ICES SYMPOSIA REPORT 2019

ICES CM 2019/GEN:01

NASCO Symposium: Managing the Atlantic Salmon in a Rapidly Changing Environment – Management Challenges and Possible Responses
Tromsø, Norway, 3-4 June 2019

Challenging the Scientific Legacy of Johan Hjort: Time for a new paradigm in marine research?
Bergen, Norway, 12-14 June 2019

Second International Science and Policy Conference on Implementation of the Ecosystem Approach to Management in the Arctic
Bergen, Norway, 25-27 June 2019

Shellfish – Resources and Invaders of the North
Tromsø, Norway, 5-7 November 2019

International Symposium on Fisheries Sustainability: Strengthening the Science- Policy Nexus
Rome, Italy, 18-21 November 2019

ICES International Council for the Exploration of the Sea
CIEM Conseil International pour l'Exploration de la Mer

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Contents

1 NASCO International Year of the Salmon Symposium 2019: Managing the Atlantic Salmon in a Rapidly Changing Environment – Management Challenges and Possible Responses

Venue and dates: Tromsø, Norway, 3-4 June 2019

Conveners:

2019 is the focal year for the International Year of the Salmon (IYS) initiative, with continuing research and outreach activities through 2022. To mark the occasion, a two-day symposium convened by the North Atlantic Salmon Conservation Organization (NASCO) and supported by ICES was held in Tromsø, Norway. The focus of the symposium was to review the specific challenges that face Atlantic salmon, particularly in a rapidly changing environment, and potential conservation responses to these challenges. Participation was open to all who are passionate about wild Atlantic salmon, and included diverse perspectives (managers, scientists, NGOs, and representatives of indigenous peoples) to support cooperative discussions.

The symposium's presentations were structured into three main sessions:

Climate change and the state of salmon. Session chaired by Niall Ó Maoiléidigh (Ireland).

> A scientific overview of the current and future states of Atlantic salmon, including a presentation of the NASCO State of Salmon report. This session covered a broad overview of climate change in the marine environment and how it links to the future of Atlantic salmon. Environmental variability creates unique challenges for wild salmon, and this session explored some of the interactions that salmon have with various ecosystem components. Specific presentation topics included salmon in the marine environment; interactions with pelagic fishes; and genetic impacts to salmon as a result of both natural and human activities.

Management challenges and solutions – perspectives from different groups and viewpoints. Sessions chaired by Steve Sutton (Canada), Eva B. Thorstad (Norway), Grant Horsburgh (UK).

> These sessions focused on linking salmon to the human dimension, with an emphasis on connecting diverse viewpoints. Topics included explorations of perspectives from indigenous peoples in Europe and North America; translating science into policies that support effective management; coastal and riverine habitat restoration; applications of practical management using science-based reference points; and interactions between wild Atlantic salmon and other salmonids, including non-native species.

What can be learned from other perspectives: Pacific salmonids and public outreach perspectives. Session chaired by Doug Bliss (Canada).

> The International Year of the Salmon is meant to engage and stimulate collaborations of all types. This session focused on sharing and applying the knowledge base from the Pacific basin to Atlantic salmon. Presentations covered the challenges of Pacific salmon management, and potential lessons that can be taken away to continue beneficial collaborative effort and engagement.

In addition, the symposium sponsored a poster session that highlighted a variety of issues also fitting into the themes above.

The symposium hosted an open discussion session following the presentations and posters to engage with the participants. The discussion resulted in identifying gaps in knowledge and led to draft recommendations for NASCO and ICES to consider. Progress on some of these recommendations will be addressed by the ICES Working Group on North Atlantic Salmon (WGNAS) in 2020.

For further details, please see the Report from the Symposium Steering Committee, available online here:
http://www.nasco.int/pdf/2019%20papers/CNL(19)16_Report%20from%20the%20Tromsø%20Symposium%20on%20the%20Recommendations%20to%20Address%20Future%20Management%20Challenges%20.pdf

2 Challenging the Scientific Legacy of Johan Hjort: Time for a new paradigm in marine research?

Venue and dates: Bergen, Norway, 12-14 June 2019

Conveners: *Olav Sigurd Kjesbu*, Institute of Marine Research, Norway; *Iain Suthers*, School of Biological, Earth and Environmental Sciences, University of South Wales, Australia; *Jennifer Hubbard*, Department of History, Ryerson University, Canada, and *Vera Schwach*, NIFU, Nordic Institute for Studies in Innovation, Research and Education, Norway

Scientific Steering Committee: *Gregory Ferguson-Cradler*, University of Bergen, Norway; *Bronwyn M. Gillanders* (until medio April 2019), University of Adelaide, Australia; *Jane Aanestad Godiksen* (from medio April 2019), Institute of Marine Research, Norway; *Brian R. MacKenzie*, DTU Aqua, Denmark; *Tom J. Miller*, Chesapeake Biological Laboratory, University of Maryland, USA; *Helen Rozwadowski*, University of Connecticut, USA

Venue: Hotel Scandic Bergen City, Håkonsgaten 2-7, Bergen
Host: Institute of Marine Research (IMR)

Sponsored by:

International Council for the Exploration of the Sea (ICES) www.ices.no

Institute of Marine Research (IMR) www.imr.no

The Research Council of Norway (NFR) www.forskningsradet.no

International Commission of the History of Oceanography (ICHO) https://oceansciencehistory.wordpress.com

Scientific justification

- We celebrated the 150-year anniversary of Johan Hjort (1869–1948), who introduced the fundamental theory for fisheries science with his concepts of the roles played by strong and weak year classes in population structure and productivity
- Since then a wide range of new methods and approaches have emerged, but today's knowledge of factors such as recruitment, connectivity and migration dynamics is still vague and thereby makes stock projections uncertain
- Moreover, the urge to broaden the standard routines in stock management to embrace today's holistic views, including ecosystem approaches to fisheries and on-going changes in the marine environment, requires an interdisciplinary cooperation.
- In order to move forward, the current situation asks for a profound shift in our approach, and a search for new ideas and a new scientific framework.
- To investigate the history and the present and to explore new directions in a free and creative atmosphere – in the spirit of Hjort – we invited marine researchers and historians of marine science to gather in this Bergen symposium, at the place where Hjort launched his paradigm-changing publication in 1914.

Opening keynote: Ray Hilborn, USA

Statistics

- 105 participants; 14 early-career scientists; 14 countries

- 23 oral presentations; 23 posters; i.e. totally 46 abstracts

Sessions

- Scientific legacy, theories and study species (over 3 days, split into sub-sessions)
- The making of fisheries scientists
- Exhibition and poster session
    - Johan Hjort and the Bergen he saw (photo exhibition)
    - Modern readings of scales and otoliths (
- Sightseeing onboard R/V Johan Hjort
- On the shoulders of the giants of marine science
- Science and management, an uneasy pair?
- Johan Hjort and the Bergen he saw: A marine science walking tour through Bergen
- When historians meet marine scientists

Received responses

Unambiguously considered a successful symposium, especially the unusual combination of marine researchers and marine historians meeting in the same symposium was expressed as stimulating (and an idea to follow up in other symposia)

Summing-up (done by Brian MacKenize, ICES SCICOM)

- It was realized that today's ocean challenges are more complex than during Hjort's career
    - → more diverse set of ocean users;
    - → climate change;
    - → habitat damage/loss;
    - → invasive species etc.
- Requires solutions and paradigms that addresses this multidimensionality and complexity
    - → Hjort's ideas and findings will be a building block for these
- Elements of a new paradigm could include
    - → improved observational capabilities,
    - → more process knowledge of factors affecting productivity, distributions, LH
    - → robust and precautionary approaches that address multiple management objectives (social, economic, ecological)

Special volume

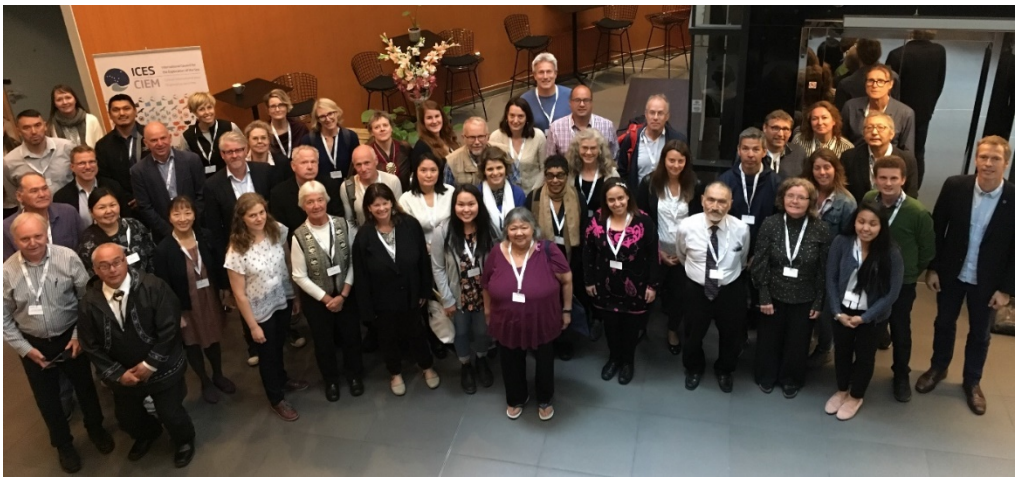
The special volume from this Symposium is scheduled for publication in *ICES Journal of Marine Science* in 2020. Deadline for manuscript submission: 15 October 2019

3 Second International Science and Policy Conference on Implementation of the Ecosystem Approach to Management in the Arctic

The Ecosystem Approach to Management of Arctic Marine Ecosystems: Integrating information at different scales in the framework of EA implementation

Venue and dates: Bergen, 25-27 June 2019

Conveners: Hein Rune Skjoldal, Norway; Lis. L. Jørgensen, Norway; Elisabeth Logerwell, USA



Participants at the 2nd EA Conference in Bergen.

Summary report

In the Kiruna Declaration in 2013, the Arctic Council (AC) ministers called for periodic reviews of the Ecosystem Approach to management (EA) in the Arctic to exchange information on integrated assessment and management experiences, including highlighting examples from Arctic States. A first international policy and science conference to review status of implementation of the EA to management of Arctic ecosystems was held in Fairbanks, Alaska, in August 2016, while a second follow-on conference was held in Bergen in June this year. The conference was organized by the Joint Ecosystem Approach Expert Group (EA-EG) (jointly by AMAP, CAFF, PAME, and SDWG), with support from ICES and PICES. The conference program was prepared with input from a planning group with members from AC countries and the EA-EG, AC working groups (AMAP, CAFF, PAME, SDWG), and ICES, PICES, and WWF.

The conference was attended by 55 participants from 9 countries (Canada, Kingdom of Denmark, Germany, Iceland, Japan, Netherlands, Norway, Russia, and USA), and several international organizations (AMAP, PAME, ICES, WWF). There was strong representation of participants from indigenous communities and organizations in Alaska, Canada, Greenland, and Norway (Sápmi) (14 in total), including Harry Brower, mayor of the North Slope Borough, and Fred Phillip, chairman of the Bering Sea Elders Group in Alaska.

The program was structured with five sessions, bracketed by an introductory session on the first day and a concluding session by the end of the meeting on the third day:

Session 1: Integrated Ecosystem Assessment

Session 2: MPAs and other special areas

Session 3: Voices from the North – a conversation about people, nature, and sustainability

Session 4: National EA implementation

Session 5: Central Arctic Ocean

The main topic for the conference was scale and scale integration, which was illuminated in each of the five sessions. The sessions were structured with a sequence (or sequences) of presentations followed by discussions recorded by appointed rapporteurs. All in all, there were 45 presentations in the five sessions plus the opening session, which included two keynotes by Harry Brower and Anne Christine Brusendorff from ICES. Presentations are (or will be made) available from the conference site at the PAME web page (pame.is).

A conference report is being prepared and will be made available by the end of August. A brief summary of the outcome is provided here.

Indigenous perspectives (session 3) were well represented with emphasis on a holistic view of nature. Humans are part of the ecosystem, but the roles we play differ. Indigenous peoples through subsistence harvesting are living lives as fully integrated components of the ecosystem. In contrast, large scale industrial activities like commercial fisheries can to some extent be regarded as an external forcing on the ecosystem leaving environmental impacts and footprints behind.

Integrated Ecosystem Assessment (IEA) (session 1) is a core element of the EA. Work of three ICES groups were presented (WGIBAR, WGINOR, and WGICA) along with examples from Canada and USA. It is fair to say that we are still on a learning curve when it comes to perform IEAs, with the fundament of ecosystem understanding being often weak and insufficient for interpreting the changes playing out in the dynamic marine ecosystems.

Marine spatial planning (MSP) and identification of areas of special ecological importance (e.g. EBSAs or MPAs) are important parts of the EA, which supplement spatial management measures with other non-spatial measures. In session 3, several presentations addressed the concept of networks of MPAs, or more generally, priority conservation areas, with examples of work in Canada, Greenland, Norway, Russia, and USA, as well as more broadly at the pan-Arctic level.

National EA implementation (session 4) is generally slow although there are some progress and developments that may facilitate EA implementation in the future. At the conference we heard reports from several Arctic countries about relevant work that are steps in this direction. The most advanced development is probably in Norway with the government-led integrated management plans for the Barents and Norwegian seas.

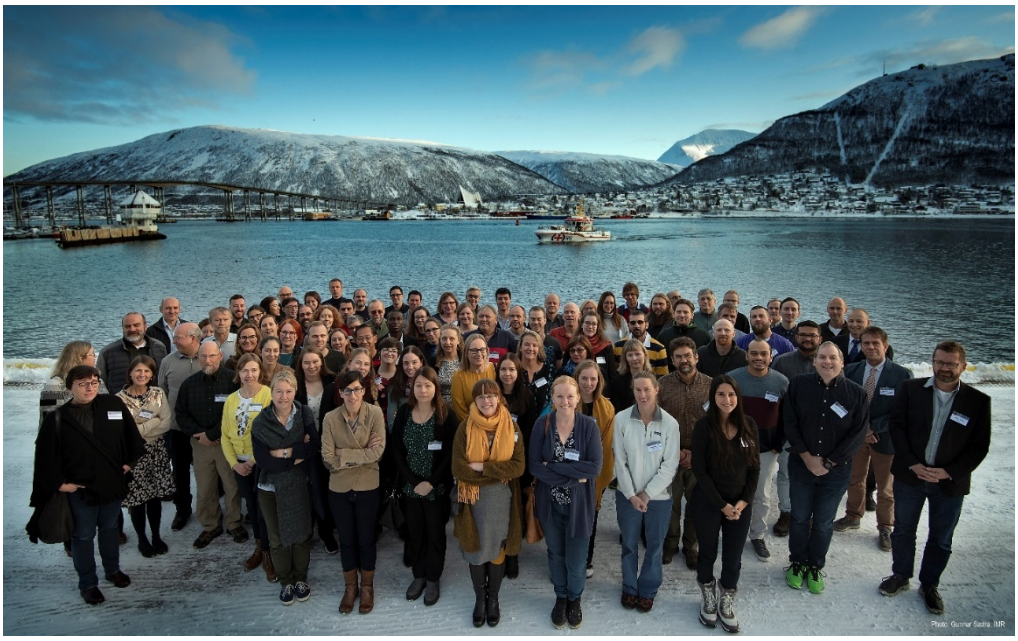
The central Arctic Ocean (CAO) is undergoing large changes associated with the dramatic loss of sea ice. In session 5, we learned about the legal systems and agreements for this sea area, the work of the joint ICES/PICES/PAME WGICA, vulnerable habitats on the deep sea floor (Gakkel Ridge), and the planned international program 'Synoptic Arctic Survey'.

4 Shellfish – Resources and Invaders of the North

Venue and dates: 5-7 November 2019 in Tromsø, Norway

Conveners: Gordon H. Kruse, Carsten Hvingel and Bernard Sainte-Marie

107 Participants



Background

The symposium, titled *Shellfish – Resources and Invaders of the North*, was hosted by Norway's Institute of Marine Research (IMR). The international Council for the Exploration of the Sea (ICES), the North Pacific Marine Science Organization (PICES), the Northwest Atlantic Fisheries Organization (NAFO) and the Research Council of Norway co-sponsored the symposium. Additional funding was provided by Lyngenfjord, and Norges Råfisklag.

Venue and organization

The symposium was held during 5-7 November 2019 in Tromsø, Norway. Conveners of the symposium were Dr. Carsten Hvingel, Institute of Marine Research, Norway (ICES), Dr. Bernard Sainte-Marie, DFO, Canada (NAFO), and Professor Gordon Kruse of the University of Alaska Fairbanks, USA (PICES). A Scientific Steering Committee included the three conveners and 11 other scientists from Norway, Russia, and Denmark, and a local organizing committee comprised of six IMR and ICES colleagues.
Web: http://www.ices.dk/news-and-events/symposia/shellfish/Pages/default.aspx.

Goals

The goal of this symposium was to discuss the role of cold-water shellfish both as a harvestable resource and as important ecosystem players in northern hemisphere cold marine ecosystems (for more detail see web page). These goals were accomplished: the presentations and posters covered a broad span of present challenges and state-of-the-art knowledge pertaining to most of the ecologically and/or commercially important cold-water shellfish species (see program). Various harvesting and management techniques were presented. Methods and models for stock assessment

were thoroughly covered as well as the ecological role of shellfish and their significance as invasive species.

The symposium

Approximately 110 symposium participants were welcomed by opening addresses by Geir Huse (IMR), Wojciech Wawrzynski (ICES), Gordon Kruse (PICES), and Katherine Sosebee (NAFO). Subsequently each session was led by two co-chairs. All presentations were delivered as either oral talks in plenary sessions or as posters during poster sessions on 5-6 November 2019. There was a total of 60 oral and 25 poster presentations. Participants came from twelve countries (Australia, Canada, Denmark, Greenland, Norway, Portugal, Russian Federation, United Kingdom, United States, Ghana, France and Iceland).

In the symposium keynote address, Gordon Kruse spoke about snow crab in the eastern Bering Sea and US Arctic as a case study owing to its global importance as a harvestable cold-water shellfish resource in both the North Pacific, North Atlantic Oceans and marginal seas of the Arctic Ocean. It is also a well-studied species that was the subject of 18 oral presentations and seven posters at the symposium.

Gordon Kruse spoke about the northward shift in this subarctic species owing to warming of the eastern Bering Sea and commensurate increases in their abundance in the US portions of the Chukchi and Beaufort Seas. He noted that snow crab are challenged by the effects of temperature on their reproductive biology, ontogenetic migration patterns in a changing thermal landscape and dynamic predator-prey associations, and by ocean acidification. He concluded that climate change has mostly negative effects on snow crab population dynamics and that these changes pose major challenges to stock assessment and fishery management as former estimates of stock productivity and fishery management units no longer hold.

In the first session, "Shellfish in new and changing environments," keynote speaker, Richard Wahle (University of Maine, USA), talked about American lobster as a poster child for the impacts of environmental change on coastal ecosystems and economies. In southern New England mass mortality and disease induced by summer heat stress and hypoxia have led to widespread collapse of the region's fishery. However, they have expanded to the north into the Gulf of Maine, benefiting from the positive effects of the widespread depletion of predatory groundfish, such as Atlantic cod, to trigger an unprecedented boom in lobster production that has contributed to elevate the lobster to its current status as the most valuable single-species fishery in the US and Canada. However, lobster landings in the Gulf of Maine appear to now have peaked or started to decline and surveys of young-of-the-year predict a further downturn in the near future. This was the largest of the four sessions with 21 talks on a wide range of species and topics including a number of talks on species invasions, trophic relationships, changes in species distributions, declines in species abundance with changing climate, and other climate-related species dynamics.

The second session, "Managing shellfish fisheries," composed of 16 talks, began with two keynote presentations. Elisabeth Sørdahl on behalf of Vidar Landmark (Ministry of Trade, Industry and Fisheries, Norway) spoke about the four main elements of the national fisheries management: research, regulatory measures, enforcement and sanctions. She pointed out that we regulate catch capacity to enhance efficiency and profitability for the fishing fleet, and use technical measures and quotas coupled with strict enforcement measures to ensure sustainability. She stressed that good knowledge and scientific advice is the key to good fisheries management. In the sec-

ond keynote presentation, Jahn Petter Johnsen (Norwegian College of Fishery Science, UiT, The Arctic University of Norway) talked about how to govern ungovernable objects. Until the establishment of the Norwegian exclusive economic zone (200 nmi) in 1977, the resources in Norwegian **waters** were in principle ungovernable, but with the new framework, peoples' activities could be regulated in effective ways. Moreover, through this change industry became a partner in governance. Over time both the ability to govern and willingness to be governed increased. Other presentations in this session addressed a number of fishery management issues, including bycatch, reconciling genetic stock structure, ghost fishing, social well-being, and convergent effects of climate change and fishing on population dynamics.

The third session, "New ways of harvesting shellfish," was comprised of nine talks including a keynote by Bradley Stevens (University of Maryland Eastern Shore, USA). He discussed benefits and disadvantages of traps (pots) as a fishing gear. He pointed out that little research has been conducted on the response of target species to traps or the impacts of trap fishing. He further noted that trap impacts fall into three categories: direct impacts on target populations, impacts on non-target populations including pelagic fish used as bait and marine mammals at risk of entanglement, and impacts on environment or habitat. After reviewing their effects, he concluded that the future of trap fisheries will depend on investment in research on new ways to reduce their negative impacts on benthic and pelagic resources. Other presentations in this session addressed issues such as alternative baits, effects of light and sound on crab catches, injury scoring of crabs after capture, live holding and transport of crabs and shrimp, and crab processing methods.

The final session, "Assessment and population dynamics of shellfish," involved 16 talks. The keynote address was delivered by Cody Szuwalski (NMFS, Alaska Fisheries Science Center, USA). He spoke about his experiences in conducting stock assessments of crab resources in the eastern Bering Sea, USA. He pointed out that one of the key challenges faced in assessing Bering Sea crab is estimating reference points because no clear stock-recruit relationships exist and population dynamics appear to have changed over time. He described several case studies and also provided an overview of an open-source assessment platform designed to streamline the stock assessment process, called a General Model for Assessing Crustacean Stocks (GMACS). Many of the other talks in this session described surveys used to assess shellfish resources, including sea urchins, scallops, lobster, crab, shrimp and other species. In one novel approach, Carsten Hvingel (IMR, Norway) presented an approach to estimate the abundance of the invading snow crab in the Barents Sea using cod stomach analysis.

Publication Plan

Oral presentations will be made available on the symposium web page ultimo 2019. Accepted written contributions to the symposium are offered publication in ICES Journal of Marine Science. Manuscripts can be submitted at any time until 3 months after the conference, i.e. 8 February 2020.

5 International Symposium on Fisheries Sustainability: Strengthening the Science- Policy Nexus

Venue and dates: FAO Headquarters, Rome, Italy (18-21 November 2019)

About the Symposium

Marine and inland fisheries today are at an important crossroads. They make a crucial and growing contribution to food, nutrition and livelihood security. Yet, despite significant successes, there is a decreasing overall trend in the proportion of marine fish stocks caught within biologically sustainable levels, especially in the least developed regions. At the same time, inland fisheries are profoundly affected by the growing demand for fresh water fish.

In the context of the 2030 Agenda for Sustainable Development and the United Nations Decade of Ocean Science for Sustainable Development, this symposium aimed to clarify:

- What is the status of global and regional fisheries sustainability?
- What are the challenges to improve the sustainability of fish resources?
- What constitutes evidence, and how do we ensure an evidence basis for decision-making? and,
- What does society expect from marine and inland fisheries in the 21st century?

The objective of this Symposium was to identify pathways to strengthen the science and policy interplay in fisheries production, management and trade, based on solid sustainability principles for improved global outcomes on the ground. Ultimately, the debates and conclusions of the symposium were intended to prepare the way for the development of a new vision for the way we perceive and use capture fisheries, outline how the sector can respond to the complex and rapidly changing challenges facing society, and support the planning process of the UN Decade of Ocean Science for Sustainable Development (2021-2030).

Participants

The international representation of the panels and the overall participants at the symposium was broad, including over 700 people from government and intergovernmental agencies, NGOs (including those supporting both conservation efforts and small-scale fisheries activities), and academics.

Fisheries Innovation Forum

The symposium opened with a pre-event called the Fisheries Innovation Forum that included exhibitor booths and corresponding talks throughout the symposium of emerging innovations in fisheries and aquaculture. The talks included:

- Innovative data services and Apps in support to decision making for sustainable fisheries -Global Atlas of AIS-based fishing activity and related applications
- Healthy oceans: Creating bioplastics from fish waste
- Nature's wonder drug – Omega-3: Stimulating skin regrowth for burn victims and amputees through the medical use of fish skin
- Fighting illegal fishing: Employing drones with artificial intelligence
- Blue Fashion: Experiences working with the wives of fisher folk in Brazil to create fish skin leather
- Blue Fashion: Experiences working to create fish skin leather from the Nile perch of Lake Turkana, Kenya

- Blue Fashion: Promoting sustainable fashion for fashion designers in Commonwealth countries
- Blue Fashion: Promoting sustainable, algae fabrics in scarf design

Side Events

There were also three side-events that occurred on the first day of the symposium:

- A photographic exhibition portraying the life and work of small-scale fishers in the Mediterranean, produced with award winning photographer Mr Carlo Gianferro
- A discussion on Blue Innovation: emerging technologies and trends in fishery sustainability
- A discussion on Innovative approaches at the regional level and their contribution to sustainable fisheries and the conservation of marine ecosystems

Discussion Panels

The general format of the 3.5-day symposium was a series of 16 panels each opening with a short keynote presentation followed by a discussion panel of five people. With the addition of both talks and panels for the opening and closing sessions, the audience heard presentations or commentary from approximately 108 different people. The panels were organized in eight different theme sessions provided below:

SESSION 1– The status of global and regional fisheries sustainability and its implications for policy and management

SESSION 2– Sustainable fisheries: linking biodiversity conservation and food security

SESSION 3 – Fish in food security and nutrition: from tide to table

SESSION 4– Securing sustainable fisheries livelihoods

SESSION 5 – The economics of fisheries

SESSION 6 – Fisheries management in the face of a changing climate

SESSION 7 – Fisheries information systems and new technologies

SESSION 8 – Policy opportunities for Fisheries in the Twenty-first century