Theme session R

World Café Session R – Addressing social and ecological challenges to advance marine aquaculture in a rapidly changing environment

Conveners: Gesche Krause (Germany), Thomas Noji (USA), Robert Rheault (USA), Wojciech Wawrzynski (ICES)

Theme session goals and objectives

The session focused on the challenges faced by society to ensure sustainable marine food security in a socially and environmentally responsible manner. Dealing with societal challenges has become a high priority for the ICES community and globally. Governments, non-governmental and other international organizations are responding worldwide to the challenges of the "blue revolution" through the rapid development innovative environmentally sustainable approaches including aquaculture.

Despite the success of aquaculture in many parts of the world, expansion is challenged by misperceptions of aquaculture being a social evil, contrasting the need for income protection via livelihood diversification strategies, as well as emerging circular economies. A contextual approach including social and economic impacts of aquaculture at different scales (individual, community, national, regional and international) has largely been neglected. Further, natural phenomena including increased storms, inundation and warming waters resulting from climate change should be considered to siting and infrastructure of aquaculture sites.

This session viewed aquaculture as an activity that links marine natural and social scientists with stakeholders in a transdisciplinary effort to ensure food security in a rapidly changing word. It focused on both ecological challenges as well as social challenges, and addressed these in three themes: Emerging Trajectories, Approaches and Tools, and Governance.

Presentations and Discussion summaries

Introduction and Housekeeping Information was provided by Gesche Krause.

Wojciech Wawrzynski provided an overview on current activities of the Atlantic Ocean Research Alliance Ocean (AORA) Literacy and Aquaculture Working Groups. AORA has developed an aquaculture education / perception landscape survey. It was distributed amongst the session participants.

Mike Rust, the new SSG Aquaculture chairperson, was introduced. The SSG will initially consist 3 working groups:

1. Pathology and Diseases
2. Social and Economic
3. Genetics

As discussed later that afternoon at an open meeting led by Mike, three additional aquaculture WGs are being considered and could be added to the SSG.

Gesche Krause set the stage for the three topical sessions with a brief introduction to a 4 step framework for aquaculture systems analysis that was developed in the ICES Working Group of Social and Economic Dimensions of Aquaculture (WGSEDA); see also Krause, G., Brugere, C., Diedrich, A., Ebeling, M.W., Ferse, S.C., Mikkelsen, E., Agúndez, J.P., Stead, S.M., Stybel, N., Troell, M. (2015): A Revolution Without People? Closing the People-Policy Gap in Aquaculture Development. Aquaculture. Vol. 447: 44-55.

First Session slot - Emerging Trajectories

Dorothy Dankel - The search for sustainable solution for coexistence but not mixing of farmed and wild salmon strains: Gene-editing to the rescue?

World Café Dialogue Session on - What emerging trajectories can be observed that need to be considered under rapid changing conditions?

Tables of about 8 persons discussed the theme and then reported out to plenary. Points from the tables are summarized here. It is important to address CRISPR applications and whether these are socially acceptable "genetic modifications". Increasing use of GMOs is clearly the pattern. What are GMOs, and where do we draw the line of acceptability? There are patent issues associated with GMOs. Increasing GMO production will bring increasing interactions with ecology of natural systems. How do approaches get decided on (what to breed/select for, which GMs, etc.) when future environment under global change is unknown. Preservation of capacity for evolutionary response to new circumstances is important. GMO's are largely focused on benefits to the farmer but not the public. It is recommended to focus on improving the product, e.g. elongation and desaturation of n-3 fatty acids for improved human health, sterilization for environmental performance, disease and parasite resistance for environmental benefits, rather than just optimize growth. The FAO has projected world food needs by 2050, which will require significant increase in food production….so does this make the argument against GMOs a moot point? One way to make GMOs (aquaculture products) acceptable might be to make products "local". A tax on aquaculture that feeds directly back into the community will have the effect of mitigating resistance to aquaculture in general and more specifically to the acceptance of the "modified" products that might be produced. Also a local "brand" supporting local seafood production is another way to make it more acceptable.

Seaweed aquaculture was considered an important growing industry as a source for food, feed and biofuel. Co-location of aquaculture with wind farms may be a consideration especially for offshore sites; this approach minimizes invasiveness and damage to habitats and more generally reduces the ecological footprint of these industries.

Offshore mussel culture is a growing industry both in terms of size and sites. South coast of England is an example. It is also expected to grow significantly in the NE USA.

Other topics considered during table discussions included:

- Finding new markets for "waste" products.
- Producing lower food chain products.
- IMTA. What is the motivation for it? Environmentally more sustainable. Is there economic motivation?
- Education top leaders of top gov't organizations
- Tropical aquaculture in the Americas could be a growth target, which would bring diversification of economies of ICES member countries' economies in the Caribbean.

Second Session slot - Approaches and Tools

Sander van den Burg - Save seaweed aquaculture in a multi-use setting

Sander focused on risk governance. Some of the hazards (based on stakeholder consultation) of concern include:

- Uptake of heavy metals
- Contamination due to accidents (oil spills)
- Impacts on animals
- Ecosystem changes (sedimentation)
- Biodiversity and invasive spp
- Pollution (due to wind turbines)

Tom Noji (for Mark Dixon) - An integrated approach to valuing the shellfish resources of a coastal community: A case study in Greenwich, Connecticut USA

World Café Dialogue Session on - What tools, methods and approaches can scientists provide to apply social-ecological aquaculture systems thinking?

Points from the table report outs are here. Conceptual model development was discussed. Inputs required include qualitative data, response variables, integrated ecosystem assessment considerations, data sources (reference Gerret Depiper 2017 ICES JMS). Important for conceptual models is scenario testing using e.g. Bayesian belief networks, or for the red knot use of Structural Decision Making process (SDM), requires (1) identification of values, (2) science-based impacts assessments on values.

GIS methods are an important suite of tools to support siting of activities, cost-benefit analyses. The GIS data may include diverse inputs such as ecological parameters, economic parameters and social indicators to assess vulnerabilities

Food web approaches have potential for better appreciating ecological carrying capacity.

Aquaculture can be an important restoration and stock enhancement tool.

Red Knot is a threatened species with the cause largely attributed to climate change. This makes it a first test case of more to come and an interesting debate where ecological and economic systems collide. Participants noted that closing an oyster farm as precautionary even though it's impact is unknown but likely minor (could even be positive but data is lacking) may be an excessive application of the precautionary principle.

Wind power and aquaculture installations were argued as complimentary. However, risk associated with co-location of these activities is a major concern for promoting aquaculture. Private industry is currently assuming the risk so that insurance (crop insurance) is a topic that needs to be addressed.

Identification of future food needs in terms of protein vs calories and also consider things like micronutrients is needed. In other words, we need a broad based debate and policy discussion to address future food needs on a world scale.

The session also acknowledged that ecosystem services from aquaculture are another tool, but did not have time to discuss it. It may be that these services outweigh the food value?

Third Session slot – Governance

Antje Gimpel - AquaSpace tool - integrated assessment of spatial planning trade-offs.

Tom Noji (for Julie Rose) - Joining science with policy to credit water quality benefits provided by shellfish aquaculture

Dave Bushek - Building a new model for regional management of shellfish health on the US East Coast

Knut Wiik Vollset - Disentangling the role of sea lice on the marine survival of marine Atlantic salmon

World Café Dialogue Session on – What are the arenas and governance structures where knowledge can be put into action to advance marine aquaculture in rapid changing environments?

Points from the discussion from all tables are summarized here. Permitting is the biggest aquaculture challenge in the USA. Decision making processes were discussed. Stoplight is simple for an alarming complexity. Uncertainty is large. It is important to be transparent about the uncertainty and keep stakeholders involved in the processes. We need to identify societal priorities.

Communication was acknowledged as key to promoting aquaculture. Non-traditional venues for spreading communication were considered; groups that were previously "anti-aquaculture", like NGOs, may be allies in this objective. Effective communication may require a shift of focus and in our lexicon of use. We may make a shift away from environment and emphasize job creation. Rebranding the concept of ecosystem goods and services could be considered, to make it more easily understood by the public and to our political decision makers. For example: “ecosystem goods and services” is not understood by the man on the street, but making the point that better water quality may mean that a beach is now open for swimming does. As people attempt to communicate with various groups they need to be aware that the language and lexicon used needs to be different for different audiences. Identifying our audience is critical. Talking to scientists is simple and straight forward for scientists. Talking to non-scientists requires a different set of communication skills. Policy makers, the public and NGOs for example, are not swayed by data and are confused by the uncertainty that is fundamental to scientific communication. To talk to non-scientists you need to tell a story that conveys a visceral message - a message that talks to the hearts and minds of individuals by addressing their concerns. It is an entirely different skill set (video, interviews with real people, personalized stories). If people are just putting out scientific papers they are only going to be reaching scientists. Don't change the objective of increased aquaculture, just change the sales pitch!

Participants noted that there is often a ministry of transport, ministry of agriculture, ministry of transportation, ministry of environment, ministry of finance, but that the connection between these with respect to aquaculture is often minimal. How do we engage multiple ministries in relation to aquaculture to handle complex multi-level issues? How this is accomplished will obviously vary by country and area.

It was noted that for the Norway Salmon-Lice Stoplight example that decisions were made with incomplete information or based on flexible definitions. What was obvious for one group

had different meaning for others. The political process went faster than scientific dialogue. The issue was discussed in media more than in meetings with experts. Lack of data on major cause of mortality and the way data was presented was exploited by a more public political process. It was agreed that this could have been handled differently and rigorously with using more measurable criteria with clear links to management objectives.

The importance of personalizing communications was acknowledged. Aquaculture in the abstract is OK, but on the fine scale it is often not accepted by the community or individual, e.g. NIMBY (Not In My Back Yard). Also there is a short term memory question and shifting baseline. Once oyster production was lost, due to disease in areas of the US, the attempts to reintroduce it were resisted because people did not have that 'traditional use' in their short-term memory and valued the marine environment for other things like bird watching.

Conclusions

With establishment of the ICES Aquaculture Steering Group and its future subsequent expert groups ICES should redefine its stance in North Atlantic aquaculture research. The approach could respond to societal needs and address scepticism about this sector, referring also to benefits such as restoration and stock enhancement functions as well as adaptation to changing environmental conditions. Focusing on consumer needs, culture of lower trophic species, IMTA, genetic enhancements and cooperation with other marine operations (e.g. renewable energy, communications, transport, security, others) should become part of scientific deliberations in order to enable the integration of findings into multi-sectoral ocean governance processes. This should include social and economic assessments at different geographical scales.

The conveners would like to thank again all attendees for their great input and willingness to share their views and expertise!