



### President's Letter

Dear AES members,

After nearly two years, my time as President of the AES has come to an end. First of all, I would like to thank to the Society and the Board of Directors for the opportunity. I have been able to meet people and to work with a very wide spectrum of personalities, which has allowed me to learn new ways of managing issues and made me become a more open, patient person and a better leader.



One of my main objectives when I stepped into this role was to make the society more industry oriented, which I think that we have achieved. We were present at RAStech 2022 with a very good audience and received great feedback for future sessions. The speakers performed an incredible session with an interesting and profitable last roundtable discussion. We will also be present in Orlando at RAStech 2023, and are hoping to see you there.

On the aquaculture side, 2021 and 2022 have been difficult years. When the pandemic situation was still in place the Ukrainian war began. These factors, combined with the growing immediacy of climate change, are some of the primary challenges that the industry needs to face. Prices have gone up (e.g. feed, energy, construction) and their high fluctuation is pushing many projects to the limit. At this point, it is difficult to say if the upcoming year will be the stabilization year or not, but it will be a promising year, I am sure of that!

One of my other objectives was to make the Society more visible worldwide, outside of the United States. Thus, the Society intends to be present in New Orleans at Aquaculture America 2023, in Orlando at RAStech 2023, and hopefully somewhere in Europe.

I leave the Society with Marc Sorensen as President. I am sure he will perform an incredible job and give the Society the increased web presence it deserves. Good luck Marc!

Happy Holidays to everyone, wishing all our members, friends, and industry colleagues the best for the upcoming 2023!

## Scientific Spotlight

### First impressions matter: The Role of the bacteria present at hatching for the microbiome of fish

In aquaculture systems, where fish are raised in high densities, protection against diseases is crucial. Here, the microbiome of the fish gains more and more attention, as it is one of the first lines of defence that pathogens have to cross to infect the fish. As for other animals, the fish's microbiome plays important roles for proper development of its host, providing nutrients and protecting the fish against potential pathogens. Even though we are getting more and more aware of these important functions, our understanding of the fish microbiome, especially in the early life stages of the fish, is still limited.

We used Atlantic salmon to investigate how the fish's microbiome is developing in the first weeks after hatching. Further, we examined what influence the water microbiome present at hatching has and how robust the microbiome is towards disturbances. To study this, we either disinfected the eggs to eliminate all bacteria on them and then re-exposed them to freshwater bacteria originating from a lake (lake-derived microbiome; LDM) or used non-disinfected eggs to keep their original egg microbiome (egg-derived microbiome; EDM). Then the eggs were kept in a sterile environment to avoid contamination by other bacteria until the fish hatched. The fish were then raised until the end of the yolk sac phase (13 weeks post hatching) without feeding them. With our system we could therefore follow the development

of the microbiome of the fish throughout the yolk sac stage.

We found that the microbiome of the freshly hatched Atlantic salmon is mainly determined by the bacteria that are present in the rearing water when the fish are hatching. The fish that got their bacteria from lake-water (LDM) and not from the egg had a different microbiome than the fish that got their microbiome from their egg bacteria (EDM, Figure 1). It also seems that the egg-derived microbiomes were more stable, both over time and between the individual fish. This is most likely the case because the bacteria colonizing the eggs were already adapted to living in and on the fish and therefore did not change much.

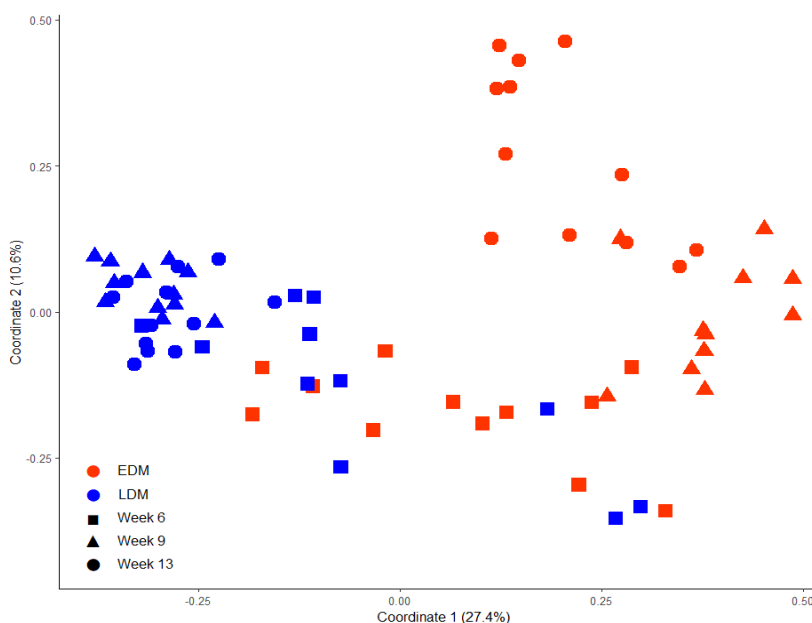


Figure 1: The microbiome of each fish sample is visualized in a principal coordinate ordination. The closer to characters are, the more alike are the microbiomes. The microbiomes of EDM and LDM fish were very different, as the blue and red characters cluster apart from each other. Further, differences between the sampling times can be observed (shapes).

Interestingly, both the fish with egg-derived and lake water-derived microbiomes were colonized by bacteria that were taxonomically close, meaning that certain bacterial groups (Proteobacteria and Bacteroidetes) were much better in colonising the fish than others (Figure 2).

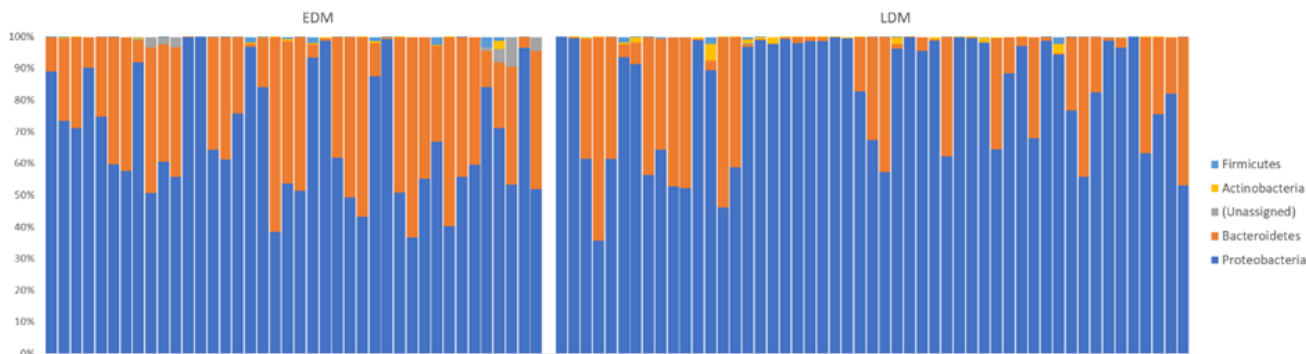


Figure 2: The bacterial compositions of all samples (taken from the gut, skin, and water of both EDM and LDM fish) shown on the order level.

We also showed that it was very hard for new bacterial strains to establish themselves in the microbiome at a later timepoint. At six weeks after hatching, we added either a non-pathogenic bacterium (*Janthinobacterium* sp.) or a pathogenic bacterium (*Yersinia ruckeri*) to the fish. This did not lead to major changes in the microbial composition. This resistance of the microbiome against introduction of new strains could be one of the explanations why administration of probiotics often does not lead to permanent colonization of the host by the probiotic bacterium.

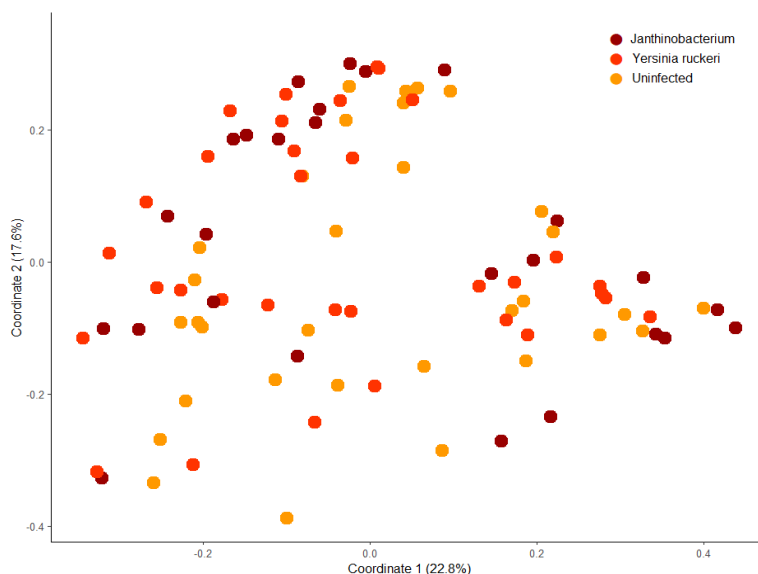


Figure 3: The microbiomes of the samples are again visualised in an ordination plot, but no differences can be seen between the different treatment groups (colours representing addition of a non-pathogenic or pathogenic bacterium or no additional bacteria)

With our research, we could show the great importance of the bacteria that are present when the fish are hatching. These initial bacteria have an enormous influence on the early microbiome of the fish and should be more in the focus of the aquaculture industry. It seems that one of the easiest ways to manipulate the fish's microbiome is to control it from early on, so a bigger focus should be put on the microbiome of the water in which the fish are hatching. This seems to be much more promising than later addition of probiotic strains, that often have a hard time establishing themselves in the microbiome.

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## Membership Spotlight

### Interview with John Holder

AES: Can you tell us about how you came to a career in Aquaculture?

John: I graduated from the U of Guelph in the spring of 1973 as a biologist. I started to work with the Ministry of Natural resources as a level entry biologist and though I enjoyed the work it was not very challenging. Our family doctor told me that they were looking for a manager at a local trout farm and was I interested? It was the Franklin Trout farm in Mount Albert, Ontario first establish in 1909 so it had been around for a long time. I did not have a clue about fish farming so I went to our local library and took out a Norwegian publication about fish farming. Read it over a few times and went for my interview. I impressed my interviewer and got the job! I started my career on July 9th, 1973 and have never looked back!

AES: Sounds like a memorable journey! How did you start with the Aquaculture Engineering Society?

John: My career took me to different provinces – Newfoundland in 1985, British Columbia in 1988 and JLH starting in October 1999. I am not sure when I joined the AES but when I started to design land based farms I needed to join an organization that would help me hone my skills – the AES fit the bill.

AES: We are glad to hear that AES fit your bill and we are so glad to still have you as a member! Where do you see aquaculture in the future?

John: Aquaculture, as you know, is going through a change. Public perception, unfortunately, is dictating some of that change, but since my whole career has been land based I see a real future in that sector. To that end JLH Consulting has strived to design the most capital efficient, energy efficient system out there, and I think that we have. Also I really believe in the 100 mile diet concept and that urban aquaculture can be a reality. You do not need to produce tens of thousands of tonnes to be a player. I believe in the smaller farms which can generate a good living if you locate it properly and farm the right species.

AES: What do you think the aquaculture sector is missing these days?

John: They are missing the small farm concept. The KIS principle and the aquaculture world is not just growing Atlantic salmon! JLH has designed many farms that are not growing Atlantic salmon and they are doing okay and can make a good living by being small and efficient.

AES: What are you currently working on or doing?

John: JLH is working on the RASWay system which has a very good energy use, roughly 2.3kW/kg produced for trout and coho salmon and even lower for Barramundi. We are also doing a lot of work with the Indigenous community in Canada, plus other projects in Oceania, Africa, and the United States.





## Call for reviewers—Aquaculture Engineering

For over 40 years, Aquacultural Engineering, the official journal of the AES, has been the main outlet for scientific developments in our field. Over the years, the journal has seen a steady increase in the number of submitted manuscripts. An essential step in the processing of these manuscripts is their evaluation by qualified reviewers. Finding willing reviewers is not easy. Hence, the evaluation stage is often the rate-limiting step in the overall publication process of manuscripts. In an effort to improve the manuscript processing time we would like to expand our reviewer database. If you would be willing to serve as a reviewer for our journal, we would appreciate it if you could provide your name, contact details and professional interests in the following link:

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Thank you for your help,

Steven Hall and Jaap van Rijn

Editors-in-Chief

Aquacultural Engineering



## Upcoming Events 2023

### Events:

#### **Aquaculture America 2023**

New Orleans, United States. February 23—26.

#### **RAStech 2023**

Orlando, United States. April 20—23.

#### **Aquaculture Europe 2023**

Vienna, Austria. September 18—21.

#### **NordicRAS 2023**

TBD. October



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