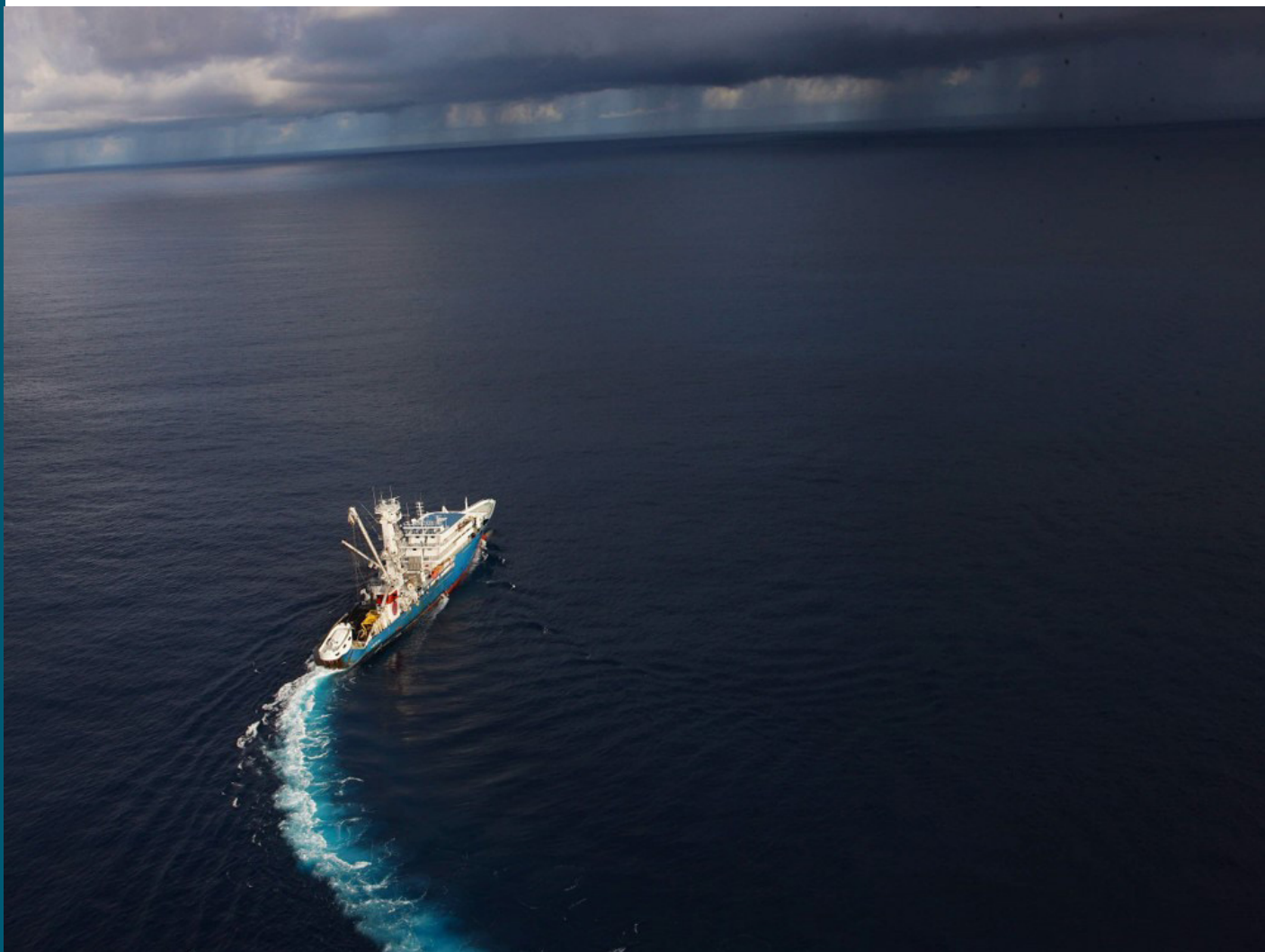




FarFish Legacy Booklet

JUNE 2017 – NOVEMBER 2021



WWW.FARFISH.EU

PUBLISHED: NOVEMBER 2021

Published by Matis ohf. www.matis.is for FarFish
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Cover image copyright: OPAGAC/LDAC
Layout and design: Blek - blekhonnun.is



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 727891



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Welcome to the FarFish legacy booklet!

The FarFish project has now come to an end, after four and a half years of intensive research and innovation involving close to 200 scientists and stakeholders from across the world. Multidisciplinary team of experts from research, academia, governance & policy, fishing industry and NGO sectors have collaborated to contribute to more sustainable and profitable fisheries in long-distance waters. The aim of this “legacy booklet” is to give an overview of the work done within the project and present the main results, which we are convinced will have a lasting impact.

FarFish is funded by the EU H2020 research and innovation programme and has the objective to improve knowledge on and management of EU fisheries outside Europe, while contributing to sustainability and long-term profitability. The EU fleet operates in long-distance waters around the world, either in international waters or within the waters of coastal states that have allowed access to surplus stocks via bilateral agreements. A total of 21% of the EU fleets catches are, as a result, caught in non-EU waters. However, the fisheries within these waters are often poorly regulated and management decisions are sometimes based on limited knowledge and enforcement capabilities, compliance, and a lack of trust between stakeholders. The EU does at the same time expect the EU fleets to set an example for other fleets regarding sustainability and best practices.



The FarFish consortium is proud the EU has invested in the project





FarFish addresses the challenges faced by the EU fleet in long-distance waters in a multidisciplinary and innovative way by focusing on six diverse case studies, four within the waters of African countries that have signed Sustainable Fisheries Partnership Agreements (SFPA) with the EU and two in international waters. The project has enabled stakeholders from five continents, reaching from China to Brazil, to cooperate towards a common goal of improving sustainability and contribute to a more profitable seafood industry in all corners of the world's oceans.

FarFish is unique to most H2020 research and innovation projects with respect to geographical coverage. It has enabled researchers, policymakers, government representatives and

other stakeholders with very different backgrounds and priorities to collaborate towards a common goal. Language and cultural barriers have been an intrinsic part of the project, which has made it challenging but also extremely rewarding. The Covid 19 pandemic affected FarFish particularly hard, as stakeholder participation remained at the core of the project. We do though feel that we have managed to make the best out of a difficult situation, proving results that will keep the legacy of FarFish alive for years to come.

On behalf of the FarFish team,

Jónas R. Viðarsson
Project coordinator



FarFish approach & background

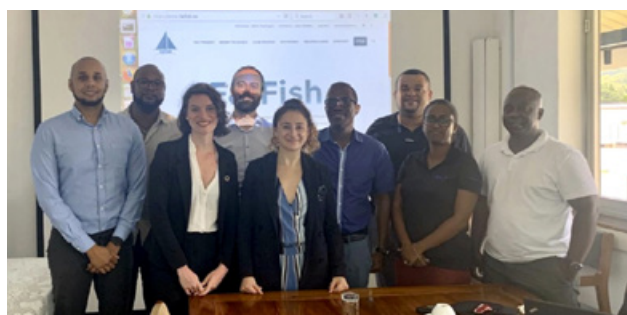
A total of 21% of the EU fishing fleet's catches come from non-EU waters, either from international waters or from within waters of countries that have signed bilateral agreements with the EU, granting EU vessels access and restricted fishing rights. There are two types of agreements: i.e. northern agreements with countries in the Northern Atlantic that have shared stocks with the EU and Sustainable Fisheries Partnership Agreements (SFPAs) with non-EU countries that are not fully utilizing their fisheries resources. The SFPAs are intended to enhance fisheries governance for sustainable exploitation within the relevant non-EU waters and contribute to stable fish supply and development in the fisheries sector. The agreements offer financial support to the partner countries in exchange for access to surplus stocks within their EEZ, which aims to promote sustainable fisheries development in the partner countries by strengthening their administrative and scientific capacity.

Many of the countries that have signed SFPAs with the EU lack the necessary infrastructure and resources to sufficiently manage and utilize their fisheries. Additionally, there is often limited biological and ecological knowledge and weak control and monitoring of the fisheries. The same goes for fisheries in international waters, or high seas fisheries. The management of these fisheries is often based on limited data, and management decisions are made in the context of limited enforcement capabilities. Understanding of the biology and ecology of target and by-catch species in these areas tends to be incomplete, with appropriate stock assessment and management tools requiring further development and implementation to provide a solid knowledge base and advice on fisheries management. Increased accountability and transparency are also needed to improve compliance.

The role and responsibilities of the EU fleet are significant in ensuring sustainable utilization of the resources to which they have access to, whether that is under SFPAs or within international waters. The goal of the FarFish project was to provide knowledge, tools and methods to support responsible, sustainable and profitable EU fisheries outside European waters. To achieve this, FarFish has collected and collated biological, ecological, social and economic data on the respective fisheries, developed practical, achievable and cost-effective fisheries management tools and advice, and built capacities and competences among the different

stakeholders. Over the past four years, this work has been undertaken by the FarFish consortium and stakeholders, involving a close collaboration of scientists, policy makers, resource users and other stakeholders through a multidisciplinary approach.

FarFish concentrated its efforts on six strategically selected case studies that provide a cross section of long-distance fisheries important for the EU fleet. These are the high seas fisheries in the SW and SE-Atlantic (FAO areas 41 & 47); and the SFPA fisheries in Cape Verde, Senegal, Mauritania and Seychelles.



FarFish has enabled researchers, policymakers, government representatives and other stakeholders from five continents to cooperate towards a common goal of improving sustainability and contribute to a more profitable seafood industry in all corners of the world's oceans.



The FarFish project concentrates on six diverse case study fisheries that provide a cross-section of long-distance fisheries important for the EU fishing fleet

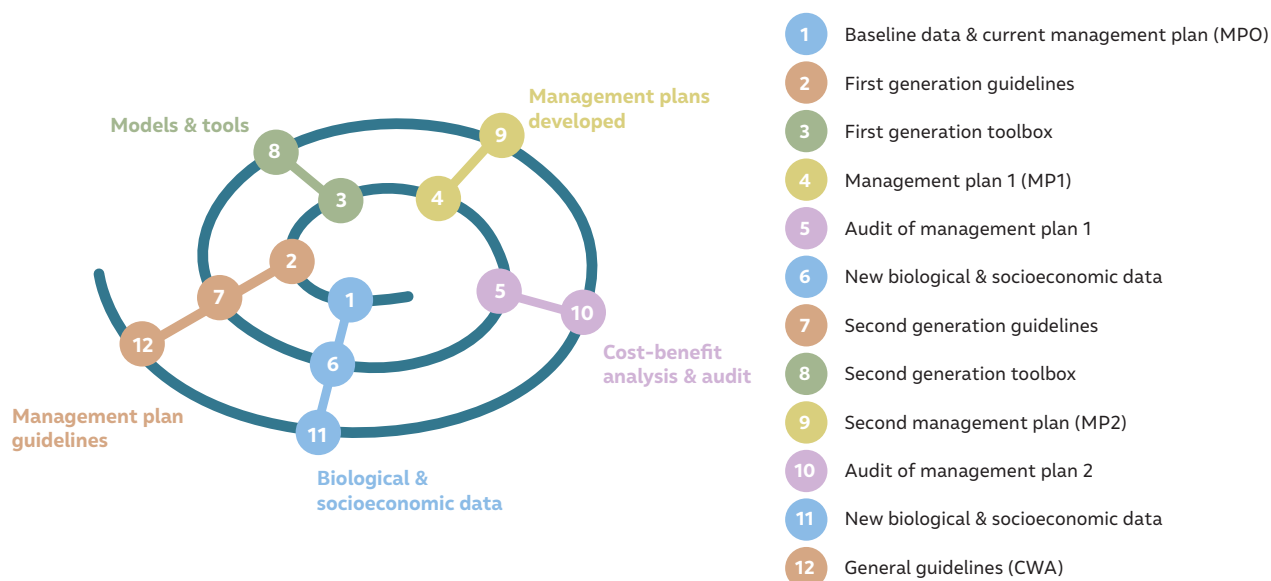
FarFish has managed to provide a better knowledge base for these fisheries and has encouraged resource users to acquire an active role in management.

A key to FarFish's success has been the active participation of project partners within research and governmental institutions in the coastal states, as well as from EU fleet representatives. We have also benefitted from good participation from a broad scope of other stakeholders, such as the members of the FarFish Reference Group, which includes Regional Fisheries Management Organisations (RFMOs), EU- and other fleet representatives that are engaged in FarFish case study fisheries, representatives from other coastal states that have signed SFPAs with the EU, NGOs and more.

The fact that the main objective of the project was to improve knowledge on and management of EU fisheries outside Europe, while contributing to sustainability and long-term profitability, does not imply that all of the focus has been on the EU fleet. The fisheries conducted within the FarFish case studies include multiple national and international fleets, making it meaningless to only look at one subsection of the fisheries in isolation. Having a sustainable and profitable fishing industry is dependent on responsible practices by all fleets involved, but the EU fleet can certainly set a good example.

FarFish was centred on wide scale stakeholder involvement and participatory processes throughout all its work. The objective of this was to involve stakeholders in creating solutions for the policy context in the six case studies. This work was instrumental for achieving specific objectives of the project e.g. for development of the so-called Management Recommendations (MRs) and Decision Support Tools (DSTs). The stakeholder participation was extremely important and successful, providing key inputs to the project and will undoubtedly increase the likelihood of uptake of project outcomes, thereby ensuring that FarFish has permanent impact.

FarFish's objectives of advancing biological knowledge, which includes collecting and collating data related to biological characteristics of the main fish stocks in the case studies, was a key component of the project. Data was collected from multiple sources, much of which served as input to other work of the project. Collecting, collating and harmonising existing data proved to be a challenging task, as data availability was often scarce and complicated, and access to existing databases was often subject to major restrictions. The challenges involved in getting access to and collecting data within these fisheries are of various nature. Often the data simply does not exist, but all too often the data that exists cannot be accessed due to data protection/sharing protocols or lack of technical expertise on how to extract the data.



As part of advancing biological knowledge, FarFish has performed an evaluation of current stock assessment models used in each of the case studies, providing important perspective on the appropriateness, relevance and applicability of stock assessment models currently in use within the case study fisheries. Additionally, FarFish has initiated a pilot self-sampling program to demonstrate how such an approach can be applied to advance biological knowledge in the case studies.

FarFish expended significant efforts to mapping and analysing the case study value chains, and the current legal and contractual practices and constraints in the fisheries. The results of this work are governance analysis and value chain analysis, resulting in identification of potential improvements, investment opportunities and policy recommendations.

Major component of the FarFish project was to develop the so-called MRs for each of the case studies. MR is a formal agreement between resource users (operators) and the relevant authorities on how to reach overall objectives for the respective fishery, by shifting responsibility for the management from authorities (top-down) to the operators (bottom-up). The project produced good practice guidelines on how to develop MRs under SFPAs, which will be published as a European standard (CEN Workshop Agreement - CWA). Each case study went through two iterations of developing the MRs. The results from the first iteration of creating MRs for the case studies were audited by an independent auditor. The second iteration was built on lessons learned in the first iteration and aimed to address the shortcomings identified by the auditors and incorporate improvements.

FarFish has developed general fisheries management tools and other decision support tools (DSTs) to support the FarFish case studies in developing MRs and to contribute to capacity building. Main outputs include: the development of the FarFish DataBase (FFDB) and DSTs, as well as production of visualization materials to support development of MRs in the case studies. New tools for using Data Limited Methods (DLM) for stock assessment have been developed, interactive maps for analysing satellite and AIS signals have been developed, as well as an interactive platform to integrate codes visualization and data interaction tools for the selected case studies.

A specific objective of the FarFish project was to build capacities, professional skills and competences of stakeholders within the case studies and beyond, within the field of fisheries management. Main results of that work include development of a special university-level certificate program that was run in Tromsø in early 2020 and is now available as e-learning material, a six-month post-graduate program tailor-made for FarFish that five students from the case study countries have attended, workshops with stakeholders on how to use the FarFish DLM-tool and development of e-learning materials on fisheries management and stock assessment (with focus on data limited scenarios) that are now available on the Tutor-web e-learning platform.

Now at the end of the FarFish project there are many interesting results to report, some of which are presented elsewhere in this legacy booklet. However, the fact is however that research and innovation projects often create more questions than answers, but asking the right questions is also important.

Introduction to the consortium

The FarFish consortium consists of 21 partners from research, academia, governance & policy, fishing industry and NGO sectors. The consortium has also been supported by a vast group of stakeholder representatives and external experts that have proven extremely important for the project. Among the stakeholder representatives are the members of the FarFish Reference Group, a group of 21 stakeholders that have actively been consulted through out the project's lifetime.

Close to 200 scientists and stakeholders from across the world have contributed to the project, reaching from northern Norway to Argentina in the south, and from Brazil in the west to China in the east. The mainstay of the work has been carried out by the project partners, a group comprised of a multidisciplinary team of experts from 12 research institutions (MATIS, IMAR, Blue Resource, IMROP, IMR, NOFIMA, CCMAR, ISRA/CROD, COREWAM, SFA, CSIC and CETMAR), 4 universities (USP, UCA, UiT and UoP), 4 private companies (ANFACO, OPRMAR and STL) 1 international academic institute (UNESCO-GRO-FTP), 1 EU Advisory Council (LDAC).







FarFish Case Studies

FarFish addressed six strategically selected case studies that together provide a cross-section of SFPA- and high-seas fisheries that are important for the fishing fleets of multiple EU countries and respond to the priorities of Regional Fisheries Management Organisations (RFMOs) and the Common Fisheries Policy (CFP). The FarFish case studies were selected based on a set of criteria. First of all, these case study areas all support fisheries that are relevant for the EU fleet and for supplying the European domestic market. This is a key criterion, as it means that any improvements made within fisheries management and advanced knowledge within the project would not only benefit the surrounding coastal states, but also the EU fleet, and thus encourage participation from European scientists, managers and relevant stakeholders. Second, our understanding of the biology and ecology of many of the fish stocks of interest to the EU in these areas, and the overall ecosystem effects of these fisheries, is far from complete, resulting in management decisions often being based on limited science. This can lead to overexploitation,

with knock-on ecosystem, economic and social effects, both for the EU fleet and the coastal states. Third, management decisions, control measures and allocation of fishing opportunities in these areas are usually not negotiated with all relevant stakeholders, often resulting in a lack of compliance and enforcement. The case studies span from relatively simple single species fisheries (Cape Verde and Seychelles tuna fisheries), to a slightly more complicated multi species fisheries (Senegalese tuna and hake), to very complicated mixed fisheries (Mauritanian and the high seas mixed fisheries). By focusing on case studies of such a diverse nature, FarFish was able to get a holistic view of the main problems and limitations facing both the EU long-distance fleets and local fishing authorities in non-EU waters targeted by EU fleets. Together with scientists, operators, stakeholders and policy makers, FarFish was able to shine a light on key challenges and advance knowledge of these fisheries, thereby providing long-term realistic and achievable solutions that can be applied to these fisheries.



Cape Verde Tuna Fishery

EU nations targeting Cape Verde under the current Sustainable Fisheries Partnership Agreements are Spain, France and Portugal, and EU companies are also heavily involved in processing in the islands. Cape Verde is a contracting party to ICCAT, and the management and conservation of tuna and tuna-like species is therefore subject to ICCAT. Most fish for the domestic market in Cape Verde is landed fresh and sold in the municipal markets while exports consist of frozen whole and processed seafood, with around 80% of the exports going to the EU. Approximately 5% of the working population (9,500 persons) are employed in the fisheries sector in Cape Verde.

The main challenges identified by FarFish in the Cape Verde case study relate to non-compliance by foreign vessels, insufficient control and monitoring, and competition with the national commercial fleet(s). Measures that have been recommended in order to improve MCS include training of inspectors and fisheries observers, research on the impact of the foreign fleet (e.g. by-catches, seabird mortality), scientific research on the main species and training programmes for improved management. Main problems identified by the national fisheries management plans in relation to the national pole and line tuna fishery in Cape Verde are overexploitation, insufficient monitoring and control of the fishery, insufficient management measures, competition with foreign fleet, high dependence on live bait, lack of support facilities on land, poor state of vessels, reduced financial capacity and marketing and economic difficulties (low sales prices, transport to markets).

Challenges associated with different reporting requirements of national and international (EU/ICCAT) institutions were also highlighted, as each require separate reporting that is

not harmonised. The availability and ability to analyse VMS and electronic catch reporting was also highlighted.

FarFish addressed the management issues identified in Cape Verde by developing solutions in line with measures of improvements described in the PGRP (Cape Verde Fisheries Management Plan). FarFish advanced knowledge of the foreign fleet fisheries, both from a biological and socio-economic perspective, by collating existing biological data, analysing stock assessment methods and evaluate and map existing value chains and infrastructure. This helped to provide the basis and understanding needed to make suggestions for improvements, developing new, effective fisheries management tools and management recommendations. By increasing stakeholder involvement and bringing all parties to the table through the application of results-based management, FarFish has not only developed management recommendations that aim to effectively address problems of overfishing, overcapacity and any potential hostility between the EU and local fleet, but has also contributed to improved data collection, monitoring and compliance. FarFish did also provide recommendations on how to harmonise catch reporting to the different institutions.

FarFish has contributed to capacity building in Cape Verde, as two employees of IMAR have graduated from the six-month Fisheries Training program (GRO-FTP) in Iceland, specialising in stock assessment. IMAR stock assessment experts have also attended other virtual training courses within FarFish.

INSITUTIDO DO MAR (IMAR) is the leader of the Cape Verde case study.



Benvindo Fonseca

Technician at Instituto Do Mar – IMAR (Cape Verde)



Why did you decide to participate in FarFish?

The project was seen as an opportunity to solve some issues related to fisheries, such as the system of reporting data from the EU vessels, improve training capacity related to stock assessment as well as an opportunity to improve the cooperation between institutions and strengthen the partnership with the EU.

Explain the importance of projects like FarFish for Cape Verde tuna fisheries

For our case study the FarFish project helped to improve the biological, economic and environmental data availability, and enhanced understanding amongst the different stakeholder within the value chains. The governance and value chain analysis of the tuna fisheries in west of Africa provided us with important results and understanding of the impact of the SFP. The Management Recommendations developed in FarFish did also provide us with valuable input to the management of our marine resources.

What were the key priorities for Cape Verde, as a FarFish case study, when entering the FarFish project?

The key priorities for us were several. One was to better understand and contribute to improving harmonisation of data reporting systems. We would like to see a system that can transmit, in near real-time, the same data to different partners (Cabo Verde authorities, EU, ICCAT). Another priority was to improve our capacity at the institute with regard to most of the FarFish objectives, in particular our competences in stock assessment and fisheries management..

How has FarFish addressed these priorities?

FarFish produced a report on the challenges associated with different reporting requirements of national and international (EU/ICCAT) institutions. The DGRM (General Directorate of Marine Resources) has since then established a compatible software to the Vessel Monitoring System (VMS) that is in place. Two researchers of IMAR (former INDP) attended the six-month Fisheries Training program (GRO-FTP) in Iceland, specialising in stock assessment. IMAR stock assessment experts have also attended other virtual training courses within FarFish, including a course on the DLM tool and the Tutor-Web, which are useful tools applied in stock assessment.

What were the main obstacles, if any?

Due to the pandemic situation, it was not possible to organise the training course in stock assessment applying the DLM tool in Cabo Verde, as initially planned. The same goes for other capacity building initiatives, but it has been replaced with virtual events that have been successful.

Outlook: What steps do you think need to be taken in the near future?

- It would be very useful to continue assisting the case study countries to apply the DLM Tool.
- It would be beneficial to add to, and improve understanding of, the value chain analysis of the fisheries, not only for tuna species but also for other species.
- Increase cooperation and partnership between EU and Cabo Verde is needed, especially in technological development and applied scientific research (R & D).



Senegal tuna and hake fishery

Fisheries are extremely important for the national economy of Senegal, with more than 400 thousand tonnes landed annually. The Sustainable Fisheries Partnership Agreement (SFPA) contributes also significantly to the state budget of Senegal, to sectoral and fleet development, alongside sustainable stock management, and supply of catches for export. The SFPA is further seen as being especially important for strengthening the fisheries governance in the West African region. Senegal is a contracting party to ICCAT, and the management and conservation of tuna and tuna-like species is therefore subject to ICCAT. Majority of the Senegalese seafood exports are destined for the EU. These exports are a vital source of hard currency for the country, the fisheries sectors, and associated activities. The Senegalese fisheries sector is estimated to provide more than 600 thousand jobs, which represents almost 15% of the workforce.

A number of challenges have been identified in the Senegalese fishery and the EU has as results committed to invest €750 thousand a year towards the development of the local fisheries sector, with particular reference to improving surveillance, combatting illegal fishing, promoting scientific cooperation, and aiding conservation and rehabilitation of spawning areas – all of which have been identified as problems specific to the fishery. The FarFish work in Senegal focused on the main challenges related to the EU fisheries in the area, including activities which will seek to advance biological knowledge of main target species and the biological, ecological and socio-economic impacts of these fisheries. This was achieved through data collection,

collation and harmonization, evaluation of current stock assessment methods and suggestions for improvements, analysis on value chains and fisheries governance structure. By creating new management recommendations in line with results-based management approaches, FarFish has attempted to contribute to improved MCS in the area, in addition to improving regional governance by bringing relevant stakeholders to the table.

FarFish has primarily focused its efforts in the Senegalese case study on tuna and black hake. The tuna emphasis was devoted to analysing governance and socio-economic aspects, whilst the black hake work concentrated mostly on MCS, understanding distribution of the two hake species and discriminating between the two species. The two species are currently mostly reported as one species, even though they have different biological characteristics, and should therefore be managed separately. FarFish did therefore initiate a pilot self-sampling programme to see if fishermen could be used to report the two species separately.

FarFish has contributed to capacity building in Senegal, as an employee of CRODT has graduated from the six-month Fisheries Training Program (GRO-FTP) in Iceland, specialising in stock assessment. CRODT stock assessment experts have also attended other virtual training courses within FarFish. The leadership of the Senegalese case study has been a collaborative effort by the Senegalese Marine Research Institute (CRODT) and the Conservation and Research of West African Aquatic Mammals (COREWAM).



Mamadou Diallo

Conservation and Research of West African Aquatic Mammals (COREWAM)

Why did you decide to participate in FarFish?

The project was seen as an opportunity to solve some issues related to fisheries, such as the system of reporting data from the EU vessels, improve training capacity related to stock assessment as well as an opportunity to improve the cooperation between institutions and strengthen the partnership with EU.

Please explain the importance of projects like FarFish for Cape Verde tuna fisheries

For our case study the FarFish project could help to ameliorate the biological, economical and environmental data and understand the stakeholder hub and their problems. The value chain analysis of the tuna can be seen as an important economic issue and an important task to better understand the social impact of the SFPA. The MR (management recommendation) helps to improve the management of the fisheries resources as well as the Common Fisheries Policy.

What were the key priorities for Cape Verde, as a FarFish case study, when entering the FarFish project?

The key priority was to understand and implant a harmonised system for data reporting, a system that can transmit, in record time, the same data to different partners (Cabo Verde authorities, EU, ICAAT). But also, to help establish a team of stock basement? at the institute by utilising training courses.

Ndiaga Thiam

Senegalese Marine Research Institute (CRODT)

How has FarFish addressed these priorities?

The DGRM (General Directorate of Marine Resources) has established a compatible software to the VMS system. Two researchers of IMac (former INDP) attended the six-months course of the FTP in Iceland, specialising in stock assessment. Soon these two researchers will attend a virtual training course on the DLM tool, which is a useful tool applied in stock assessment.

What were the main obstacles, if any?

Due to the pandemic situation, it was not possible to organise the training course in stock assessment applying the DLM tool, previously to be held in Cabo Verde with the participation of other case study countries of the project.

Outlook: What steps do you think need to be taken in the near future?

- It would be very useful to continue assisting the case study countries to apply the DLM Tool.
- Help to understand the value chain analysis of the fisheries, not only for tuna species.
- Increase cooperation and partnership between EU and Cabo Verde, especially in technological development and applied scientific research (R & D).



Mauritania mixed fishery

The Sustainable Fisheries Partnership Agreement between the EU and Mauritania covers several types of fisheries, including tuna, shrimp, demersal and small pelagic species. During the last twenty years, fleets from 25 different nations were operating in the pelagic fishery in the Mauritanian EEZ. The main target species in this fishery is horse mackerel, followed by mackerel, sardine and sardinellas, with the most dominating countries being Russia, Ukraine, the Netherlands and more recently, Belize. Octopus is the most important demersal species in Mauritanian waters and its high commercial value and relative ease of exploitation by the artisanal segment is causing a rapid industrial development of foreign and domestic fleets. In 2012, a peak production of 17,420 tonnes of octopus was reached, 25% of which was taken by the EU fleet. Due to the large number of fleets targeting octopus, the stock is considered overexploited, with fishing mortality currently exceeding FMSY. Another targeted demersal species is black hake, which is mainly exploited by European trawlers and long-liners. Deep-sea tuna fishery in Mauritanian waters is conducted by a number of foreign fleets, such as the EU fleet, Japanese and Senegalese. None of those fleets land their catches in Mauritania. As Mauritania is a contracting party to ICCAT, the tuna fishery is subject to ICCAT catch and effort limits.

Some of the main species targeted by the EU fleet in these waters are considered overfished. Due to this overexploitation, the number of fleets participating in Mauritanian fisheries (foreign and local) and the irregularity in the activities of these vessels, improved monitoring of catches, effort and catch sizes is needed. FarFish has been able to contribute to solving this overfishing and overcapacity problem in Mauritania by engaging stakeholders in the process of evaluating existing management tools and stock assessment methods and formulating new management tools and results-based management recommendations. The management recommendations address these problems, in addition to any other problems highlighted by the Mauritanian fisheries management authorities and the EU fleet operating in the area, with the aim of increasing the long-term profitability of both parties. The management recommendations have been developed based on biological and socio-economic data collected/collated within FarFish.

FarFish has primarily focused its efforts in the Mauritanian case study on small-pelagics and black hake. The project employed and supervised a PhD student that is modelling small-pelagics in west-coast of Africa and how utilisation and environmental forcing (such as climate change) is affecting the stocks. This work, and other outputs of FarFish, have been presented at a CECAF meeting, and at a dedicated FarFish workshop on Small-Pelagics in W-Africa that experts from CECAF, DG MARE, coastal state researchers and many more attended. This work will, without a doubt, provide an important understanding on small-pelagics and environmental forcing in the area. The work on black hake has mostly concentrated on MCS, understanding distribution of the two hake species and discriminating between the two species. The two species are currently mostly reported as one species, even though they have different biological characteristics, and should therefore be managed separately. FarFish did therefore initiate a pilot self-sampling programme to see if fishermen could be used to report the two species separately.

Mauritania has poorly developed value chains for seafood products, minimal amount is landed in local ports and processing facilities are limited, all due to insufficient infrastructure and lack of investments therein. FarFish put focus on this issue and has mapped and analysed the value chains connected to the EU fisheries and their infrastructure, and suggested improvements. A cost-benefit analysis for EU-fleet investments in Mauritania has also been conducted.

FarFish has contributed to capacity building in Mauritania, as an employee of IMROP has entered the six-month Fisheries Training Program (GRO-FTP) in Iceland, specialising in stock assessment. IMROP stock assessment experts have also attended other virtual training courses within FarFish.

The Mauritanian Marine Research Institute (IMROP) is the leader of this case study and the Cadi Ayaad University in Morocco has led the work on small-pelagics and environmental forcing in the West Coast of Africa.

Dr. Mamadou Dia and Dr. Khallahi Brahim

Mauritanian Institute of Oceanographic and Fisheries Research – IMROP (Mauritania)

Why did you decide to participate in FarFish?

Mauritania and the EU have enjoyed a long-lasting cooperation when it comes to utilisation and management of fisheries resources in Mauritanian and other West African coastal states waters. The agreement with Mauritania is considered the most important in West Africa, in terms of the variety of resources exploited and financial compensation. The agreement gives the EU fleet access to tuna, small-pelagics, demersal fish and crustaceans, many of which are also exploited by national and other international fleets. IMROP could therefore not fail to be a player in the FarFish project, which deals with the challenges associated with the exploitation of resources by vessels flying the EU flag outside European waters.

Explain the importance of projects like FarFish for Mauritania

Taking part in international research projects is very important for Mauritania and for IMROP, as it expands our knowledge base, competences and networks. The work carried out by the FarFish teams relating to environmental and socio-economic aspects is part of the basic documents examined during the various meetings in the Mauritanian case study, and the work presented during the project meetings and workshop have been very important.

What were the key priorities for Mauritania, as a FarFish case study, when entering the FarFish project?

When starting the project, it was our main priority to acquire more knowledge on the resources exploited by the EU in Mauritanian waters and how to manage them more efficiently. We also saw an opportunity in developing the skills of IMROP scientists in different scientific fields and capacity building, especially regarding stock assessment and socio-economics.

How has FarFish addressed these priorities?

The FarFish project has addressed our priorities through collection and collation of data, governance and socio-economic assessment, development of management recommendations focusing on important challenges identified by stakeholders, analysis of environmental forcing on small pelagics in W-Africa, and capacity building. The ecosystem modelling work that has been done on small-pelagics and environmental forcing is extremely important for us to better understand how the small-pelagics in Mauritanian waters are affected by the utilisation and environmental factors, and trends (such as climate change). Far fish took part in a CECAF meeting last year that was beneficial for us, and the workshop on small-pelagics facilitated by FarFish earlier this year provided us with new knowledge and tools that will be important for us in the future. The capacity building provided by FarFish is also important for IMROP. Having the opportunity to send one of our scientists to the six-month Fisheries Training Programme in Iceland, where he is focusing on the use of acoustics in stock assessment, will expand our ability when it comes to stock assessment and fisheries management.

What were the main obstacles, if any?

The main obstacles we experienced were caused by the Covid pandemic, as it had a major effect on the interaction with project partners and stakeholders. The attempts made to move events online were challenging for us because of unstable internet connections. Language barriers did also cause obstacles for us.



Prof. Khalid Elkalay and prof. Khalil Karima

Cadi Ayaad University (Morocco)

Why did you decide to participate in FarFish?

Morocco is currently investing in its fisheries and building up improved competences in fisheries management, aiming at increasing sustainability and profits of the sector. This is best done with improved knowledge and the main objective of our participation in the FarFish project was to facilitate cooperation and to learn from our European and African colleagues.

Explain the importance of projects like FarFish for your country?

Morocco is the biggest fish producer nation in Africa and the 25th biggest worldwide. Since 2020 the total annual production has been 1.6 million tons of which the artisanal and coastal fishing industry accounts for 1.3 million tons. The fishing industry represents between 2% and 3% of Morocco's GDP, and generates over 700 thousand jobs. Moroccan fish exports contribute to 58% of the country's total food exports. The FarFish project gave us the opportunity to work intensely on our case study in cooperation with international experts, therefore building our competences and creating networks for the future. It also gave us the opportunity to increase our knowledge on the Moroccan environment, the main fishing species, and the species most important for interaction in the Atlantic coast.

What were the key priorities for your case study when entering the FarFish project

Our number one priority was to increase knowledge. Firstly, to increase our knowledge on stocks and their utilization (main species, build fishing data base for the country) in the Moroccan ecosystem and to

compare it to the African ecosystems. Secondly, to gain knowledge from the European experts. In addition, we wanted to increase collaboration with colleagues from Europe and Africa.



How has FarFish

addressed these priorities?

FarFish was a very good opportunity to increase our network, especially with European colleagues, where we have initiated some new collaborations. One of our students is now in a training in Spain (as part of FarFish) and we think that this training will add great value to our laboratory and will bring a new research area to our institute and to our country.

What were the main obstacles, if any?

The main obstacle was the Covid situation. With more time, we are sure that our institute could have gained even more knowledge from the FarFish project.

Outlook: What steps do you think need to be taken in near future?

More collaboration is needed between African countries, with the help of European colleagues. And for our case study, we need more knowledge on the fishing evolution, more data on fish biomass and more details on the fishing methods.





Seychelles tuna fishery

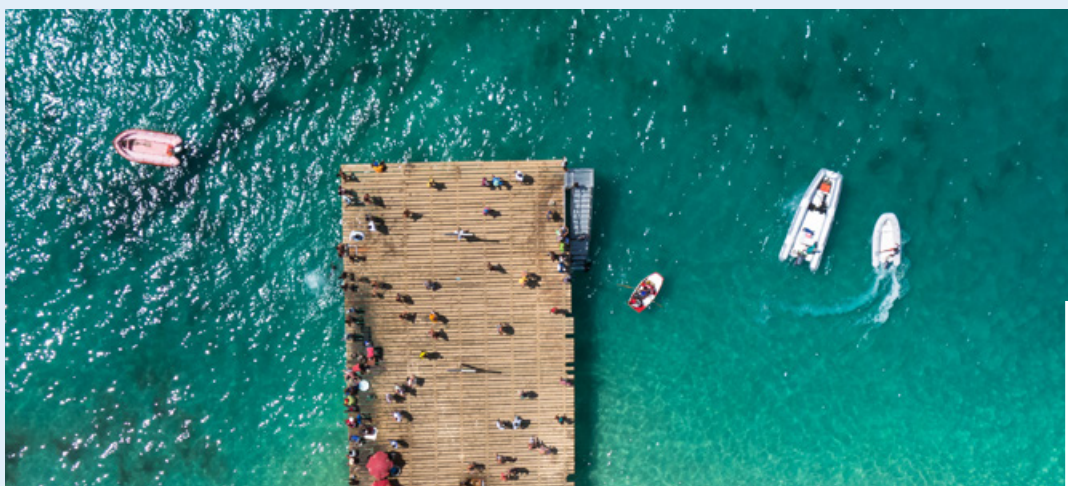
Seychelles is amongst the most fisheries-dependent countries in the world and the countries' tuna industry is its main pillar. Gross income from the sector is mainly derived from foreign fishing vessel expenditure on goods and services, as well as through payments and financial compensation. The EU has considerable interest in this fishery, both through its existing Sustainable Fisheries Partnership Agreements (SFPA) and tuna processing in the Islands. Spanish vessels are the major EU player in the Seychelles tuna fishery, with more vessels operating in the fishery than Seychelles themselves. Seychelles is a contracting party to the Regional Fisheries Management Organisation (RFMO) Indian Ocean Tuna Commission (IOTC), and the tuna fishery in Seychelles is therefore subjected to IOTC catch and effort limits, of which the EU is also a contracting party.

EU vessels land the majority of their catches in Seychelles (92% of the Spanish catch and 82% of the French catch). Approximately 20% is canned in the Seychelles and the rest is transhipped to other countries, of which 12.5% goes directly to the EU for processing or retail trade. Canned tuna is the main exported good of the Seychelles and is primarily supplied to European markets.

Given the importance of tuna exports for Seychelles, and the EU's dependence on tuna fisheries and seafood products deriving from the Seychelles, sustaining a good and effective relationship between the EU and Seychelles is

of utmost importance. This includes maintaining sustainable management system for the tuna fishery, a responsible SFPA, as well as an efficient value chain and infrastructure, where responsibilities of all parties are clearly defined. By working together with the Seychelles Fishing Authority (SFA), IOTC and relevant EU operators in Seychelles, such as OPAGAC (Organisation of Associated Producers of Large Tuna Freezer Vessels), FarFish has developed effective management tools and management recommendations for the EU Seychelles tuna fishery in collaboration with stakeholders. These management recommendations are based on existing and new biological, ecological, stock-assessment and socio-economic data which has been collected/collated within FarFish with input from IOTC and SFA, and together with value chain and infrastructure analysis and suggestions for improvements, FarFish has made its contribution to strengthening the stable and long-lasting cooperation on tuna fisheries and processing between Seychelles and the EU.

FarFish has contributed to capacity building in the Seychelles, as an employee of SFA has joined the six-month Fisheries Training Program (GRO-FTP) in Iceland, specialising in stock assessment. FarFish experts have held meetings and workshops in Seychelles, and SFA stock assessment experts have attended virtual training courses within FarFish. The Seychelles Fishing Authority (SFA) is the leader of the Seychelles case study in FarFish.



Yannick Roucou

Legal advisor at the Seychelles Fishing Authority (SFA)

Why did you decide to participate in FarFish?

The Seychelles Fishing Authority (SFA) is one of the key players in the Indian Ocean tuna fishery, and it was seen as an opportunity to address a number of pertinent issues relating to the fishery covered under the SFPAs as part of the FarFish project. The most important issues we identified early on were data collection, networking, training and capacity building, and Fish Aggregating Device (FAD) management. It was also important for us to give visibility to Seychelles and its effort at improving the sustainability of the tuna fishery. Seychelles acknowledges the many challenges faced at the level of the IOTC in regard to sustainability of tuna resources in the Indian ocean, which is why we welcomed the opportunity to join FarFish with expectations of advancing our knowledge and competences.

Explain the importance of projects like FarFish for your country?

Projects like FarFish are important for remote island nations like Seychelles, as they enable national researchers and stakeholders to be a part of an international team of experts. The networking, new knowledge and competences gained reach far beyond the project itself. FarFish also provided us with a better understanding of how SFPAs work around the world. It offered capacity building opportunities, particularly in fisheries management and value chain analysis. It also provided us with an opportunity to better understand the fishery, including the value chains.

What were the key priorities for your case study when entering the FarFish project?

Key priorities for SFA when starting the project were access to more data, particularly on the value chains, capacity building opportunities, better understanding of the FAD fishery and its impact on fishing effort and ecosystem including bycatch, and development of a framework for enhanced FAD management.

How has FarFish addressed these priorities?

FarFish has addressed these priorities in a number of ways, such as by:

- providing capacity building opportunities,
- collecting and collating biological, ecological, social and economic data,
- developing fisheries management tools that for example include the FarFish Data Limited Method tool, which will be beneficial for SFA,
- training SFA staff via the 6-month fisheries training Programme at the UNESCO-GRO-FTP,
- providing value chain & governance analysis for the Seychelles case study

The project did however decide not to put major efforts on analysing FADs and FAD management, as this is currently being addressed by IOTC.

What were the main obstacles, if any?

The main obstacles were data availability, particularly with regard to socio-economic data. Much of the data we wanted to use for scientific analysis is available, but the data was not shared because the data owners considered it commercially sensitive information or potentially privileged information. Covid 19 did also present an obstacle for us, as data collection, networking and participation in meetings and workshops are less effective online than in person.

Future outlook: What steps do you think need to be taken in near future?

In the near future we would welcome more capacity building opportunities in-line with those provided by FarFish. We will seek greater collaboration with all relevant stakeholders and look for greater transparency within the fishing industry.

Mixed Fishery in the international waters of the South West Atlantic

The South West Atlantic (FAO statistical area 41) is mostly international waters that are not subjected to any Regional Fisheries Management Organisation (RFMO), and a wholistic fisheries management approach or agreements for all fleets fishing in the area is therefore lacking. The area is extremely large, more than 17 million km², knowledge on the stocks, catches and efforts is limited, and Monitoring, Control and Surveillance (MCS) is poor.

There are fleets from all across the world fishing in the area, including several EU fleets. The main target species are hake, squid, rock-cod and southern-cod, with Spain being the dominant EU fleet with around 20 vessels. Spain's catches in the SW-Atlantic increased from 26 thousand tonnes in 2006 to 200 thousand tonnes in 2014 but have been around 140 thousand tons in recent years. Other EU nations fishing in this area are Portugal, Estonia and France. In 2019, the catches deriving from the SW Atlantic amounted to 3.3% of total EU catches. This area is also targeted by the coastal states of Argentina, Brazil and Uruguay, as well as other distant water fleets, mainly China, Taiwan and South Korea. The SW-Atlantic has no RFMO in place with legal competence to regulate demersal or deep-water fisheries but falls under the convention area of ICCAT and CCBT (Commission for the Conservation of Bluefin Tuna). However, there are no reports of tuna catches from the area.

In the absence of an RFMO and following UN General Assembly (UNGA) Resolutions on sustainable fisheries and the FAO Deepwater Guidelines, the Spanish Institute of Oceanography (IEO) initiated a series of research surveys in 2007 to identify Vulnerable Marine Ecosystems (VMEs) in the international waters of the SW Atlantic. Following upon that research, which resulted in seafloor and VME mapping of an area of approximately 60 thousand km², Spain closed nine areas to bottom fishing in 2011 for the protection of existing VMEs. These closures were further accepted by the European industry, thus applying to all EU fisheries in the area. Bottom trawling by the EU fleet is further restricted to the existing bottom trawling footprint, which leaves two areas open for fishing that have been subject to bottom fishing for 25 over years.

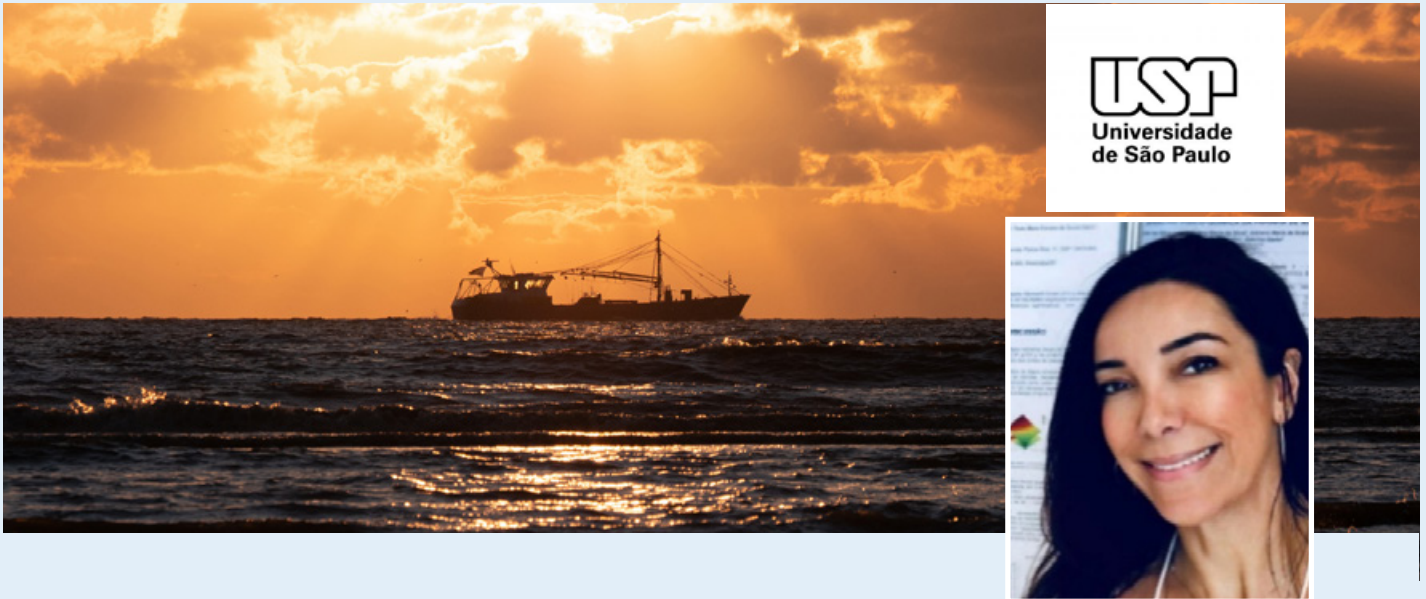
While the European industry operating in the area accepted the conditions of protecting VMEs, other international fishing fleets, mainly Asian (China, Taiwan and South Korea), have not adopted any equivalent conservation measures for the area. This means that fishing in the international waters of SW-

Atlantic is no longer a level playing field. The main objectives of these area closures are also unlikely to be achieved if they do not apply to everyone. The Long Distance Advisory Council (LDAC) expressed their concerns on this issue in May 2016 to DG MARE, requesting the EU to "demand at the relevant international fora (UN, FAO), as well as in commercial negotiations and bilateral fishing agreements that it might reach to all third countries, that the implementation of UNGA Resolution 61/105 be extended to all fleets fishing in the South West Atlantic in order to promote good international governance of oceans and seas and ensure a level playing field for EU fleets and foreign fleets alike".

One of the main objectives of FarFish in this case study has been to initiate a dialogue between key representatives operating in the area. FarFish has connected representatives of the EU fleet (Spain and Portugal), the two coastal states with fishing interest in the area (Argentina and Brazil), China (including a member of Distant Water Fishing Consultants in China), FAO and many more fleets, institutes and country representatives. These participants, which are either FarFish Partners or members of the FarFish "Reference Group", range from being industrial representatives to academics and research institutes, but all share the aim of making fisheries in international waters sustainable and profitable. This fact allowed the Project Consortium to gather relevant stakeholders for series of workshops and conferences on fisheries management in international waters. The first workshop was held in Vigo, Spain, in 2018 and was titled "Strengthening fisheries sustainability outside EU", the second workshop was held in Madrid, Spain, in 2019 and was titled "Bringing fisheries sustainability into the high seas: the case of the Atlantic south west" and the final conference on the subject was held online in early 2021, titled "Sustainable fisheries in SW Atlantic: A scientific approach". The FarFish project did also facilitate a conference on "The external dimensions of the CFP" which was very relevant for the SW-Atlantic case study. The main conclusion of these events was the need of scientific cooperation between the involved countries.

FarFish has addressed management challenges facing the EU fleet in the area by developing management tools and management recommendations for the EU fleet, building on the extensive research conducted by Spain in the area and other available data sources.

University of Sao Paulo (USP) is the leader of the SW-Atlantic case study in FarFish.



Dr. Juliana Antunes Galvão

Research Specialist in Freshwater fish and Seafood – “Luiz de Queiroz” College of Agriculture. University of São Paulo (Brazil)

Why did you decide to participate in FarFish?

The SW-Atlantic is of huge importance for Brazil as a coastal state and although Brazil does not have major operations in the area, it is still extremely important for us that the resources and the ecosystem is managed sustainably. The SW-Atlantic faces severe challenges when it comes to sustainable utilisation, which is why we were happy to take part in the FarFish project.

Explain the importance of projects like FarFish for your case study?

FarFish is an international research and innovation project involving different institutions and expertise from around the world. The consortium includes experts and networks that are important for us to link with, for us to develop further and expand our competences and networks.

What were the key priorities for your case study when entering the FarFish project?

The key priorities were to improve biological, ecological and socio-economic knowledge on the fisheries in the area, implementation of an international legislation to guarantee the conservation and management within the area, and to improve the interaction between the stakeholders in the SW-Atlantic fisheries.

How has FarFish addressed these priorities?

The most important output of the FarFish project in the SW-Atlantic case study has been the stakeholder interactions. The project has managed to link very important stakeholders and facilitate dialogue on how to best proceed to facilitate sustainable management for the area. The workshops and conferences have been extremely fruitful and do provide a positive indication that there is truly a willingness to cooperate towards improved sustainability.

What were the main obstacles, if any?

There were many obstacles and challenges within this case study of the FarFish project. The conflict between Argentina and UK proved to be challenging to navigate, the fact that there is no RFMO operating in the region was an issue, available data was fragmented and not easily accessible, the absence of an international legislation in this area presented challenges. From the Brazilian side the challenge was to motivate the national industry, as it is primarily interested in the tuna species, not in hake and squid. USP did also experience obstacles in its participation in the project, due to funding difficulties (Brazil was expected to fund USP's participation in the project, which they failed to do). Finally, Covid 19 proved to be a big challenge in the project, as travel was restricted for a really long time.

Outlook: What steps do you think need to be taken in near future?

It is necessary to continue with the work that FarFish has started in facilitating increased cooperation among the different stakeholders. The importance of allowing for cooperation among the scientific community is extremely important. The following are steps that I think would be necessary in the future:

- Introducing an RFMO for the area
- Improve stakeholder involvement among all stakeholders
- Development of an international legislation to protect VMEs in the area
- Improving data collection on biological and ecological variables
- Improving catch registration, particularly on bycatch
- Improved monitoring, control and surveillance



Mixed Fishery in the international waters of the South East Atlantic

The management of international waters in South East Atlantic is subject to a non-tuna Regional Fisheries Management Organisation (RFMO), the South East Atlantic Fisheries Organisation (SEAFO), of which the EU is a Contracting Party. Target species in the SEAFO Convention Area include alfonso, horse mackerel, mackerel, orange roughy, skates, sharks, deep-sea crab, hake, and toothfish. SEAFO is a relatively young RFMO, with the Convention entering into force in 2003. SEAFO has an active Scientific Committee, but due to scarcity of scientific data, Total Allowable Catch advice are usually not based on sufficient data. Although the EU fleet activity has been limited in this area over the past few years, the EU has been a Contracting Party from the beginning and has, now most recently in 2015, expressed its willingness to work on strengthening SEAFO's performance in terms of scientific knowledge, monitoring, compliance and enforcement. The work in this case study did therefore have an interesting angle as FarFish was able to explore different roles of the EU in RFMOs. In particular, and in relation to the relatively low fishing effort in the SEAFO area, FarFish explored how to best deal with such a data-poor situation when there is a need to maintain an international framework, both for future use and protection.

The extremely limited activity in the SEAFO area, the lack of available biological-, fisheries dependant- and independent data, as well as the complete lack of interest of the EU fleet in the area resulted in little advances being made in this case study of FarFish. In addition to using biological data collected by SEAFO, attempts were made to build on the scientific work already conducted through the Nansen programme, a programme initiated and managed by Norway and FAO, which aims to "provide the fisheries research institutions and management administrations in the participating countries with knowledge on their ecosystems for their use in planning and monitoring". Despite repeated attempts and extensive effort by the FarFish consortium, these data could not be made available to the project. Therefore, the expected output from this CS could not be reached. The stock assessment methods and tools used within the area were however analysed with respect to their applicability, and the application of VMS/ AIS signal analysis for monitoring, control and surveillance in the area were evaluated. Due to data limitations, the overall outputs and impact of this case study were limited.



FarFish outcomes

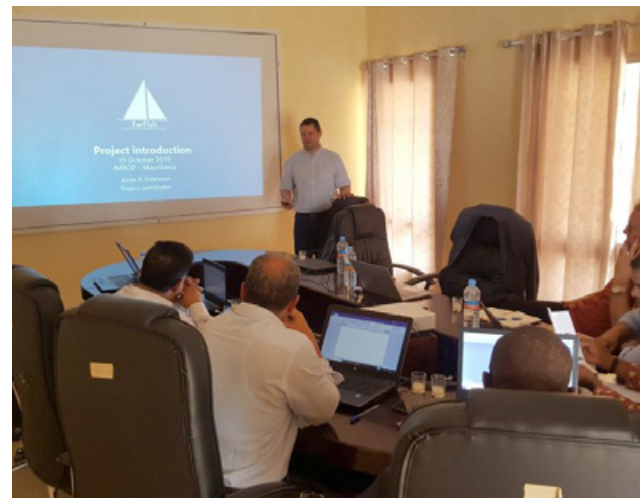
– a quick look

After over four years of hard work it is time to reflect on some of the key outcomes of the FarFish project. FarFish has produced a diversity of practical tangible outputs, such as new management tools and methodologies, new data and databases, results from detailed socio-economic analyses, policy recommendations, educational material and numerous scientific journal publications. The project has also produced other valuable outcomes, reflected in new networks of people working within EU long distance fisheries, as well as new knowledge and improved capacity of both professionals and students, gained through FarFish's broad scale capacity building and education within and outside of the EU.

FarFish Capacity Building



FarFish puts emphasis on broad scale capacity building, knowledge transfer and dissemination across multiple stakeholder levels, reaching people with different cultural, economic, political and social backgrounds. The EU SFPAs include financial support which aims to promote sustainable fisheries development in the partner countries by strengthening their administrative and scientific capacity. Building strong relationships and working to create capacity both within the EU and in partner countries abroad is a key component to the success of the FarFish project. The capacity building activities within the FarFish project are based on training needs assessments conducted at the beginning of the project. With these needs established, FarFish developed training activities which were tailor-made to meet the needs in each CS, thus optimising the effort and funds available to put into capacity building.



FarFish training needs assessment

Mary Frances Davidson, GRÓ Fisheries Training Programme

To set a basis for capacity building activities undertaken in the FarFish project, the UNESCO GRÓ- Fisheries Training Programme completed Training Needs Assessments in relation to the FarFish project in the four Case Study countries; Mauritania, Senegal, Cape Verde, and Seychelles. The primary aim of these assessments was to determine mutually agreed upon capacity building priorities to form the basis for training administered through WP 7 in the FarFish project. These Training Needs Assessments targeted institutions partnering in the FarFish project within the case study countries and were conducted through site visits during which key staff were interviewed by the GRÓ-FTP team. The initial results of these assessments were presented to FarFish partners on site at the end of the field visits, and input from FarFish partners were incorporated in the final Training Needs Assessment report.

Training Needs Assessments were conducted through interviews with key staff at the FarFish case study organisations. The aim of the assessments was to establish where key capacity gaps existed between the institutional mandate and human capacity to deliver on those mandates. In all cases, capacity gaps were identified and agreed upon by the FarFish partners. These identified training needs then formed the basis for capacity building interventions undertaken later in the project.

Institutional arrangement, management structure, data collection strategies, priorities, and wider fisheries development context in each case study country is unique. In Mauritania, given the importance of pelagic fisheries, the

team identified the specific need to develop capacity in the field of acoustic surveys for stock assessment. Also, considering the importance of the upwelling system in total production, a closer cooperation within the IMROP department researching Oceanography and the Stock

Assessment department could yield higher resolution analysis required for predictive modelling of stocks. In Senegal, the CRODT scientists are each tasked with a specific area of study but lack research support staff to successfully complete their mandate to provide scientific advice to fisheries policy makers. In this case, institutional constraints have led to an overworked and overcommitted core team of researchers who heavily rely on doctoral students to complete basic research. In the Senegalese context, there is one species allocated TAC, shrimp, and while other stocks are monitored through significant data collection efforts, there is no predictive modelling taking place. It was determined that stock assessment and modelling are the key priorities for building institutional capacity at CRODT. In Cape Verde, IMAR has one stock assessment researcher on staff, but there is a strong determination to invest in building research capacity to conduct stock assessment. At the time the team visited Seychelles, the SFA was undergoing a transition towards financial autonomy, which may to impact the primary mandates of the organisation. A newly established quota on yellowfin tuna in the Indian Ocean demands more predictive stock modelling methodologies of SFA scientists.



Touring the Senegalese Research Vessel with CRODT scientists in Dakar, Senegal



Touring the Ocean Science Center of Mindelo (OSCM) in Cabo Verde



GRÓ-Fisheries Training Programme, 6 month training course

Mary Frances Davidson, GRÓ Fisheries Training Programme

GRÓ-Fisheries Training Programme, 6 month training course
The mission of the GRÓ Fisheries Training Programme is to strengthen institutional capacity to support the sustainable use of living aquatic resources in developing countries through international educational and research cooperation. The FTP's aim is to assist partner countries in achieving their own development goals related to fisheries. Based on the capacity gaps identified in close consultation with our partners, the FTP creates content and training programmes to address the needs in each country and organisation.

The GRÓ-FTP applies an approach based on the principles of Education for Sustainable Development and builds on the knowledge and expertise of different experts by liaising with a wide range of Icelandic and international institutions and organisations.

The core activity of the FTP is an annual postgraduate level six-month training programme in Iceland which aims to strengthen the professional capacity and competency of FTP Fellows to actively contribute to work done in their organisations and to recognise development potential in their home countries. Each year, the course runs from September to March and comprises three modules; an introductory part, a specialisation part, and an individual research project. Successful graduates receive a UNESCO GRÓ certificate of completion.

Introductory course

The introductory part gives Fellows a holistic view of fisheries, providing them with insights into various disciplines within fisheries and their connectedness. In this course, Fellows receive a comprehensive overview of fisheries in an international context, sharpening their understanding of fisheries in their home countries and what is needed for a fisheries sector to evolve. The introduction consists of a series of lectures, site visits and assignments, touching upon the subject of personal and professional growth, and group dynamics. The FTP places emphasis on environmental conservation and gender equality which are integral to sustainable fisheries and the development of the fisheries sector.

Specialist course

Upon completion of the introductory part, each Fellow joins a specialist line according to their area of expertise and responsibilities at home. The lines focus on one specific area of fisheries and aims to hone each Fellow's knowledge and experience throughout a six-week programme of lectures, assignments, and site visits. During this time, Fellows develop ideas for a final project in collaboration with their supervisors communicated through a project proposal submitted orally and in writing.



The FTP offers training in four areas of specialisation:

- Fisheries Policy and Management
- Stock Assessment and Gear Technology
- Quality Management of Fish Handling and Processing
- Sustainable Aquaculture

Project work

The programme culminates in a twelve-week individual project in which fellows work closely with a supervisor to conduct research on a pressing issue related to their work at home. The project work combines the Fellow's experience and practical skills gained in the introductory and specialist training, along with their personal goals on an individual research topic. Project design skills are applied to develop and present a research proposal, and then research is conducted individually through close collaboration with an expert supervisor. Final projects most often involve data directly from Fellows' home countries. On completion, a research paper is submitted and published on the GRÓ-FTP website. In addition, Fellows are required to design an information poster summarising their research and present their results in an open dissemination meeting.

Five Fellows participated in the six-month GRÓ-Fisheries Training Programme through the FarFish project. Due to a delay in the regular operations of the 6-month training brought on by the pandemic, not all were able to complete their studies by the end of the project. Three were able to complete their research, and two are currently participating in the post-graduate training programme.



Alciany Nascimento da Luz, from Cabo Verde undertook a research project, *Testing methods to estimate the age of blackspot picarel (Spicara Melanurus) using otoliths, from the waters of Cape Verde Islands.*



Nuno Vieira, also from Cabo Verde, conducted his research on *Stock assessment and the influence of environmental parameters on the distribution of mackerel scad (Decapterus Macarellus) in Cabo Verde waters.*



Kamarel Ba, from Senegal, conducted his research work on *Assessing the north-west african stock of black hakes (Merluccius Polli and Merluccius Senegalensis) using catch-msy and length-based spawning potential ratio models.*



Sid'ahmed Hemmed, from Mauritania is a GRÓ-FTP fellow, and will conduct his research in an area related to acoustic data to support the stock assessment efforts on Mauritania's small pelagic fisheries.



Margret Ally, from Seychelles is a GRÓ-FTP fellow, and will conduct her research in an area related to value addition and economic development related to the bycatch species from the tuna fisheries in Seychelles.

The impact of this training is already being felt in the FarFish Case Study organizations. In May of 2019, a seminar was held at the INDP in Cabo Verde where the final research projects were presented in the ambit of the Fisheries Training Program (FTP) and the FarFish project. At the seminar, the work of the FarFish project, and the research produced via the post-graduate training offered through the project was presented. The seminar was opened by the President of INDP (now IMar), a representative from the Cabo Verdian Ministry of Maritime Economy, and the Work Package 7 (Capacity Building and Dissemination) leader from the FarFish project. The Case study leader for Cabo Verde gave a presentation of the project to the seminar attendees, and the research results from the fellows participating in the training was presented to the organisation.



feedback of the assignments.

- Sid'ahmed Hemmed, Mautirania

The FTP so far has been filled with important lectures overviewing trends in world fisheries, exploring fisheries databases, ecosystem approach to fisheries, fishing gears and environmental impacts of fishing gear. I have improved especially from the GRO-FTP team



The journey has been challenging, but in a positive way. The program moves you away from your comfort zone and your know-how. It shows you that there is a lot more to be done. One becomes both analytical and critical of the current model at home and sees ways to improve it.

Each country is unique and different.

That is why it is important to keep building capacity in people in such a way that they are able to develop models that can be applied effectively in their own economy, to grow socially and economically in a sustainable manner.

Knowledge is indeed power, and everyone can contribute in a way or another.

-Margaret Ally, Seychelles



Through the FarFish project and the GRÓ-FTP, I am learning a lot of interesting things about the Icelandic fishing and aquaculture system through lectures and field visits. It's a real experience I am living now as old Icelandic fishing days were very similar to what my country (Senegal) is facing now in terms of challenges in fisheries, such as overfishing of most stocks, fish processing, regulations, etc. What I'm learning here will be a great opportunity for me to share with colleagues, fisheries directorate agents, artisanal and industrial fishers, as well as fish processing managers, to make changes in our fishing and aquaculture system to achieve sustainable development goals.

-Kamarel Ba, Senegal

FarFish Data Limited Methods course

Margarita María Rincón, the Spanish Institute of Oceanography

The Data Limited Methods short course was developed based upon the needs identified in the Training Needs Assessment, while building upon the work developed by partners in the FarFish project.

In this way, the course is both a tool for capacity building in the GRÓ-FTP's partner countries, as a reinforcement of our ongoing capacity building initiatives, and as a tool for systematic dissemination of results of the FarFish project for stakeholders in case study countries.

It was determined early on that to maximise impacts, this course should allow all case study partners to participate rather than focusing on one case study or country. Upon completion of the training needs assessment, stock assessment competencies were identified as one common capacity need for each of the partner institutions evaluated. Based on the training needs assessments and subsequent meetings with Case Study leaders and other FarFish partners, it was determined that the most useful topic for all involved would be to focus on training scientists working the case study institutions on the use of a Data Limited Methods Tool (DLM) developed by the FarFish project.

The DLM Tool is built from existing methodologies for stock assessment where data availability is limited. Underlying this is the theory that even with limited data, some crude stock assessment methodologies can still be applied, and can still be useful. These methodologies all have trade-offs. The DLM Tool created by FarFish is a system which allows the user to input any data that exists and see which data limited methods may be used to analyse that data, what the limitations of the methods are, and what data might be useful to collect in the future for more robust analysis.

The DLM course was originally planned to take place in Mindelo, Cabo Verde, hosted by the INDP/IMar. It was to have a regional in focus, with participants from CRODT in Senegal and IMROP in Mauritania. With travel ultimately impossible due to the COVID pandemic, the course was modified, and a hybrid in-person and virtual model was used for instruction.

The course was led by two experts: Spanish IEO/CSIC Margarita Rincon, who developed the DLM tool, and a GRÓ-FTP fellow from CRODT in Senegal, Kamarel Ba, who presented his work on Length-Based Spawning Potential Ratio (LBSPR) models he developed through his final project for FTP in the DLM course.



This course aims to explore some methods used for stock assessment when data available is very limited. The theory behind and their implementation will be explained, as well as their advantages and caveats. An emphasis on data input and results expected regarding establishing some reference points for sustainable exploitation will also be provided. The skills learned from this course will be directly applicable for exploratory stock assessments for fisheries of the countries of the participants.

The course took place in Iceland from Sept 29th – Oct 1st, 2021. It was divided into two parts. The first part was an open seminar which was held both in person and virtually, attended by 50 people. The second part of the DLM course was a closed workshop, where data limited methods were explained in more detail with practical examples and exercises. Participants were encouraged to work on datasets from home, and used the FarFish DLM tool and R-statistical software to explore the world of data limited fisheries modeling for stock assessments. The workshop was attended by 9 people.



FarFish and Tutor-web

– a novel approach to education and training



Tutor-web is an e-learning tool that enables tailor-made education and training to meet individual needs. The design of the tutor-web educational system is based on research at the University of Iceland and funded by several projects, FP7, H2020 and others. The tutor-web is fully open and accessible at <https://tutor-web.net> to instructors and students with an Internet connection, even slow and intermittent.

Whether through a regular school or self-study, students of fishery science need a basic understanding of fish population dynamics and of how to handle data. This can be as a part of either assessing stock size, evaluating long-term yield potential or statistical analysis of ecological measurements. In combination, these tasks require background knowledge including mathematics up through multivariate calculus, statistics up through multiple linear and nonlinear regression, followed by elements of population dynamics. Only after mastering these basic concepts can the students expect to understand the tools used to assess fish stocks and their yield potential.

As a part of the FarFish project, new material and drills have been added in these fields in Tutor-web and aggregated together as a single course with many study units (called

tutorials) at <https://tutor-web.net/fish/fish850>. The study units are split into drillsets or “lectures”, many of which contain reading material in the form of course notes, but research and use of the tutor-web has shown that the most important aspect of the tutor-web is the large number of drills. These are normally multiple-choice questions.

A student can register into the system, click their way into any study unit and click the “Take a drill” button to request drills and start practicing. The student can keep on requesting new questions until they feel that they have mastered the material.

Alternative methods have also been developed and used experimentally as a part of the FarFish project. These include using real data in questions. For example, a regression course can access randomly chosen data sets from statistical agencies and pull those together into a question on regression.

The FarFish lectures and drills will remain as a part of Tutor-web e-learning platform providing students, researchers and stakeholders with a valuable tool for capacity building in stock assessment and fisheries management.



Marine Management and Innovation Course

From March 9th-13th 2020, UiT – The Arctic University of Norway hosted the university-level programme called “Marine Management and Innovation” (SVF-6013), that was funded by the European Commission Horizon 2020, through the FarFish project. The programme consisted of short courses in international ocean governance, traceability, value and supply chains, and economics, taught by different FarFish partners.

The main learning objectives of the programme were:

- (1) to provide an overview of central concepts and actors within laws and regulations in fisheries management
- (2) to provide the opportunity for students to learn about the challenges of managing resources sustainably in a common pool resource setting, with realistic resource dynamics
- (3) to achieve an understanding of the main concepts of food value chains, supply chains and traceability.

Moreover, the taught topics also touched upon numerous UN Sustainable Development Goals (SDGs), such as nr.14 life below water, nr.2 zero hunger, nr.12 responsible consumption and production and nr.3 good health and well-being. We want to highlight this, as one of the strengths of the programme is that it is relevant and timely.

The goal was to educate decision makers, in particular fish business operators and EU fleet representatives, and allow for the participation of students at the Master or PhD level. Twenty-nine participants from 14 countries took part. Among the participants were students and researchers from UiT, nine invited stakeholders, and seven online participants who followed the programmes’ live streaming.

Lectures were recorded and uploaded to UiT’s online storage Mediasite, where they will be freely available for five years. The lectures have since been viewed several times (the lecture on business development 45 times).

Figure 1: Participants and teachers on the university-level programme “Marine Management and Innovation” at the Norwegian College of Fishery Science, UiT the Arctic University of Norway.



The programme, was unfortunately affected by the COVID-19 pandemic. Lockdown restrictions were imposed mid-way through the week, and thus, the last 1.5 days of the programme had to be taught only remotely. Despite the sudden turn of events, participants were satisfied with the programme’s overall quality, with 61% reporting they were very satisfied, 31% satisfied.

Among the 29 participants, eight took the exam. All passed and received a certificate, meaning the project reached its goal of graduating at least five participants. The exams, essays with self-chosen topics, contribute to the programme’s academic outcome, and with the permission from the respective essay authors, FarFish has published a summary of six essays on the FarFish web page (Table 1). The hope is that the online lectures, and the essays will act as effective tools to make sure the programme has a learning impact beyond the course.

Table 1: List of essay summaries available online

1. Pan-Arctic Marine Protected Area Network – A Solution For Anthropogenic Threat In The Arctic
2. Patching The Gaps Of ABNJ Governance
3. Tasks And Limits Of Marine Protected Area Management: The Case Of The Islet Of Nosy Ve, Madagascar
4. Considerations on art.25 of the proposal for amendment of European Parliament Regulation N.1224/2009 CCTV control system in fishing
5. Analysis Of The Conflict Over The Use Of Marine Space In Madagascar
6. FarFish – Inspiration For Changes

Data

Data collection and harmonisation was a key component of FarFish, where biological, ecological, social and economic data was collected and collated throughout the project's lifetime. The data limitations within FarFish case studies were well known from the start of the project, as well as the fact that access to the existing, but fragmented, data would be challenging. However, as the FarFish consortium included many institutions with access to the data that does exist, it enabled us to successfully collect important data. There are, however, important datasets that could not be accessed due to data protection policies, technical challenges in extracting data and willingness to share commercially delicate information.

Much of the data gathered was uploaded to the FarFish database (FFDB) and then used as input into FarFish visualisations and the development of decision support tools. FarFish further initiated a self-sampling pilot programme, that enables fishermen to take part in the data collection. Following are brief introductions to some of the data collected and management tools developed within the project.

The FarFish database (FFDB)

Jamie Lentin, Shuttle Thread Limited.

FFDB is a banner applied to a suite of tools developed as part of FarFish, focusing on data collection, model output and visualisation. All of the tools mentioned here are available on the FarFish website at <https://ffdb.farfish.eu>. These tools are also open-source, and source code is also available on the FarFish GitHub page at <https://github.com/farfish/>.

Firstly, FFDB Upload is a web application that can allow anyone to add structured datasets into a central database. The datasets are templated to make sure the data is well formed, and whilst it could be used for any data collection exercise, the main purpose is to collect fisheries data to then feed into the FarFish-DLMtool (data limited tool). This will produce visualisations of the data and run DLMtool and SPiCT models based on that data. Full instructions are available to install both on any server and could be used for any kind of data collection exercise in the future.

In addition, applications for anyone to use were developed; FarFish DLMGui and FarFish SPiCTGui. These allow anyone to produce models and visualisations using DLMtool or SPiCT without having to learn R or install anything on their system. There are publicly available instances of the tools at <https://ffdb.farfish.eu>, and being R Shiny applications, they are easy to install onto your own server or hosted on <https://shinyapps.io>. Full instructions on both how to use the tools and how to install on your own server are available on the website.



As part of this work, many open-source contributions were made, improving the state-of-the-art for many:

- Additions to the Rpostgres library, improving the R language's Postgres database support
- Handsontable. To include flexible data tables into both Javascript and R Shiny web applications
- Tape-server, providing easy testing of Javascript code in a web browser

The FarFish data limited tool

Margarita María Rincón from the Spanish Institute of Oceanography

One of the key objectives of FarFish was to develop tools that provide added value, relevance and usefulness in support of management and decision-making for the actors involved in each of the case studies. The relevance and added value were ensured through a consultation process. The FarFish data-limited tool (FarFish-DLMtool) has been receiving feedback mainly from the partners involved in the implementation of the case studies but also from external actors: the WKDLSSLS ICES group, some participants in the ICES Annual Scientific Conference, the members of the IMPRESS (Improving scientific advice to fishery management for resources of interest for Spain in Atlantic waters) project and university students. This constant feedback ensures relevance and added value while having technical characteristics that make it useful within the context of the Responsive Fisheries Management System implemented in FarFish. As an active component of this system, according to the DoA, the tool was set out to accomplish a set of operative characteristics such as:

1. Facilitating an equal footing for the technical dialogue of all actors involved.
2. Guaranteeing all-actors accessibility by working under open-access schemes.
3. Interaction with data, simulation and visualization based on free platforms.
4. Tools remaining once the project has ended.

To achieve this, we developed a suite of R-based tools that let users upload and analyse their own data purely through a web browser, so they can be used on any computer without installation or knowledge of the R programming language. The source code for the tools is also public and hosted on GitHub, allowing institutions to manage their own installation if required in the future.

The FarFish-DLMtool is an interactive tool where the users can incorporate their data and obtain pertinent information in return. The open-access scheme based on Github and the

user data-input guide* guarantee accessibility and ensures that the tool will remain useful once the project has ended. This effort has also benefited from work in FarFish Work Package 1 (Stakeholder interactions) that allows us to directly explain the tool functionalities to operators

and scientists, as well as get their feedback. Data gathered by FarFish in Work Package 2 (Advancing biological knowledge and evaluation of current stock assessment models) had also been used to provide examples of performance of important bycatch species identified by Management Recommendations (WP4). In this sense we highlight the master thesis of Mercedes Aramburu for University of Cadiz, using the FarFish-DLMtool to provide an exploratory assessment of Common dolphinfish, wahoo and frigate tuna in the Indian and Atlantic oceans.

The tool has also been presented in the FarFish Data-limited methods hybrid workshop (online and in person) to the GRO-FTP fellows in Iceland and to representative students from different case studies.

The FarFish data-limited tool (<https://ffdb.farfish.eu/>) has been designed by Margarita María Rincón from the Spanish Institute of Oceanography, Cadiz Oceanographic center (IEO-CSIC) and Jamie Lentin from Shuttlethread. This work does not necessarily reflect European Commission views and in no way anticipates the Commission's future policy in the area.

* the user data-input guides are available at the FarFish website: <https://www.farfish.eu/wp-content/uploads/2021/10/FarFish-DLMGui-user-guide.pdf> and <https://www.farfish.eu/wp-content/uploads/2021/10/FarFish-SPiCTGui-user-guide.pdf>



The FarFish black hake self-sampling pilot study

Dr. Karim Erzini, Professor at University of Algarve and Senior researcher at CCMAR

“Black hakes” is the common name that includes both *Merluccius senegalensis* and *M. polli*, that overlap in their geographic distribution over approximately 2,000 km off the west coast of Africa. Morphologically similar, they are difficult to identify, resulting in mislabelling of catches and the lack of separate stock assessment, scientific advice and management measures for each species. The objective of the FarFish project (www.farfish.eu) pilot study was to evaluate the ability of fishermen to sample and identify the hake species, thereby providing a means of collecting data that could contribute to improving assessment and management of the hake resources.

Sampling kits, protocols, and data sheets were provided by FarFish. Self-samplers were asked to collect data on fishing locations, dates, depth, and to visually identify samples of hake, store a fin clip in 100% ethanol, and record sex and length of each individual. Three OPROMAR trawlers fishing in Mauritanian waters participated in the pilot study, while in Senegal, sampling was done from a trawler from the Spanish-Senegalese company SOPERKA S.A. and from small artisanal (pirogue) longline vessels operating in the Kayar canyon by fishers on board but the data recording and the sampling for the DNA analysis was done by CRODT technicians.

DNA analysis of the samples was carried out at the Department of Functional Biology of the University of Oviedo, Spain. Follow-up questionnaires evaluated the views of the fishers on the difficulties encountered, willingness to participate in self-sampling programmes and usefulness for management of the fishery.

In total, 460 samples were obtained from a SOPERKA trawler and the artisanal longline vessels. Of the samples from the SOPERKA trawler 46% of the hake were mis-classified, with 43% and 48% of *M. polli* and *M. senegalensis* respectively not identified correctly. For the artisanal fleet, 116 *M. polli* were classified as *M. senegalensis*, with no misclassification of individuals of the latter species, giving an overall misclassification of 41% (n = 286). Statistical analysis showed

that labelling errors were mainly due to the assumption of *M. polli* being bigger and inhabiting deeper waters, and the opposite in *M. senegalensis*. Thus, location of fishing grounds and depth were the main contributing factors to mislabelling.



In total, 405 samples were obtained from three OPROMAR fishing vessels. Differences in mislabelling were found between the 3 trawlers: 2.5%, 13.5% and 27.9%. Overall, 26% of hakes labelled as *M. polli* were shown to be *M. senegalensis* by DNA analysis. Statistical analysis showed that on-deck labelling errors were mainly due to the assumption of *M. polli* being bigger and inhabiting deeper waters, and the opposite in *M. senegalensis*. Thus, location of fishing grounds and depth were the main contributing factors to mislabelling.

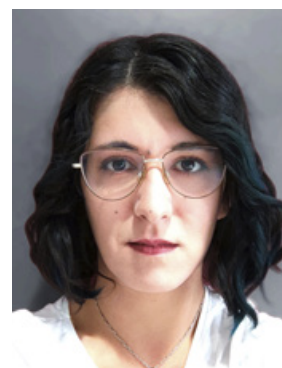
In general, the sampling protocols were found to be clear, understandable and easy to follow. The amount of time needed to sample ranged from a few minutes to less than 30 minutes per sampling episode (i.e., trawl haul in the case of industrial fleet trawlers), meaning that self-sampling does not occupy a significant amount of time, which accounts for most of the self-samplers responding that they would be willing to continue self-sampling or other collaborations with scientists. Self-samplers were interested in the study, believing that the results would be important for the management of the fishery. Given the levels of mislabelling, specific training in catch species identification is recommended to improve the accuracy of labelling and traceability. DNA barcoding could be applied as a method for routine control of species identification, to confirm in periodical surveys, that species are correctly labelled and also contribute valuable data on species composition (relative abundance of each species) for a scientific basis for management of the fisheries.

The FarFish Shiny App

Sonia Doblado, LDAC FarFish Coordinator

The FarFish consortium acknowledges the difficulty to follow our work for someone that comes from outside the project. As we organise ourselves by work packages (WPs), it can be difficult to navigate through all the deliverables to find the information of interest. Following the recommendations and comments about this issue from the external advisory group and the consulted stakeholders, we have created a tool with the hope of overcoming this barrier. Using the R package “Shiny”, we have created an app that divides our deliverables and outcomes not by WPs but by case studies and themes. This way, any person interested in the results of a specific case study (CS) will be able to access the information related to it without being familiarised with the internal organisation of the project. To do so, the user will select the CS of interest, and a menu will appear with several thematic options, that is: “Background”, with general information about the CS, “Stakeholder interaction”, “Governance and value chain”, “Scientific advances”, “Management Recommendations”, “Audit”, “Visualisation materials” and “Dissemination and

capacity building”. These sections will include a link to the deliverables that contain the wanted information for the selected CS. It is worth noting that for the CSs of Senegal and Mauritania there are two special sections that contain dynamic graphics about the fleet present in their EEZs. The user can either choose the nationality of the fleet or the year of interest, and the graphic will return the number of vessels identified via AIS or AIS+VMS in the case of Senegal. In this section, a report is also available so the user will know the meaning of these fleets being present compared to what nationalities are allowed to be operating in the area according to the available agreements between Mauritania/Senegal and third countries.



The app further includes a special section dedicated to one of the main outcomes of the project, the DLMTool. It includes all the deliverables related to the tool, plus a user-friendly guideline on how to use it. The DLMTool can be found embedded in this app, so there is no need to go to the FarFish site to look for it.

The app will remain available for the public after the project ends, so we hope it would be useful for anyone interested to know about the FarFish efforts in any specific case study.



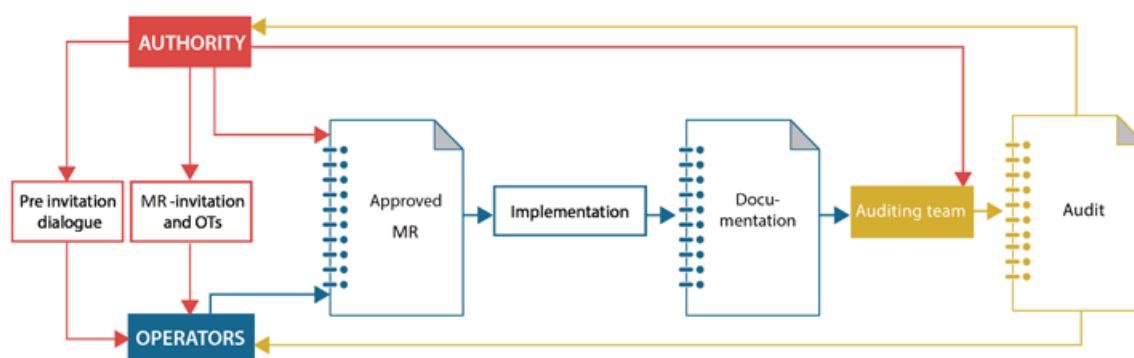
QR code for the app, but it can also be accessed through a browser [here](https://farfish-summary.shinyapps.io/Outcomes/)
<https://farfish-summary.shinyapps.io/Outcomes/>

The FarFish Management Recommendations

A key component of FarFish was the development of a Results-Based Management (RBM) approach for EU fisheries in non-EU waters. This approach aimed to facilitate increased stakeholder involvement in management decisions and delegate management responsibilities to the resource users. The approach would therefore reduce top-down micromanagement that has proven to be of limited efficiency, with ill-fitting regulations, high cost and low buy-in from resource users and other stakeholders. FarFish achieved this by producing and testing a framework for implementing the RBM approach in EU long distance fisheries, summarised in FarFish's voluntary European standard: "Good practice guidelines for developing management recommendations for the EU fleets operating outside European waters". These guidelines were produced after an open CEN process, including phases of public commenting, while also integrating the experience gained and lessons learned from testing the approach in FarFish case studies.

The approach is based on the concept that the authorities in charge of management in the respective fishery establish specific management objectives, based on existing environmental, social and economic policies and current management challenges. Based on these, the authorities further establish specific and measurable Outcome Targets (OTs), that the operators (resource users) address by proposing management measures for reaching the OTs. The OTs, the management measures and associated indicators, as well as specifications on how to document success are then incorporated into a contract/agreement called Management Recommendations (MR). The MR is then implemented, and its success monitored by an auditing team. The auditing team reports back to the authority and the operators, providing feedback on success and failures that are incorporated into a new MR if needed, or result in the termination of the MR.

The guidelines detail a step wise process, where the roles and responsibilities of all actors are explained in detail. A simplified outline of the process is shown in the figure below.



The RBM process was iterated within FarFish to allow for testing, improvement and validation of the approach. The first draft of the guidelines was produced early on in the project, MR invitations were provided to the operators in each of the FarFish case studies, who proposed MRs that were approved after negotiations with the authorities (represented by the FarFish team). The "implementation" of the MRs was then documented with simulations, data collection, analysis, and various actions instigated by FarFish. The success of the MRs was then audited by the FarFish auditing team, and the results used to improve the guidelines, MR invitations and the second MRs. These were then audited again, and the feedback used to develop the final version of the "Good practice guidelines for developing management recommendations for the EU fleets operating outside European waters" which are to be published as a low-level, voluntary European standard (CEN workshop agreement).

Through this process, MRs were developed for each of the FarFish case studies. Following are brief summaries detailing the challenges, OTs and outcomes.

FARFISH MANAGEMENT RECOMMENDATIONS CASE STUDY 1

Mixed fisheries in the Southwest Atlantic high seas – Issues with regional governance

The case study of the Southwest Atlantic high seas consists in one of few areas of international waters where no Regional Fisheries Management Organization (RFMO) is overseeing the activity. The international mixed fisheries in FAO Area 41, in the subareas 41.3.1 and 41.3.2, at the part of the Patagonian shelf and slope (< 300 m) that extends beyond the Argentina EEZ and the Falkland/Malvinas Islands Outer Conservation Zone. The lack of a Regional Fisheries Organization acting as a key body responsible for managing fisheries makes the coexistence of international fleets within the area difficult. Especially due to the little to no dialogue or exchange of information between the different fishing nations/authorities operating in this area, due to the unresolved controversy with Falkland/Malvinas FPZ between Argentina and United Kingdom. This longstanding issue constitutes a main challenge in terms of fisheries governance in an area with different levels of regulation and monitoring, control, and surveillance (MCS) of the various flag states, and a lack of a shared scientific knowledge base for the regulation of targeted species.

Key challenges

1. Lack of level playing field
2. Data availability
3. Insufficient monitoring, control, and surveillance

Objectives

1. Initiate dialogue between stakeholders involved in mixed fisheries within FAO area 41.
2. Improve the quality and quantity of data collection.
3. Compile knowledge of the straddling stocks from the different scientific institutions.
4. Contribute to better monitoring in the area by supporting enforcement through the utilization of the latest available satellite systems and tools.

Results of the MR process

Management objectives

Contribute to a level playing field for international fleets involved in the fisheries in the ASW high seas

Outcome Target

OT 1.1 A soft-law mechanism (International Conference) focused on sustainable management in ABNJ (FAO area 41) available.

.....
Contribute to improved fishing and conservation through monitoring, control, and surveillance mechanisms

OT 1.2 All vessel transmitting AIS signals

.....
Contribute to improved fishing and conservation through monitoring, control, and surveillance mechanisms

OT 1.3: Theoretical frame for a specific control and inspection programme in FAO area 41 as a basis for a future pilot project on a joint deployment plan for this region

Outcomes

A workshop arranged for this CS under the title “Bringing fisheries sustainability into the High Seas: the case of the Southwest Atlantic (FAO area 41)” was held in Madrid, in September 2019. The workshop brought together international experts and representatives from the fishing industry, policy-makers, international institutions, and FarFish partners. A result of this workshop the international conference “Sustainable fisheries management in the Southwest: a scientific approach” was held on March 4th, 2021. This conference aims to be embedded in the current International Ocean Governance Agenda of the European Commission. The big-data analysis done in this region proved the value of remote sensing when comparing independent sources to add transparency and support compliance of the different fleets in vast and distant areas of the sea (Ruiz et al., 2019). Also, the development of a pilot project on a joint deployment plan for this region was considered a step in the right direction. Although some of the objectives set for this case study could not be achieved in the lifetime of the project, some important advancements towards key objectives were made.

FARFISH MANAGEMENT RECOMMENDATIONS CASE STUDY 2

Mixed fisheries in the Southeast Atlantic high seas – Theoretical implementation of RBM

The SEAFO Convention area is covered by the high seas area beyond the EEZ of Angola, Namibia, South Africa and the United Kingdom on behalf of St. Helena and its dependencies of Tristan de Cunha and Ascension Island. The contracting parties to SEAFO are Angola, the EU, Japan, Namibia, Norway, South Africa and South Korea. As stated in the second MR invitation presented by the authority representative in Deliverable 3.6 (Viðarsson et al., 2020), very limited fishing activity is conducted in waters beyond areas of national jurisdiction within the FAO Area 47 (under the jurisdiction of SEAFO). Most of the area is deep sea (>2000 m) with some seamounts, where limited fisheries are taking place. This limited fishing activity is mostly conducted within two subareas B1 and D1. Only two Spanish vessels have showed some activity in 2017, but no catches were reported. Other fleets operating in the SEAFO CA in that same year were Japan and Namibia

Key challenges

1. Data availability
2. Insufficient monitoring of the fishery

Objectives

1. Improve data quality and quantity.
2. Advance biological knowledge in the SEAFO area.
3. Contribute to better monitoring in the area by supporting enforcement through the utilization of the latest available satellite systems and tools

Results of the MR process

Management objectives

Improve the knowledge base for sustainable fisheries management.

Support the fishing against IUU fisheries by utilizing the latest available satellite system and tool

Ensure compliance by observer program

Outcome Target

OT 2.1: Reporting of all catches via e-logbooks

OT 2.2: All vessels transmit AIS or VMS signals

OT 2.3: All vessels have onboard observers

Outcomes

The Outcome Targets (OTs) identified in this case study are developed at a “theoretical” level, where the MR2 serves as a good practice guideline for well-functioning RFMO to implement in the event of the fisheries activity would resume. Focus was given to reporting, data availability and increased coverage of the observer program.

FARFISH MANAGEMENT RECOMMENDATIONS CASE STUDY 3

Tuna fisheries through SFPA in Cape Verde

– Issues with coordination with other national institutes for data sharing

The SFPA between EU and Cape Verde concerns the highly migratory species of tuna (yellowfin, skipjack, and bigeye), blue shark and swordfish. Up to 69 EU vessels (28 purse seiners, 27 surface long liners, 14 pole-and- line vessels) apply for licence to fish for tuna and tuna like (highly migratory) species under the agreement, at a reference tonnage of 8,000 tonnes per year in the period 2019– 2024 (COUNCIL REGULATION (EU) 2019/ 952, 2019). Two specific management goals were set within the RBM. First, to strive for sustainable fisheries based on best scientific advice and second, by supporting the fight against IUU fisheries. The most relevant challenges to be addressed through the RBM were the high uncertainty in data collection, insufficient control and monitoring in the Cape Verde EEZ. Within the RBM, the administration representatives define the management objectives and then, the operators are given the responsibility to develop a strategy to achieve them in the management recommendation.

Key challenges

1. High level of uncertainty in data collection
2. Insufficient control and monitoring in the Cape Verde EEZ
3. Data flow in terms of discrepancies in the data reported to ICCAT by Cape Verde and the EU (DG MARE) on the catch, bycatch, and discards taken by EU vessels in Cape Verde

Objectives

1. In conformity with ICCAT, collect and analyse data on catches of swordfish and bycatches of blue shark by the EU fleet in the Cape Verde EEZ, if the data is available. If sufficient data is accessible, model scenarios, which may add value to development of HCR for these bycatch species.
2. Contribute to better monitoring in the area by supporting enforcement by utilizing latest available satellite systems and tools.

Results of the MR process

Management objectives

Improve data collection in conformity with ICCAT on directed catch and bycatch of swordfish and blue shark

Outcome Target

OT 3.1 A harmonized catch data protocol in place that facilitates improved reporting of swordfish and blue shark commercial and biological data

Support the fight against IUU fishing by utilizing the latest available satellite systems and tools.

OT 3.2 All vessels transmit AIS and/or VMS signals

Improve the use of observer data and feed it into stock assessment in the context of ICCAT

OT 3.3 Strengthened observer program in place

Improve knowledge in the value chain, processing, and market conditions

OT 3.4 Trade flow data from operators provided

Outcomes

The harmonised protocol for catch and bycatch reporting advanced well within the project, yet implementation by relevant authorities was not possible within the lifetime of the project. Yet, it was reported that ICCAT is working on harmonising data collection from tuna fisheries (logbook templates) and working towards implementing existing proposals. In this case, the lack of data to conduct the compliance analysis for OT 3.2 hindering the development of the action. The data was not available due to protocol restrictions by the compliance authorities. Other actions such as those for OT3.3 for strengthening the observer's program were also completed to a large extent, yet implementation was not possible due to the lack of a provision for the observer program in the national legislation.

FARFISH MANAGEMENT RECOMMENDATIONS CASE STUDY 4

Mixed fisheries through SFPA in Senegal: Regional scope

Developing a case study covering all the species targeted by the EU fleet within Senegalese EEZ was considered unattainable within the FarFish project. Therefore, the case study leader was asked to prioritize which fishery to address, based on the main challenges and the ability of FarFish to contribute. Consequently, the black hake fishery was selected. A deciding factor for this selection was that ICCAT is believed to be assessing and managing the tuna fishery well, whilst the black hake fishery is presented with more challenges. Therefore, the case of Senegal focuses on the EU Fishery for deep-sea demersal fishery targeting mainly black hake in the Senegalese EEZ. The black hake fishery targets two different species, Tropical African hake (*Merluccius polli*) and Senegalese hake (*Merluccius senegalensis*). The MR developed through the RBM aims to tackle the lack of knowledge about the proportion of the two species caught in Senegalese waters and the bycatch species in this fishery. Also, within the RBM, another goal set was to improve MCS in the area by utilizing the latest available satellite systems and tools and utilize onboard observers more efficiently. Knowledge in trade flows and value chain was also expected.

Key challenges

1. Insufficient availability/reporting of bycatch data in the black hake fisheries
2. Data limitation for sustainable conservation and separate stock assessment of black hake
3. Insufficient monitoring of the fishery

Objectives

1. Develop a process that will enable species discrimination and identification for stock assessment
2. Improve MCS through the use latest satellite tools
3. Better utilize onboard observers

Results of the MR process

Management objectives

Enhance data collection for species identification of black hake in catches

Outcome Target

OT 4.1 Information on the proportion of the two species of black hake in catches provided

Enhance data collection for species identification of black hake in catches

OT 4.2 Bycatch data in black hake fishery available

Support the fight against IUU fishing by utilizing the latest available satellite systems and different kinds of electronic devices, like AIS and VMS

OT 4.3 VMS and/or AIS signals are transmitted

Improve knowledge in the value chain, processing, and market conditions

OT 4.4 Trade flow data on black hake provided

Outcomes

The OT 4.1 about information on the proportion of the two species of black hake in catches reports extensive and effective work towards achieving the target. The OT has been successfully implemented, achieving broader participation than just the EU fleet. Few actions are pending, one of which is the feedback on the results of the self-sampling program. The OT 4.2 in terms of by-catch data reporting, presents important advancements that are likely to be implemented by the relevant authorities even after the project's end. Some critical actions are still to be taken, the MR2 proposes a roadmap for achieving the target. For the OT 4.3, critical issues with data availability were found, although they were tackled through the provision of documentation by the research institute IS-RA-CRODT, which allowed for the analysis to move forward. Some actions are still pending to achieve the OT. Finally, work towards achieving the OT4.4. on trade flow data is well advanced and the final report is expected within the lifetime of the FarFish project.

FARFISH MANAGEMENT RECOMMENDATIONS CASE STUDY 5

Mixed fisheries through SFPA in Mauritania – Issues with balance of power and participation

The SFPA between the EU and Mauritania handles mixed fisheries including shrimp, demersal fish, tuna, and small pelagic fish up to 287.050 tonnes per year. Octopus is exclusively reserved for national artisanal fishers. The SFPA with Mauritania is the most expensive agreement the EU has with a coastal state. Europeans pay Mauritania a financial contribution of EUR 61,625,000 per year in the form of royalties. EUR 4,125,000 is earmarked to support local fishing communities in Mauritania and improve fisheries governance. Within the RB process, the developed MR aims to improve the quality of the current stock assessment for the species included in the SFPA and strive to provide information on the proportion of the two species of black hake in catches and bycatch. The aims for the different species are:

- Black hake: Improved discrimination between the two hake species and value chain analysis to explore alternatives for increasing the importance of the black hake for national economy and employment.
- Small pelagic: The small pelagic within the Mauritanian EEZ are vulnerable to environmental forces, which need to be further studied. There are also uncertainties around stock assessment and catch reporting/estimates that make this fishery highly relevant for FarFish. In addition, there have been recent significant changes in the value chain of small pelagics caught in Mauritanian waters that need to be studied, as, e.g., fishmeal plants have been established in considerable numbers.

Key challenges

1. Lack of a level playing field where all operators oblige to the same rules
2. Divergent conversion factors used in logbooks to obtain live weight
3. Data limitation for sustainable conservation and separate stock assessment of black hake
4. High bycatch of black hake in non-hake fisheries
5. Bycatch in black hake fisheries
6. Insufficient monitoring of catch in relation to the TAC

Objectives

1. Improve the quality of the stock assessment for the species included in the SFPA
2. Provide information on the proportion of the two species of black hake in catches and bycatch

Results of the MR process

Management objectives

Improve the quality of the current stock assessment for the species included in the agreement

Improve the quality of the current stock assessment for the species included in the agreement

Increase and improve the data collection on bycatch and discard from high-capacity pelagic vessels

Gathering available fisheries data for catches, discards, and bycatches

Improve knowledge in the value chain, processing, and market conditions

Outcome Target

OT 5.1: Information on the proportion of the two species of black hake in catches provided

OT 5.2: Information on black hake caught as bycatch provided

OT 5.3: Increased onboard observer coverage on all high-capacity pelagic vessels in place

OT 5.4: Data on all catches, discards and bycatches provided

OT 5.5: Trade flow data on small pelagic species provided

Outcomes

The developments from MR1 to MR2 reflect the interests of the involved operators. Some limitations were found in terms of participation, which hindered better implementation of some of the actions. The OT 5.1 about information on the proportion of the two species of black hake in catches has great potential for the implementation of a more regional approach in the management of the black hake stocks. Although the action is well advanced, the good performance in the Senegalese CS could be replicated in the Mauritanian CS, where broader participation could render important advancements. The OT 5.2 is also dependent on participation. Most of the resources to conduct the action have been developed in FarFish could be implemented, yet the non-EU fleet is outside of the scope of the project. For the OT 5.3, important advancements have been reported. However, lack of data is a critical challenge, and additional efforts to collaborate with the local authorities are needed to attain this goal. The OT 5.4 rendered important advancements in terms of data collection and evidenced the importance of collaborating at regional level, considering the data was analysed in Morocco. Challenges towards obtaining by-catch data remain. Additional efforts are needed towards increasing monitoring and data collection, which relates to OT 5.3. Finally, work towards achieving the OT 5.5 on trade flow data is well advanced and the final report is expected within the lifetime of the FarFish project.

FARFISH MANAGEMENT RECOMMENDATIONS CASE STUDY 6

Tuna fisheries through SFPA in Seychelles – Issues with participation

With the development of industrial tuna fisheries in the Western Indian Ocean, Seychelles has progressed considerably over the last three decades. It is a regional hub and hosts the IOTC. Although industrial fisheries are a major pillar of the economy, artisanal fisheries remain of great importance for food security, employment, and cultural identity. Revenue and capacity building generated by the industrial fisheries sub-sector has supported significant national investment in developing and managing artisanal fisheries. The two sub-sectors have complemented each other well.

Within the RBM the main goal was established to strengthen data collection to promote sustainable fisheries and reinforce monitoring, control, and surveillance (MCS). The subsequent OTs are related to support data standardisation of fisheries information systems, enhancing data collection on non-target species and, improving MCS tools to strengthen compliance.

Key challenges

1. Marine protected area
2. Lack of data to undertake a stock assessment of bycatch species
3. Status of MCS in the Seychelles EEZ
 - a. Vessel monitoring system (VMA)
 - b. Automatic identification system (AIS)
 - c. Observers
 - d. Catch data reporting
4. Lack of transparency
5. Limited knowledge of ecological and economic effects of DFADs

Objectives

1. Harmonising the fisheries information system by producing a report on all relevant data protocols for the EU fleet fishing under the SFPA agreement and creating a standardised fisheries information system.
2. Developing a template for a catch reporting protocol for non-target species to be implemented in e-logbooks.
3. Contributing to better monitoring, control, and surveillance (MCS) in the area by supporting the enforcement by utilising the latest available satellite systems and tools.

Results of the MR process

Management objectives

Improving the scientific knowledge base for the fisheries management

Improving the scientific knowledge base for the fisheries management

Enhance a level playing field where all fleets comply by the commitment to honour Marine Protected Areas (MPAs)

Support the fight against IUU fishing by utilizing the latest available satellite system and tools

Improve knowledge in the value chain, processing, and market conditions

Support the fight against IUU fishing by utilizing the latest satellite systems and tools

Outcome Target

OT 6.1 Harmonised fisheries information system in place

OT 6.2 Catches of non-target species registered in e-logbooks

OT 6.3 MPAs and no-take zones identified in the SMSP are respected

OT 6.4 Updated observer program in place

OT 6.5 Trade flow data provided

OT 6.6 VMS or AIS signals are transmitted

Outcomes

The outcome targets are not finalised, and some further action will take place within the lifetime of FarFish for some OTs and others must be brought further by relevant FarFish partners beyond the lifetime of the project. At a practical level the OTs and related indicators only reached low level of achievement. Part of the result was a result of the high ambition of the OTs and indicators, which could not be achieved by the FarFish partners. Some also should be ascribed the audit framework itself. All in all, a lot of good initiatives have been taken place and some might at a later stage be taken up by relevant actors at a national and potentially also, at the regional level.

FarFish's European voluntary CEN standard

One of many FarFish project outputs is the development of a European voluntary CEN standard that will be published as a CEN Workshop Agreement (CWA) after the end of the project, after going through an open CEN process. The focus of this standard is to provide guidelines for the development of so-called Management Recommendations for the EU fleet operating outside EU waters, which have been in development in the FarFish project over the past four years. The standard contains good practice guidelines on how to develop Management Recommendations (MRs) for EU fleets operating outside European waters. This document is built on the experience of developing MRs within the FarFish project and lessons learned. therefore, building on the development and implementation of the MR framework in FarFish.

Creating Management Recommendations means following a framework where the operators themselves are given new management responsibilities. They become directly involved in the management and decision-making process of the fishery in question, as they are given the responsibility to develop strategies to reach specific fisheries management objectives set by the relevant authorities.



The CEN process for developing the CWA standard is a 1 ½ year process. During this time, FarFish researchers have, in cooperation with the stakeholders that are voluntarily participating in the process, developed a final version of the guidelines through numerous physical and online meetings. Draft versions of the standard were made publicly available on two occasions during the process, calling for feedback from stakeholders.

The first draft guidelines were made public in September 2020 and were then subjected to a public review and commenting phase that lasted for two months. The guidelines were then further developed, taking the received comments into account. The second draft version was made available for public review in August 2021, with a commenting phase lasting for one month. After the final public commenting phase, feedback was used to create the third draft version, which will be transferred into final CWA at a consensus meeting that is planned in November 2021.



FarFish governance and value chain analysis

FarFish analysed the governance structures in the case studies and provided recommendations for improvement. The project also delivered value chain analysis for each of the case studies, identified investment opportunities and published policy briefs on value chain improvements. Several of these results will be published as peer-reviewed journal papers.

FarFish governance analysis

Ingrid Kvalvik, Nofima

FarFish has analysed the development of the monitoring, control and surveillance (MCS) of the EU fisheries access agreements, from the 1980's until today. The EU's own evaluations show a need for improved monitoring and control of its external fishing fleet. Still, since the adoption of the first bilateral access agreements, the provisions on MCS have been substantially strengthened. There are however implementation challenges.

The trend is that for each renegotiation of a fisheries access agreement, what is now SFPAs, new and improved MCS requirements are introduced. They generally follow the development in the Common Fisheries Policy (CFP) and the regulations on the external dimension of the EU fishing fleet. In some cases, they even precede the EU regulations. A major change occurred with the introduction of FPAs (Fisheries Partnership Agreements) in the 2002 reform of the CFP. The agreements and protocols negotiated after this clearly reflect new governing ideas and a commitment to better monitor this fleet. The EU is also becoming more and more engaged in the partner countries, illustrated by the increased importance of the Joint Committees, the introduction of the sectoral support and multiannual sectoral programs.

Even though there is a positive development in the MSC requirements in the agreements, the implementation of new requirements is often slow and sometimes difficult to achieve. Requirements in line with modern MCS standards are not always implemented. Even though it sometimes takes several protocols from when a new MCS requirement

is first introduced until it is implemented, it might not be implemented. Sometimes there is a natural delay in implementation of new policies where the agreements and protocols remain under the framework of earlier CFPs until they are re-negotiated. Other times there are other factors affecting the level of implementation. There is a lack of resources in the partner countries in all the four SFPAs countries studied in FarFish, both with regards to manpower and technical resources and infrastructure. The capacity with regards to technical resources are limited either by lack of proper equipment or lack of funding to maintain it properly, like limited capacity to operate and keep patrol vessels and aircrafts in operational condition. Electronic monitoring and reporting stand out as a particular challenging area. Both VMS and ERS are required in all the protocols but are not easily implemented. Catch reporting to a high degree still relies on manual logbooks. For instance, the VMS of the EU vessels is not always compatible with the technical solutions in the coastal state. There is also a general lack of resources to analyse and verify catch data received from the EU fleet. It is difficult to assess whether the physical controls of the EU-vessels are adequate or not as it is difficult to collect data on frequency of inspections and the control coverage. In general, the coastal state focus is centred around the national fishing fleets. The coastal states control of EU catches is considerably better when the catches are landed or transhipped in a port of the said coastal state.

When MCS requirements are not implemented they may end up as paper-regulations, which over time will undermine the credibility, and sustainability, of the access agreements. However, our study shows that gradual and slow implementation of the EU policy might be a viable approach and a way for the EU to implement its external fisheries policy, in particular when accompanied with capacity building initiatives and increased cooperation.



FarFish tuna value chain analysis

Øystein Hermansen, Nofima and Gregoire Tournon-Gardic, University of Portsmouth

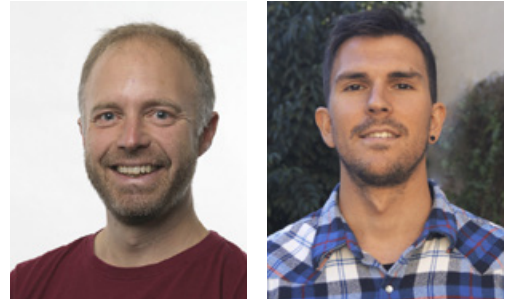
Favourable environmental conditions and large migrations of tropical tunas yield highly attractive fisheries within the coastal zones of several developing nations. Hence the EU negotiates SFPAs agreements for its fleets and, together with vessel owners, pay compensation and contributes to fisheries management improvement projects. Such agreements are especially important in west-African countries and around the Indian Ocean. These agreements are important for EU vessels, as about 40% of the tuna caught in the central east Atlantic area stem from these fisheries, supporting primarily about 20 purse seiners and 10 pole-and-line vessels.

Some important agreements have been discontinued recently and there have been changes in fish stocks, both of which have had economic implications for the EU fleet. Catch composition has also changed, with less of the most valuable yellowfin and decreased fish size, further reducing the value from these fisheries. Shipowners are vulnerable to restrictions and policy changes, although they do generally believe that it also brings stability, compared to the sometimes volatile regulatory regimes of the countries in which they fish. European pole-and-line vessels based in Dakar cannot fish their own live bait near Dakar any longer, and need to obtain this further away, which implies additional time and costs. Several pole-and-line vessels have already left the area.

The tuna fisheries are the first step in a complex and globe-spanning value chain. Tuna is generally landed close to the fishing area. Some is processed at nearby large canneries, but a large share is also traded and transported to processors elsewhere, using reefers and container ships. Processing plants are placed in various countries, including SFPAs partners such as Cote d'Ivoire, Ghana, Senegal, and Cabo Verde, in an attempt to optimise economics, including saving on labour costs and taking advantage of preferential tariff agreements. Some processing plants are also placed within the EU.

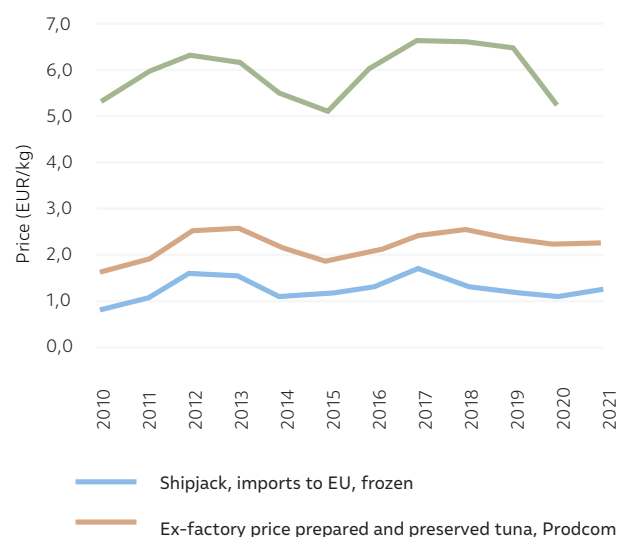
The organisation of value chains is diverse. Some have a very high degree of vertical integration – owning fishing vessels, through logistics all the way to own brands distributed in supermarkets. Others are independent operators at only one stage of the value chain. To further rationalise economics, a trade in intermediary products such as pre-cooked loins has developed. This saves on labour intensive loining and transport costs.

The direct and indirect impact of the SFPAs is difficult to assess, as the counterfactual is hard to establish. However, the



payments from the EU to host nations do contribute to the national economy and initiates many development projects. Perhaps most importantly, the tuna processing industry has become a large employer in many countries, for instance the Frescomar cannery, which is the largest employer in Cabo Verde. Women also constitute the majority of the workforce. EU vessels are usually obliged to hire local crew. The tuna fisheries also support a large processing industry with high levels of employment within the EU.

The FarFish studies have highlighted how the tuna SFPAs activities are part of a very large and integrated market for tuna, spanning large parts of the globe. In such a mature industry, it is difficult to identify clear value adding opportunities. SFPAs are important for the EU tuna fleets as they increase efficiency, although some important factors have had negative impact on profits. In some of the countries with SFPAs with the EU, the tuna activity contributes strongly to employment, although a large share of catches is transported from the area and processed in the EU. This provides both employment and value adding for the EU.



The Hake puzzle: Hake fisheries in the Southwest Atlantic

Sveinn Agnarsson and Juliana Arias Hansen, Sjókovin

The Argentine hake (*Merluccius hubbsi*) fishery is one of the most important in the Southwest Atlantic Ocean (FAO 41). Spain is the largest hake producer in Europe and in the last decade, the Spanish hake market has become increasingly dependent on Argentine hake.

Most of the Argentine hake processed and sold in Spain is harvested from the Patagonian stock which is a straddling stock found within the Argentinian EEZ, in waters under British domain around the Falkland/Malvinas Islands and in the high seas. The Patagonian stock is the largest hake stock in the region but has been overexploited although with recent signs of recovery (Melnichuk et al., 2020, Santos and Villarino, 2020).

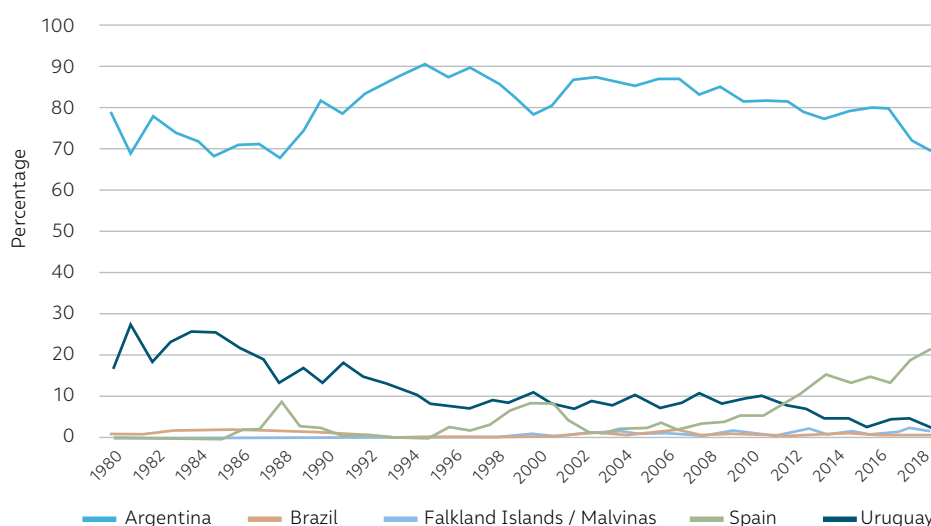
Yet, lack of cooperation for a more coordinated management of this stock creates uncertainty about the future sustainability of the Patagonian stock and the Argentine hake fishery in general (Godelman, 2021). Management of the Patagonian stock fishery is hampered by the fact that the high-seas fishing is neither governed by international agreements nor a RFMO. In 2005, Argentina withdrew from the South Atlantic Fisheries Commission which was established in 1990 and since then vessels fishing in the high seas have only been subject to regulation by their respective flag states or EU regulation. Some conservation measures have also been introduced in the area. No fishery for Argentine hake has been MSC-certified which puts Argentine hake harvesters in disadvantaged position as the main rivals on the European market all hold MSC-certifications. Meeting the necessary conditions for MSC certification will require the establishment of an effective management and governance



system for the Argentine hake Patagonian stock fishery.

Supply of Argentine hake is likely to diminish in the next years. As the hake stocks are still being fished at unsustainable levels, catches must be curtailed if the stocks are to be managed sustainably. Such a decrease will most likely occur regardless of whether the states involved apply for MSC-certification or not. Without internationally acknowledged certification, producers of Argentine hake may also find their market access reduced. Reduced supply of Argentine hake will affect the Spanish value-chain for hake, as turnover will probably decrease, and some loss of jobs occur. The effect on prices is more uncertain. Demand for hake in Spanish market has been decreasing, both because of demographic changes and higher prices, and it is therefore not clear how the interplay of decreased demand and supply will affect market prices.

The FarFish project has brought light to this situation with the aim of adding market-driven knowledge to the potential dialogues leading to the advancement towards adequate fisheries management in the Southwest Atlantic high seas.

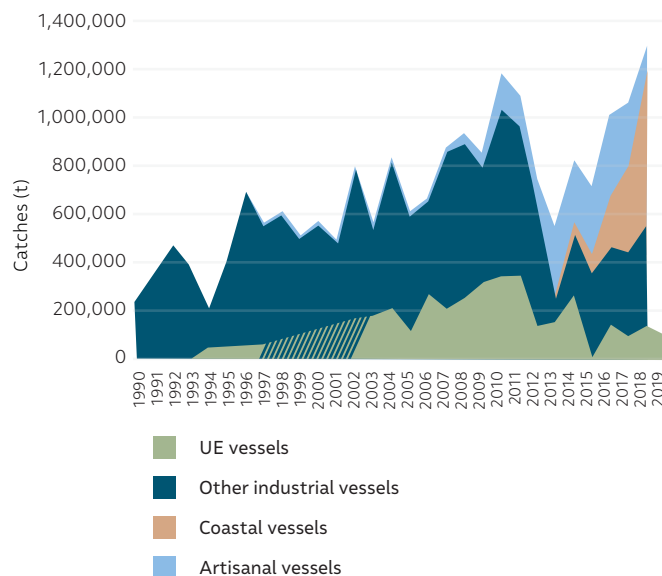


Relative share of Argentina, Brazil, the Falkland Islands/Malvinas, Spain and Uruguay in the Argentine hake fishery in FAO area 41 during 1980-2019. Percentages. Source: FAO. 2020a. Fishery and Aquaculture Statistics. World production database for capture fisheries 1950-2018 (FishstatJ)

Small Pelagics in Mauritania, a quick look

Gregoire Tournon-Gardic, University of Portsmouth

Small pelagics are the most imported fish by Gulf of Guinea countries. Some countries like Nigeria, Ghana and the Ivory Coast consume far more fish than their national production can support. As a result, imports into the ECOWAS region amount to two million tonnes annually. At the same time, the coastal waters of West Africa benefit from particularly productive conditions (more than 2 million exploitable tonnes of small pelagics), owing to the great current of the Canaries, with a dominance in Mauritania and Morocco. Historically, artisanal fleets captured only a small part of the total catches, the remaining part being fished by Soviet and then Dutch industrial fleets and subsidiaries (see next figure about catches in Mauritania).

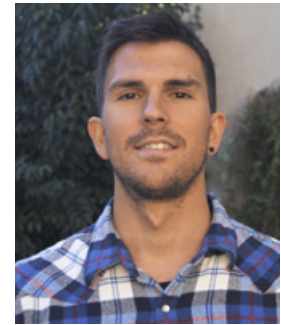


Small pelagics catches in Mauritania

While Soviet (then ex-Soviet) vessels primarily supplied Baltic countries and Russia, with Africa as a less important destination, Dutch ships quickly supplied African countries of the Gulf of Guinea. Small pelagics are processed and frozen on board, then stored in 10 kg frozen blocks, with three blocks per box. These boxes are then landed or transhipped in the ports of the region (Nouadhibou mainly, as catches in Mauritania are mandatorily landed in the country), before being distributed. In the countries of the Gulf of Guinea, wholesalers - including the famous "Big mammas" - buy small numbers of boxes in the ports and sell them in the local markets. Some Dutch companies have infrastructures (factory, cold stores) in some countries (Mauritania, Ghana, etc.), where they supply saleswomen more directly.

The number of industrial vessels active in Mauritanian waters has decreased since the early 1990s. Access restrictions

(fishing areas located further from the coast), as well as increasingly expensive licenses have discouraged some vessels. Currently, around forty large trawlers (sometimes over 100 m long) are fishing in Mauritania, including around ten vessels under European flags. The latter belong to two large groups: the "PFA" association (or Pelagic Freezer-Trawler Association), made up of several large Dutch companies (Cornelis Vrolijk, Parlevliet & Van der Plas, Van der Zwan & Zonen) and their subsidiaries (with German and Lithuanian flags), and the "Baltreids" group, named after the Latvian company, that supplies the Baltic and Russian markets. However, vessels under European flags are only a small part of these companies' fleets; they own other vessels with various non-EU flags.



The fishing restrictions were generated by Mauritanian authorities because the government wanted the local sector to develop. Consequently, many authorisations for setting up fishmeal plants were given. These factories prepare fishmeal for Asian aquaculture consumption, and oil for cosmetic products (especially in Europe). These factories only do little to favour local sectors as they often rely on foreign investments, while the number of jobs generated is very low compared to processing sectors for human consumption. Above all, the rapid development of the fishmeal industry resulted in huge fishing pressure on small pelagic resources (600,000 tonnes caught in 2018 for the fishmeal plants). These fishes are therefore being removed from the previous supply for human consumption in Africa.

As a result, Dutch and German "PFA" vessels now target sardines, which are situated more offshore, while their Lithuanian subsidiaries target horse mackerel. While horse mackerel continues to supply Gulf of Guinea countries, sardines are sent to canneries in South Africa, Brazil or elsewhere. Baltreids' vessels target mackerel and horse mackerel, mainly bound for Russia and Baltic countries. These flows, relatively low in comparison with previous fishing agreements, no longer supply the Gulf of Guinea markets directly.

The innovation brought by FarFish is to have comprehensively analysed the fishing industry by cross-checking various data sources (including exclusive institutional data) and by directly identifying and interviewing the operators involved.

Results based management in practice: Lessons learnt and policy recommendations from the implementation of RBM principles

Juliana Arias Hansen, Sjókovin

The results-based management (RBM) concept was introduced in the reform to the Common Fisheries Management (CFP) in 2009 in the so-called Green Paper. The RBM was envisioned to reduce complexities in fisheries management and reverse the burden of proof, allowing the industry to demonstrate that it operates responsibly in return for access to fishing rights (Commission of the European Communities, 2009). The RBM was conceptualized as a contract situation between the authorities, the operators and a third, independent evaluator party (Nielsen et al., 2015, 2017). The RBM was then operationalized within six different case studies (CS) within the FarFish project, involving two EU fisheries in the high seas in the Southwest and Southeast Atlantic respectively, and four under Sustainable Fisheries Partnership Agreements (SFPA) in Cape Verde, Senegal, Mauritania, and Seychelles. Relevant institutions and operators' representatives were involved in the implementation of the RBM approach. This trial allowed to experience in a structured manner, what sharing power and responsibility for managing the resource would look like. Authorities' and operators' representatives were able to engage in a process where they were both engaged into achieving targets that were perceived as common. The process underwent a continuous evaluation process that allowed for responsiveness and adaptation of the management measures. This experience rendered important lessons that allowed for the drawing of a set of policy recommendations for improving fisheries management through the implementation of the RBM approach.

As a pivotal factor for the success of the approach, participation was highlighted as the vertebral axis of the process. Ensuring meaningful and effective participation enabled the RBM process to render most advancements towards improved fisheries management. Effective and meaningful engagement and collaboration were only possible when participation was managed as a top priority. Absence of relevant bodies, sectors and fleet segments proved detriment throughout all cases. Also, the structured dialogue process as well as planned evaluations and iterations of the RBM contract enabled responsiveness, adaptation, and continuous improvement of the management process. Additional lessons were drawn on the importance of scoping,

goal setting and timing of the actions, as well as managing realistic expectations of the goals set within the RBM. Data availability and accountability was also a major highlight, considering that in cases where cooperation succeeded, data was made available, and knowledge therefore was expanded and enriched.



Following these results, a set of three policy recommendations areas were identified for the improvement of the fisheries management through the adoption of RBM for EU vessels fishing in international- and SFPA waters. First "Participation and stakeholder involvement are top priorities" within this section the identification of the right parts was described, followed by additional recommendation on ensuring effective participation, as well as manage participation within the RBM process and building trust and incentive to responsible fisheries through collaboration. The second area was identified as "Adequate scoping of legal framework and the role of the authorities" including the scoping of the legal framework, identification of common goals through dialogue, management of expectations, involvement of all relevant authorities and ensuring responsiveness and adaptation through multiple iterations. The third and final policy recommendation area was categorized as "Give priority to transparency – A data management policy that enables data sharing for building knowledge", which included reporting and data availability, ensuring continuity through collaboration and broaden the scope to other actors in fisheries, such as the processing and commercialization sectors.



Communicating Globally: FarFish conferences and workshops

Communication, outreach and dissemination was a key focus throughout the project. FarFish set out to ensure a high level of stakeholder interactions throughout the project's lifetime and, where needed, to connect key players and initiate dialogues where needed, to pave the way for improved fisheries management in international waters and other non-EU waters targeted by the EU long distance fleet. While putting emphasis on stakeholder interactions through various platforms, and project dissemination through social media, the FarFish website and regular newsletters, FarFish also hosted various exciting events, conferences and workshops. Let's have a closer look at some of the highlights.

Sustainable Fisheries in SW Atlantic: A scientific approach

Alexandre Rodríguez, LDAC

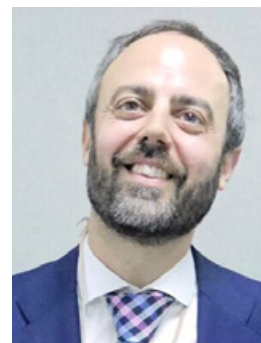
The SW Atlantic (FAO41) is one of the six case studies examined in the FarFish project.

An international conference on sustainable fisheries in the Southwest Atlantic took place online on 4 March 2021 hosted by CETMAR and the LDAC within the auspices of FarFish project. This initiative was the outcome of a workshop organised in 2019 titled 'Bringing fisheries sustainability into the High Seas: the case of the Southwest Atlantic (FAO41)'.

This event was attended by near 150 key stakeholders from 25 countries, including Brazil, Argentina, Falkland Islands, Spain and Portugal. Its aim was to bring together fisheries scientists, policymakers including national administrations and international organisations (including FAO, EFCA, DG MARE), fleet operators, and other stakeholders interested to present and discuss scientific knowledge of key commercial stocks and to highlight the status and management challenges in these waters.

The conference was organised in three thematic sessions on science, management and control. It was discussed how recent scientific initiatives, findings, and international collaborations help to enhance our understanding of the biological and environmental status of these waters. It also provided examples of governmental, industry and NGO initiatives on how to promote compliance of conservation and management practices through data reporting and electronic monitoring. A record of the videos with the presentations from invited speakers as well as a summary report and action plan with key priorities and needs for the region can be downloaded here: <https://www.farfish.eu/international-conference/>

This forum was particularly useful to gain a better understanding of the evolution of the activities of the long-distance fleets operating in the area (in terms of nationality, gear, target species, capacity and fishing effort) and identify key challenges, knowledge gaps, and needs within SW Atlantic fisheries management. It also reported on progress and methodology for the identification of vulnerable marine ecosystems (VMEs) by FAO and the EU in line with implementation of UN 61/105. A presentation was given on the pioneering work carried out by Spain-IEO on seabed mapping through the ATLANTIS projects.



THE EXTERNAL DIMENSION OF THE
COMMON FISHERIES POLICY:
PRESENT CHALLENGES AND FUTURE
OPPORTUNITIES
1st - 2nd June 2021



In terms of next steps, this event worked as a stakeholders' hub to set the basis for the creation of an international forum that facilitates technical, institutional, and scientific cooperation amongst key stakeholders on a periodic basis. In particular, there was a strong emphasis in moving towards a regional approach to underpin sustainable fisheries management in the area.

Building upon the recommendations and outcomes, FarFish continued working in 2021 on developing three areas of work: 1. Exploring and improving scientific collaboration between countries and institutions; 2. Promoting use of big-data systems and low range satellite systems as a support tool for monitoring, control and surveillance; 3. Carrying out a value chain analysis for the EU fleets fisheries to get an overview of the main socio-economic challenges within the region.



The External Dimension of the Common Fisheries Policy: present challenges and future opportunities

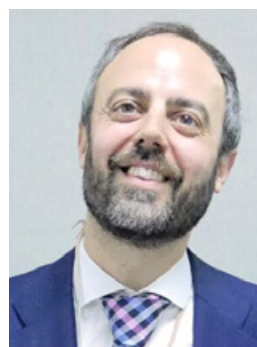
**Alexandre Rodríguez, LDAC
and Duarte F. Vidal CETMAR**

The EU has an enhanced responsibility to promote sustainable and responsible fisheries management in international waters, in its double role as a major player in the fishing value chain (catching, processing and trading) and as the largest single market for imported fisheries products in the world. The EU distant water fleet (representing near 15% of the landings of the EU in volume and value) operates within the legal framework of the External Dimension of the CFP, which includes conservation, management and control provisions on Sustainable Fisheries Partnership Agreements (SFPAs), Regional Fisheries Management Organisations (RFMOs) and management of the high seas. The international or “external” dimension of the CFP also has close links with the fight against IUU fishing and other EU sectoral policies other than trade such as cooperation for development, labour, human rights and health.

In order to deepen the knowledge on the External Dimension of the CFP and analyse its present challenges and future opportunities”, an International Conference was organised within the auspices of FarFish H2020 project. It was jointly organised by the EU Long Distance Fleet Advisory Council (LDAC) and CETMAR and took place on June 1st 2021. The aim of this event was twofold: (a) analyse the implementation of the External Dimension of the Common Fisheries Policy in force (CFP); and (b) explore how the external dimension can be a driver for positive change in the field of sustainable fisheries and governance in international waters for the next CFP.

During the two days, this online event gathered a number of high-level experts and key stakeholders from the fishing, industry and NGO sectors, together with policy makers, scientists and academics. The mix of panel discussions, visual presentations and interactive plenary sessions helped to reflect on the role of the EU in the fields of international fisheries management and ocean governance.

A number of specific objectives and recommendations were agreed for each day of the meeting, namely:



Day 1 – Perspectives of External Dimension and EU participation in RFMOs

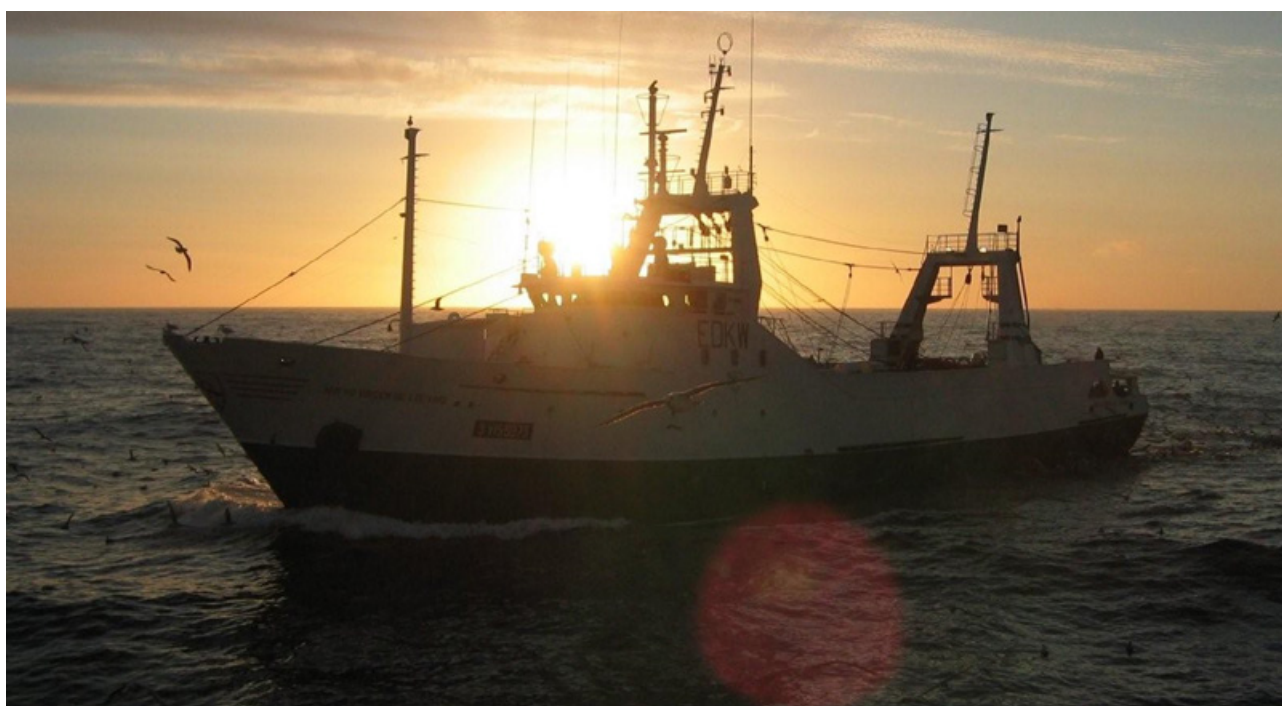
- Discuss the achievements and shortcomings of each of the constituent elements of the external dimension of the CFP.
- Propose measures for enhancing Europe’s role in the International Ocean and Fisheries Governance (in line with the EU Communication on IOG, Green Deal and UN Lisbon Agenda for 2030).
- Recommend ways to strengthen contributions and influence of the European Union in the preparatory work (i.e. technical, control and scientific committees) as well as plenary annual meetings of the Commission and Council of those RFMOs where the EU is a contracting party.
- Reflect on mechanisms to achieve sustainable management and conservation measures in international waters without the existence of RFMOs. This can only be achieved through effective adoption and implementation of international legal instruments related to maritime safety at sea to ensure level playing field among EU and non-EU operators; and carry out comprehensive environmental assessments covering cumulative impacts from all human induced economic activities and pressures in areas beyond national jurisdiction.

Day 2 – The value of SFPAs as an instrument for cooperation with third countries

- Promote the level playing field and the principle of non-discrimination
- Explore the adoption of a regional approach to strengthen collaboration
- Improve data collection, particularly on assessing impacts of fishing activity on marine ecosystems, fisheries and coastal communities

- Encourage an increased relevant stakeholder participation, including civil society, in all discussions and implementation processes
- Improve alignment of SFPAs with the coastal State's national strategies within a global and international framework to fit with the Sustainable Development Goals (SDGs) and European environmental requirements, complying with the Policy Coherence for Development (PCD)
- Strengthen the SFPAs evaluation processes incorporating the experience-based knowledge (EBK) and local institutions as the best approach to identify new indicators to efficiently address local challenges
- Improve EU policy coherence through the promotion of capacity building through the identification of training needs by coastal States and reinforcement into the SFPAs agreements and protocols
- SFPAs sectoral support is key to institutional capacity building if it is able to connect to real needs and interest from the partner coastal States
- Rethinking the financial structure at sectoral support execution, avoiding rigidity through the inclusion of flexibility mechanisms
- The promotion of initiatives for partnership between science and fishing industry are essential to generate entrust, bringing science to fishers
- Encourage networking between EU programmes and partnerships from the fisheries sector, also reinforcing cooperation with other DGs to ensure coherence and consistency

The main outcome of the conference was the formulation of a series of recommendations which served as basis for a policy briefing on this subject. This document (FarFish deliverable 1.4) was issued in July 2021 in the form of a written contribution from FarFish to the EU consultations on the CFP evaluation report which is expected to be launched in early 2022. It is a critical overview of the historical evolution of the CFP ED and an analysis of its building blocks (SFPAs, RFMOs and fight against IUU fishing) and how they can contribute to improve international fisheries governance. In order to disseminate these recommendations, a Policy Briefing digital booklet was developed and published on FarFish website, summarizing the content of D1.4. The booklet is expected to reach a wider audience than the original document (D1.4), therefore improving its impact.





Small Pelagics Workshop

Goal: To advance the knowledge on what impact is climate change having on small pelagic in the CECAF Area

Output: A Research Agenda with concrete actions

On June 29th 2021 experts from 13 organizations participated in FarFish's Workshop on Small pelagics and climate change in the CECAF area. Improving knowledge of the impacts that environmental factors have on key commercially important stocks in the region has become crucial. Researchers, managing authorities and the Joint Scientific Committees (JSCs) of the European Union's Sustainable Fisheries Partnerships Agreements (SPFAs), agree on the need to advance the current state of the art.

At the workshop, experts presented scientific knowledge concerning the need for ecosystem based management approaches in the CECAF area, recent results of regional climate change and ecosystem studies, as well as first conclusions from regional case studies that applied fisheries, climate and/or ecosystem models. Building on these findings and workshop discussions, workshop participants suggested key research priorities, formulated into a research agenda.

Acknowledging the number of research needs, the proposed research agenda emphasized the most urgent and feasible actions to improve and intensify fishery, ecological, biological and environmental data collection. If successfully implemented, the suggested actions will improve specific biological and wider ecological knowledge to better understand the behaviour, distribution and dynamics of small pelagic fish species and their availability to the fishing industry.

This action calls for **enhanced regional cooperation** on:

1. In-situ observations of trophic relationships (e.g. stomach sampling), habitat and other environmental monitoring,
2. Data exchange and sharing between the relevant scientific research institutes and bodies (including e.g. CECAF working groups, the EU SFPA's JSCs, Rafismer, etc.).
3. Participatory approaches for interdisciplinary scientific observations and data exchange and sharing. Significant advances can be obtained through increased cooperation across stakeholders and their engagement in research activities (including citizen science and community-driven research).

While existing data in the area is limited, science could already progress significantly if the existing data would be shared. An initial step could therefore be to initiate a platform or make use of an existing one where data can be shared. The hosting by a regional organization, geographically situated in a CECAF coastal state and the involvement of all partnering countries with the same and direct access are critical to ensure that the platform is accepted and used with a feeling of legitimacy and ownership, operational, and thus sustainable in the long term.

This first step needs to be complemented by the following:

- Jointly designing data-collection programs where data gaps exist (fishery, ecological, biological and environmental information) and participatory approaches (scientist and end-users, etc.).
- Designing a data-base framework to store the data collected in a standardized and transparent way, agreeing on mechanisms on how to exploit them for the benefit of science and to support fisheries management.
- Ensuring sustained communication between parties, promoting networking and scientific cooperation
- Investing in long-term interactions to build trust and commitment and to formalize the processes.

The challenges associated with these actions are considerable: the lack of resources and infrastructure, the size of the area to cover, the lack of communication between

the parties involved at the management level, the diverging views for how the data should be used, the reluctance to transparently share data, the regional disparities in terms of capacity, expertise and knowledge, the translation of science into policy advice to support decision making (institutional and human resources), etc. The solutions suggested are to enhanced regional cooperation, investing in strengthening existing mechanisms and building additional capacities where needed: sharing infrastructure (e.g. research vessels, computing facilities, etc.) and increasing trust and reliability (training personnel and providing means of employment in national and regional institutes). Regional ownership is crucial.

From a pragmatic approach, setting a solid baseline entails mapping the actors involved and design protocols for data collection, harmonization across data sets, how data flows to the system, how to access the data and who are the end-users of these data. Some initiatives such as Visualizing data flows and survey protocols (ICES) could be inspirational to address those questions, advancing towards a systematic approach suitable for the CECAF area.

The Workshop participants are committed to contribute to the implementation of these actions in their respective positions, facilitating cooperation and networking. Formalized and well-defined cooperation frameworks are essential to achieve this objective.



Conference on strengthening fisheries sustainability outside the EU

The FarFish project hosted a conference titled “Strengthening fisheries sustainability outside EU” in Vigo, 26th-27th of June 2018. The conference marked the official kick-off of the FarFish case studies, as scientists, authority representatives, fisheries operators and other stakeholders presented and discussed challenges related to the six FarFish case studies. The conference was well attended and provided excellent input to upcoming work in the FarFish project.

Representatives from each of the FarFish case studies participated in the conference, and there was an important input from authorities, operators and other stakeholders such as from DG MARE, EFCA, LDAC, the Chinese long-distance fleet, FAO, ARVI, ANFACO, ORPAGU, OPROMAR, DARE, DPSP and more. The discussions initiated at the conference proved extremely important for the progress of the project onward.

Jilong Li, representing the Chinese distant water fishing fleet, and Alexandre Rodriguez from the EU Long-distance advisory council (LDAC) provided important input to the discussions at the conference

Emmanuel Berck, deputy head of the DG MARE unit responsible for the Sustainable Partnership Agreements (SFPAs), gave an overview of the EU perspectives on SFPAs and high Seas fisheries, and provided important input to the conference.



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FarFish legacy and challenges ahead

The FarFish project has been an interesting and rewarding journey, with many challenges, successes and failures. FarFish is unique in comparison with most European research and innovation projects with respect to geographical coverage, multi-disciplinary, multi-cultural, multi-lingual, multi-time zone, multi-fleet, multi-stakeholder and multi-prioritisation considerations. Despite a global pandemic breaking out halfway through the project, FarFish has succeeded in bringing together researchers, policymakers, government representatives, fishing fleet representatives and other stakeholders to collaborate towards the common goal of improving sustainability and profitability within the FarFish case studies.

FarFish has provided new knowledge and networks, developed tools, approaches and methodologies, built professional competences and offered education, as well as policy and management recommendations. The challenge ahead is to facilitate the uptake and implementation of

these results and to continue with the work that FarFish has started. This requires a common effort from all stakeholders within high-seas and SFPA fisheries across the world.

Beyond the FarFish project, the governance and management of high-seas fisheries and SFPA fisheries is still faced with many challenges, as the need for improved cooperation, data collection and data access, transparency, monitoring, control and surveillance, governance and value chain improvements continue. The responsibility of the EU fleet to contribute to solving these challenges is significant, but to facilitate any tangible improvements, cooperation among all fleets and stakeholders is needed.

We believe that the legacy of FarFish will continue to have an impact for years to come and hope it will set an example for other long-distance fleets to follow, thereby contributing to sustainable fishing practices all over the world.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 727891

