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Report of the

REGIONAL CONSULTATION FOR EUROPE AND NORTH AMERICA ON THE DEVELOPMENT OF GUIDELINES FOR SUSTAINABLE AQUACULTURE (GSA)

Virtual Meeting, 27–29 April 2021

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PREPARATION OF THIS DOCUMENT

This document provides a summary of the presentations, discussions, conclusions and recommendations of the Regional Consultation for Europe and North America on the development of Guidelines for Sustainable Aquaculture (GSA), held virtually from 27 to 29 April 2021. The consultation was prepared and coordinated by the FAO Fisheries and Aquaculture Division in collaboration with the FAO Regional Office for Europe and Central Asia and the FAO Liaison Office for North America.

ABSTRACT

The Regional Consultation for Europe and North America on the development of Guidelines for Sustainable Aquaculture (GSA) was held virtually from 27 to 29 April 2021. A total of 84 participants attended the consultation: 33 government representatives, 24 representatives from academia, non-governmental organizations and intergovernmental organizations, 7 observers, 3 representatives from FAO regional bodies, and 17 FAO staff members and consultants. This was the seventh and last of the series of regional consultations.

The objectives of the regional consultation were to: (i) share current policies and practices related to aquaculture in the regions; (ii) review existing regional and national governance instruments for sustainable aquaculture; (iii) develop a list of priority thematic modules, including regional and national strengths and challenges; (iv) propose and prioritize possible case study concepts linked to one or more thematic modules; and (v) identify regional priority areas to be included in the GSA.

During the consultation, the participants were informed about the list of 72 thematic modules composing the GSA. The consultation was organized into plenary and breakout sessions. The participants of the Europe Working Group proposed 46 case studies covering 17 thematic modules, while the North America Working Group recommended 17 case studies covering 22 thematic modules. The Europe and North American working groups identified five and four priority areas, respectively. While there were significant overlaps in the priorities identified for the two regions, there were regional nuances within these priorities. The common areas of interest included governance, planning, spatial planning, ecosystem approach to aquaculture, biosecurity, climate change and stakeholder participation.

The participants were informed of the following next steps to be led by FAO for the development of the GSA: (i) selecting and writing the case studies (May–July 2021); (ii) drafting the thematic modules (May–July 2021); (iii) drafting the GSA (July–October 2021); (iv) holding the second Expert Consultation for reviewing the draft of the GSA (September 2021); (v) submitting the draft of the GSA to the Eleventh Session of the COFI Sub-Committee on Aquaculture (COFI:AQ) for information and advice; (vi) organizing a technical consultation with Members, subject to Members' request (tentative, April 2022); (vii) submitting the final draft of the GSA to the Thirty-fifth Session of the Committee on Fisheries (COFI) for endorsement; (viii) publish the GSA (2022–2023); and (ix) implementing the guidelines, for example capacity building (from 2023 onwards).

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ACKNOWLEDGEMENTS

The organization of this consultation benefited from the funding provided by the Korea Maritime Institute through the FAO Project “Support to global consultations to developing sustainable aquaculture guidelines” (GCP/GLO/990/ROK).

ABBREVIATIONS AND ACRONYMS

AAC	Aquaculture Advisory Council
ALI	Aquatic Life Institute
AZA	allocated zone for aquaculture
BMP	better management practice
CCRF	FAO Code of Conduct for Responsible Fisheries
CO_2	carbon dioxide
COFI	Committee on Fisheries (FAO)
COFI:AQ	COFI Sub-Committee on Aquaculture
DFO	Fisheries and Oceans Canada
EAA	ecosystem approach to aquaculture
EATiP	European Aquaculture Technology and Innovation Platform
EIFAAC	European Inland Fisheries and Aquaculture Advisory Commission
EMFF	European Maritime and Fisheries Fund
EMPA	European Mollusc Producers Association
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FARM	Framework for Aquaculture Risk Management
FEAP	Federation of European Aquaculture Producers
FLAG	fisheries local action group
GBA+	Gender-Based Analysis Plus
GFCM	General Fisheries Commission for the Mediterranean
GSA	Guidelines for Sustainable Aquaculture
IFREMER	Institut Français de Recherche pour l'Exploitation de la Mer
IGO	intergovernmental organization
IMTA	integrated multi-trophic aquaculture
ISPRA	Istituto Superiore per la Protezione e la Ricerca Ambientale
IUCN	International Union for Conservation of Nature
MOSSS	Menai Offshore Subsurface Shellfish Systems
MPA	marine protected area
NACEE	Network of Aquaculture Centres in Central-Eastern Europe
NFI	FAO Fisheries and Aquaculture Division
NGO	non-governmental organization
NOAA	National Oceanic and Atmospheric Administration
R&D	research and development
RAS	recirculating aquaculture system
REFAS	Reef Enhancement for Aquaculture Sites
REPROSEED	Research to improve PROduction of SEED of established and emerging bivalve species in European hatcheries
RFB	Regional Fisheries Body
SDG	Sustainable Development Goal
TM	thematic module
WiSA	Women in Scottish Aquaculture

BACKGROUND

1. The Ninth Session of the FAO Sub-Committee on Aquaculture of the Committee on Fisheries (COFI:AQ), held in Rome, Italy, from 24 to 27 October 2017, recognized the growing global significance of sustainable aquaculture development and its potential contributions to global food security and nutrition as well as the achievement of a wide range of Sustainable Development Goal (SDG) targets. COFI:AQ further recognized the increasing need for implementation of best practices in aquaculture in many countries and regions, and recommended that FAO should develop global Guidelines for Sustainable Aquaculture (GSA).

2. The purpose of the GSA is to provide practical guidance to government authorities and policymakers in their efforts of promoting the implementation of the Code of Conduct for Responsible Fisheries (CCRF) and enable aquaculture to effectively participate in the implementation of the 2030 Agenda for Sustainable Development. The guidelines will further help FAO Members to enhance their capacity development programmes for the sustainable management of the sector.

3. In line with the recommendation of COFI:AQ to develop the GSA as endorsed by the Committee on Fisheries (COFI) at its Thirty-third Session, held in Rome, Italy, from 9 to 13 July 2018, a document containing the possible scope, structure and content of such guidelines was drafted and presented at the Expert Consultation on the development of the GSA, held in Rome, Italy, from 17 to 20 June 2019. The consultation brought together 15 experts from governments, international organizations, research institutes and academia, ensuring that all regions would be represented. The Expert Consultation produced: (i) a methodology for developing the GSA, including making use of existing guidelines; (ii) a methodology, including criteria, for selecting case studies aimed at providing lessons learned; (iii) a methodology for identifying lessons learned; (iv) a list of thematic modules, which GSA should cover; and (v) an updated roadmap for the production of GSA.

4. The outcomes of the Expert Consultation were presented at the Tenth Session of COFI:AQ, held in Trondheim, Norway, from 23 to 27 August 2019. COFI:AQ commended FAO's work on the guidelines and provided guidance on the way forward, including support for regional consultations.

5. Within this context, the Regional Consultation for Europe and North America on the development of GSA was held virtually from 27 to 29 April 2021. This was the seventh and last of the series of regional consultations.

6. A total of 84 participants attended the consultation: 33 government representatives, 24 representatives from academia, non-governmental organizations (NGOs) and intergovernmental organizations (IGOs), 7 observers, 3 representatives from FAO regional bodies, and 17 FAO staff members and consultants. The list of participants is given in Appendix 1.

OPENING REMARKS

7. Mr Nathanael Hishamunda, Team Leader, FAO Fisheries and Aquaculture Division, moderated the regional consultation and welcomed the participants.

8. Mr Vladimir Rakhmanin, Assistant Director-General and Regional Representative for Europe and Central Asia of the FAO Regional Office for Europe and Central Asia, and Mr Thomas Pesek, Senior Liaison Officer of the FAO Liaison Office for North America, delivered welcome remarks and provided an overview of the status of aquaculture development across Europe and North America, respectively.

9. Mr Audun Lem, Deputy Director, FAO Fisheries and Aquaculture Division, officially opened the consultation. In his remarks, he emphasized the importance of the GSA consultation process in identifying pathways for successful and sustainable aquaculture development and, through their

implementation, achieving the 2030 Sustainable Development Goals (SDGs). The full texts of all opening remarks are presented in Appendix 2.

SESSION 1: SETTING THE SCENE

10. The Secretariat introduced the background and objectives of the GSA, the methodology for their development, the progress made to date in undertaking the consultation process, as well as the objectives, expected outputs and agenda of this regional consultation (Appendix 3).

11. The objectives of the regional consultation were stated as follows: (i) share current policies and practices related to aquaculture in the regions; (ii) review existing regional and national governance instruments for sustainable aquaculture; (iii) develop a list of priority thematic modules considering regional and national strengths and challenges; (iv) propose and prioritize possible case study concepts linked to one or more thematic modules; and (v) identify regional priority areas to be included in the GSA.

12. The expected outputs of the regional consultation include a list of: (i) existing regional governance instruments for sustainable aquaculture; (ii) regionally prioritized thematic modules considering strengths and challenges for each of the 72 thematic modules; (iii) proposed case study concepts mapped against the thematic modules; and (iv) regional priorities to be included in the GSA with linkages to the thematic modules and proposed case studies.

SESSION 2: GOVERNANCE INSTRUMENTS AND THEMATIC MODULES

13. The Secretariat introduced the objectives of the session. Firstly, the participants were invited to share information on regional and national existing governance instruments related to sustainable aquaculture and to recommend useful information for developing the GSA. The participants were then asked to review the list of 72 thematic modules endorsed by COFI:AQ at its Tenth Session and to develop a list of regional strengths and regional challenges to help refine and prioritize the list of thematic modules.

14. Afterwards, the Secretariat described the concept of a thematic module and presented the list of thematic modules, the process that led to its development as well as the main results of the previous six regional consultations. Finally, the Secretariat presented the reporting templates for the working group discussion. The relevant documentation and reporting templates were shared with the participants prior to the consultation.

Working group session

15. The participants were divided into two working groups, one for the European region and one for the North America region. The discussions were facilitated by Mr Reinhold Hanel, Director, Thünen Institute of Fisheries Ecology, for the Europe Working Group and by Mr Barry Green, Manager, Fisheries and Oceans Canada, for the North America Working Group.

16. Almost all participants provided information on their specific governance instruments for aquaculture at different levels. The participants in the Europe Working Group informed the consultation about the existence of governance instruments, including laws, policies, strategies, guidelines, plans and programmes at the country, body, subregional and regional levels. In the North America Working Group, the participants also shared comprehensive information on the available governance instruments, such as laws, regulations, policies, strategies, guidelines, tools and protocols at the provincial, national, federal and subregional levels. The detailed results of each group discussion on the existing governance instruments are reported in Appendix 4.

17. Following that discussion, the thematic modules of major relevance as well as the regional strengths and challenges were discussed.[1] The detailed results of each group discussion on the thematic modules are reported in Appendix 5.

18. For Chapter 1 "Sustainable Aquaculture and the 2030 Agenda", the Europe Working Group highlighted as relevant three thematic modules, namely Implementing the CCRF (TM 2); Food security, nutrition and improved diets (TM 6); and Capacity development (TM 7). Some participants stressed that the SDGs are highly considered in the political agenda of the region. In addition, some participants identified as strengths the quality of fish proteins and genetic resources.

19. The North America Working Group identified as relevant the thematic module Capacity development (TM 7). The participants highlighted that a number of thematic modules could fit under the umbrella of TM 7, such as Equitable and inclusive development (TM 3); Gender in aquaculture (TM 4); Sustainable livelihoods, social protection and safety nets in aquaculture (TM 5); Food security, nutrition and improved diets (TM 6); and gender issues as well as the involvement of youth. In the context of TM 1 – Dealing with trade-offs between different SDGs in aquaculture – some participants identified balancing increasing production, economic development and environmental objectives as challenges. Some participants highlighted the integration of gender-based analysis into the development of federal government programmes and policies in their country as strengths.

20. In Chapter 2 "Governing and Planning Aquaculture Development", the Europe Working Group identified as relevant 13 thematic modules: Ecosystem approach to aquaculture (TM 8); Aquaculture in integrated coastal management (TM 9); Aquaculture in watershed management or land use development plans (TM 10); Aquaculture in community development planning (TM 11); Climate-smart aquaculture (TM 14); Access rights to land and waterbodies (TM 15); Local communities and livelihoods (TM 16); Governance (TM 21); Stakeholder participation (TM 22); Aquaculture planning and policy (TM 23); Spatial planning (TM 24); Zoning (TM 25); and Climate change and aquaculture (TM 33). Some delegates identified as strengths governance, aquaculture planning and policy and spatial planning.

21. The North America Working Group identified as relevant 15 thematic modules: Ecosystem approach to aquaculture (TM 8); Aquaculture in integrated coastal management (TM 9); Aquaculture in watershed management or land use development plans (TM 10); Climate-smart aquaculture (TM 14); Local communities and livelihoods (TM 16); Collective management of common resources (TM 17); Governance (TM 21); Stakeholder participation (TM 22); Aquaculture planning and policy (TM 23); Spatial planning (TM 24); Zoning (TM 25); Public-private partnerships in aquaculture (TM 26); Enabling environment (TM 27); Natural disasters management (TM 30); and Climate change and aquaculture (TM 33). The participants pointed out that Chapter 2 is the most important chapter. They recommended grouping similar thematic modules, e.g. thematic modules 8 and 9. They also suggested providing new wording for the thematic module Precautionary principle/precautionary approach (TM 20).

22. In Chapter 3 "Biodiversity and Genetic Resources", three thematic modules were identified as relevant for the Europe Working Group: Biodiversity, habitat, ecosystems functions and aquaculture (TM 34); Genetic resource management, development and conservation (TM 35); and Species introduction and transfers for aquaculture purposes (TM 36). The North America Working Group flagged as relevant two thematic modules: Genetic resource management, development and conservation (TM 35) and Species introduction and transfers for aquaculture purposes (TM 36).

23. In Chapter 4 "Better Management Practices in Aquaculture", the Europe Working Group recognized as relevant eight thematic modules: Business management (TM 38); Human and labour rights, decent work and acceptable working conditions (TM 40); Corporate social responsibility,

[1] The identification of the regional priorities was finalized during the last day of the consultation. The regional priorities are presented in Section 5: The Way Forward and Closing Session.

including social licence and public acceptability (TM 41); Farmers' collaboration, clusters and professional associations (TM 42); Environmental integrity (TM 43); System construction, engineering, maintenance or rehabilitation (TM 44); Better management practices and codes of practices (TM 46); and Predator and unwanted organisms (plants, fish, etc.) management control in aquaculture (TM 50). The North America Working Group highlighted as relevant three thematic modules: Business management (TM 38); Corporate social responsibility, including social licence and public acceptability (TM 41); and Environmental integrity (TM 43).

24. Both working groups recognized as relevant two thematic modules in Chapter 5 "Sustainable Feed": Nutrition, feed and feeding (formulation of natural, farm-made and commercial) (TM 51) and Use of fish, fish oil and fishmeal in aquaculture feed; use of alternative feed ingredients to fish oil and fishmeal i.e. algae, insect meal, single-cell protein, plant protein, etc. (TM 52).

25. In Chapter 6 "Water Management", the Europe Working Group flagged the thematic module Water abstraction and conservation (TM 54). The North America Working Group selected Wastewater and water quality management (TM 55) and Efficient energy use and alternative/renewable energy sources of energy in aquaculture (e.g. solar, wind) (TM 57).

26. Both working groups recognized as relevant two thematic modules in Chapter 7 "Biosecurity, Aquatic Animal Health and Animal Well-being": Biosecurity and aquatic health management (TM 58) and Animal well-being (TM 60).

27. In Chapter 8 "Specific Farming Systems", the Europe Working Group selected as relevant three thematic modules: Promotion of aquaculture innovation and technology adoption among users, including BMPs (TM 61); Integrated aquaculture systems (TM 62); and Farming of other aquatic products (TM 65). The North America Working Group selected the thematic module Promotion of aquaculture innovation and technology adoption among users, including BMPs (TM 61).

28. In Chapter 9 "Aquaculture Value Chains, Consumers, Markets and Trade", both groups selected as relevant the thematic modules Public perception and acceptability (TM 66) and Nutritional value, quality and safety of aquaculture products (TM 67). In addition, the Europe Working Group also selected the thematic modules Marketing of aquaculture products (TM 68) and Fair and productive value chains (TM 69).

29. Both working groups selected the thematic module Monitoring, data and statistics (TM 72) in Chapter 10 "Aquaculture Statistics and Information". During the group discussion, the importance of this thematic module for sustainable governance was stressed.

Plenary session

30. The facilitators reported the results of the working group discussions in the plenary session. Both groups agreed that the two regions have rich and diverse governance instruments at various levels.

31. After reviewing all the inputs from the participants of the two working groups, it was noted that 25 out of 72 thematic modules are the focus and priorities of both regions, namely:

- Chapter 1: Capacity development (TM 7).
- Chapter 2: Ecosystem approach to aquaculture (TM 8); Aquaculture in integrated coastal management (TM 9); Aquaculture in watershed management or land use development plans (TM 10); Climate-smart aquaculture (TM 14); Local communities and livelihoods (TM 16); Governance (TM 21); Stakeholder participation (TM 22); Aquaculture planning and policy (TM 23); Spatial planning (TM 24); Zoning (TM 25); and Climate change and aquaculture (TM 33).
- Chapter 3: Genetic resource management, development and conservation (TM 35) and Species introduction and transfers for aquaculture purposes (TM 36).

- Chapter 4: Business management (TM 38); Corporate social responsibility, including social licence and public acceptability (TM 41); and Environmental integrity (TM 43).
- Chapter 5: Nutrition, feed and feeding (formulation of natural, farm-made and commercial) (TM 51) and Use of fish, fish oil and fishmeal in aquaculture feed; use of alternative feed ingredients to fish oil and fishmeal i.e. algae, insect meal, single-cell protein, plant protein, etc. (TM 52).
- Chapter 7: Biosecurity and aquatic health management (TM 58) and Animal well-being (TM 60).
- Chapter 8: Promotion of aquaculture innovation and technology adoption among users, including BMPs (TM 61).
- Chapter 9: Public perception and acceptability (TM 66) and Nutritional value, quality and safety of aquaculture products (TM 67).
- Chapter 10: Monitoring, data and statistics (TM 72).

SESSION 3: CASE STUDY CONCEPTS

32. The Secretariat introduced the objectives of the session as follows: (i) identify case study concepts among the proposed ones during the Expert Consultation on the development of the GSA (held in Rome, Italy, from 17 to 20 June 2019) and the Tenth Session of the COFI:AQ (held in Trondheim, Norway, from 23 to 27 August 2019) (Appendix 6) and taking into account the selection criteria; (ii) suggest additional case study concepts, if any; and (iii) recommend a list of case study concepts, which include the links to thematic modules, countries and lessons learned. The Secretariat also stated that the purpose of the case study concepts is to inform the development of the GSA and to illustrate the implementation of good approaches and practices.

33. The Secretariat introduced presented the criteria for selecting the case studies as well as the case studies selected by the previous six regional consultations. The Secretariat concluded by displaying the reporting template for the working group discussion. The relevant documentation and reporting template were shared with the participants prior to the consultation.

Working group session

34. The participants were divided into two working groups following the same composition of the previous session, one for the European region and one for the North America region. The discussions were facilitated by Mr Hanel for the Europe Working Group and by Mr Green for the North America Working Group. The detailed results of each group discussion are reported in Appendix 7.

35. For the Europe Working Group, examples of case study concepts at the country level included spatial planning, risk assessment, integrated multi-trophic aquaculture (IMTA), farmed and wild species interactions, fisheries local action groups (FLAGs), small-scale mollusc aquaculture, and aquaculture in protected areas. At the regional level, the proposed concepts referred to allocated zones for aquaculture (AZAs), sustainable intensification, aquaculture in marine protected areas (MPAs), and disease prevention, control and mitigation.

36. The North America Working Group also proposed concepts at both the country and regional levels. Examples included zoning and area management, the role of governments in promoting technological innovation, carbon reduction technologies, co-governance models involving indigenous people and local communities, the role of governments in promoting job opportunities and in supporting youth and women, sustainable aquaculture guidelines, studies in biotechnology, fishmeal replacement and feed formulation, and veterinary telemedicine.

Plenary session

37. The facilitators reported the results of the group discussion in the plenary session. The participants of the Europe Working Group proposed 46 case studies covering 17 thematic modules, whereas the North America Working Group recommended 17 case studies covering 22 thematic modules.

SESSION 4: REGIONAL PRIORITIES

38. The Secretariat stated that the objectives of the session were to: (i) review the selected thematic modules and recommended case study concepts of the previous sessions; (ii) identify and rank all preferred regional priorities; and (iii) propose additional priority areas, if any, to be included in the GSA.

39. The Secretariat next presented the regional priority areas identified by the previous six regional consultations and displayed the reporting template for the working group discussion. The relevant documentation and reporting template were shared with the participants prior to the consultation.

Working group session

40. The participants were divided into two working groups following the same composition of the previous session, one for the European region and one for the North American region. The discussions were facilitated by Mr Hanel for the Europe Working Group and by Mr Green for the North America Working Group. The detailed results of each group discussion are reported in Appendix 8.

41. The Europe Working Group identified five regional priority areas:
- Governance and planning, including administrative simplification, spatial planning, access rights to land and waterbodies, and monitoring (related to Chapter 2).
- Environmental interactions, including water management and protection, climate change, ecosystem services and biodiversity, and ecosystem based-approach (related to Chapters 2 and 3).
- Biosecurity and animal welfare (related to Chapter 7).
- Capacity building and skills development, including bringing innovation to farmers and across the value chain, and education at all levels (related to Chapters 1 and 9).
- Social perception and acceptability, including stakeholder involvement, local development and transparency (related to Chapters 2 and 9).

42. The North America Working Group identified four regional priority areas:
- Ecosystem approach to aquaculture (EAA), governance, planning and policy, stakeholder participation, spatial planning and zoning, technology for impact mitigation, and adaptation of climate change (related to Chapter 2).
- Alternative feed ingredients (related to Chapter 5).
- Biosecurity and aquatic animal health (related to Chapter 7).
- Innovation and technology (related to Chapter 8).

Plenary session

43. The facilitators reported the results of the group discussions in the plenary session. The Europe and North American working groups identified five and four priority areas, respectively. While there were significant overlaps in the priorities identified for the two regions, there were regional nuances within these priorities. Common areas of interest included governance, planning, spatial planning, EAA, biosecurity, climate change and stakeholder participation.

SESSION 5: THE WAY FORWARD AND CLOSING SESSION

44. The Secretariat provided an outline of the steps to be taken to develop and implement the GSA. The timeline for these activities is as follows: (i) select and write the case studies (May–July 2021); (ii) draft the thematic modules (May–July 2021); (iii) draft the GSA (July–October 2021); (iv) hold the Second Expert Consultation for reviewing the draft of the GSA (September 2021); (v) submit the draft of the GSA to the Eleventh Session of COFI:AQ for information and advice; (vi) organize a technical consultation with members, subject to members' request (tentative, April 2022); (vii) submit the final draft GSA to the Thirty-fifth Session of COFI for endorsement; (viii) publish the GSA (2022–2023); and (ix) implement the Guidelines (e.g. capacity building – from 2023 onward).

45. The closing address was provided by Mr Matthias Halwart, Team Leader, FAO Fisheries and Aquaculture Division. He thanked the participants, facilitators and support staff for their attendance and contributions. He noted that, in the past, FAO has supported aquaculture development in the European and North American regions, and will continue to do so in the future. He reiterated the importance of developing the GSA as a tool for guiding policymakers, enhancing sustainable aquaculture and maximizing its contribution to the 2030 Agenda for Sustainable Development. He stressed the importance of the regional consultation process in the GSA development process. The full text of the closing statement is presented in Appendix 9.

46. Mr Hishamunda closed the consultation by providing a brief summary of the three-day meeting. He thanked everyone for attending and contributing to the consultation.

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APPENDIX 2 – OPENING STATEMENTS

WELCOME REMARKS BY MR VLADIMIR RAKHMANIN, ASSISTANT DIRECTOR-GENERAL AND REGIONAL REPRESENTATIVE FOR EUROPE AND CENTRAL ASIA

Distinguished participants, guests and colleagues,

It gives me great pleasure to extend to you all a very warm welcome from the FAO Regional Office for Europe and Central Asia.

As you may be aware, the FAO Committee on Fisheries (COFI), in 2018, recommended FAO to develop Guidelines for Sustainable Aquaculture, or GSA. In 2019, the COFI Sub-Committee on Aquaculture provided guidance on the development of the GSA, including support for regional consultations. To date, regional consultations have been held in Africa, Asia, Latin America, the Pacific and the Caribbean, Eastern Europe and Central Asia, and Near East and North Africa; and this will be the seventh regional consultation of the series and the sixth to be organized in a virtual environment. The Thirty-fourth Session of COFI held last month urged the further development of the GSA.

In 2018, total European fish production was 18.7 million tonnes with a trade value of USD 15.6 billion. Of this total production, aquaculture accounted for 18.1 percent. Atlantic salmon, rainbow trout, sea mussels, European seabass and common carp were the top five species by production quantity. European aquaculture is generally performed by small-scale enterprises, which use comparatively advanced production, post-harvest and processing technologies and systems. High environmental standards and certification, conditions for fish farm licences are known as the major constraints for aquaculture development in the European Union countries.

Before I conclude, allow me to recall that the aims of this consultation are to: (i) share current policies, practices and instruments related to aquaculture in the Europe and North America regions; (ii) develop a list of thematic modules and related case studies considering regional strengths and challenges; and (iii) identify regional priority areas to be included in the GSA.

We expect the GSA to provide practical guidance to government authorities and policymakers in their efforts of promoting the implementation of the Code of Conduct for Responsible Fisheries (CCRF) and to engage and enable aquaculture to effectively participate in the implementation of the 2030 Agenda for Sustainable Development.

Once again, I thank all the participants in your efforts to join the consultation. With these few remarks, I would like to conclude by wishing you all a fruitful consultation.

Thank you.

WELCOME REMARKS BY MR THOMAS PESEK, SENIOR LIAISON OFFICER FOR NORTH AMERICA

Distinguished participants, guests and colleagues, good morning and good afternoon,

I would like to express my warm welcome to you all to this virtual consultation from the FAO Liaison Office for North America.

As you are aware, aquaculture's continued growth worldwide has created jobs, supported livelihoods and provided a source of protein for human consumption. Aquaculture plays an important role in food security and nutrition worldwide since it can be developed in a wide variety of locations and systems. Today, aquaculture contributes to more than half of all fish and fish products for human consumption. Aquaculture will continue to be the driving force behind the growth in global fish production worldwide.

In 2018, total fish production in North America was nearly 6.5 million tonnes. Aquaculture accounted for 10.1 percent of total fish production. Channel catfish, Atlantic salmon, American cupped oyster, red swamp crawfish and rainbow trout were the top five species in terms of quantity.[1]

The Sub-Committee on Aquaculture of the FAO Committee on Fisheries during its Ninth Session, held in Rome, Italy, in October 2017, underlined the vital contribution of aquaculture to food security and nutrition as well as the importance of market access and post-harvest issues, and emphasized the need to support small-scale producers. The Sub-Committee recognized the growing global significance of sustainable aquaculture development and its potential contributions to both global food security and nutrition, as well as to the achievement of a wide range of Sustainable Development Goal targets while recognizing that there is a growing need for implementation of best practices in aquaculture in many countries and regions.

This virtual regional consultation constitutes an essential step towards improving our knowledge on sustainable and successful aquaculture developments and towards the identification of possible success factors and pathways that might provide for suitable guidance to ensure its continued sustainable growth in all possible aquaculture sets and stages of development.

We see this as a very important fundamental first stepping stone and expect that, at the end of the three days, we will have a better view of the scope and contents of the existing and new paths of success and of what methodologies to use for the development of the GSA.

Let me close these welcome remarks by wishing you all a fruitful meeting that will help put the contribution of this consultation on the map for the benefit and growth of a truly sustainable aquaculture for all, without exceptions.

Thank you.

[1] Based on FAO. 2020. FishStatJ - Software for Fishery and Aquaculture Statistical Time Series. In: *FAO Fisheries and Aquaculture Division*. Cited 21 April 2021. www.fao.org/fishery/en/statistics/software/fishstatj

OPENING ADDRESS BY AUDUN LEM, DEPUTY DIRECTOR, FAO FISHERIES AND AQUACULTURE DIVISION

Distinguished participants, guests and colleagues,

On behalf of FAO, I wish you all a convivial welcome. We are looking forward to having a fruitful and enjoyable discussion together.

I greatly thank all of you for your participation in the Europe and North America regional virtual consultation towards the development of Guidelines for Sustainable Aquaculture.

Please allow me first to thank the FAO's Regional Office for Europe and Central Asia and Liaison Office for North America for their excellent support in organizing this virtual consultation. I would also wish to express my appreciation for their continuing endeavour to facilitate an intergovernmental dialogue on sustainable and responsible aquaculture development.

This regional consultation is an essential step towards achieving the Sustainable Development Goals through improvement of our knowledge on sustainable and successful aquaculture developments. It is also an essential move towards identification of possible success factors and pathways that provide suitable guidance to ensure its continued sustainable growth in all possible aquaculture sets and stages of development.

We look forward to working with you, Member Nations, to develop universally applicable and adequate Guidelines for Sustainable Aquaculture in the Europe and North America regions.

I take this opportunity to also bring to your attention that FAO is the lead agency for celebrating the International Year of Artisanal Fisheries and Aquaculture (IYAFA) in 2022 in collaboration with other relevant organizations and bodies of the United Nations system. IYAFA 2022 is an important recognition of the millions of small-scale fishers, fish farmers and fish workers who provide healthy and nutritious food to billions of people and contribute to achieving Zero Hunger.

Let me close these opening remarks by wishing you all a fruitful meeting that will help put the outcome of this consultation to work for the benefit and growth of a truly sustainable aquaculture for all, without exception, in all the Europe and North America regions.

APPENDIX 3 – AGENDA

Time (CEST)	Day 1: 27 April 2021	
14.00–14.05	Instruction and rules	Mr Nathanael Hishamunda, FAO Ms Elisabetta Martone, FAO
14.05–14.15	Opening ceremony: Welcome remarks Opening remarks	 Mr Vladimir Rakhmanin, Assistant Director-General and Regional Representative for Europe and Central Asia Mr Thomas Pesek, Senior Liaison Officer for North America (LOW) Mr Audun Lem, Deputy Director, FAO Fisheries and Aquaculture Division
14.15–14.30	Session 1: Introduction to GSA and regional consultation	Mr KwangSuk Oh, FAO
14.30–14.45	Session 2: Existing governance instruments and thematic modules of importance	Ms Ana Menezes, FAO
14.45–14.50	Instructions for group discussions	Ms Yumi Son, FAO
14.50–15.00	Break	
15.00–16.50	Working Group A discussions on Sessions 1 and 2	Mr KwangSuk Oh and Mr Nathanael Hishamunda, FAO, Moderators Mr Reinhold Hanel, Thünen Institute of Fisheries Ecology, Facilitator Ms Elisabetta Martone and Ms Yumi Son, FAO, Note takers
	Working Group B discussions on Sessions 1 and 2	Ms Ana Menezes and Mr Rodrigo Roubach, FAO, Moderators Mr Barry Green, Fisheries and Oceans Canada, Facilitator Ms Yeseul Byun and Mr Pierre Murekezi, FAO, Note takers
16.50–17.00	Wrap-up	Mr Nathanael Hishamunda, FAO

Time (CEST)	Day 2: 28 April 2021	
14.00–14.30	Working Group A summary and report on Sessions 1 and 2	Mr Reinhold Hanel, Thünen Institute of Fisheries Ecology, Facilitator
	Working Group B summary and report on Sessions 1 and 2	Mr Barry Green, Fisheries and Oceans Canada, Facilitator
14.30–15.50	Session 3: Case study concepts	Mr Rodrigo Roubach, FAO
15.50–16.30	Working Group A discussions on Session 3	Mr KwangSuk Oh and Mr Nathanael Hishamunda, FAO, Moderators Mr Reinhold Hanel, Thünen Institute of Fisheries Ecology, Facilitator Ms Elisabetta Martone and Ms Yumi Son, FAO, Note takers

Time (CEST)	Day 2: 28 April 2021	
15.50–16.30	Working Group B discussions on Session 3	Ms Ana Menezes and Mr Rodrigo Roubach, FAO, Moderators Mr Barry Green, Fisheries and Oceans Canada, Facilitator Ms Yeseul Byun and Mr Pierre Murekezi, FAO, Note takers
16.30–16.40	Presentation of regional consultation survey	Ms Yumi Son, FAO
16.40–16.50	Wrap-up	Mr Nathanael Hishamunda, FAO

Time (CEST)	Day 3: 29 April 2021	
14.00–14.15	Working Group A summary and report on Session 3	Mr Reinhold Hanel, Thünen Institute of Fisheries Ecology, Facilitator
14.15–14.30	Working Group B summary and report on Session 3	Mr Barry Green, Facilitator
14.30–14.35	Session 4: Introduction to regional priorities	Mr Haydar Fersoy, FAO
14.35–15.50	Working Group A discussion on session 4	Mr KwangSuk Oh and Mr Nathanael Hishamunda, FAO, Moderators Mr Reinhold Hanel, Thünen Institute of Fisheries Ecology, Facilitator Ms Elisabetta Martone and Ms Yumi Son, FAO, Note takers
14.35–15.50	Working Group B discussion on Session 4	Ms Ana Menezes and Mr Rodrigo Roubach, FAO, Moderators Mr Barry Green, Fisheries and Oceans Canada, Facilitator Ms Yeseul Byun and Mr Pierre Murekezi, FAO, Note takers
15.50–16.05	Break	
16.05–16.35	Plenary session for reporting back on Session 4	Mr Reinhold Hanel, Thünen Institute of Fisheries Ecology, Facilitator Mr Barry Green, Fisheries and Oceans Canada, Facilitator
16.35–16.50	Session 5: Summary of the regional consultation's results	Ms Ana Menezes, FAO
16.50–17.00	Session 6: Presentation of survey results	Mr Rodrigo Roubach, FAO
17.00–17.10	Next steps on the development of the GSA	Mr KwangSuk Oh, FAO
17.10–17.20	Closing remarks	Mr Matthias Halwart, Team Leader, Global and Regional Processes Team, FAO Fisheries and Aquaculture Division

APPENDIX 4 – WORKING GROUP RESULTS ON EXISTING GOVERNANCE INSTRUMENTS IN EUROPE AND NORTH AMERICA

The tables below encompass all inputs received by participants prior to this consultation through homework, during the consultation through working group discussions and after the consultation (only by the Europe Working Group).

RESULTS OF THE EUROPE WORKING GROUP

Existing regionally or nationally developed aquaculture governance instruments	Category*	Area**	Remarks
European Maritime and Fisheries Fund (EMFF)	Fund	European Union	
EU Maritime Strategy Framework Directive (MSFD)	Directive	European Union	
EU Water Framework Directive	Directive	European Union	
Guidance on Aquaculture and Natura 2000	Guidance	European Union	Guidance on how to integrate aquaculture activities into protected areas.
Commission staff working document on the application of the Water Framework Directive (WFD) and the Marine Strategy Framework Directive (MSFD) in relation to aquaculture	Guidance	European Union	Guidance on the application of EU environmental legislation to aquaculture activities.
The Great Cormorant – Applying derogations: Guidance and the EU Cormorant Platform	Guidance	European Union	Guidance regarding cormorant management (as both protected species and predators) and application of relevant EU legislation.
Strategic Guidelines for a more competitive and sustainable EU aquaculture	Guidelines	European Union	Communication from the European Commission prepared by the European Commission in consultation with Member Nations and national experts. Non-binding guidelines setting a vision and concrete recommendations and actions for the sustainable development of EU aquaculture in the period 2021–2030.
European Union legislation applicable to aquaculture	Legislation	European Union	See reply to CCRF questionnaire by the European Commission. Several pieces of EU legislation apply to aquaculture activities, covering environmental aspects, human and animal health and animal welfare, markets, certification as organic, maritime spatial planning, etc.

Existing regionally or nationally developed aquaculture governance instruments	Category*	Area**	Remarks
Aquaculture Multiannual National Plans	National plan	European Union	
Aquaculture Advisory Council (AAC) Recommendations on the Specific Protection of Shellfish Water Quality	Recommendation	European Union	Articles of the Rural and Maritime Fisheries Code, which establishes the principle of "Structures' schemes in shellfish farming": Sous-section 2: Schémas des structures des exploitations de cultures marines (Articles D923-6 à D923-8) du Code rural et de la pêche maritime. Article D923-6 du Code rural et de la pêche maritime (principle): I. A diagram of the structures of marine culture operations by department and by type of activity is drawn up. This scheme is established by the prefect or, when a production basin extends over the territory of several departments, by the prefects of the river departments, in view of the elements produced by the regional committees of the conchyliculture concerned and affected or marine culture commissions. II. This scheme defines the priorities according to which the objectives of the policy for the development of the structures of marine culture operations set out below are implemented in the sector considered: 1. Promoting the settlement of young operators; 2. Ensuring the maintenance of economically viable enterprises by avoiding their dismembership and by promoting their takeover; 3. Allowing the creation or resumption of operations with a functional unit; 4. Promoting the expansion of farms that do not reach the minimum reference dimension; 5. Promoting the redevelopment of marine culture zones and the installation of young farmers, in particular by reserving areas conceded to the regional conchyliculture committees.

Existing regionally or nationally developed aquaculture governance instruments	Category*	Area**	Remarks
			III. The exploitation of marine cultures, within the meaning of this book, combines all the plots, whatever their location, subject to deeds of concession, granted by the prefect to the same exploiter. Links to the articles that define the content of these schemes: Article D923-7 du Code rural et de la pêche maritime and Article D923-8 du Code rural et de la pêche maritime. Links to existing schemes by region: Département Ille-et-Vilaine; Département Loire Atlantique; Département Finistère; Département Pas de Calais; Département Seine Maritime; Département de la Manche; Département du Var; Région Normandie; and Département des Alpes Maritimes.
Strategic Guidelines IV–AAC recommendation on the development of shellfish-specific guidelines	Recommendation	European Union	
EU ACQUIS	Rights and obligations	European Union	Body of common rights and obligations that are binding on all EU countries, as EU Members.
EU Animal Health Law	Legislation	European Union /European Economic Area	
EU Strategy for the Adriatic and Ionian Region (EUSAIR)	Strategy	Adriatic and Ionian region	
European Inland Fisheries and Aquaculture Advisory Commission (EIFAAC), FAO RFB, Article VI	Body	Europe	
General Fisheries Commission for the Mediterranean (GFCM), FAO RFB, Article XIV	Body	Mediterranean and the Black Sea	
Guidelines for the streamlining of aquaculture authorization and leasing processes	Guidelines	Mediterranean and the Black Sea	The overall objective of the guidelines is to support contracting parties and cooperating non-contracting parties in streamlining

Existing regionally or nationally developed aquaculture governance instruments	Category*	Area**	Remarks
			authorization and leasing procedures in order to facilitate the development of aquaculture.
Guidelines on a harmonized environmental monitoring programme (EMP) for marine finfish cage farming in the Mediterranean and Black Sea	Guidelines	Mediterranean and the Black Sea	The purposes of the EMP at the regional level are to enable the different counterparts to meet safe environmental objectives and to ensure long-term sustainability of living marine resources and sustainable development of aquaculture and protection of sensitive habitats. At the national level, the main purpose is to adopt a harmonized regulated activity so as to ensure adequate measures for the conservation of the water quality status surrounding finfish farms at sea.
Strategy for Mediterranean and Black Sea fisheries and aquaculture	Strategy	Mediterranean and the Black Sea	Under preparation
Strategy for the sustainable development of Mediterranean and Black Sea aquaculture	Strategy	Mediterranean and the Black Sea	
Multiannual National Strategic Plan for the Development of Sustainable Aquaculture	Strategic plan	Czechia	Development of aquaculture as a sector with great potential that will create an important alternative in the future for declining marine fish stocks. Promoting the exploitation of the results of science and technology and, in particular, supporting innovation activities and the transfer of innovation into practice in order to strengthen the competitiveness of the aquaculture sector and maintain employment in the regions. Promotion of the consumption of freshwater fish as a highly nutritionally valuable food with the aim of increasing their consumption throughout the year. The last multiannual national strategic plan for aquaculture comes from 2014. Currently, this plan is updated and will be determined for years 2021 to 2030.
Operational Programme (OP) for Fisheries	Operational programme	Czechia	The OP for Fisheries 2021–2027 is an instrument for drawing of the financial resources from the European Maritime, Fisheries and Aquaculture Fund (EMFAF) for the 2021–2027

Existing regionally or nationally developed aquaculture governance instruments	Category*	Area**	Remarks
			programming period and contributes primarily to the objectives of the Common Fisheries Policy, the Green Agreement for Europe and the Multiannual National Strategic Plan for Aquaculture. The OP for fishery priorities: – Increase the competitiveness of traditional aquaculture, including investments in the preservation of sustainable production of market fish; – Invest in recirculating systems, thus increase production; – Improve the share of processed fish, promote aquaculture and support fish consumption; – Support the transfer of scientific knowledge to aquaculture businesses (product and process innovations); – Support business forms which contribute to the protection or improvement of the environment and biological diversity.
Strategy of the Ministry of Agriculture of the Czech Republic with a View to 2030	Strategic plan	Czechia	Strengths: long history of pond farming and the exercise of fishing rights; advanced and effective breeding know-how based on traditional carp farming; specific regionalism of their dominant pond fish farming; trademarks and protected geographical indications, protected designations of origin; high level of fishing research and education; quality educational; awareness-raising and work with children and youth; existence of professional organizations. Weaknesses: continued pressure from fish-eating predators on fish stocks and beavers causing damage to pond structures.
Comprehensive specific legislation on all aspects of aquaculture	Legislation	Norway	Shared legislation regarding fish health in the European Union/ European Economic Area with high focus on preventing diseases.
White Paper on Sustainable Growth in Norwegian Aquaculture	Policy	Norway	Meld. St. 16 (2014–2015)
Aquaculture Strategy	Strategy	Norway	Under development
Strategy for an Environmentally Sustainable Norwegian Aquaculture Industry	Strategy	Norway	The strategy identifies five focus areas where aquaculture have impact on the environment: genetic interaction, pollution, diseases, spatial planning and feed resources.

Existing regionally or nationally developed aquaculture governance instruments	Category*	Area**	Remarks
Plan for Continent, Madeira and Extended Continental Shelf subdivisions	Plan	Portugal	Resolution of the Council of Ministers No. 203-A/2019 approves the National Maritime Spatial Planning Situation Plan for Continent, Madeira and Extended Continental Shelf subdivisions.
Freshwater fish farming good practices guidelines	Guidelines	Romania	
Controlled reproduction good practices guidelines	Guidelines	Romania	
Health management of aquaculture farms	Guidelines	Spain	
Good practices guidelines in relation to slaughtering in fish	Guidelines	Spain	
Interactions between the environment and aquaculture	Guidelines	Spain	
Regional Plan for Aquaculture Priority Zones in the Canary Islands	Plan	Canary Islands, Spain	The plan is already in place. Although it needs some improvements, it could be used as a governance and marine spatial planning tool to advance sustainable aquaculture production.
Aquaculture Leadership Group (England)	Group	England, United Kingdom of Great Britain and Northern Ireland	The value of this group is in focusing on aquaculture improvements that are pragmatic in the short and long term and enabling real change to support the shellfish industry to expand within realistic culture conditions.
Fisheries and Seafood Scheme	Policy (fund)	England, United Kingdom	England's replacement to EMFF. The Fisheries and Seafood Scheme will provide financial support for projects in England that secure sustainable growth across the catching, processing and aquaculture sectors, and that protect and enhance the marine environment.
English Aquaculture Strategy	Policy (strategy)	England, United Kingdom	An industry-led strategy. The strategy has been developed by Poseidon Aquatic Resource Management Ltd, working closely with Seafood 2040's Aquaculture Leadership Group
Aquaculture Regulatory Toolbox (England)	Regulatory tool (guidelines)	England, United Kingdom	The Centre for Environment, Fisheries and Aquaculture Science (Cefas) guidance on regulatory requirements for new aquaculture businesses in England covering existing and emerging subsectors. This information has been offered on the Seafish website since March 2016 and the downloadable

Existing regionally or nationally developed aquaculture governance instruments	Category*	Area**	Remarks
			documents in the website were most recently updated by Cefas in March 2020.
Fish Health Inspections	Guidelines	Northern Ireland, United Kingdom	
Sustainable Mariculture in Northern Irish Sea Lough Ecosystems (SMILE)	Guidelines	Northern Ireland, United Kingdom	This is a suite of ecosystem models, including shellfish carrying capacity models for each of Northern Ireland's five sea loughs designed to determine the optimum stocking density of shellfish aquaculture and assess water quality issues at a catchment scale. These models are maintained and updated regularly by the Agri-Food and Biosciences Institute.
Licensing for Northern Ireland Aquaculture	Licensing	Northern Ireland, United Kingdom	
Draft Marine Plan for Northern Ireland	Plan (draft)	Northern Ireland, United Kingdom	Aquaculture is one of the key activity policies within the draft Marine Plan for Northern Ireland. While the plan is still a draft, it is a material consideration for all aquaculture proposals, and consideration must be given as to how any proposals will impact the marine area. Achieving sustainable development is at the heart of the draft Marine Plan and any decisions on aquaculture should reflect this.
Marine Fund Scotland	Policy (fund)	Scotland, United Kingdom	Scotland's replacement to EMFF.
Scottish Government Blue Economy Action Plan	Policy (strategy)	Scotland, United Kingdom	
Consultation on future fisheries: Brexit and Our Land – securing the future of Welsh farming	Consultation	Wales, United Kingdom	Consultation document to seek industry views on the future of fisheries. Shellfish and aquaculture section is on pages 21–23.

Existing regionally or nationally developed aquaculture governance instruments	Category*	Area**	Remarks
			The pandemic has delayed this process, but conversation is still ongoing with industry concerning policy development and will put forward proposals to ministers once the new Government is appointed.
Welsh National Marine Plan	Plan	Wales, United Kingdom	There is a detailed section on developing sustainable aquaculture on pages 80–84.
Aquaculture Regulatory Toolbox (Wales)	Regulatory tool (guidelines)	Wales, United Kingdom	This page brings together guidance on regulatory requirements into a single portal covering both existing sectors and those that are emerging. It provides summary information with links and contacts on the type of licences, authorizations and permissions required to set up and run differing types of aquaculture businesses. Also provided is a separate list of regulators with contact details, and a breakdown of existing and emerging aquaculture sectors. Aquaculture developers should also consider the following plans and acts when considering new development in Wales: – The Welsh National Marine Plan (draft 2017) – The Wellbeing of Future Generations Wales Act 2015 – The Environment (Wales) Act 2016 – Area Statements (Terrestrial and Marine equivalents) – River Basement Management Plans
DOCUMENTS OTHER THAN GOVERNANCE INSTRUMENTS			
Aquatic Life Institute (ALI) animal welfare guide for aquaculture	Guide	Global	Key Aquatic Animal Welfare Recommendations for Aquaculture (English) Recomendaciones clave para el bienestar de los animales acuáticos en la acuicultura (Spanish)
IUCN Thematic guidelines about trout fish farming (in French)	Thematic guidelines	Global	
IUCN Thematic guidelines about sustainable fish feeds (in French)	Thematic guidelines	Global	

Existing regionally or nationally developed aquaculture governance instruments	Category*	Area**	Remarks
IUCN Aquaculture and Marine Protected Areas: Exploring Potential Opportunities and Synergies	Thematic recommendations	Global	Document with recommendations about the synergies and opportunities between aquaculture and marine protected areas.
Strategic Research and Innovation Agenda for European Aquaculture (2017)	Recommendations and guidelines	Europe-wide	Developed through the European Aquaculture Technology and Innovation Platform (EATiP). Non-binding.
EATiP position paper and recommendation	Recommendations	Europe-wide	Developed and agreed through the EATiP Mirror Platform (national/regional cluster) network.
FAO Data Collection Systems and Methodologies for the Inland Fisheries of Europe	Technical paper	Europe inland fisheries	
European Inland Fisheries and Aquaculture Advisory Commission (EIFAAC) Welfare of Fishes in Aquaculture	Circular	Europe inland fisheries	
Regional Conference on River Habitat Restoration for Inland Fisheries in the Danube River Basin and Adjacent Black Sea Areas	Report	Europe inland fisheries	
Roadmap towards a blue-green economy in the Baltic Sea Region	Roadmap	Baltic Sea	
Helcom Recommendation 37/3 “Sustainable Aquaculture in the Baltic Sea Region”	Recommendation	Baltic Sea	
Legislation of Aquaculture: Status and Perspectives in the Baltic Sea and Nordic Countries	Position paper	Baltic Sea and Nordic countries	
GFCM guide for the establishment of coastal zones dedicated to aquaculture in the Mediterranean and the Black Sea	Guide	Mediterranean and the Black Sea	
GFCM Toolkit on Allocated Zones for Aquaculture	Toolkit	Mediterranean and the Black Sea	
IUCN series of Guides for sustainable development of Mediterranean aquaculture	Guide	Mediterranean	Three publications under the series of Guide for the Sustainable Development of Mediterranean Aquaculture. The guidelines have been elaborated in collaboration with the sector (FEAP) and with the support of the Governments of Spain and France.

Existing regionally or nationally developed aquaculture governance instruments	Category*	Area**	Remarks
IUCN aquaculture and marine conservation Zanzibar case study	Case study	United Republic of Tanzania, Zanzibar	IUCN case study examines the interaction between aquaculture and marine conservation in Zanzibar. |

*Policy, guidelines, legislation, etc.; **Country, subregion, region, subregional body.

RESULTS OF THE NORTH AMERICA WORKING GROUP

Existing regionally or nationally developed aquaculture governance instruments	Category*	Area**	Remarks
There are three principal regulatory regimes for aquaculture in Canada: – In the Province of British Columbia, where the province issues the lease, and Fisheries and Oceans Canada (DFO) issues the licence and monitors licence conditions; – In the Province of Prince Edward Island, where a management board with members from DFO, the province and industry issues a lease which has a licence attached; and – In all other provinces and territories, where provincial authorities issue both the lease and the licence.	Legislation	Canada: national/ provincial	Additional links for legislation and regulations for each province and territory can be found here.
Fisheries and Oceans Canada (DFO) regulates the aquaculture industry through the Fisheries Act (1985). The Act sets out authorities on fisheries licensing, management, protection and pollution prevention. The following Fisheries Act regulations are relevant to aquaculture: – Aquaculture Activities Regulations (2015) clarify conditions under which aquaculture operators may treat their fish for disease and parasites, as well as deposit organic matter; – Atlantic Fisheries Regulations and Maritime Provinces Fisheries Regulations (1985) regulates size limits and harvest seasons; – Fishery (General) Regulations (2006) regulates release of fish into fish habitats and transfer of live fish to rearing facilities; – Management of Contaminated Fisheries Regulations (1990) authorizes the Minister of Fisheries and Oceans Canada to close areas when there is a danger to public health; – Marine Mammal Regulations (1993); – Maritime Provinces Fishery Regulations (*): At present, aquaculture operators are constrained by these wild capture regulations and unable to use current farming practices.	Legislation	Canada: national	In December 2019, the mandate letter by the Minister of Fisheries and Oceans Canada included a commitment to begin work to introduce a federal Aquaculture Act of limited scope that respects federal, provincial and territorial jurisdictions. The creation of new federal aquaculture legislation will provide greater clarity and certainty as the industry develops across Canada while respecting existing jurisdictions. The proposed Act will foster a nationally consistent and adaptable legislative framework while taking into account important regional differences. DFO is also developing forward-looking, aquaculture-specific regulations, to be known as the General Aquaculture Regulations (GAR). The GAR will result in one comprehensive aquaculture regulation that consolidates aquaculture-related content currently included within the Fisheries Act, thus providing an opportunity to modernize the regulations and implement them under the proposed Aquaculture Act.

Existing regionally or nationally developed aquaculture governance instruments	Category*	Area**	Remarks
– Pacific Aquaculture Regulations (2009 – sets out aquaculture licensing and management in British Columbia where DFO is the principal regulator). – Pacific Fishery Regulations (1993) set out DFO's authorities respecting fishing in the Pacific Ocean and the Province of British Columbia.			
Policy objective by policy: Limit ecosystem impact: – Aquaculture Activities Regulations. – Access to Wild Aquatic Resources as it Applies to Aquaculture provides the aquaculture industry with access to wild stocks in a manner that is consistent with the department's sustainable management of those stocks. – National Code on Introductions and Transfers of Aquatic Organisms. Ensure coherence with marine spatial planning: – As announced in December 2018, the Government of Canada is moving towards an area-based approach to aquaculture management to ensure that environmental, social and economic factors are taken into consideration when identifying potential areas for aquaculture development, including considerations relating to migration pathways for wild salmon. Control the quality of aquaculture products: – Canadian Shellfish Sanitation Program is a federal food safety program that implements controls to verify that only shellfish that meet food safety and quality standards reach domestic and international markets. Supporting innovation: – Fisheries and Aquaculture Clean Technology and Adoption Program was a national contribution program (2017 to 2021) to assist Canada's fisheries and aquaculture industries in improving their environmental performance.	Policy objective by policy	Canada: national	

Existing regionally or nationally developed aquaculture governance instruments	Category*	Area**	Remarks
Obligation to hold a licence or permit to operate: – Under the Pacific Aquaculture Regulations, the Minister of Fisheries and Oceans Canada may issue an aquaculture licence authorizing a person to engage in aquaculture and prescribed activities in the Province of British Columbia. https://laws-lois.justice.gc.ca/eng/regulations/SOR-2010-270 – Information on Provinces and territories permits, leases and licenses regimes. Standards on environmental impact: – Aquaculture Activities Regulations clarify conditions under which aquaculture operators may treat their fish for disease and parasites, as well as deposit organic matter. Limits to use of sanitary and phytosanitary treatments: – Aquaculture Activities Regulations – Pacific Aquaculture Regulations Regulations on aquaculture feed: – The manufacture, sale and import of livestock feeds are regulated under the Feeds Act and Regulations administered by the Canadian Food Inspection Agency. All feeds must be safe to livestock and to the environment. Limits related to visual and environmental impact: – Aquaculture Activities Regulations	Aquaculture management tools Legislation	Canada: national	Licence for operating aquaculture facility: enforceable regulation.
Canada is finalizing the Framework for Aquaculture Risk Management, based on the precautionary approach, which will ensure the sustainable management of aquaculture and will be the overarching framework for future policies.	Management tool	Canada	
There are many other federal government departments and agencies involved in the regulation of the aquaculture sector: Impact Assessment Agency of Canada, formerly known as the Canadian Environmental Assessment Agency – The Canadian Environmental Protection Act provides governance respecting pollution prevention and the	Legislation	Canada: national	

Existing regionally or nationally developed aquaculture governance instruments	Category*	Area**	Remarks
protection of the environment and human health in order to contribute to sustainable development. Canadian Food Inspection Agency – Feeds Act sets out authorities governing the manufacture and sale of livestock feeds in Canada to ensure they are safe, effective and labelled appropriately. – Fish Inspection Act sets out authorities to regulate food quality, food safety and identity of fish and seafood products that are processed in federally registered establishments or imported into Canada. – Health of Animals Act sets out authorities to support the management of animal diseases, including aquatic animals (e.g. finfish and shellfish). The Act is delivered through the National Aquatic Animal Health Program (NAAHP) and the Health of Animals Regulations. Health Canada – Food and Drugs Act sets out provisions for the regulation of the production, import, export and transport across provinces and sale of food and drugs. Pest Management Regulatory Agency – Pest Control Products Act sets out provisions for the regulation and registration of pest control products to ensure that pesticide and related products are safe for people and animals, efficacious and of value, and that the environment is protected when products are used. Transport Canada – Canada Shipping Act sets out provisions for the regulation of vessel-related pollution prevention and response, vessel requirements and inspections, and vessel personnel and safety. – Navigation Protection Act sets out provisions for the protection of the public right of navigation, ensuring			

Existing regionally or nationally developed aquaculture governance instruments	Category*	Area**	Remarks
infrastructure and other works in navigable waterways are appropriately reviewed and regulated such that aquaculture operators may have to obtain a Navigation Protection Act permit.			
National Aquaculture Act (under updates)	Legislation	United States of America: country	Establishes that it is national policy to encourage the development of aquaculture in the United States of America and ensure coordination among federal agencies that have aquaculture programmes and policies.
National Aquaculture Development Act	Legislation	United States of America: country	Amended the National Aquaculture Act in 1980; directed the development of a National Aquaculture Development Plan.
National Environmental Policy Act	Legislation	United States of America: country	Ensures government agencies consider the significant environmental consequences of their proposed actions and inform the public about their decision-making.
Rivers and Harbors Act	Legislation	United States of America: country	Grants the U.S. Army Corps of Engineers the power to issue permits for obstructions to the navigable capacity of any of the waters of the United States of America.
Clean Water Act	Legislation	United States of America: country	Grants the U.S. Environmental Protection Agency (or authorized states) the power to permit discharges into United States waters. Grants the U.S. Army Corps of Engineers authority to permit the discharge of fill material into United States waters.
Magnuson-Stevens Fishery Conservation and Management Act	Legislation	United States of America: country	Establishes a regional management system for wild and aquaculture fisheries. Requires federal agencies to consult with NOAA Fisheries regarding effects on essential fish habitat for federally managed species.
Endangered Species Act (ESA)	Legislation	United States of America: country	Provides protections for protected species and requires federal agency consultations to determine if actions may affect species listed as threatened or endangered under the ESA or their critical habitat.
Marine Mammal Protection Act	Legislation	United States of America: country	Prohibits, with certain exceptions, the “take” of marine mammals and the importation of marine mammals and marine mammal products into the United States of America.

Existing regionally or nationally developed aquaculture governance instruments	Category*	Area**	Remarks
Coastal Zone Management Act	Legislation	United States of America: country	Requires federal agencies to obtain certifications from states that authorized actions are consistent with the state programme.
Fish and Wildlife Coordination Act	Legislation	United States of America: country	Requires that federal agencies consult with the U.S. Fish and Wildlife Service, the National Marine Fisheries Service and state wildlife agencies for activities that affect, control or modify waters of any stream or bodies of water.
National Marine Sanctuaries Act	Legislation	United States of America: country	Seeks to identify, designate and manage ocean and Great Lake areas of special national significance.
Migratory Bird Treaty Act	Legislation	United States of America: country	Seeks to conserve migratory birds through protection, restoration and management.
Animal Health Protection Act	Legislation	United States of America: country	Seeks to prevent, detect, control or eradicate diseases of farmed animals and to promote best management practices.
Food Safety Modernization Act	Legislation	United States of America: country	Seeks to ensure the safety of animal feed produced in the United States of America and feed that is imported.
Lacey Act	Legislation	United States of America: country	Prohibits the trade of wildlife, fish and plants that have been illegally taken, possessed, transported or sold; regulates the import of any species protected by international or domestic law; and prevents the spread of invasive or non-native species.
Federal Insecticide, Fungicide and Rodenticide Act	Legislation	United States of America: country	Provides regulation of pesticides used in aquaculture.
Federal Food, Drug and Cosmetic Act	Legislation	United States of America: country	Establishes “tolerances” (or maximum legally permissible levels) for pesticide residues in food.
Virus-Serum-Toxin Act	Legislation	United States of America: country	Protects farmers by regulating the quality of vaccines and point-of-care diagnostics for animals.

Existing regionally or nationally developed aquaculture governance instruments	Category*	Area**	Remarks
Minor Use and Minor Species Act	Legislation	United States of America: country	Seeks to make medications legally available for the treatment of minor animal species and to make medications legally available to major species for uncommon indications, so-called minor uses.
Animal Drug Availability Act	Legislation	United States of America: country	Facilitates approval of new animal drugs and medicated feeds.
National Historic Preservation Act	Legislation	United States of America: country	Requires evaluation of an aquaculture project's potential impacts to historical properties.
Coast Guard and Maritime Transportation Act	Legislation	United States of America: country	Provides a system by which offshore obstructions to navigation must be marked.
National Strategic Plan for Aquaculture Research	Guidelines	United States of America: country	Strategic plan to guide federal research in aquaculture.
National Aquatic Animal Health Plan (NAAHP) 2008	Guidelines	United States of America: country	Provides recommendations to prevent, manage and minimize disease in farmed and wild aquatic animals.
Comprehensive Aquaculture Health Program Standards	Guidelines	United States of America: country	Non-regulatory framework for the improvement and verification of the health of farm-raised aquatic animals produced in United States of America.
National Shellfish Sanitation Program Guide for the Control of Molluscan Shellfish	Guidelines	United States of America: country	Provides guidelines to ensure that the shellfish produced in the United States of America are safe and sanitary.
Infectious Salmon Anemia Program Standards	Guidelines	United States of America: state	Standards providing recommended procedures for the prevention and containment of infectious salmon anemia from farm-raised Atlantic salmon in Maine.
National Aquaculture Health Plan & Standards 2021–2023	Guidelines	United States of America: country	Replaces the 2008 NAAHP (National Aquatic Animal Health Plan) and establishes infrastructure and health inspection options to certify and verify aquatic animal health.

Existing regionally or nationally developed aquaculture governance instruments	Category*	Area**	Remarks
American Medicinal Drug Use Clarification Act (AMDUCA)	Legislation	United States of America: country	Permits veterinarians to prescribe extra-label uses of certain drugs; allows the Food and Drug Administration (FDA) to prohibit use of certain drugs and entire classes of drugs in animals, including food-producing animals.

* Policy, guidelines, legislation, etc.; **Country, subregion, region, subregional body.

APPENDIX 5 – WORKING GROUP RESULTS ON THEMATIC MODULES

The tables below encompass all inputs received by participants prior to this consultation through homework and during the consultation through working group discussions.

RESULTS OF THE EUROPE WORKING GROUP

Chapters and thematic modules (TMs)	Country or regional strengths	Country or regional challenges	Prioritize	Comments	Proposed by
Chapter 1: Sustainable Aquaculture and the 2030 Agenda				SDGs are high on the political agenda	Norway
TM 2: Implementing the CCRF			Y: Ranked 3rd within chapter		Romania
TM 6: Food security, nutrition and improved diets	Quality fish protein; quality genetic resources		Y		Czechia
					United Kingdom
			Y: Ranked 2nd within chapter		Romania
TM 7: Capacity development			Y: Ranked 1st within chapter		Romania
					EATiP
Chapter 2: Governing and Planning Aquaculture Development					Cyprus
				Chapter 2 is the most important; however, TMs 19, 26, 29, 30 and 31 are of less importance	Ireland
				Knowledge-based management in place	Norway
					European Union
					GFCM

Chapters and thematic modules (TMs)	Country or regional strengths	Country or regional challenges	Prioritize	Comments	Proposed by
TM 8: Ecosystem approach to aquaculture			Y: Ranked 1st within chapter		Romania
	Yes, but more needs to be done		Y: Ranked 1st	This is provisional and pending further discussion	European Union
TM 9: Aquaculture in integrated coastal management					
TM 10: Aquaculture in watershed management or land use development plans					EMPA
TM 11: Aquaculture in community development planning			Y: Ranked 4th within chapter		Romania
TM 12: Blue Growth Initiative					
TM 15: Access rights to land and waterbodies					
TM 16: Local communities and livelihoods			Y: Ranked 3rd within chapter		Romania
TM 21: Governance	Quality human resources, cooperation with scientific entities, national legislation		Y		Czechia
			Y: Ranked 1st within chapter		Romania
TM 22: Stakeholder participation					EATiP
TM 23: Aquaculture planning and policy	Quality human resources, cooperation with scientific entities		Y		Czechia
					Portugal

Chapters and thematic modules (TMs)	Country or regional strengths	Country or regional challenges	Prioritize	Comments	Proposed by
			Y: Ranked 1st within chapter		Romania
	Yes		Y: Ranked 2nd	This is provisional and pending further discussion	European Union
TM 24: Spatial planning	Yes				Portugal
			Y: Ranked 2nd within chapter		Romania
			Y: Ranked 3rd	This is provisional and pending further discussion	European Union
TM 25: Zoning			Y: Ranked 2nd within chapter		Romania
TM 33: Climate change and aquaculture	Czechia: be prepared for climate change		Y		Czechia
					United Kingdom
Chapter 3: Biodiversity and Genetic Resources		Genetic resource management, development and conservation	Y: Ranked 4th	Genetic impact of escapees influence wild salmon for decades; polluter-pays principle introduced	Norway
				Considering in Chapter 3 the concept/frame of Nature-based Solutions, interventions in aquaculture for climate change (e.g. shellfish, large seaweed culture), loss of biodiversity, and win-win solutions (also in MPAs); good examples are from the United Nations Climate Manifesto 2019	ISPRA
TM 34: Biodiversity, habitat, ecosystems functions and aquaculture			Y: Ranked 1st within chapter		Romania
				In Ireland, it is important but is covered under Governance (Chapter 2)	

Chapters and thematic modules (TMs)	Country or regional strengths	Country or regional challenges	Prioritize	Comments	Proposed by
TM 35: Genetic resource management, development and conservation	Conservation of typical quality genetic resources – *Cyprinus carpio, Oncorhynchus mykiss, Silurus glanis, Coregonus*, etc.		Y		Czechia
					Ireland
			Y: Ranked 2nd within chapter		Romania
TM 36: Species introduction and transfers for aquaculture purposes				In Ireland, it is important but is covered under Governance (Chapter 2)	
				EATiP: it can be linked to EAA in Chapter 2	
Chapter 4: Better Management Practices in Aquaculture					
TM 38: Business management			Y: Ranked 1st within chapter		Romania
TM 40: Human and labour rights, decent work and acceptable working conditions					
TM 41: Corporate social responsibility, including social licence and public acceptability					
TM 42: Farmers' collaboration, clusters and professional associations	Education for local farmers				Ireland
TM 43: Environmental integrity				Environmental integrity is most important in Chapter 4	Cyprus

Chapters and thematic modules (TMs)	Country or regional strengths	Country or regional challenges	Prioritize	Comments	Proposed by
					Ireland
	Yes, but more needs to be done		Y: Ranked 4th	This is provisional and pending further discussion	European Union
TM 44: System construction, engineering, maintenance or rehabilitation					Ireland
TM 46: Better management practices and codes of practices			Y: Ranked 2nd within chapter		Romania
TM 50: Predator and unwanted organisms (plants, fish, etc.) management control in aquaculture	Manage fish protection against predators and unwanted organisms in species such as *Phalacrocorax carbo*, *Lutra lutra*, etc.		Y		Czechia
			Y: Ranked 3rd within chapter		Romania
				United Kingdom: if the TM includes parasites, it should move up a bit	
Chapter 5: Sustainable Feed	Use of fish, fish oil and fishmeal in aquaculture feed; use of alternative feed ingredients to fish oil and fishmeal i.e. algae, insect meal, single-cell protein, plant protein, etc.		Y: Ranked 3rd		Norway
				Feed ingredients are critical as well; feed also has a big influence on sustainability	Finland
				Good research is underway in Scotland on alternative fish feeds, such as the insect diet	United Kingdom

Chapters and thematic modules (TMs)	Country or regional strengths	Country or regional challenges	Prioritize	Comments	Proposed by
		Using live bait fish and wild fish as feed in aquaculture	Y	Sustainable fish feed is very important: (i) smaller feed fish can be more nutritious than larger farmed fish; (ii) using smaller feed fish for farmed fish then being consumed by humans is not an economical nor sustainable way of using fisheries resources; (iii) ALI's Blue Loss report finds that one-third to one-half of all wild-caught fish, or 1.2 trillion fish, are ultimately fed to farmed aquatic animals; (iv) prioritize the development of local alternative, plant-based feed options.	Aquatic Life Institute (ALI)
TM 51: Nutrition, feed and feeding (formulation of natural, farm-made and commercial)					Romania
TM 52: Use of fish, fish oil and fishmeal in aquaculture feed; use of alternative feed ingredients to fish oil and fishmeal, i.e. algae, insect meal, single-cell protein, plant protein, etc.				There is the need to focus on disease prevention	Belgium
	Yes, but more needs to be done		Y: Ranked 7th	This is provisional and pending further discussion	European Union
				The use of alternatives, such as insects, should be prioritized as these may play a key role in upscaling both conventional and organic aquaculture (protein-rich feed ingredients promoted by the EU Farm to Fork that are forecast to grow in both the European Union and North American context)	International Platform of Insects for Food and Feed (IPIFF)
Chapter 6: Water Management				All TMs under Chapter 6 are important	Ireland

Chapters and thematic modules (TMs)	Country or regional strengths	Country or regional challenges	Prioritize	Comments	Proposed by
					Romania
TM 54: Water abstraction and conservation					
Chapter 7: Biosecurity, Aquatic Animal Health and Animal Well-being	Biosecurity and aquatic health management	Animal well-being	Y: Ranked 1st	Intensive farming challenges biosecurity and animal well-being and must always have priority	Norway
					Romania
					GFCM
				European Union is revising its animal welfare legislation (regional strength), so forward-thinking regarding high animal welfare in aquaculture is needed. It can serve as a cross-cutting solution to many challenges in aquaculture (e.g. biosecurity, disease control, antimicrobial resistance, reduced wild fish needed for fish feed, lower carbon emissions in the value chain, food safety/security)	Aquatic Life Institute
TM 58: Biosecurity and aquatic health management	Yes		Y: Ranked 5th	This is provisional and pending further discussion	European Union
TM 60: Animal well-being	Yes, but more needs to be done		Y: Ranked 6th	This is provisional and pending further discussion	European Union
	European Union rules on animal welfare reflect the "five freedoms"	Lack of adequate aquatic animal welfare guidelines	Y	Using World Organisation for Animal Health (OIE) aquatic animal health code as absolute minimum, while developing ALI's key aquatic animal welfare recommendations for aquaculture. Avoid developing RAS as the dominant system in the European Union, as RAS is factory farming in its truest sense. Prioritize: aquaculture housing and rearing conditions; stunning and slaughter; psychological health in addition to physiological health	Aquatic Life Institute (ALI)

Chapters and thematic modules (TMs)	Country or regional strengths	Country or regional challenges	Prioritize	Comments	Proposed by
Chapter 8: Specific Farming Systems	Promotion of aquaculture innovation and technology adoption among users, including BMPs			Norway: salmon farming is a high-end industry with a high innovation rate	Norway
	Multi-trophic fish farming, low greenhouse gas fingerprint, productive capacity	Under-utilization of production capacities, lack of adequate national support policies and legislation			Romania
TM 61: Promotion of aquaculture innovation and technology adoption among users, including BMPs	Yes, but more needs to be done		Y: Ranked 9th	This is provisional and pending further discussion	European Union
TM 62: Integrated aquaculture systems					Ireland
					Romania
TM 65: Farming of other aquatic products	Molluscs		Y: Ranked 8th	This is provisional and pending further discussion	European Union
Chapter 9: Aquaculture Value Chains, Consumers, Markets and Trade					Ireland
					Germany
				Under COVID-19, it is important to improve social inclusion by cooperating with farmer associations	GFCM
TM 66: Public perception and acceptability			Y: Ranked 1st within chapter		Romania
TM 67: Nutritional value, quality and safety of aquaculture products			Y: Ranked 2nd within chapter		Romania

Chapters and thematic modules (TMs)	Country or regional strengths	Country or regional challenges	Prioritize	Comments	Proposed by
TM 68: Marketing of aquaculture products					
TM 69: Fair and productive value chains			Y: Ranked 3rd within chapter		Romania
Chapter 10: Aquaculture Statistics and Information					Ireland
	Monitoring, data and statistics		Y: Ranked 2nd	It will always be a basis for sustainable governance	Norway

RESULTS OF THE NORTH AMERICA WORKING GROUP

Note: During the consultation, the results table could not be completed due to time constraints. While regional strengths were not fully discussed, regional challenges were discussed in some detail. The following table primarily provides a review of the regional challenges as discussed by the delegates.

Chapters and thematic modules	Country or regional strengths	Country or regional challenges	Prioritize	Comments	Proposed by
INPUTS PROVIDED BY CANADA					
Chapter 4: Better Management Practices in Aquaculture					
TM 43: Environmental integrity	Canada has well-developed policy instruments regarding environmental integrity (see Appendix 4)			Environmental integrity is a priority of the Government of Canada; Canada has a robust management regime for aquaculture that prioritizes environmental integrity	Canada
Chapter 2: Governing and Planning Aquaculture Development					
TM 20: Precautionary principle/ precautionary approach	FARM (see comments)			Canada is finalizing the Framework for Aquaculture Risk Management (FARM). The framework provides a consistent, predictable process to assess the risks and options for avoidance, mitigation or other management measures available to reduce the risks relative to specific objectives for the environment in which the aquaculture activity will be located	Canada
TM 33: Climate change and aquaculture/TM 14: Climate-smart aquaculture		Climate change is causing challenges for marine aquaculture with an increase		Guidelines that support the development of aquaculture technologies that reduce carbon emissions and reduce impact on	Canada

Chapters and thematic modules	Country or regional strengths	Country or regional challenges	Prioritize	Comments	Proposed by
		in extreme weather events, warming oceans, etc. There is interest in reducing the impact of marine aquaculture by moving it on land, which can result in technologies that have a higher carbon footprint. Challenges posed by climate change: − Governmental management; − Technological adaptation and application to the changing environment		climate change are of interest in addition to technologies that adapt to a changing climate (warming ocean temperatures, algal blooms, etc.) Guidance that could be of interest: − ClimeFish (2016–2020) 21 institutions from 16 countries collaborated to address challenges of climate change on European fisheries and aquaculture. Chile is also a partner; − Case studies on marine aquaculture, e.g. salmon and cod in the Northeast Atlantic and shellfish in Scotland, United Kingdom; − Developed general guidelines for making Climate Adaptation Plans	
TM 21: Governance	For existing aquaculture systems, Canada has a robust management regime. A strong federal-provincial management approach launched in 2008: federal government and provincial level organization cooperating (co-management) for governing aquaculture activity	For emerging technologies, such as offshore aquaculture, how to legislate, regulate and manage these new technologies when this form can involve multiple levels of government (federal, provincial and international)		How to govern emerging aquaculture technologies, e.g. offshore systems	Canada
TM 22: Stakeholder participation	In the Canadian context, there are strong co-governance models between the	Co-governance models specific to aquaculture do not exist		Interested in BMP for co-governance models between governments and First Nations and	Canada

Chapters and thematic modules	Country or regional strengths	Country or regional challenges	Prioritize	Comments	Proposed by
	government and indigenous groups, such as wildlife management boards. Canada also involves stakeholders in policymaking, planning and management through public consultations and stakeholder engagement sessions			local communities. In Canada, indigenous groups that have aquaculture operations in their traditional territories have indicated a desire to have more involvement and decision-making power in the management of aquaculture, particularly in alignment with the principles of the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP).	
TM 25: Zoning TM 24: Spatial planning TM 18: Conflict resolution schemes		Involving indigenous communities in the co-management of aquaculture in their traditional territories. No co-management model with indigenous groups in the aquaculture sector		Canada is exploring the development of an area-based management approach to aquaculture management that could benefit from guidelines on co-governance, marine spatial planning, etc. In addition, Canada is interested in guidance on conflict resolution to balance the effects of aquaculture development on existing fisheries (competition for space with other marine resource users, competition for resources, direct or indirect effects, etc.) and the potential economic trade-offs between the fishery being preserved and development being stifled	Canada
TM 66: Public perception and acceptability in Chapter 9 (Aquaculture Value Chains,		Challenge in improving public perception, acceptability of aquaculture		In some parts of Canada, there is vocal opposition to marine-based salmon farming, with concerns focused on its impact on wild	Canada

Chapters and thematic modules	Country or regional strengths	Country or regional challenges	Prioritize	Comments	Proposed by
Consumers, Markets and Trade) TM 41: Corporate social responsibility, including social licence and public acceptability in Chapter 4 (Better Management Practices in Aquaculture)		and the mechanism and roles and responsibilities to do so		salmon. Canada has a robust management regime, with peer-reviewed science that has demonstrated minimal impact, yet there is still a lack of acceptability and social licence. While this is an issue for industry to manage, guidelines on how governments can contribute to improving acceptability would be useful	
TM 61: Promotion of aquaculture innovation and technology adoption among users, including BMPs in Chapter 8 (Specific farming systems)		Challenge in accelerating and incentivizing the adoption of alternative technologies		Global aquaculture operators are trialling many different types of salmon production technologies to enhance environmental performance and to be more resistant to environmental factors. However, many of these new systems have yet to be proven at a commercial scale and are preventing their adoption. Canada is interested in how to accelerate and incentivize the development of these technologies to de-risk early adopters	Canada
TM 56: Effluent, waste management/disposal and wastewater use in Chapter 6 (Water Management)		Operational challenges exist in production systems regarding waste and effluent. Better environmental performance (including waste management) in aquaculture sector is required		Opponents of marine-based aquaculture are pressuring governments to move these systems on land to reduce interactions and impact in the marine environment. However, effluent and wastewater management of land-based systems still have challenges from a permitting and operational	Canada

Chapters and thematic modules	Country or regional strengths	Country or regional challenges	Prioritize	Comments	Proposed by
				perspective that could benefit from guidelines	
Chapter 1: Sustainable Aquaculture and the 2030 Agenda					
TM 1: Dealing with trade-offs between different SDGs in aquaculture		There are challenges in balancing increasing production, economic development and environmental objectives		How do we reconcile that alternative production technologies (alternative to marine aquaculture) may result in different environmental challenges, such as increased water use, significantly increased power consumption, waste management effluent discharges into the marine environment and CO_2 emissions? For example, land-based RAS vs marine-based aquaculture	Canada
TM 4: Gender in aquaculture	Canadian Government incorporates gender-based analysis into the development of programmes and policies			The Government of Canada is committed to supporting the full implementation of gender-based analysis plus (GBA+) across federal departments. GBA+ ensures that the differential impacts of people of all genders are considered when policies, programmes and legislation are developed	Canada
TM 28: Resource sharing and international/transboundary cooperation in Chapter 2 (Governing and Planning Aquaculture Development)	Canada, Norway, Scotland (United Kingdom) and Chile, the top Atlantic salmon-producing countries, have a Memorandum of Understanding to meet annually to share and discuss				Canada

Chapters and thematic modules	Country or regional strengths	Country or regional challenges	Prioritize	Comments	Proposed by
	best practices, challenges, and opportunities for cooperation. Canada also meets regularly with the United States of America to discuss aquaculture management issues				
TM 34: Biosecurity, habitat, ecosystems functions and aquaculture in Chapter 3 (Biodiversity and Genetic Resources)	Canada operates the National Aquatic Animal Health Program and maintains a registry of federally reportable aquatic animal diseases				Canada
INPUTS PROVIDED BY THE UNITED STATES OF AMERICA	United States of America cannot provide prioritized thematic modules due to no official guidance at the moment (currently in transition of a new administrative structure)				United States of America
Chapter 1: Sustainable Aquaculture and the 2030 Agenda					
TM 3: Equitable and inclusive development					United States of America
TM 5: Sustainable livelihoods, social protection and safety nets in aquaculture					United States of America
TM 6: Food security, nutrition and improved diets					United States of America
TM 7: Capacity development					United States of America

Chapters and thematic modules	Country or regional strengths	Country or regional challenges	Prioritize	Comments	Proposed by
Chapter 2: Governing and Planning Aquaculture Development					
TM 8: Ecosystem approach to aquaculture					United States of America
TM 9: Aquaculture in integrated coastal management					United States of America
TM 10: Aquaculture in watershed management or land use development plans					United States of America
TM 11: Aquaculture in community development planning	Framework and legal issues				United States of America
TM 14: Climate-smart aquaculture					United States of America
TM 16: Local communities and livelihoods					United States of America
TM 17: Collective management of common resources					United States of America
TM 21: Governance					United States of America
TM 22: Stakeholder participation					United States of America
TM 23: Aquaculture planning and policy					United States of America
TM 24: Spatial planning					United States of America
TM 25: Zoning					United States of America
TM 26: Public-private partnerships in aquaculture					United States of America
TM 27: Enabling environment					United States of America

Chapters and thematic modules	Country or regional strengths	Country or regional challenges	Prioritize	Comments	Proposed by
TM 30: Natural disasters management					United States of America
TM 33: Climate change and aquaculture					United States of America
Chapter 3: Biodiversity and Genetic Resources					
TM 34: Biodiversity, habitat, ecosystems functions and aquaculture					United States of America
TM 35: Genetic resource management, development and conservation					United States of America
Chapter 4: Better Management Practices in Aquaculture					
TM 38: Business management					United States of America
PRIORITY AREAS BOTH FOR CANADA AND THE UNITED STATES OF AMERICA (BOTH IN LINE WITH THE FIELD OF INTEREST/PRIORITIZATION)					
Chapter 1: Sustainable Aquaculture and the 2030 Agenda TM 7: Capacity development				Under the umbrella theme of "Equitable and inclusive aquaculture", Food security and nutrition, Social protection, Sustainable livelihoods, Gender issues and Involvement of youth can be collected together	
Chapter 2: Governing and Planning aquaculture TM 8: Ecosystem approach to aquaculture TM 9: Aquaculture in integrated coastal management				TM 20: Precautionary principle/ precautionary approach needs new wording/definition because no advanced action might be taken with a precautionary approach. Instead of precautionary, the United States of	

Chapters and thematic modules	Country or regional strengths	Country or regional challenges	Prioritize	Comments	Proposed by
TM 10: Aquaculture in watershed management or land use development plans TM 23: Aquaculture planning and policy TM 24: Spatial planning TM 25: Zoning TM 16: Local community and livelihoods TM 22: Stakeholder participation TM 17: Collective management of common resources TM 21: Governance TM 14: Climate-smart aquaculture TM 26: Public-private partnerships in aquaculture TM 30: Natural disasters management TM 33: Climate change and aquaculture TM 27: Enabling environment				America suggested “responsible” or “sustainable” as less controversial	
Chapter 3: Biodiversity and Genetic Resources TM 35: Genetic resource management, development and conservatism TM 36: Species introduction and transfers for aquaculture purposes	There are political instruments on alien fish introduction in Canada and the United States of America				

Chapters and thematic modules	Country or regional strengths	Country or regional challenges	Prioritize	Comments	Proposed by
Chapter 4: Better Management Practices in Aquaculture TM 38: Business management TM 41: Corporate social responsibility, including social licence and public acceptability TM 43: Environmental integrity					
Chapter 5: Sustainable Feed TM 51: Nutrition, feed and feeding (formulation of natural, farm-made and commercial) TM 52: Use of fish, fish oil and fishmeal in aquaculture feed, Use of alternative feed ingredients to fish oil and fishmeal i.e. algae, insect meal, single cell protein, plant protein, etc.	There are aquaculture programmes for fish feed in Canada and the United States of America			Case studies on feed innovation and public perception proposed. One key investment/research area of the Government is alternative feed being adopted by industry	
Chapter 6: Water Management TM 55: Wastewater and water quality management TM 57: Efficient energy use/renewable energy					
Chapter 7: Biosecurity, Aquatic Animal Health and Animal Well-being TM 58: Biosecurity and aquatic health management TM 60: Animal well-being					

Chapters and thematic modules	Country or regional strengths	Country or regional challenges	Prioritize	Comments	Proposed by
Chapter 8: Specific Farming Systems TM 61: Promotion of aquaculture innovation and technology adoption among users, including BMPs	The United States of America is promoting innovative seed/algae culture				
Chapter 9: Aquaculture Value Chains, Consumers, Markets and Trade TM 66: Public perception and acceptability TM 67: Nutritional value, quality and safety of aquaculture products	One of governmental key area is quality and safety of aquaculture				
Chapter 10: Aquaculture Statistics and Information	The United States of America is collecting comprehensive data on aquaculture				

APPENDIX 6 – PROPOSED CASE STUDIES CONCEPTS FOR USE DURING GROUP DISCUSSIONS

No.	Case study proposed	Country	Region	Proposed in
1	Aquaculture zoning and carrying capacity	Norway	Europe	Expert consultation (June 2019)
2	Legislation concerning feed and therefore nutrient discharge for trout aquaculture	Denmark	Europe	COFI:AQ (August 2019)
3	Further development of full or partial recirculation aquaculture systems		Europe	COFI:AQ (August 2019)
4	Sustainable intensification of traditional pond aquaculture systems		Europe	COFI:AQ (August 2019)
5	Reduction of the potential impact of climate change on the inland fisheries and aquaculture sector		Europe	COFI:AQ (August 2019)
6	Water resources management, including land water interactions and spatial planning		Europe	COFI:AQ (August 2019)
7	EMFF subsidies for the conservation and sustainable intensification of pond aquaculture		Europe	COFI:AQ (August 2019)
8	Increase efficiency through use of fish by-products – use of fish skin (tilapia) to treat burns		Any	Expert consultation (June 2019)
9	Social inclusion of inhabitants in rural aquaculture development (global)		Any	Expert consultation (June 2019)
10	Alternative feed formulation based on local ingredients (global, Hasan, FAO)		Any	Expert consultation (June 2019)
11	Efficient use of natural resources (global, live feed management)		Any	Expert consultation (June 2019)
12	Improvement in molluscs production for small-scale farmers (global)		Any	Expert consultation (June 2019)
13	How has aquaculture contributed to poverty alleviation, gender equality, youth, etc.?		Any	Expert consultation (June 2019)
14	Environmental issues, spatial planning, waste management		Any	Expert consultation (June 2019)
15	Species diversification, alien species		Any	Expert consultation (June 2019)

No.	Case study proposed	Country	Region	Proposed in
16	Seed improvement; genetics, breeding hybrids, escapees		Any	Expert consultation (June 2019)
17	Feed improvement; fishmeal replacement		Any	Expert consultation (June 2019)
18	Disease prevention, diagnosis and biosecurity		Any	Expert consultation (June 2019)
19	Adaptation to climate change		Any	Expert consultation (June 2019)
20	Role of extension and education in developing aquaculture		Any	Expert consultation (June 2019)
21	Connection of R&D with the stakeholders/industry/producers		Any	Expert consultation (June 2019)
22	Examples of support from the government; importance of policy/policies. A policy is needed to create a sustainable aquaculture industry		Any	Expert consultation (June 2019)
23	Conflict resolution and animal welfare		Any	Expert consultation (June 2019)
24	Positive and negative impacts of greater intensification and expansion of pond, tank and cage production systems		Any	COFI:AQ (August 2019)
25	Ecosystem health and integrity promoted as best practice for sound business, including biodiversity, biosecurity, One Health, climate-change resilience and early warning		Any	COFI:AQ (August 2019)
26	EMFF subsidies for the conservation and sustainable intensification of pond aquaculture		Any	COFI:AQ (August 2019)
27	Marine ranching (MR)		Any	COFI:AQ (August 2019)
28	Antimicrobial resistance, biosecurity, animal welfare		Any	COFI:AQ (August 2019)

APPENDIX 7 – WORKING GROUP RESULTS ON CASE STUDY CONCEPTS

The tables below encompass all inputs received by participants prior to this consultation through homework, during the consultation through working group discussions and after the consultation (only by the Europe Working Group).

RESULTS OF THE EUROPE WORKING GROUP

No.	Case study title	Relevant*	TM supported	Country/ region	Lessons learned/comments	Possible authors	Published**	Literature	Proposed in/by
	Aquaculture zoning and carrying capacity	Y		Norway					Expert consultation (2019)†
1	Spatial planning for offshore aquaculture		24	Israel	Carrying capacity is an international and/or regional issue		Y	To be provided	Israel
2	GFCM allocated zones for aquaculture (AZAs) resolution and toolbox		24	Mediterranean and the Black Sea	AZA implementation process also improves the social acceptability of the sector		Y	Resolution GFCM/36/2012/1 on guidelines for AZAs	GFCM
3	Recommendation of the European AAC for zoning AZAs in the European Union		24	European Union			Y	Recommendations for planners of marine spatial planning: developing criteria and methodology for determining aquaculture zones under marine spatial planning in the European Union	EMPA
	Several Horizon 2020 projects on marine spatial planning						Y	To be provided	EATiP
	Several projects of the Directorate-General for Research and Innovation of the European Commission (DG RTD), e.g. Green							To be provided	Belgium

No.	Case study title	Relevant*	TM supported	Country/ region	Lessons learned/comments	Possible authors	Published**	Literature	Proposed in/by
	Aquaculture Intensification in Europe (GAIN) project, several IMTA projects with industry								
4	Scotland Sea Lice Risk Assessment Tool		50, 58	Scotland, United Kingdom	Sea lice risk assessment tool was developed initially by an expert panel of regulators then taken to the aquaculture sector where technical experts had input and involved other relevant stakeholders, such as wild fisheries and environmental stakeholders		Y	Scottish Government. 2021. *Impacts of lice from fish farms on wild Scottish sea trout and salmon: summary of science;* The Fish Site. 2020. *A novel means of monitoring sea lice*	United Kingdom
5	IMTA-EFFECT: Integrated Multi Trophic Aquaculture for EFFiciency and Environmental ConservaTion		62	Portugal; Greece; France; Romania			Y	IMTA Effect project presentation	Romania
6	AquaSpace project (2015–2018)		24		AquaSpace was a research project aiming to understand spatial and socioeconomic constraints on the expansion of aquaculture, and to test tools to help overcome these constraints		Y	AquaSpace project website	IFREMER
7	COEXIST – Interaction in European coastal waters: a roadmap to sustainable		25		The COEXIST goal was to provide a roadmap to better integration,		Y	COEXIST project website	Portugal

No.	Case study title	Relevant*	TM supported	Country/ region	Lessons learned/comments	Possible authors	Published**	Literature	Proposed in/by
	integration of aquaculture and fisheries (2010–2013)				sustainability and synergies across the diverse activities taking place in European coastal zones				
8	Nutrient footprint and ecosystem services of carp production in European fishponds in contrast to EU crop and livestock sectors		43	European Union			Y	Koushik, R., Jaroslav, V., Sadasivam, J.K. & Jan, M. 2020. Nutrient footprint and ecosystem services of carp production in European fishponds in contrast to EU crop and livestock sectors. *Journal of Cleaner Production*, Volume 270.	Romania
9	Multifunctionality of pond fish farms in the opinion of the farm managers: the case of Hungary		43	Hungary			Y	Popp, j., Békefi, E., Duleba, S. & Oláh, J. 2019. Multifunctionality of pond fish farms in the opinion of the farm managers: the case of Hungary. *Reviews in Aquaculture*, Volume 11, Issue 3.	Romania
	Legislation concerning feed and therefore nutrient discharge for trout	Y		Denmark					COFI:AQ EIFAAC (2019)†
								To be provided	European Union
	Further development of full or partial recirculation aquaculture systems	Y		Europe					COFI:AQ EIFAAC (2019)†

No.	Case study title	Relevant*	TM supported	Country/ region	Lessons learned/comments	Possible authors	Published**	Literature	Proposed in/by
	Sustainable intensification of traditional pond aquaculture systems	Y		Europe					COFI:AQ EIFAAC (2019)†
10	Sustainable intensification of traditional pond aquaculture systems		46	Central and Eastern Europe	More information needed on this concept		Y	To be provided	NACEE
11	Policy on building RAS in ponds: intensive ecological aquaculture model (under development)		9	Israel	It combines the preservation of open ponds and development of RAS		N		Israel
12	Research project on ecological intensification in different aquaculture systems		46		RAS combined with IMTA		Y	Aubin, J., Rey-Valette, H., Mathé, S., Wilfart, A., Legendre, M., Slembrouck, J., Chia, E., Masson, G., Callier, M., Blancheton, J.P., Tocqueville, A., Caruso, D. & Fontaine, P. 2014. *Guide for implementing ecological intensification of aquaculture systems.* INRA, Rennes, France.	IFREMER
13	Sustainable intensification of wetland aquaculture (proposal)		46				N		Portugal
14	Aquaculture in protected areas		9				Y	To be provided	European Union
46	Integration of Spanish aquaculture in protected areas, Natura 2000 Network (proposal)		9	Spain			N		Spain
15	The importance of small pond aquaculture for		46				N		Germany

No.	Case study title	Relevant*	TM supported	Country/ region	Lessons learned/comments	Possible authors	Published**	Literature	Proposed in/by
	preserving traditional values (proposal)								
	Reduction of the potential impact of climate change on the inland fisheries and aquaculture sector			Europe					COFI:AQ EIFAAC (2019)†
								To be provided	EIFAAC
								To be provided	European Union
	Water resources management, including land water interactions and spatial planning	Y		Europe					COFI:AQ EIFAAC (2019)†
16	Salmon Interactions Working Group		26	Scotland, United Kingdom	In Scotland, a Salmon Interactions Working Group was launched comprising members from the aquaculture and wild fisheries sectors, the local government, the Scottish Government, the Scottish Environment Protection Agency, NatureScot and Scottish Environment Link. They reported over 40 recommendations for improvement		Y	Scottish Government. 2020. *Salmon Interactions Working Group report*	United Kingdom
17	Finfish aquaculture sector plan		9	Scotland, United Kingdom	The plan for the finfish aquaculture sector covers all aspects of fish farming in Scotland, including supply chain, feed, hatcheries, freshwater fish		Y	Finfish aquaculture sector plan website	United Kingdom

No.	Case study title	Relevant*	TM supported	Country/ region	Lessons learned/comments	Possible authors	Published**	Literature	Proposed in/by
					pens, marine pen fish farms and processing facilities				
18	Aquaculture in marine protected areas (MPAs)		8		The general objective of the PHAROS4MPAs project is to enhance management effectiveness and networking for Mediterranean MPAs in order to contribute to the conservation of marine biodiversity and natural ecosystems, taking into account the complex ensemble of human activities developed within the Blue Growth perspective and their interaction with protected areas and marine ecosystems		Y	PHAROS4MPAs project presentation Coz, R. & Ragot, P. 2020. *Référentiel pour la prise en compte des activites de cultures marines dans la préservation de l'environnement marin. TOME 1. Contexte national et européen de l'encadrement des activités de cultures marines*. Office français de la biodiversité. Coz, R. & Ragot, P. 2020. *Référentiel pour la prise en compte des activités de cultures marines dans la préservation de l'environnement marin. TOME 2. Interactions des activités de cultures marines avec le milieu marin – Avec focus sur les habitats et espèces Natura 2000.* Office français de la biodiversité.	ISPRA IUCN
19	Guidance on Aquaculture and Natura 2000		8	European Union	The guidelines mainly focus on the implementation of the provisions of Articles 6(3)			European Commission. 2012. *Guidance document on aquaculture activities in the Natura 2000 Network.*	IUCN

No.	Case study title	Relevant*	TM supported	Country/ region	Lessons learned/comments	Possible authors	Published**	Literature	Proposed in/by
					and 6(4) of the Habitats Directive (appropriate assessment of plans and projects) and are designed to contribute to a better understanding of the conservation objectives of the sites, promoting best practices which illustrate how nature protection provisions can be compatible with sustainable aquaculture development				
	European Maritime and Fisheries Fund (EMFF) Subsidies for the conservation and sustainable intensification of pond aquaculture	N		Europe					COFI:AQ EIFAAC (2019)†
	Increase efficiency through use of fish by-products – use of fish skin (tilapia) to treat burns				Have more case studies on the use of fish by-products				EC (2019)†
	Social inclusion of inhabitants in rural aquaculture development (global)								EC (2019)†
20	Fisheries Local Action Groups (FLAGs)		16	Country to be provided	FLAGs are partnerships between fisheries actors and other local private and public stakeholders. Together, they design and		Y		European Union

No.	Case study title	Relevant*	TM supported	Country/ region	Lessons learned/comments	Possible authors	Published**	Literature	Proposed in/by
					implement a local development strategy to address their area's needs be they economic, social and/or environmental. Based on their strategy, the FLAGs select and provide funding to local projects that contribute to local development in their areas, involving thousands of local stakeholders				
21	WiSA: Women in Scottish Aquaculture		4	Scotland, United Kingdom	In 2019, Scotland launched a WiSA initiative to promote equality, support women in the sector and attract more women to join. The group has strong domestic and international reach		Y	WiSA initiative presentation	United Kingdom
	Alternative feed formulation based on local ingredients (global, Hasan, FAO)	N							Expert consultation (2019)†
	Efficient use of natural resources (global, live feed management)	N							Expert consultation (2019)†
	Improvement in molluscs production for small-scale farmers (global)	Y							Expert consultation (2019)†
				Bulgaria				To be provided	European Union

No.	Case study title	Relevant*	TM supported	Country/ region	Lessons learned/comments	Possible authors	Published**	Literature	Proposed in/by
22	How to adapt electric boats for molluscs aquaculture (proposal)		44				N		EMPA
23	Coexistence of wild species and molluscs aquaculture (proposal)		49				N		EMPA
24	How to reduce energy consumption in molluscs aquaculture (proposal)		47				N		EMPA
25	Economic and social assessment of small-scale molluscs aquaculture (proposal)		46						Portugal
	How has aquaculture contributed to poverty alleviation, gender equality, youth, etc.?								Expert consultation (2019)†
		Y		Greece				To be provided	European Union
26	Economic and social impact of environmental protection measures on aquaculture (proposal)		43						Germany
27	Scientific, Technical and Economic Committee for Fisheries (STCEF) report: analysis of the economic performance of various segments of aquaculture in the Member States and comparison with other kind of aquaculture enterprises		46					STCEF report	EMPA

No.	Case study title	Relevant*	TM supported	Country/ region	Lessons learned/comments	Possible authors	Published**	Literature	Proposed in/by
	Environmental issues, spatial planning, waste management	N							Expert consultation (2019)†
	Species diversification, alien species								Expert consultation (2019)†
28	AquaVitae project		36				Y		European Union; Finland
29	How to prevent alien species (proposal)		36				N		European Union
30	How to manage alien species (to be developed)		36				N		European Union
31	AquaIMPACT project		36					AquaIMPACT project presentation	Finland
	Seed improvement, genetics, breeding hybrids, escapees								Expert consultation (2019)†
32	Research to improve PROduction of SEED of established and emerging bivalve species in European hatcheries (REPROSEED)		49					REPROSEED project presentation	EMPA
	Feed improvement, fishmeal replacement								Expert consultation (2019)†
33	Fishmeal replacement		52				Y	To be provided	EIFAAC
34	H2020 projects on alternative feed ingredients		52					Alternative proteins for food and feed	Belgium
	Disease prevention, diagnosis and biosecurity								Expert consultation (2019)†

No.	Case study title	Relevant*	TM supported	Country/ region	Lessons learned/comments	Possible authors	Published**	Literature	Proposed in/by
35	EU project on antimicrobial resistance		58, 60						
36	ParaFishControl project		58, 59	Europe				ParaFishControl project presentation	Romania
	Adaptation to climate change								Expert consultation (2019)†
37	Guidelines for co-creating climate adaptation plans for fisheries and aquaculture		33				Y	Guidelines for co-creating climate adaptation plans for fisheries and aquaculture	Finland
	Role of extension and education in developing aquaculture								Expert consultation (2019)†
38	EUROSHELL project		72		It will focus on identification of the underlying factors that inhibit effective knowledge management in the sector and provide regional forums to facilitate dialogue between shellfish companies (especially through their regional or national producers' organizations) and researchers, with a strong focus on developing an efficient methodology for knowledge transfer		Y	EUROSHELL project website	
39	Aquaculture Demonstration Centers (ADCs)		72		ADCs fulfill three main objectives:		Y	ADCs presentation	GFCM

No.	Case study title	Relevant*	TM supported	Country/ region	Lessons learned/comments	Possible authors	Published**	Literature	Proposed in/by
					research and develop aquaculture techniques and technologies; showcase best practices in aquaculture; and train specialists from local and national administrations, academia and the private sector				
40	Aquaculture skills action plan (under development)			Scotland, United Kingdom			N		United Kingdom
	Connection of R&D with the stakeholders/industry/ producers								Expert consultation (2019)†
41	The purpose and methodology behind the European Technology Platforms (proposal)		72						EATiP
	Examples of support from the government; importance of policy/policies. A policy is needed to create a sustainable aquaculture industry								Expert consultation (2019)†
42	Governance in aquaculture: the case studies of the AAC		21					AAC website	EMPA
43	Awareness-raising and social perception of aquaculture in the public administration (proposal)		41						FEAP; Israel; Germany

No.	Case study title	Relevant*	TM supported	Country/ region	Lessons learned/comments	Possible authors	Published**	Literature	Proposed in/by
	Conflict resolution and animal welfare								Expert consultation (2019)†
44	Animal welfare	Y	60	Europe			Y	To be provided	EIFAAC
	Positive and negative impacts of greater intensification and expansion of pond, tank and cage production systems	N							COFI:AQ (2019)†
	Ecosystem health and integrity promoted as best practice for sound business, including biodiversity, biosecurity, One Health, climate-change resilience and early warning	N							COFI:AQ (2019)†
	Marine ranching (MR)								COFI:AQ (2019)†
45	GFCM guidance on restocking		45				Y		GFCM
	Antimicrobial resistance, biosecurity, animal welfare								COFI:AQ (2019)†
	ADDITIONAL CASE STUDIES								
	Czechia operates several academic institutions, publishing scientific papers in terms of aquaculture, e.g. pond farming, genetic resources, influence of climate change, influence			Czechia					Czechia

No.	Case study title	Relevant*	TM supported	Country/ region	Lessons learned/comments	Possible authors	Published**	Literature	Proposed in/by
	of fish predators on fish population								
	White Paper on Sustainable Growth in Norwegian Aquaculture		Most TMs in Chapter 2	Norway	Growth based on environmental indicators		Y	White Paper on Sustainable Growth in Norwegian Aquaculture (not available in English)	Norway
	Licensing systems		23	Several	Information to authorities and a tool for financing				Norway
	Strategy for an Environmentally Sustainable Norwegian Aquaculture Industry		Several TMs in Chapters 2, 3, 5, 6 and 7	Norway			Y	Strategy for an Environmentally Sustainable Norwegian Aquaculture Industry	Norway
	Aquaculture and marine conservation			Worldwide	Several examples		Y	Aquaculture and MPAs brochure Le Gouvello, R., Hochart, L.-E., Laffoley, D., *et al*. 2017. Aquaculture and marine protected areas: Potential opportunities and synergies. *Aquatic Conserv: Mar. Freshw. Ecosyst*, 27(S1): 138–150.	IUCN
	Aquaculture and Marine conservation–Zanzibar case study (IUCN collection)		Chapter 1: 1, 2, 3, 4, 5 Chapter 2: mainly 11, 12, 13, 14	United Republic of Tanzania, Zanzibar	Synergies between aquaculture and marine conservation issues, common challenges and gender issues		Y	Zanzibar case study	IUCN
	Aquaculture as Nature-based Solutions (NbS): Zanzibar case study		Chapters 1, 2, 3, 4	United Republic of Tanzania, Zanzibar	Seaweed farming as a potential NbS under the global NbS standard evaluation		N (under review)		IUCN

No.	Case study title	Relevant*	TM supported	Country/ region	Lessons learned/comments	Possible authors	Published**	Literature	Proposed in/by
	Aquaculture and marine conservation: Monastir Bay, Tunisia, case study (IUCN collection)		Chapters 1, 2, 3, 4	Tunisia	Local co-construction of an integrated coastal zone management project, including aquaculture and an MPA; mutual benefits		N (to be edited soon)		IUCN
	Aquaculture and marine conservation: Indonesian case study (IUCN collection)		Chapters 1, 2, 3, 4, 8	Indonesia	Mutual benefits between aquaculture (brackish pond culture) and an MPA		N (to be edited soon)		IUCN
	Aquaculture and marine conservation: French Polynesian case study (IUCN collection)		Chapters 1, 2, 3, 4, 8	French Polynesia	Aquaculture acting for maintenance of giant clam stock, MPA creation, local governance		N (to be edited soon)		IUCN
	Aquaculture Centre of Excellence in Wales (WalesACE)		62, 65	Wales, United Kingdom	Swansea University is working with aquaculture businesses and have gathered evidence on various IMTA systems	Paul Howes	Y	WalesACE website	United Kingdom
	Menai Offshore Subsurface Shellfish Systems (MOSSS)		63, 65	Wales, United Kingdom	MOSSS is a research and innovation project led by Bangor University with support from the shellfish industry in North Wales to develop sustainable shellfish culture techniques	Lewis LeVay	Y	MOSSS website	United Kingdom
	Mowi Scotland: sustainability and use of by-products		47	Scotland, United Kingdom			N		United Kingdom
	Sustainable Aquaculture Innovation Centre		61	Scotland, United Kingdom	"Our purpose is to transform Scottish aquaculture by unlocking sustainable growth		Y	Sustainable Aquaculture Innovation Centre website	United Kingdom

No.	Case study title	Relevant*	TM supported	Country/ region	Lessons learned/comments	Possible authors	Published**	Literature	Proposed in/by
					through innovation excellence. Connecting businesses and academics, we fund and support commercially relevant, collaborative research."				
	Aquaculture skills action plan (in collaboration with the sector and main skills providers)		16, 42	Scotland, United Kingdom	In Scotland, an aquaculture skills action plan is under development in collaboration with the sector and our main skills providers, including schools, colleges, universities, skills development Scotland, lastra, etc. The work was delayed due to COVID-19		N		United Kingdom
	Promoting aquaculture as a career path in schools		16, 66	Scotland, United Kingdom	In Scotland, aquaculture is trying to be promoted via the work being done to promote Science, Technology, Engineering and Mathematics (STEM) subjects. "STEM ambassadors" are used by schools to help with thinking about careers. A STEM network specific to aquaculture is currently under development that will go out to schools in rural and urban locations to change perceptions of		No		United Kingdom

No.	Case study title	Relevant*	TM supported	Country/ region	Lessons learned/comments	Possible authors	Published**	Literature	Proposed in/by
					aquaculture and to get youth to consider it as a viable career				
	Inner Dundrum Bay Ecosystem Study		10	Northern Ireland, United Kingdom	The need to involve stakeholders at a catchment level		N		United Kingdom
	Inner Dundrum Bay Ecosystem Study		34	Northern Ireland, United Kingdom	Management of aquaculture in an ecosystem context		Y	Agri-Food and Biosciences Institute. 2021. *Science Impacts 2021*	United Kingdom
	Decision Support Tools		23, 24	Northern Ireland, United Kingdom; Ireland	Planning should be proactive and identify where development should occur		Y	Gangnery, A., Bacher, C., Boyd, A., Liu, H., You, J. & Strand, Ø. 2021. Web-based public decision support tool for integrated planning and management in aquaculture. *Ocean & Coastal Management*, Volume 203.	United Kingdom
	SIMAtlantic		28	Northern Ireland, United Kingdom; Ireland	The need to ensure common understanding of the regulatory approach and central data sharing			SIMAtlantic website	United Kingdom
	Ards Peninsula Seed Mussel Fishery		49	Northern Ireland, United Kingdom; Ireland	Standardization of methods and reporting		Y	Agri-Food and Biosciences Institute. 2020. *Summer 2020 – Seed Mussel Stock Assessment Report*	United Kingdom
	Aquaculture Suitability in the Dorset and East Devon Fisheries Local Action Group area (2018–2019)		9, 11, 16, 17, 23, 24	England, United Kingdom	Project aiming to help develop sustainable aquaculture across the region while recognizing existing marine activity		Y	Centre for Environment, Fisheries and Aquaculture Science. 2021. *Interactive Map and Report to Support Dorset and Devon Aquaculture.*	United Kingdom

No.	Case study title	Relevant*	TM supported	Country/ region	Lessons learned/comments	Possible authors	Published**	Literature	Proposed in/by
								Dorset and East Devon Aquaculture. 2021. *Aquaculture Map*	
	Reef Enhancement for Aquaculture Sites (REFAS) (ongoing R&D project)		1, 8, 34	England, United Kingdom	The REFAS project will install Reef Cubes® on a large scale to accelerate reef creation underneath aquaculture sites and enhance multi-trophic aquaculture and fishery opportunities, ensuring all stakeholders benefit from a growing blue economy		N	REFAS project presentation	United Kingdom
	SUSFEED 2 (ongoing R&D project)		51, 52	England, United Kingdom	SUSFEED 2 aims to optimize the process of generating sustainable fish feed through mixing microbial fermentation from inexpensive mixed and/or waste gas streams. The project will also assess economic viability and carbon credentials of the process		N	SUSFEED 2 project presentation	United Kingdom
	Polychaete Upcycling of Aquaculture Wastes (ongoing R&D project)		51, 52	England, United Kingdom	This project aims to develop a commercially viable, sustainable method of production across the fisheries and aquaculture supply chain by mitigating environmental impacts of operations through the redirection of protein-		N	Polychaete Upcycling of Aquaculture Wastes project presentation	United Kingdom

No.	Case study title	Relevant*	TM supported	Country/ region	Lessons learned/comments	Possible authors	Published**	Literature	Proposed in/by
					rich by-products from fisheries processing into the aquaculture feed supply chain				
	Aquaculture Regulatory Toolbox for England		21, 23, 31	England, United Kingdom	Guidance on regulatory requirements for new aquaculture businesses in England covering existing and emerging subsectors		Y	Seafish. 2021. *Aquaculture Regulatory Toolbox for England*	United Kingdom

*Is it relevant for the country and/or region? (Yes/No); **Already published (Yes/No); †*Source*: Appendix 6. Proposed case studies concepts for use during the group discussions.

RESULTS OF THE NORTH AMERICA WORKING GROUP

No.	Case study title	Relevant*	TM supported	Country/ region	Lessons learned	Possible authors	Published**	Literature	Proposed in/by
	Aquaculture zoning and carrying capacity	Y	25	Norway; United States of America	As permitting aquaculture opportunity, case study on zoning needs to include presence of pathogen, environmental impact assessment, determining multiple use (study on area management)				Expert consultation (2019)†
	Legislation concerning feed and therefore nutrient discharge for trout	N		Denmark					COFI:AQ EIFAAC (2019)†
	Further development of full or partial recirculation aquaculture systems			Europe					COFI:AQ EIFAAC (2019)†
	Further development of full or partial recirculation aquaculture systems	Y	61	United States of America	How the Government can facilitate technological invention and how to govern the adoption of new technology and help access to new market				United States of America
	Further development of full or partial recirculation aquaculture systems		1, 61	Canada	While RAS systems are being used for hatcheries, full grow out of salmon at industrial scale is still in its infancy		Y	'Namgis First Nation's Kuterra RAS in British Columbia Reports: DFO. 2008. *Potential Technologies for Closed-containment Saltwater Salmon Aquaculture*. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2008/001.	Canada

No.	Case study title	Relevant*	TM supported	Country/ region	Lessons learned	Possible authors	Published**	Literature	Proposed in/by
								Boulet, D., Struthers, A. & Gilbert, E. 2010. *Feasibility Study of Closed-Containment Options for the British Columbia*. Innovation & Sector Strategies, Aquaculture Management Directorate, Fisheries & Oceans Canada *'Namgis Land-Based Atlantic Salmon Recirculating Aquaculture System Pilot Project Final report* *'Namgis Land-Based Atlantic Salmon Recirculating Aquaculture System Pilot Project Milestone #7 Performance Metrics Report* News showing different perspectives of the issue: *Land-based salmon still not investor-ready* *Kuterra Responds* *US firm takes 15-year lease on 'Namgis RAS farm* *Land-based fish farming a net loss for BC*	
	Reduction of the potential impact of climate change on the inland fisheries and aquaculture sector			Europe					COFI:AQ EIFAAC (2019)†

No.	Case study title	Relevant*	TM supported	Country/ region	Lessons learned	Possible authors	Published**	Literature	Proposed in/by
	Reduction of the potential impact of climate change on the inland fisheries and aquaculture sector	Y for North America	14, 33	Europe; United States of America	Guidelines supporting the development of aquaculture technologies that reduce carbon emissions and reduce impact on climate change are of interest in addition to technologies that adapt to a changing climate (warming ocean temperatures, algal blooms, etc.) Case study more focusing on the impact of climate change on the production of freshwater aquaculture		Y from a European perspective on climate adaptation	ClimeFish (2016–2020) – 21 institutions from 16 countries collaborated to address challenges of climate change on European fisheries and aquaculture. Chile is also a partner – Case studies on marine aquaculture, e.g. salmon and cod in Northeast Atlantic and shellfish in Scotland, United Kingdom – Developed general guidelines for making Climate Adaptation Plans	Canada
	Water resources management, including land water interactions and spatial planning	Y for North America	24, 55	Europe	Similar to case studies on environmental assessment, spatial planning, wastewater management				COFI:AQ EIFAAC (2019)†
	Social inclusion of inhabitants in rural aquaculture development (global)								Expert consultation (2019)†
	Social inclusion of inhabitants in rural aquaculture development (global) *(case study not available)*	Y for North America	22, 41, 66	Canada; United States of America	Guidelines that support the development of co-governance models, as well as guidelines to improve the perception				Canada

No.	Case study title	Relevant*	TM supported	Country/ region	Lessons learned	Possible authors	Published**	Literature	Proposed in/by
					and acceptability of aquaculture. Be of high interest for Government. Development of co-management/ co-governance models, including indigenous groups and local community in the process				
	How has aquaculture contributed to poverty alleviation, gender equality, youth, etc.?	Y for Canada	3, 4	Canada	Government promoting job opportunity in fishery sector and supporting involvement of youth and women				Expert consultation (2019)†
	Environmental issues, spatial planning, waste management								Expert consultation (2019)†
	Environmental issues, spatial planning, waste management	Y for North America	24, 25, 56		Guidelines that support the development of sustainable aquaculture. Zoning and spatial planning are key areas of interest area for the United States of America. There is still much to be developed in spatial planning for marine and land environments				Canada
	Species diversification, alien species	N for the United States of America							Expert consultation (2019)†

No.	Case study title	Relevant*	TM supported	Country/ region	Lessons learned	Possible authors	Published**	Literature	Proposed in/by
	Seed improvement; genetics, breeding hybrids, escapees								Expert consultation (2019)†
	Seed improvement; genetics, breeding hybrids, escapees	Y for North America	35	United States of America	A key important area for the United States of America. There are many explorations, studies of biotechnology for genetic improvement. Focusing on minimizing impact of escapes and modelling genetic impact on wild stock				United States of America
	Feed improvement; fishmeal replacement								Expert consultation (2019)†
	Feed improvement; fishmeal replacement	Y for the United States of America	52	United States of America	Technical paper reviewing literature on successful case studies of fishmeal replacement and feed formulation. Case studies on how to make regulations more welcoming to alternative feed ingredients		Y	Many open-source research documents in the field of fishmeal and alternative ingredients	United States of America
	Disease prevention, diagnosis and biosecurity								Expert consultation (2019)†
	Disease prevention, diagnosis and biosecurity	Y for North America	58	United States of America	National plan for biosecurity and aquatic livestock management plan: conducting risk				United States of America

No.	Case study title	Relevant*	TM supported	Country/ region	Lessons learned	Possible authors	Published**	Literature	Proposed in/by
					evaluation to avoid pathogens. Need of diagnostic approach and evaluation tools for proficiency testing at the farm level and for supporting national surveillance on aquatic animal health				
	Adaptation to climate change								Expert consultation (2019)†
	Adaptation to climate change	Y for North America	33	Canada; United States of America	Study on the climate change negative impact on inland fisheries and aquaculture sector				United States of America
	Role of extension and education in developing aquaculture								Expert consultation (2019)†
	Role of extension and education in developing aquaculture	Y for the United States of America	7	United States of America	Important transition of infrastructure/process/technology to farmers: how national educational programme can be set up for farmers; how the research result can be transferred to the farm level				United States of America
	Examples of support from the government; importance of policy/policies. A policy is								Expert consultation (2019)†

No.	Case study title	Relevant*	TM supported	Country/ region	Lessons learned	Possible authors	Published**	Literature	Proposed in/by
	needed to create a sustainable aquaculture industry								
	Examples of support from the government; importance of policy/policies. A policy is needed to create a sustainable aquaculture industry *(case study not available)*	Y for North America	23	Need for statistical results from the application of policies and instruments	Permitting process and national legislation for promoting sustainable marine aquaculture. National Aquaculture Act, United States of America: need to figure out what kind of support is specifically needed for target group, i.e. research institute, farmers, etc.				United States of America
	Ecosystem health and integrity promoted as best practice for sound business, including biodiversity, biosecurity, One Health, climate-change resilience and early warning								COFI:AQ (2019)†
	Ecosystem health and integrity promoted as best practice for sound business including biodiversity, biosecurity, One Health, climate-change resilience and early warning	Y for the United States of America	8, 34, 58		The term "One Health" can be expanded/renamed in a way to include not only biosecurity matters but also a linkage with socioeconomic support				United States of America
	Antimicrobial resistance, biosecurity, animal welfare	Y for North America	34	Canada; United States of America	Veterinary telemedicine and other technological advancement				COFI:AQ (2019)†

No.	Case study title	Relevant*	TM supported	Country/ region	Lessons learned	Possible authors	Published**	Literature	Proposed in/by
	The ecological and humanitarian importance of developing fishmeal and fish oil substitutes to enable aquaculture's growth and prevent zero hunger		6, 7, 10, 52		Use of diminishing wild-caught feed inputs risks aquaculture's future	Feed Innova-tion Network	N	Global Reporting Program and NBC news. 2020. *The fish you don't know you eat*. Froehlich, H.E., Jacobsen, N.S., Essington, T.E., Clavelle, T., Halpern, B.S. 2018. Avoiding the ecological limits of forage fish for fed aquaculture. *Nat Sustain*, 1, 298–303. Katheline, H., Cobcroft, J.M., Cole, A., Condon, K., Jerry, D.R., Mangott, A., Praeger, C., Vucko, M.J., Zeng, C., Zenger, K. & Strugnell, J.M. 2019. The Future of aquatic protein: implications for protein sources in aquaculture diets. *One Earth*, 1 (3), 316–329.	Feed Innovation Network
	Successes in fishmeal and fish oil replacement and economic feasibility		52, 65	United States of America; Viet Nam	Introduce case studies related to the latest research by species for aquaculture without fishmeal and fish oil	Feed Innova-tion Network	N	Barrows, F.T. & Gaylord, T.G. 2006. Changing technologies, ingredients and formulations to replace fish meal in salmonid diets, pp. 307–324. *In*: T.P.T. Lyons & K. Jacques, eds. *Nutritional Biotechnology in the Food and Feed Industry*. Nottingham University Press, UK.	Feed Innovation Network

No.	Case study title	Relevant*	TM supported	Country/ region	Lessons learned	Possible authors	Published**	Literature	Proposed in/by
								McLean, E., Tran, L.H., Craig, S.R., Alfrey, K. & Barrows, F.T. 2020. Complete replacement of fishmeal by soybean and poultry meals in whiteleg shrimp feeds: growth and tolerance to EMS/AHPND and WSSV challenge. *Aquaculture*, 527, 735383. McLean, E., Fredrickson, L., Alfrey, K., Craig, S.R. & Barrows, F.T. 2020. Performance of largemouth bass *Micropterus salmoides* (Lacépède, 1802), fed fishmeal- and fish oil-free diets. *International Journal of Fisheries and Aquatic Studies*, 8, 6–10. McLean, E., Fredricksen, L., Alfrey, K., Tlusty, M.F. & Barrows, F.T. 2020. Growth, integrity, and consumer acceptance of largemouth bass, *Micropterus salmoides* (Lacépède, 1802), fed marine resource-free diets. *International Journal of Fisheries and Aquatic Studies*, 8, 365–369.	

No.	Case study title	Relevant*	TM supported	Country/ region	Lessons learned	Possible authors	Published**	Literature	Proposed in/by
								Stuart, K.R., Barrows, F.T., Silbernagel, C., Alfrey, K., Rotstein, D. & Drawbridge, M.A. 2020. Complete replacement of fish oil and fish meal in the diet of juvenile California yellowtail *Seriola dorsalis*. *Aquacult Res*.	
	Alternative ingredients		51, 52		Some alternative ingredients reduce waste and are carbon negative	Feed Innova-tion Network	N		Feed Innovation Network
	Forward faster: a case study for encouraging sustainable feeds through incentive prizes and meetings		28, 52			Feed Innova-tion Network	N		Feed Innovation Network
	A case study of policy: regulation change and encouragement of alternative ingredients			Canada, United States of America Europe	Regulation changes for insects in Europe and the United States of America	Feed Innova-tion Network	Y	All About Feed. 2021. *Canadian approval for insects in salmon feed.* The Fish Site. 2018. *Insect meal gains US fish feed approval*	Feed Innovation Network
	Research funding, synthetic biology and the new alternative ingredients industry		38		A new industry is arising that is creating jobs in insects, algae and single-cell proteins	Feed Innova-tion Network	N		Feed Innovation Network
	A case study of alternative ingredients and savings of forage fish		52	Netherlands	Fish oil substitutes can save millions of fish	Feed Innova-tion Network	N		Feed Innovation Network

No.	Case study title	Relevant*	TM supported	Country/ region	Lessons learned	Possible authors	Published**	Literature	Proposed in/by
	Alternative ingredients and adoption in the seafood supply chain		52	France	Alternative ingredients can scale; retailers are starting to demand more sustainable seafood	Feed Innova-tion Network	Y	Feednavigator. 2020. *Auchan backing sustainably fed trout, looks to other fish species* Feed Planet. 2020. *Cargill and InnovaFeed partner for innovative and sustainable feed*	Feed Innovation Network
	Alternative ingredients in feeds, trade barriers and trade partnerships		30, 52	Japan, United States of America		Feed Innova-tion Network			Feed Innovation Network
	Forward faster: a case study for encouraging sustainable feeds through incentive prizes and meetings		28, 52			Feed Innovati on Network			Feed Innovation Network

*Is it relevant for the country and/or region? (Yes/No); **Already published (Yes/No); †*Source*: Appendix 6. Proposed case studies concepts for use during the group discussions.

APPENDIX 8 – WORKING GROUP RESULTS ON REGIONAL PRIORITIES

RESULTS OF THE EUROPE WORKING GROUP

Ranking	Regional priority	Chapters
Not applicable	Governance and planning, including administrative simplification, spatial planning, access rights to land and waterbodies, and monitoring	Chapter 2: Governing and Planning Aquaculture Development
Not applicable	Environmental interactions, including water management and protection, climate change, ecosystem services and biodiversity, ecosystem based-approach	Chapter 2: Governing and Planning Aquaculture Development Chapter 3: Biodiversity and Genetic Resources
Not applicable	Biosecurity and animal welfare	Chapter 7: Biosecurity, Aquatic Animal Health and Animal Well-being
Not applicable	Capacity building and skills development, including bringing innovation to farmers and across the value chain, and education at all levels	Chapter 1: Sustainable Aquaculture and the 2030 Agenda Chapter 9: Aquaculture Value Chains, Consumers, Markets and Trade
Not applicable	Social perception and acceptability, including stakeholder involvement, local development and transparency	Chapter 9: Aquaculture Value Chains, Consumers, Markets and Trade Chapter 2: Governing and Planning Aquaculture Development

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Rank	Additional regional priority	TM	Regional strength	Regional weakness	Linkage with case studies concepts	Comments	Respondent
	Further development of emerging finfish technologies, e.g. offshore, fully or semi-closed containment in marine environment, super smolts, post smolts	Chapter 8, TM 61	The finfish sector in Canada is at the forefront of technology development and innovation	Some organizations are vocal and are concerned with the impact of finfish aquaculture on the marine environment; they are calling for a transition to other forms of production, faster than the current rate of technology development			Canada
Chapter 1							
		3, 4			Government promoting job opportunities in fishery sector and supporting the involvement of youth and women		Canada
		7			Important transition of infrastructure/process/technology to farmers: how national educational programmes can be set up for farmers, how the research result can be transferred at the farm level		United States of America
Chapter 2							
High		8			Minimizing marine mammal interaction with aquaculture gear	Experiences from other countries on how to minimize negative impact of fishing gears on marine environment, legislation etc.	North America

Rank	Additional regional priority	TM	Regional strength	Regional weakness	Linkage with case studies concepts	Comments	Respondent
		8, 34			One Health initiative is linked to Chapters 2 and 7	The term "One Health" can be expanded/renamed in a way to include not only biosecurity matters but also a linkage with socioeconomic support	United States of America
		21, 23	Permitting process and national legislation for promoting sustainable marine aquaculture, National Aquaculture Act	United States of America: need to figure out what kind of support is specifically needed for target groups, i.e. research institute, farmers, etc.	No case study available; Need statistical results from the application of policies and instruments		
		25			Case study of zoning as a permitting aquaculture opportunity (study on area management)	Case study further needs to include the subject of the presence of pathogens, environmental impact assessment, determining multiple use	North America
		23, 24			Guidelines that support the development of sustainable aquaculture	Zoning and spatial planning are key interest areas for the United States of America. There is still much to be developed in spatial planning for marine and land environment	

Rank	Additional regional priority	TM	Regional strength	Regional weakness	Linkage with case studies concepts	Comments	Respondent
		14, 33			Guidelines supporting the development of aquaculture technologies that reduce carbon emissions and reduce impact on climate change are of interest in addition to technologies that adapt to a changing climate, e.g. warming ocean temperatures, algal blooms ClimeFish (2016–2020) – 21 institutions from 16 countries collaborated to address challenges of climate change in European fisheries and aquaculture. Chile is also a partner. – Case studies on marine aquaculture, e.g. salmon and cod in the Northeast Atlantic and shellfish in Scotland (United Kingdom) – Developed general guidelines for making Climate Adaptation Plans	Case study more focusing on the impact of climate change on the production of freshwater aquaculture	North America
		21, 22, 41, 66	Development of co-management/co-governance models including indigenous groups and local community in the process		Guidelines that support the development of co-governance models, as well as guidelines to improve the perception and acceptability of aquaculture	Be of high interest for Government	North America
		33			Study on the climate change negative impact on inland fisheries and aquaculture sector		

Rank	Additional regional priority	TM	Regional strength	Regional weakness	Linkage with case studies concepts	Comments	Respondent
Chapter 3							
		8, 35, 36, 43			A key important area for the United States of America: there are many explorations, studies of biotechnology for genetic improvement; Focusing on minimizing impact of escapes and modelling genetic impact on wild stock		
		34			Veterinary telemedicine and other technological advancement		North America
Chapter 4							
		45			Proficiency test panels (ring testing) to strengthen global harmonization of pathogen testing and accuracy; Availability of positive control material		United States of America
Chapter 5							
High		52			Technical paper reviewing literature on successful case studies of fishmeal replacement and feed formulation; Case studies on how to make regulations more welcoming to alternative feed ingredients	There is ample open-source research in the field of fishmeal and alternative ingredients (United States of America); Treatment or pasteurization in terms of fish biosecurity is becoming more and more important in the United States of America not only from an environmental point of view but also from an economic perspective	
					Use of diminishing wild-caught feed inputs risks aquaculture's future		Feed Innovation Network

Rank	Additional regional priority	TM	Regional strength	Regional weakness	Linkage with case studies concepts	Comments	Respondent
Chapter 6							
		55				This fits under Chapters 2 and 5	
Chapter 7							
High		58			National plan for biosecurity and aquatic livestock management plan: conducting risk evaluation to avoid pathogens; Risk-based approaches for both national and premises specific strategies for proactive pathogen introduction avoidance and biosecurity; Improving fit for purpose diagnostic methods, work flow and developing and validating multiplex assays for aquatic animal pathogens (proficiency testing at the farm level and supporting national surveillance on aquatic animal health); Develop harmonized guidance to fit for purpose testing to support meaningful, accurate and cost-effective testing to support aquatic animal movement/trade; Determine assays with high sensitivity as well as impact of pooling of tissues/animals on sensitivity need; Modernizing veterinary health inspection	Instead of terms "biosecurity", "risk mitigation (in terms of water management)" suggested by the United States of America	United States of America

Rank	Additional regional priority	TM	Regional strength	Regional weakness	Linkage with case studies concepts	Comments	Respondent
Chapter 8							
High		61			How government can facilitate technological invention and how to govern the adoption of emerging technology and help access to new market, i.e. how to govern legislation, and permitting of technologies, such as offshore where multiple levels of government (e.g. federal, provincial/state, international) are involved		North America
				While RASs are being used for hatcheries, full grow out of salmon at industrial scale is still in its infancy	Best management practices; Public-private partnership for introduction of new technology		Canada
Chapter 9							
		66				Nutritional value and safety is rather associated with the theme “food safety” than public perception	

APPENDIX 9 – CLOSING STATEMENT

CLOSING STATEMENT BY MATTHIAS HALWART, TEAM LEADER, GLOBAL AND REGIONAL PROCESSES TEAM, SUSTAINABLE AQUACULTURE AREA, FAO FISHERIES AND AQUACULTURE DIVISION

Distinguished participants, guests and colleagues,

On behalf of FAO, I would like to thank you, the participants, for your active participation and your valuable contributions over the past three days. I would also like to thank the organizers and facilitators for keeping us on track.

Distinguished participants,

Aquaculture has seen spectacular growth over recent decades, attaining another all-time record high of over 114 million tonnes in live weight in 2018, with a total farm-gate sale value of over USD 263 billion. As you well know, the contribution of world aquaculture to world fish production has constantly increased, reaching 46 percent in 2018, up from 26 percent in 2000; and world aquaculture production has progressively surpassed that of capture fisheries. The "farming more than catch" milestones were reached in 1970 for aquatic algae, in 1986 for freshwater fishes, in 1994 for molluscs, in 1997 for diadromous fishes, and in 2014 for crustaceans.[1]

FAO has actively supported ways to balance economic growth, social development and sustainable use of aquatic living resources at global, regional and national levels while simultaneously pursuing its universal goals of food security, nutrition and poverty eradication. However, sustainable aquaculture development has not been uniform globally, and the sector has performed differently in various contexts, countries and regions. Some aquaculture development efforts have failed to promote socioeconomic and environmental progress, while other efforts have proven successful, leading COFI (Committee on Fisheries) to recommend that FAO develop Global Guidelines for Sustainable Aquaculture development.

Which is why we gathered for this event: to understand what has worked, and what has not worked, in the Europe and North America regions; your regional or national priorities were discussed, reflecting your concerns and your hopes for the future of aquaculture development; and to highlight the success stories, and analyse the failures, so that we can find lessons learned from the past as we look to the future and to ensure that the regional contexts are well considered in the development of the Global Guidelines for Sustainable Aquaculture.

Your actions here over the last few days, your discussions and the eventual deliverables will pave the way towards enhancing sustainable aquaculture and maximizing its contribution to the 2030 Agenda for Sustainable Development. We believe in the possibilities of aquaculture, and we trust that your contribution to these guidelines will support the increased economic, environmental and social sustainability of this important sector.

Distinguished participants,

Your active participation in the discussions that have taken place in the last three days is highly appreciated. Remember, these will be your own guidelines. Very informative suggestions were recorded during this gathering, and this progress is admirable given its limited duration and other challenges.

[1] www.fao.org/3/ca9229en/ca9229en.pdf.

I would like to conclude by reminding you that the outcomes of all the regional consultations will inform and guide the development of the GSA. The GSA will feature prominently in our discussions at the next COFI Sub-Committee on Aquaculture to be held in Mexico in November this year.

We hope, of course, that later this year it will be possible and normal again to physically meet, but if not, or if only partially possible, we will ensure to make the most out of our increased ability to have virtual meetings and to record your valuable views and interventions this way.

All the best and stay safe!

This document represents the final report of the Regional Consultation for Europe and North America on the development of Guidelines for Sustainable Aquaculture (GSA), held virtually from 27 to 29 April 2021. The objectives of the consultation were to: share current policies and practices related to aquaculture in the regions; review existing regional and national instruments for sustainable aquaculture; develop a list of priority thematic modules considering regional and national strengths and challenges; propose and prioritize possible case study concepts linked to one or more thematic modules; and identify regional priority areas to be included in the GSA.

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