-Report-

Welcome and housekeeping rules

The moderator Tamsin Rose welcomed in-person and on-line participants, introducing the seminar interaction tools (i.e. Slido) and asking the audience to indicate their origin and the stakeholders group represented. A broad audience from throughout Europe and abroad (e.g. South Africa, Hong Kong, Norway, Brazil) joined the seminar, comprising scientists (36%), policymakers (31%), civil society (20%), fisheries managers (11%) and fishers (3%).

Welcome (video recording) by Mr Virginijus Sinkevičius, European Commissioner for Environment, Oceans and Fisheries

Commissioner Sinkevičius welcomed the audience and emphasized that citizen science presents opportunities to address current challenges in terms of the growing demands on the scientific process, related to rapid environmental changes and the implementation of a more holistic ecosystem approach. He highlighted that citizen science could also address growing demands from stakeholders to be more involved with the implementation of the common fisheries policy (CFP).

[Transcript:

Ladies and Gentlemen,

Welcome to another edition of the Fisheries Science Seminar. Thank you for joining us today.

It's a pleasure to see that so many of you wanted to be part of this important discussion, whether in person or online.

The current climate crisis has been having major implications for the planet and our oceans. It has been driving unprecedented changes of the marine habitats and ecosystems. As a results, we find ourselves facing major challenges in trying to understand their impact on the status of the marine ecosystems.

Increasingly, stakeholders like yourselves talk about the need to better take into account the implications of ecosystem changes on the status of species we fish for.

This requires a more holistic approach, one with the stakeholders at its heart. One that captures the full potential of their participation, knowledge and aspirations.

For example, fishers have a great deal of knowledge and information that is not used enough. The information that fishers collect, could at the very least be useful in setting the context for scientific advice. And, as we will see today, if used properly, it could be incorporated to refine it.

So, the question we need to ask is - how can we fully harness the potential contribution of stakeholders. Create the conditions to get them engaged, while at the same time capturing the trends in the ecosystem?

As you are well aware, there are still persistent data gaps for many fish stocks. What we sometimes call data poor stocks. But to apply an ecosystem approach, we need even more data than we would for a more traditional management approach.

This is why stakeholders should play a growing role in the implementation of the common fisheries policy, including the possibility of contributing to the scientific process.

We urgently need to understand how to better harness the potential of the transdisciplinary approach, such as citizen science. How to use these opportunities to secure more data, while empowering stakeholders and increasing their participation in the scientific process.

In February this year, the Commission published its Action Plan[1] to protect and restore marine ecosystems promoting sustainable, science-based, innovative and inclusive fisheries management We also published the Communication on the CFP[2] which calls for strengthening the ecosystem-based approach through better science.

To implement both, we will need more and new data to ensure that management decision is well-informed. Certainly, this is an area where citizen science could make a useful contribution.

Of course, the most recent knowledge about citizen science indicates that there is no one-fits-all formula to fully benefit from it.

In addition, there are often misleading perceptions about citizen science, such as questioning the quality or relevance of the data collected.

Today you will hear that there are answers to these questions, so they should no longer be used as excuses for preventing a wider use of citizen science. Today you will also hear about the potential of marine citizen science, how the sector tackles the challenges and opportunities of using citizen science to improve the stock assessment, to increase knowledge on marine biodiversity, or to record the recreational catches.

These are only a handful of concrete examples to show how citizen science can have a greater hand in improving our understanding of the marine environment and informing our decisions.

Ladies and Gentlemen,

I hope that this seminar can generate wide and interesting discussions to feed into our reflections on how to increase the role of citizen science in supporting the CFP.

Thank you.]

[1] EUR-Lex - 52023DC0102 - EN - EUR-Lex (europa.eu)
[2] EUR-Lex - 52023DC0103 - EN - EUR-Lex (europa.eu)

Presentations:

- **General introduction on marine citizen science - Dr Ana Cristina Cardoso, Joint Research Centre[3]**

Dr Cardoso presented some potential applications of citizen science to inform policy, driven by lessons from environmental monitoring. Citizen science (CS) is a flexible concept which can be adapted and applied to different situations and disciplines, from ecology to fisheries, and many more. CS activities of JRC have focussed on developing dedicated citizen science demonstrators aiming to stimulate the contribution and coordination of collaborative work on topics such as invasive alien species and marine litter, and on contributing to the development of an overarching framework that positions CS activities in respect to European policy making, the Open Science agenda and Better Regulation.

CS to inform environmental policy means providing opportunities for the citizens to engage at all stages of the policy cycle and to contribute to relevant scientific insights at right time by connecting with established processes and closing the loop from data gathering to monitoring policy impacts.

The fitness check on environmental monitoring and reporting of 2017[4] evaluated if European policy on environmental monitoring was still fit for purpose and concluded that improvements could be made. For instance, to improve the evidence base it recommended that other sources of information could also be taken in consideration, such as those generated through CS. These findings have been reflected in the Communication on actions to streamline environmental reporting[5], which Action Plan proposes to promote the wider use of CS as a promising source of complementary information and data on environmental issues.

Towards this objective, the 2018 study on CS for environmental policy[6] assembled an inventory of CS for environmental policy initiatives and analysed selected practices for information on what are the challenges, the obstacles and the opportunities and solutions.

Building on this, the EC together with JRC and EEA elaborated the Staff working document on best practices in CS for environmental monitoring[7], providing recommendations and actions for promoting and enhancing the use of CS. This activity entailed extensive consultations with stakeholders. The document provides an overview of the EU environmental citizen science landscape and practices, sharing good practices and lessons learnt in how CS & EU policies can support each other. Several initiatives are included in the SWD as examples of good practices. Marine Litter Watch[8] is a CS initiative facilitated through a mobile application developed by EEA, which contributes to the protection of marine ecosystems by facilitating contributions and helping to fill in the gaps in marine beach litter monitoring. Seasearch[9] is a project led by Marine Conservation Society which offers divers and snorkelers the opportunity to learn about the marine life, while helping to track the health of our marine environments. JRC app for Tracking Invasive Alien Species in Europe[10] is available in 14 languages and aims at promoting engagement and direct involvement of citizens in early detection and monitoring of invasive alien species. The SWD also highlights potential benefits (e.g. Improved knowledge base; Cost-effectiveness; Granularity (spatio-temporal); Citizen empowerment; Network and partnership creation; Detection of emerging issues; More inclusive and open research) and challenges (e.g. Long term resources needed; Resistance from public authorities (perceived low quality); Identifying policy linkages and knowledge

[3] PowerPoint Presentation (usercontent.one)
[4] Fitness Check of Reporting and Monitoring of EU Environment Policy (europa.eu)
[5] EUR-Lex - 52017DC0312 - EN - EUR-Lex (europa.eu)
[6] Citizen science for environmental policy - Publications Office of the EU (europa.eu)
[7] citizen science for environmental monitoring (europa.eu)
[8] Marine LitterWatch (europa.eu)
[9] Seasearch - Home
[10] Tracking Invasive Alien Species in Europe with a mobile app | European Commission (europa.eu)

gaps; Feedback and acknowledgement; Data heterogeneity, scalability, integration, accessibility, licensing; Governance Sustaining engagement. The SWD formulates targeted recommendations and possible actions for exploiting the full potential of CS in environmental monitoring, for key actors (e.g. EU authorities, Public authorities in EU Member States, Researchers, Citizen science communities, Citizen science associations and networks). Recommendations include 1) matchmaking between environment policy needs and citizen science activities; 2) promote awareness, trust and recognition; 3) promote data quality and interoperability standards and share; and 4) support coordination, collaboration and resources for policy impact.

- **Contribution of the Scottish fishing industry towards the provision of data supporting the scientific advice on pelagic fisheries. What are the challenges and opportunities to use citizen science? – Dr Steven Mackinson, Scottish Pelagic Fishermen's Association**[11]

Steven Mackinson (SM) presented the role of the Scottish pelagic fishermen's association in professionalizing science engagement of fishers as respected providers of scientifically credible data used to assess fish stocks, monitor changes in the pelagic ecosystem and support management decisions.

The development of self-sampling programme, operational since January 2021, is a key activity of the association, of voluntary nature but involving all vessels of the association. The program replaced national onshore sampling programmes for pelagic species in favour of sampling collected at sea, where the crew are executing the sampling. This is due to the richness of data (on biomass) that the crew was able to provide in terms of time and space (i.e. 850+ trips; 1.900+ hauls; 223.000+ fish measured), since every boat can be sampled as well as every haul rather than every landing.

SM highlighted some lessons learned from their experience so far. He stressed the importance of people dynamics, with relationships that need to be build and trust earned. Respective expectations, priorities and risks need to be managed. Having a shared will is of key relevance, while technical problems can be solved. Collaboration is more successful when having a shared need, although you don't need to have the same incentive. SM pointed out the example of industry being concerned on what poor samplings would do for them, while the science being afraid to have bad quality information: different incentives for a common goal of improving quality of information going into stock assessment. Active participation is better but also more complex.

Trust, respect and feeling valued are key ingredients for a successful collaboration. There is a need to satisfy the value of individuals and collective needs, making feedback a core design principle. In managing expectations, is it important to deliver the intended product and implement it well in line with and adding value to existing operational practices. He presented a five-step approach as guidelines on industry-science data collection: initiation by co-creation; planning by co-decision; survey and analysis; applying the knowledge; and evaluation. SM references to the article charting the work done by the association in incorporating Scottish pelagic industry data in science for stock assessments[12].

Finally, SM gave a word of caution on digitalisation (i.e. REM), which can help citizen science, but it is not a substitute for engagement. It's a tool and must be implemented in a way that engages people.

[11] Slide 1 (usercontent.one)
[12] Frontiers | The road to incorporating Scottish pelagic industry data in science for stock assessments (frontiersin.org)

- **Insight on Citizen Science and its contribution to increase knowledge of Greek marine biodiversity, and to increase collaboration between recreational fishermen and promote conservation measures. - Ms Anastasia Charitou, iSea (Environmental Organisation for the preservation of the aquatic ecosystems)[13]**

Anastasia Charitou (AC) introduced iSea[14], an NGO working for the protection of the aquatic ecosystem through the promotion of science-based management towards a healthy Mediterranean Sea and with the support of the local communities. Their actions are organized around four pillars: aquatic litter; citizen science; human & aquatic ecosystem; and vulnerable species.

AC presented some projects involving an active participation of recreational fishers and conducted to increase knowledge of Greek marine biodiversity through citizen science.

The project "Is it Alien to you? Share it!!!"[15] is the most successful citizen science project of Greece regarding the marine environment, engaging thousands of people and colleting vast amount of information. Until 2020, the project aimed to monitor the expansion of the already established alien species in Greece and Cyprus utilizing an extended network of citizen scientists. In 2022, the project expanded at collecting data on protected, exploited, rare and indicator species. An example of impact made possible by the project regards the data citizen science helped to provide on lionfish, making it possible to develop a model of future expansion of species in the Mediterranean.

The M.E.C.O.[16] project was launched in 2014, aiming to create a network of Mediterranean elasmobranch sighting citizen science initiatives in 10 countries, to better understand the occurrence, seasonality, and distribution of elasmobranchs in the region. iSea is responsible for collecting citizen observations of sharks and rays in Greece and Cyprus through the corresponding Facebook group. The project is also implemented in Albania, Austria, France, Israel, Italy, Libya, Spain, and Turkey.

Both projects are based on observations reported in dedicated Facebook groups, with 80% of observations coming from recreational fishers on top of other sea users.

AC highlighted some main contributions in filling knowledge gaps. Thes include the record of 4 new alien species for Greece and 2 new alien species for the Mediterranean, as well as the first record of green alga Acetabularia caliculus in Greece. Apart from filling the gaps, these projects are a strong tool to keep recreational fishers involved on different issues of environmental protection and fishing. Most enthusiasts are involved in targeted removal of invasive species from MPAs in Greece and Cyprus, and in the promotion for responsible seafood consumption[17]. Together with them, iSea designed a "Recreational fishers guide"[18] for species that should/ should not be targeted, their seasonality and minimum size. thereby creating a progress loop from active involvement to conservation measures. These projects are also a tool to promote continuous training on existing legal framework on protected species and adopting best handling and release techniques.

Presented projects and data collected were instrumental to move from active involvement to conservation measures, contributing to the identification of the first Critical Angel Shark Area in the Mediterranean, supporting the proposals for designation of important areas for sharks and rays in the Mediterranean, and supporting iSea comments to the public consultations on the Special Environmental Studies concerning Natura 2000 Areas in Greece.

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[13] Slide 1 (usercontent.one)
[14] HOME - iSea
[15] Is it Alien to you.... Share it!!! - iSea
[16] Sharks and Rays in Greece and Cyprus - iSea
[17] HUMAN & AQUATIC ECOSYSTEMS - iSea
[18] Doumpas, N., Giovos, I., Moutopoulos, D.K., Minasidis, V., Tyrikos-Ergas, G. (2020). Recreational Fisheries Guide. iSea, Thessaloniki, 2020. 54 pp.

AC presented identified challenges, which focussed on data accuracy and validation. To overcome these challenges, the validation of observation obtained through citizen science was conducted by species experts, and all information on which there were second thoughts or basic information was lacking were excluded. Similarly, AC presented identified opportunities, being: the record of species with no regular occurrence; the development of collaborations on other topics based on their local ecological knowledge; and the exploration of means of communication to raise awareness on environmental protection.

- **Use of citizen science to collect data on recreational fisheries in Ireland. Examples of the bluefin tuna and salmon recreational fisheries - Dr Cathal Gallagher, Inland Fisheries Ireland[19]**

Cathal Gallagher (CG) introduced Inland Fisheries Ireland[20], which works on the conservation, protection, management, development, and improvement of inland fisheries in Ireland. CG presented several programs in which citizens and stakeholders are involved, from providing data to engagement in the management.

In Atlantic Salmon management, involvement of anglers is crucial in collecting data on catch returns to drive management, providing information on the conservation status of salmon and whether legislation has to be put in place and how. Each year angling returns feed into the knowledge at the base of management outcome, which anglers have been part in generating, thus making it easy to engage and explain with stakeholders.

Another example is the ICCAT tuna-tagging programme Tuna CHART[21]. The programme aims to build on our understanding of the Atlantic bluefin tuna, population demographics and seasonal distribution around the Irish coast. Recreational angling for bluefin tuna is not currently permitted in Ireland; however, as part of Tuna CHART, authorised charter skippers can catch, tag and release bluefin during the open season. Citizens involved contribute to standard scientific process with the data in their catchment and on conservation. Both, environmental and socio-economic data need to be collected to get a holistic picture of the ecosystem and the drivers. This will help estimate the potential for a future catch and release recreational fishery and provide with a sustainable way of managing bluefin tuna.

The Irish Marine Recreational Angling Survey[22] was established to collect information on fishing effort and catches around the coastline. An angling record app is used to record catches and in parallel a survey program captures data as well, which are then compared.

Regarding citizen science in fisheries, CG stressed the importance of education and empowerment of the citizens. These programmes help contributing to filling key gaps in data poor areas, and enhancing conservation efforts with data (e.g. species protection; MPAs; monitoring). In addition, they can help making citizens drive own management decisions, and support a sustainable development (e.g. offshore renewable energy) contributing to citizen engagement. They also contribute to fulfilling Data Collection requirements[23].

Finally, CG argued involving citizens and stakeholders is a low-cost solution when compared to traditional sampling methods.

[19] ICT Strategy 2016-2020 (usercontent.one)
[20] Inland Fisheries Ireland
[21] Tuna CHART | Inland Fisheries Ireland
[22] Irish Marine Recreational Angling Survey (arcgis.com)
[23] EUR-Lex - 32008R0199 - EN - EUR-Lex (europa.eu)

- **Q&A**

Questions from the audience were addressed by panellists. When asked on how to make sure that citizens' data collections apply methodology which make the data acceptable and workable for scientists and decision makers, Steven Mackinson (SM) argued that - similarly to any other scientific institution- training, methods, manuals, quality assurance, processes are needed.

Another participant inquired on how to engage recreational fishers in citizen science, in view of possible concerns that scientific data collected could result in them being excluded from certain areas. Cathal Gallagher (CG) highlighted that anglers are also stakeholders, and the vast majority of fishers is genuinely concerned about the state of the stocks and become advocates for the species. If they are engaged correctly, it is relatively easy as they do understand that if there's pressure on vulnerable species, they won't be able to catch them in the future. Anastasia Charitou (AC) further remarked that here's always "the good" and "the bad" extremes in every sector. Those who are more easily involved are concerned about the state of the stocks they are fishing. These constitute the majority of recreational fishers involved, but also contribute reaching out to other anglers creating a wave of involvement.

A question was raised on motivation for fishers to engage. SM indicated fishers are mostly driven by a genuine concern. CG indicated giving fishers the opportunity to tell their story with data, because they've seen the changes as they've been fishing for decades, to attempt to establish historical knowledge contributes to their motivation. AC highlighted the aspects of curiosity and of socialisation with other fishers fostering exchange of knowledge as drivers.

Audience asked clarification on whether Inland Fisheries Ireland collect data per segment. CG indicated this depends on the goal of the program concerned: they could focus on a single species or on a broader remit.

There was a question from the audience whether the citizen science data is also being used for new insights, such as for example the climate change implications. SM responded that indeed, novel information which otherwise wouldn't be attained are gathered through citizen science. What is also very important is the elaborate feedback, to which lots of time needs to be dedicated. Every fisher gets individual feedback reports as well as also on a fleet basis. Comparative analyses and charts can thereby be produced. CG referred to The National Salmon Scale Project[24], a citizen science initiative for anglers to collect and submit salmon and sea trout scales. The initiative allows to provide feedback to fishers on fish they caught, including its age, growth rate and life-history experiences. Provide similar feedback of interest to the fishers can be an effective tool for positive engagement.

Further questions addressed whether citizen science initiatives include collection of additional information such as on marine litter and dead dolphin standings. AC referred to projects presented as positive examples in this regard. SM stressed the importance in identifying a clear need that is specific and implement the project well. After a successful completion, the skills and capacity developed can subsequently be deployed in new projects.

[24] National Salmon Scale Project | Inland Fisheries Ireland

Coffee break and Poster session

This year for the first time, a poster exhibition showcasing Citizen Science (CS) projects was set up and took place during the Annual Fisheries Science Seminar. This exhibition aimed to offer more insights before the panel discussion and supplemented the seminar with CS projects from a wider geographic range. The projects covered an interesting range of marine and freshwater species from primary consumers (crustaceans), carnivores (squid and octopus) to top predators (tuna). The exhibition displayed the diversity of CS projects that already exist showcasing CS project that focussed on: "Traditional Methods"; "Novel Technologies"; "Phone Apps & Self-Sampling"; "Community Involvement" and "Pollution & Lost Fishing Gear". More information on each project as well as the posters are made available on the event website[25]. Here below a short overview:

FARFISH provides the opportunity for collecting important data on the black hake fisheries on the West African coast through a self-sampling programme onboard EU and Senegalese fishing vessels operating in those waters.

Fish&Click showcases the contribution of CS to identify and collect lost fishing gear along 800 km of coastline in France. Thanks to this CS science initiative, Ifremer has collected data on abandoned, lost and discarded fishing gear, both at sea and on the seashore.

The **Measuring the Impact of Citizen Science (MICS)** project is an online platform used by project coordinators as a tool for impact assessment. MICS considers the impact of CS across five domains: 1) society, 2) environment, 3) science and technology, 4) governance, 5) economy.

ILIAD displays how CS can contribute to a sustainable blue economy. It built a Digital Twin of the ocean using CS data on fisheries, ports and ocean conditions. This project provides simultaneous engagement between models and real-world systems.

OTTERS project will support the coordination of water-related CS initiatives to accelerate the creation and adoption of technical, legal, and ethical standards for protocols and methods.

PREP4BLUE shows how CS can support the EU Mission: Restore our Ocean and Waters by 2030. More concretely, the Flanders Marine Institute leads the task to establish a public database of all aquatic CS initiatives across the EU. Now PREP4BLUE identified 1000 aquatic CS initiatives.

The **Irish Marine Recreational Angling Survey (IMREC) Diary** highlights the potential of CS to collect high-level data across space and time in comparison to conventional fishing surveys. Here, the combination of fishery scientist's data with CS data provides a new insight into Marine Recreational Fishing in Ireland.

ICTIO is a fish-watching phone application used by citizen scientists to record fish observations and understand their migratory patterns. It aims to inform fisheries management decisions at multiple scales in the Amazon Basin.

The Community Based Fisheries Monitoring (CBFM) initiative is based in India and utilizes local fishers' knowledge to inform sustainable management of natural resources such as the pelagic skipjack tuna. Through the Dakshin foundation, the local fishers revealed that keeping detailed records of day-to-day fishery dynamics helps them to better manage their fishing operations.

[25] Posters – Seminar on Fisheries Science (fisheriessciencesseminar.eu)

Laptikhovsky et al. is a research paper highlithing the use of CS to identify spawning habitat of squid and cuttlefish. The data was collected by divers, fishers and walkers who recorded the eggs. Consequently, this helped establishing seasonal changes in extension of these cephalopods spawning habitats.

Thorbjornsen et al. is a research paper that focuses on how CS provides crucial data on the hazard and catch composition of lost fishing gear along the Norwegian coast. Retrieving lost fishing gear from the seafloor requires a specialized effort, thus, since 2015 this CS project receives the help of recreational divers to retrieve, and report lost fishing gear.

FISHstory emphasizes the effort of CS to analyse historic photos to inform fisheries management. Through the following set of components: 1) archiving, 2) analysing, and 3) developing a way to estimate fish length in historical photos, the project ensures that the data collected is fit for purpose and useful for fisheries management.

Panel discussion with stakeholders

- **How to better harness the potential of citizen science to support the CFP, what possible actions should be considered. – Dr Nathalie Steins, Wageningen Marine Research; Prof. Anna Helene Rindorf, DTU AQUA; Dr Eoin Mac Aoidh, DG MARE**

Moderator asked audience to identify greatest challenges to use citizen science more routinely, who indicated (percentage for each answer in brackets): uncoordinated approach (47%); data unreliability (24%); data bias (22%); anecdotal information (5%); data gaps (3%). In response, Nathalie Steins (NS) highlighted the different types of citizen science existing (e.g. science-driven, interest-driven), depending on which you make trade-offs in terms of data quality. At the same time, data quality is not an issue unique to citizen science. Anna Rindorf (AR) argued there is a lot of good coordinating efforts, possibly less at international level. Eoin Mac Aoidh (EMA) reminded of the existence of "eu-citizen.science", a dedicated platform[26] under Horizon Europe, designed to be a resource bringing citizen science projects together. In terms of data quality, citizen science has grown to such an extent that it can no longer be dismissed as non-reliable, with data that can be verified against ore traditional science sampling surveys, being able to filter out less relevant data. EMODnet[27] coordinates datasets contributed by citizens -not at level of citizens by as organizations/NGOs- to make them interoperable. Citizen science has been developed very organically over the years and it's important to conserve that organic development.

Moderator asked panel whether citizen science can also be used to test new methods and tools, going beyond a role of providing data. AR indicated this is already happening when trying to develop a tailor-made solution to a problem, with possibly more to be done at broader citizen level. NS highlighting how trust is crucial, recalling a positive example of collaboration when having to conduct an industry survey with no possibility for researchers to be on board due to COVID restrictions. Fishers were asked to do the survey for the researchers, collecting all the data (with researchers doing the sampling and monitoring onshore), and they responded very positively and welcomed the trust given. EMA stressed the importance of how involving citizens with collecting data also lead to a better connection with the environment and involvement with policies.

Audience inquired on how technology, which is deemed to be challenging for small and artisanal fisheries, is being approached in developing countries. NS remarked that digitalisation can open doors to citizen science. Smartphones can be a very democratic tool for citizen science, also in developing countries. She recalled a project in which she is involved, and which includes use of easy technology which can be operated by fishers to record and monitor catches of lobsters in the Netherlands. This is based on an opensource algorithm, which after being trained, can be used by other countries fishing the same species (i.e. Norway). Increasing cooperation, similar open-source algorithms can be used by fishers in developing countries too.

Moderator asked EC representative how citizen science can fit in a bigger picture, together with the many and various sources of information that fit in the policies dealt by DG MARE. EMA indicated we are at a turning point calling for a need to look at complementarities, and for more established science data to help verify and make citizen science data as broad and applicable as possible. Citizen science can contribute to the volume of data. Mission Ocean and Waters targets to have 20% of data to assess how our oceans and seas are impacted coming from citizen science by 2025. While this might be a difficult percentage to measure in practice, the message behind is the need for data to come from citizen science too. The Fisheries policy package published in February 2023[28] includes several documents addressing many topics, but a common theme is the need for data and analysis to understand current state and how to reach identified objectives. NS recalled a review on research collaboration in fishing industry, which highlighted a vast number of projects

[26] EU-Citizen.Science
[27] European Marine Observation and Data Network (EMODnet) (europa.eu)
[28] https://ec.europa.eu/commission/presscorner/detail/en/IP_23_828

happening, but little data going into science due to concerns on data quality (e.g. bias towards fishers knowledge; data collected by enthusiasts might affect integrity and credibility of science). She stressed a need for receiving systems like national authorities to start changing to embrace these data, as well as the EU to start asking for these data to be delivered, in a context of ensuring data quality through a framework. EMA indicated how advancements in technology and AI can support making citizen science data reliable. AR reported an experience in collecting citizen science data with commercial fishermen since 1999 and since 2003 with recreational fishers, which allow for long-time series of indices now. Major concern there is not about quality of data but rather on possible disruptions to the relationships established with the people sampling, as it would lead to loosing all the data leading to further consequences (e.g. if a MS would rely on this method for data collection, receiving no data in one year would lead to fines).

Moderator asked on success stories and key moments or achievements made possible through citizen science. AR highlighted how citizen science can be regarded as a cheap option of collecting data, although stressing it is cheap but not free. There is a lot of effort in keeping it running. At the same time, being a cheaper monitoring, it allows for data collection and monitoring in many different localities where it would not be possible to collect samples continuously otherwise. This leads to a lot of added value and science being made possible through those data. NS pointed out the ethics element in involving a wider pool of actors in collecting data, arguing citizens, recreational fishers etc, should not be regarded as a free service to make use of for collecting data. There should be something in return, such as information, rewards, recognition. Technology is not a substitute for personal engagement, so we need continuous effort in engaging with and providing feedback to stakeholders.

A positive involvement means a higher amount of information and data to process. AR replied positively to the moderator's question on whether we have the processing power to deal with this increased amount of data, on which AI can help too. EMA stressed there is a continuous reflection along policy developments on how to take on board the different sources of data in a complementary manner. AR highlighted how citizen science can be a precious source of information of species important for biodiversity, but which might be of lesser importance from a commercial point of view and with therefore a lower incentive in deploying resources for collecting data on them. EMA further stressed the role this can play in gathering data relevant to an ecosystem approach to fisheries management (e.g. water quality; plant life). NS argued that investing on engagement can lead to a more cooperative environment. She recalled the example of data collecting in the Netherlands where fishers initially (i.e. about 20 years ago) opposed researchers and the policy making consequent to the stock assessment. An effort in involving fishers and explaining the process of collecting data and functioning of stock assessment led to an improved communication and increased support.

- **Q&A**

From the audience, Steven Mackinson (SM) inquired about the collection on new and more data, with some collected to fit current and know needs, while some others collected in event of future possible relevance. For example, high-resolution whole level data could be used for future stock assessment including spatial models. Keeping feeding data for the system we are in risks keeping us within the current system. SM asked about how citizen science can help collecting data for future needs and stressed the importance in investing in PhDs and AI, as a way of investing in the future steps of data analysis with collaboration and citizen science in mind. EMA stressed the importance of allowing citizen science to develop organically to be able to contribute identifying new data and data needs. An organic development of data collection and analysis allows us to be proactive in policy decisions and not just reactive to problems. Cathal Gallagher (CG) stressed the importance of making technology available, to be developed at European level, and offering tools (e.g. AI identification tools) to citizens to collect large data. CG advocated to bridge the gap with AI to help

citizen scientists become active scientists to elaborate data collected directly (e.g. on their phones) without the need to be processed in a lab.

Replying on identifying ways to make sure data collected from citizen science practice is fit for policy making, audience indicated: supervision by researchers and policy makers (51%), provide training (17%), assess the quality and quantity (11%), other (20%). Panellists reacted to identify other factors. AR argued perceived bias is a recurrent issue, despite quality of data collected being verified. NS stressed science involvement is key in citizen science, making quality and bias of data easily tackled but the perception of bias can persist. It is important to also involve social scientists, aside data scientists, to discuss integrity of data and perceptions.

Audience asked on how citizens are involved after data collection in data analysis and dissemination of scientific information. AR indicated that participants in programs she has been involved have had a big role in the dissemination and advocacy activities. However, this might also be counter-productive, increasing the perceived bias on quality of the results when higher visibility is given to industry and specific stakeholders being involved in data collection. Audience asked on possibilities to decentralize decision making, considering people are empowered to collect data needed to make decisions. CG reacted suggesting providing soft power to citizens engaged by offering feedback with further and elaborated information on data they collect. A better understanding can lead to better engagement and to better support to the decision-making process. SM argued we should not confuse co-management with citizen science. There is a natural synergy in developing the capacity to do citizen science engages people in thinking in the management applications, developing both the capacity and the understanding. Management on the other hand, it faces regulations in place, making it difficult a wide solution for co-management. NS stressed the importance in distinguishing fishers as citizen scientists and as stakeholders, with citizen science not being a substitute for stakeholder engagement. Better involvement and engagement can lead to better understanding, which can also entail critical questions on the scientific method. Scientists should embrace such criticism to improve science. Similarly, in the context of policy making. EMA stressed however on the importance of citizen science also in terms of engagement, making citizens more involved and interested in policy.

Conclusions and closing by Charlina Vitcheva, Director General, DG MARE

DG Vitcheva highlighted the vast number and diversity of CS initiatives, which are indicative of citizens' care for sustainable management of the oceans. She expressed the need to streamline this exemplary engagement in our work.

She stressed the crucial importance of CS for the Pact for Fisheries and Oceans29. We would like to see fishers as stakeholders and as data collectors, with data that do not come only from fisheries but refer to a wider ocean perspective. We need to understand how to operationalise these data from various initiatives in a more holistic manner.

We need to feed the Ecosystem based approach, which changes the data that are needed, and we need to diversify the sources of data that can contribute to the implementation of the ecosystem-based approach.

She highlighted the issue of availability of data, which cannot always come from regulatory resources within the DCF. We need alternative data sources and need to get them from everybody. New sources of data are welcomed, so to factor them into the creation of the evidence-base for our decisions. This however confronts us with challenges (e.g. data coherence and representativeness). There is a need for dialogues between citizens and scientists, a structured dialogue involving science and advice providers, like ICES and STECF.

Recalling Mission Ocean and Waters and its objectives and enablers, she highlighted the role of citizens' engagement and CS and emphasized the need to see how DTO can be fed by CS.

We have an enormous potential because of the huge interest from citizens on how to sustainably manage our oceans. We can overcome the upcoming challenges with engagement from both sides and open-mindedness from our side, so that this dialogue can produce the best evidence that we need for our sustainably used ocean.

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