Theme session L

Future-oriented seafood markets: economic dimensions, ecological compatibility and social aspects of fisheries and aquacultures

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More than 2000 different species can currently be found in the global seafood market displaying an immense variety of products derived from these species. The seafood market provides consumers with a choice between wild-caught or farmed and a large variety of eco-labelling and further quality division through various different labels. These are often based on narrowly defined concepts of sustainability, face issues of credibility, and may have limited impact at driving environmental improvements (Roheim et al 2018). Due to multiple objectives pertaining to environmental, economic and social issues, the sustainability assessment and transparency of aquaculture and fisheries and their products may be difficult consumers, authorities and other stakeholders.

In contrast to the fishing and aquaculture sector's widely known environmental impacts such as overfishing, pollution, and ecosystem degradation, the economic and social costs and benefits deriving from fisheries and aquaculture are less widespread (e.g. multiplier effects). However, the competitiveness of the various production systems, their ecological, societal and economic impacts, and the competition of products or between different species (e.g. white fish segment) are important aspects to consider for a future-oriented management of the sector. Furthermore, an understanding of the main drivers of change within the seafood industry including customers' perspectives is crucial for successful management and planning of the sector as well.

Within theme session L, we aimed to provide a transdisciplinary platform focusing on aspects that help to shape a future-oriented fish industry. Oral and poster presentations on the following topics were invited:

• Studies and data collection approaches on economic aspects of the fish sector including efficiency of production systems, market competition between aquaculture and fisheries or meat sector, between products, inputs, and species

• Studies including framework or „inclusive governance" approaches and case studies examining social aspects/effects as well as ecological aspects of fish production or along the entire value chain like e.g. overarching fair trade standards or LCA analysis

• Studies on the fish sectors communication, consumer perception, market benefits of eco-labelling/certification and fish quality attributes, and market analysis

Contributions to session L were very diverse and covering all three categories (see above) and thereby addressing economic, social and a few ecological aspects of the seafood sector. In general, fishery-related topics were more represented than those concerning aquaculture production and small-scale fisheries took a significant share within the targeted fisheries actors. However, the thematic fields with highest popularity were consumer perception and preference as well as seafood labelling.

The session was opened by a key note talk of Gesche Krause on socio-economic indicators supporting knowledge on sustainable aquaculture including a follow-up of the results from the World Café session (R) of the ICES Annual Science Conference 2017 on „Addressing social and ecological challenges to advance marine aquaculture in rapidly changing environments“as well as work done by the Working group on Social and Economic Dimensions of Aquaculture (WGSEDA) related social indicators.

The following first theme block of talks included global market dynamics affecting the market situation of cod (Sguotti et al.); impacts of CFP implementation to North Sea demersal fisheries using a bio-economic mixed fisheries model (Taylor et al.); a comparison of production costs and substitution of wild and farmed whitefish (Kreiss et al.); game theory applications to Baltic Sea fisheries under climate variability (Tunca et al.) and fishing gears' effect on ex-vessel fish prices (Cashion and Sumaila).

The second thematic block included presentations on the sustainability of capture fisheries analysed through ecological risk assessment and life cycle assessment (Hornborg et al.); the theory of change underpinning seafood eco-labelling tested through stock assessments (Longo et al.), the potential of small scale and traditional firms in fisheries and aquaculture (Daures et al.), market practices of small scale fishers in the Mediterranean (Penca) and a Canadian case study on what should be recognized and rewarded in sustainable fisheries (Parlee et al.).

The last group of topics covered consumer preference heterogeneity and preference segmentation in the case of eco-labeled salmon in Danish retail sales (Ankamah-Yeboah et al.); conclusions from comprehensive consumer studies of the Primefish project for the seafood industry (Matullat et al.) as well as poster teasers on fisheries eco-certification being questioned as a large-societal experiment (Kochalski); the young consumer segment of fish products (Mytelewski and Kulikowski); and the relation between sustainable knowledge and sustainable fish choice (Hoque et al.). The final poster teaser introduced a case study on the stagnating German aquaculture production and related stakeholder perspectives (Gimple and Lasner).

Besides the very interesting specific findings of these diverse studies, overall conclusions for an (ideally) future-oriented seafood market were collected and discussed. From an economic perspective mixed fisheries modelling could be used to identify economic inefficiencies in fishing effort distribution and aid in the fulfilment of quotas. Within the whitefish sector, typical Pangasius farming has a tight margin and to be profitable under potentially rising feed or fingerling prices, a higher market return or a further vertical integration would be beneficial; the situation for typical mixed whitefish fisheries (DE, DK) seems better, but will depend on species composition and vessel costs. Game theory analysis under climate change variability for Baltic (Denmark, Polen and Sweden) cod, herring and sprat fisheries suggested that cooperation would help to mitigate economic losses.

From the ecological perspective an alignment of tuna fisheries incentives with ecosystem outcome of their gears' habitat impact and bycatch, and respective governmental intervention where necessary, was suggested for the future. The case study on Patagonian toothfish fishery proposed seafood product management that embraces a product perspective and to mitigate market demand influence on product sustainability, e.g. frozen fish should be promoted over fresh fish to limit flight transportation and GHG emission. Another discussion point here was the role of certification and if GHG or supply chain indicators (product yield) could be included in certification such as MSC. Discussion on seafood labelling, its function, (potential) impact, responsibility and consumers acceptance dominated the rest of the session, taking different perspectives. Based on stock assessment analysis, rigorously-designed studies of ecolabeling programs, with clear hypothesis-testing that refers to the programs' theory of change, was proposed to advance understanding impacts of certification. These studies would produce more useful and actionable results if they were to focus not on the simple question 'does certification work or not?', since well-designed studies have already shown evidence of positive impacts, but rather try to understand 'when does certification work as an improvement tool, and when does it not, and why?'. From the perspective of the small-scale fisheries sector MSC was perceived to be too costly and ignoring relevant social attributes such as safety and local community dependency. A small scale fisheries label (e.g. small scale fleet EU label) was mentioned as potential alternative option, whereas there is also awareness of "label fatigue" and the need of sufficient consumer education, also within other fish market segments. In general, a higher focus on the origin of products and a more segmented market were mentioned as improvements for the future seafood market from the small-scale fisheries perspective. A Canadian case study on snow crab, cod, lobster and capelin fish harvesters reflected that they demand a better recognition and rewarding of fishing safety and an overall better value and rewarding of those who fish. MSC was perceived as lacking most social issues and some institutional elements. When including the consumer preference and willingness to pay, a theoretical high willingness to pay for "good quality seafood" (sustainable produced/high nutritional value seafood) was detected on the one side, but on the other (cod retail sector Denmark), there was no clear consumer segment that preferred MSC-certified cod, whereas one for organic and conventional existed. Referring also to Roheim et al. 2018, the question was posed if label do any good at all and if certification should be within governmental responsibility instead of the private sector.

Overall, the discussion revealed that it is important to take into account different perspectives and sectors within future seafood market discussions. Furthermore, the interaction between social and natural sciences, NGOs, as well as the inclusion of sector representatives perspectives and consideration of consumers' behaviour and knowledge is crucial to generate a holistic view of the future seafood sector.