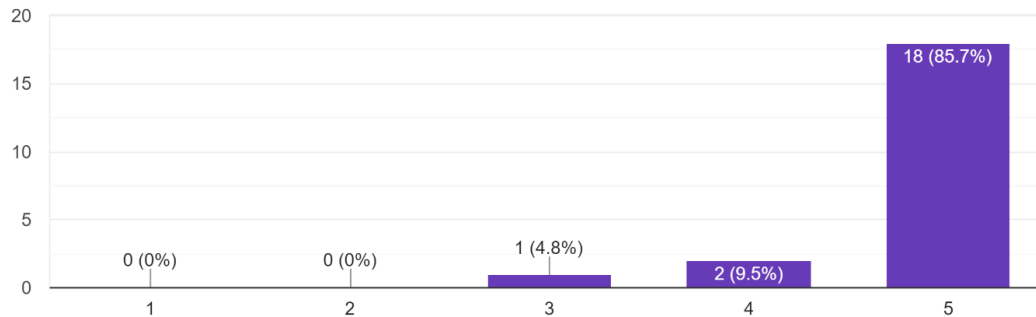
Day 4 - Show and tell of cases- relevance for you

21 responses



Day 4 - Show and tell of cases- increase of your knowledge

21 responses



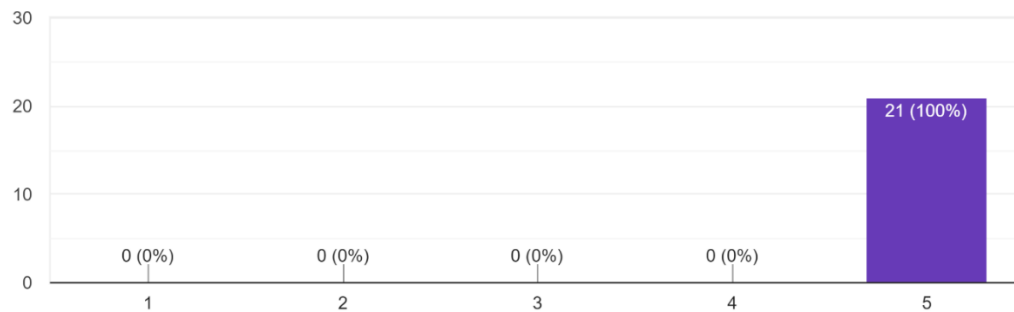
Day 4 – Show and tell of cases - general comment

- very clear
- None
- Interesting and useful, and great to benefit from OB's many years of experience
- thanks.
- Practical improvement for me.
- It was great
- Really enjoyed the show and tell with an array of different diseases highlighting gills, fungal infections and bacterial disease. Also useful during and after practical exercises in the previous days.
- Would appreciate more cases.. :)
- It was a very good overview of the many important fish diseases we come across.
- Good information, good lecturer
- I think it would be better if this was at the beginning of the course before working in groups as it gave a really nice broader picture of the diseases
- Was interesting
- It would have been good to go a bit deeper in to some cases and show the histological deviations more in detail
- Breakout group is very beneficial
- Excellent presentations
- Excellent. It would be beneficial if the discussed slides were available (with annotations) for some time for the course participants.
- Excellent
- Many cool and interesting cases.
- All is new for me, but very interesting.
- excellent cases

Course evaluation of Day 4 and 5

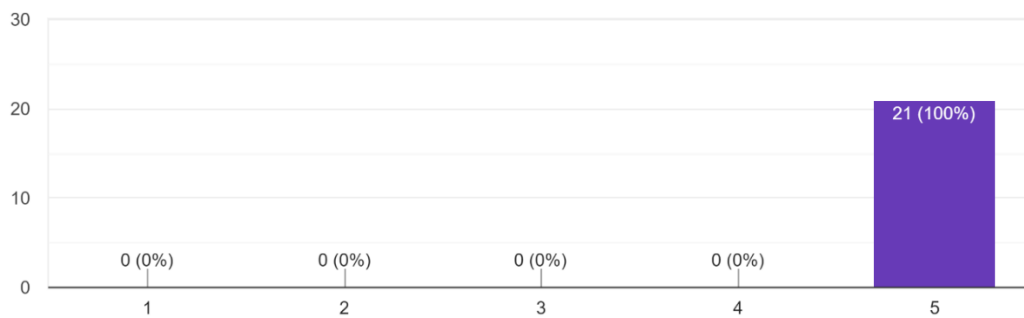
Day 4 and 5 - Crustacean diseases - teachers' expertise

21 responses



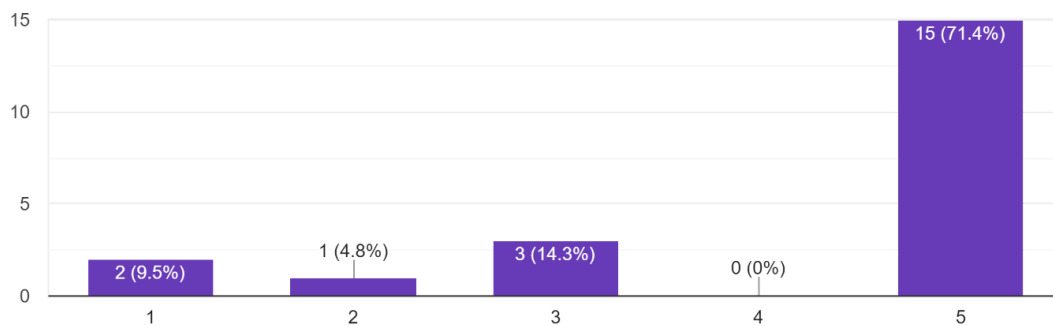
Day 4 and 5 - Crustacean diseases - teachers' preparedness

21 responses



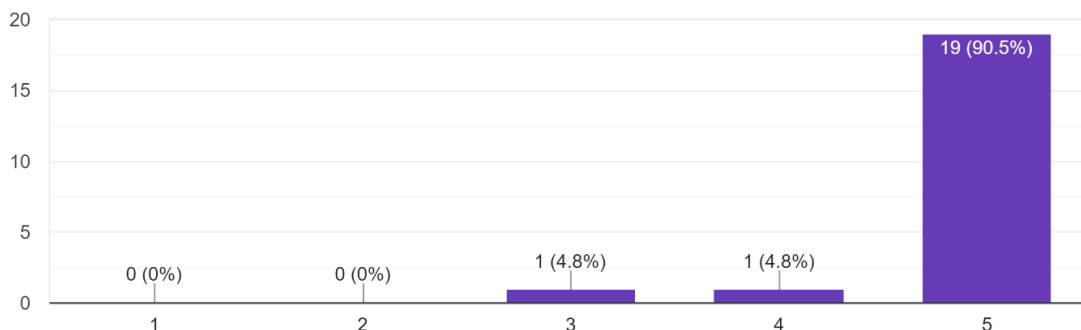
Day 4 and 5 - Crustacean diseases - relevance for you

21 responses



Day 4 and 5 - Crustacean diseases - increase of your knowledge

21 responses



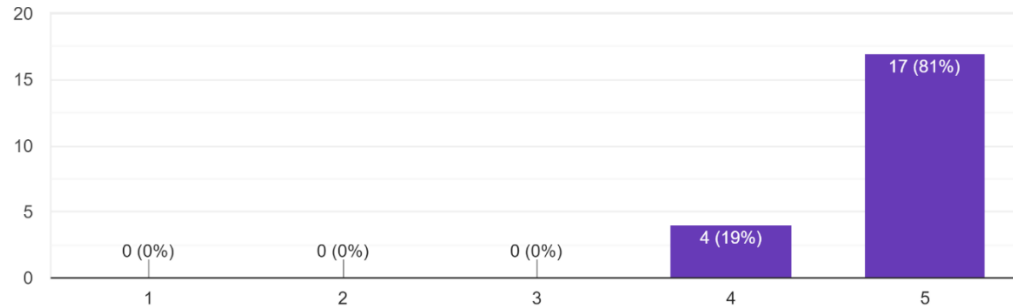
Day 4 and 5 – Crustacean diseases - general comment

- Excellent.
- She explained the first slides very fast I had a hard time following and it was better towards the end.
- Excellent
- one of the most educative part of the training. I am happy I had to chance to learn further on crustaceans.
- Without practical impact for me, but interestin.
- excellent
- Very useful to get an overview of the most important diseases, general knowledge on anatomy and recognition of them in histo slides. Good handouts that can be used for a future reference. Excellent database setup.
- At the beginning was hard to follow her as English is not my mother language. But as the course progressed it was much better
- The talks on crustacean diseases were very good and Kelly's expertise evident.
- Good information, good lecturer
- very good and great look at heathy organs first before moving onto diseases
- Kelly was really good at explaining and teaching, keeping her lectures interesting
- Really good. In the last lecture I would have prefered to split the diseases and the exercise in to shorter ones with fever diseases in each.
- Very clear
- Excellent presentations
- Very nicely presented
- Presentations were very structured/organized. Cefas digital slides database is super instructive.
- I didn't be on Friday on course, but I thing, it was great.
- very well given information in short time

Course evaluation of practical exercises

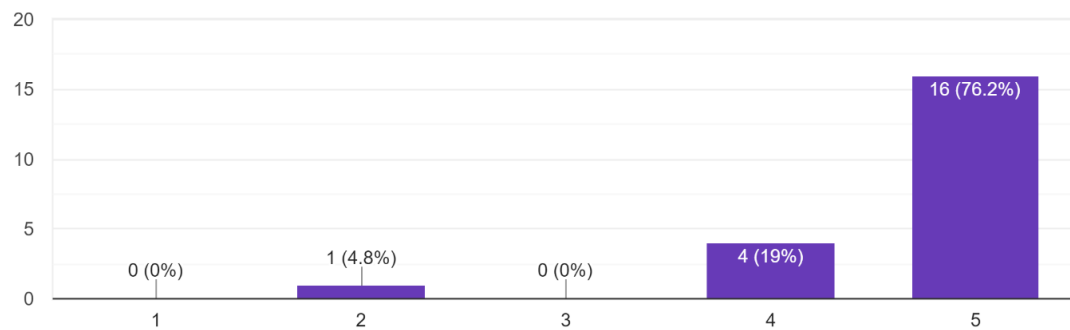
Digital slide exercise on fish pathology - Relevance for you

21 responses



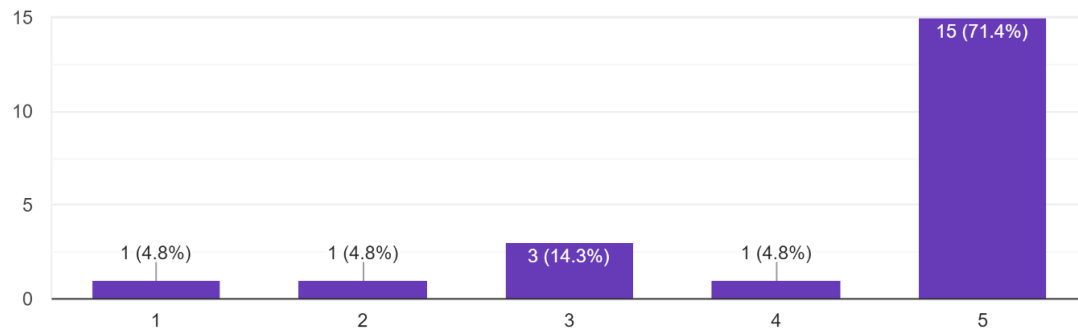
Digital slide exercise on fish pathology - quality of the exercise and accessibility to the function

21 responses



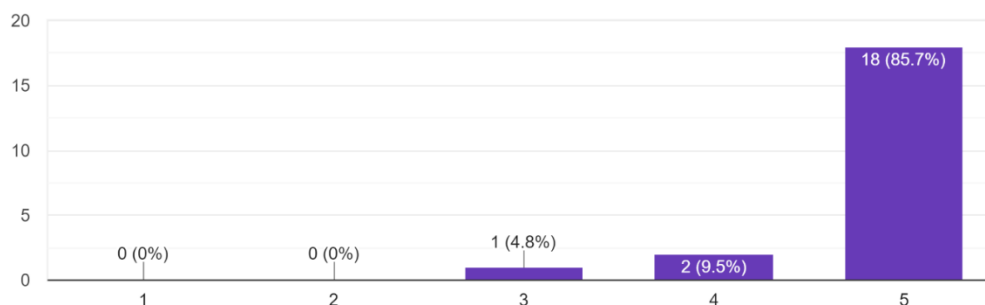
Digital slide exercise on crustacean pathology - Relevance for you

21 responses



Digital slide exercise on crustacean pathology - quality of the exercise and accessibility to the function

21 responses



Closing remarks

The EURL training course on “Introduction to histopathology in fish and crustacean diseases” 2021 was - based on the very positive feedback from the participants - considered a success. The evaluation schemes enabled the participants to evaluate each day and topic on the course. A large majority of the participants evaluated the course as “excellent”.

Due to the Covid-19 pandemics and the restrictions in travelling and gathering, the course has this time been organized virtually, giving us serious challenges to solve for teaching an on-hand course virtually. On the other hand, the virtual course has allowed us to increase the number of participants to the course significantly as well as to expand the accessibility of countries located far from Denmark, and thereby providing the possibility to increase the expertise in National Reference Laboratories in EU and abroad.

All participants were registered on a daily basis, and all participated in the whole course. A signed certificate of participation was issued and sent individually to the participant at the end of the course.

DTU-Aqua is acknowledged for offering training course facilities for free.

The external tutors, Dr. Ole Bendik Dale and Dr. Raoul Kuiper from Norwegian Veterinary Institute, Oslo, Norway; Dr. Kelly Bateman, Cefas, UK and Dr. Tobia Pretto, IZSve, Italy, are deeply acknowledged for their very enthusiastic and excellent lectures.

Copenhagen, Thursday, 11 November 2021

Tine Moesgaard Iburg, Niccolò Vendramin, Morten Schjøtt, Niels Jørgen Olesen

EURL for Fish and Crustacean Diseases