REPORT

Meeting: **2024 Fisheries Science Seminar: Artificial Intelligence**
Parties: **DG MARE, researchers, AC stakeholders**
Date: **25 September 2025**
Location: **Brussels / online**
Rapporteur: **Tamara Talevska, Kateryna Urbanovych, NSAC Secretariat**

1 Welcome and introduction by Raluca Ivanescu, Head of Unit - Scientific Advice and Data Collection (MARE.C.3)

The 2024 DG MARE science seminar was dedicated to exploring the rapid developments in the area of artificial intelligence (AI) to support the scientific process, and in particular how this approach can be instrumental towards sustainable fisheries management with increased transparency of fishing activity and reduced impact on the environment.

The seminar explored ways in which the potential of AI could be fully harnessed to capture trends in the ecosystem. Holistic approaches are needed to capture and understand the impact of looming changes (i.e. climate change), where data from various sources will be needed to understand the full scale of drivers and impacts. The seminar was aimed at understanding how much and what can be done with AI.

Management decisions need a solid basis of data and sound science. More and new types of data, as well as new approaches will be needed for more holistic and better integrated management solutions. Fisheries stakeholders should be part of this, represented through Advisory Councils.

The Marine Action Plan and the new Control regulation provide the first opportunity to capture new data for management decisions.

2 Keynote speech “Can we produce trustworthy artificial intelligence to support fisheries and marine research and policy?” by Dr José Antonio Fernandes Salvador, AZTI, chair of ICES Machine learning working group

Fernandes Salvador drew attention to the Artificial Intelligence Act and relayed some implications for fisheries.

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The aim of the new legislation is to ensure more service based on AI but also protect people, ensuring that AI services are trusted and ethical. The AI Act provides a broad definition of AI, with **machine learning**, learning from data, being the most commonly understood and used AI tool.

Opportunities of machine learning are:

- Increased transparency, reduced impact on the environment, improved public image of fisheries
- Early warning, forecasting, and spatial planning systems
- Accelerated and increased data acquisition
- Increased economic sustainability by reducing operational costs
- Modernisation of fisheries and increased attractiveness to younger generations

Threats of AI approaches are:

- Lack of trust
- Reluctance to change
- High initial costs
- Lack of expertise
- Lack of multidisciplinary teams
- Biased training sets
- High expectations
- Legal burden/uncertainties
- Language barriers

Collected data should adhere to the following principles:
FAIR (Findable, Accessible, Interoperable, and Reusable),
CARE (Collective benefit, Authority to control, Responsibility, Ethics), and
TRUST (Transparency, Responsibility, User-focus, Sustainability, Transparency).

Trust building is ensured through **robust statistical validation**, such as repeated k-fold, stratified cross-validation, bootstrapping. There are statistical tests to compare different methods, such as: paired t-test, Friedman plus Shaffer's, Novel Bayesian approaches. Not only the model but also the pipeline needs to be verified with a so-called "Honest Pipeline Validation."

Ground truth testing for data collection is also important. Biased training data and over confidence in expert knowledge are likely one of the main issues when statistically tested AI models underperform in real environment's final operationalisation.

FAO Global Fishing Watch was also presented as a case where experts questioned how much could AI be used for assessing global fishing effort. A comparison of VMS data with catch data contributes to accuracy. If differences found between two datasets, experts should search for and determine the source of errors. Ground truthing also tells us about such discrepancies.

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An example of **big data and AI for conservation** was provided by VMEs case, where it was determined that protecting 50% of high seas would have low impact on human activities and would ensure high protection of endangered species.

There are also **forecast maps** of areas with low/medium/high probability of tuna catches, the final aim of which is route optimisation, where similar catches could be obtained with 50% less time at sea and lower fuel consumption.

Another example is where AI acts as **management decision support** tool by prioritising certain ecosystem services and determining impact on fisheries.

3 Breakout sessions

The Seminar was broken into three sessions:

A. **Fisheries conservation and management**
B. **Benefits and challenges for fishermen**
C. **Data Collection and Analysis**

A. Fisheries conservation and management

The **Fully Documented Fisheries project** was presented by Edwin van Helmond, Wageningen University.

The Dutch project deals with optimisation of catch registration of bottom trawlers at sea. The challenges in catch registration are represented by the half of the catch that is not landed = is discarded. The data on discarded catch are extremely relevant for scientific bodies (ICES, STECF) for assessment of fish stocks and supporting research on LO. The main problem with traditional manual registration is that it is labour intensive and it only covers very small fraction of the catch (less than 5% of the catch and less that 1% of the fleet).

REM with onboard computer with CCTV and sensors provides opportunities for improved catch registration. The issue is that the large amount of footage generated is analysed manually, which again is labour intensive, with data storage and privacy aspects presenting an issue.

This is where AI comes in. AI focuses on a very small part of the conveyor belt. Narrow camera system means it does not need a lot of space and enables better-controlled lines (lighting etc). It also never counts the same fish twice.

The system turned out highly accurate, with fish overlapping or turned on the wrong side not presenting an issue. The system allows for species detection and volume estimation, where volume can be turned into weight, with mean absolute error at 29 grams.

Conclusion:

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- Camera close to conveyor belt with 80% accuracy and controlled illumination
- Direct documentation of catch, no storage needed, processing onboard, no video data transfer,
- Increase robustness, conducting trials at sea,
- Possibility of integration with commercial EM systems in the EU

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Saving Norway's Endangered Atlantic Salmon by sorting out unwanted species using AI was presened by Vegard Kjenner, Huawei Norway and Geir Kristiansen, Berlevag Hunter and Fishermen's Association

Alien salmon species such as Humback Salmon (HS) are threatening endemic Atlantic Salmon (AS). AS is struggling due to lice spread resulting from warming sea, alien species, fisheries, all constituting increased pressure on the species. HS is considered a climate winner, outperforming AS. With no predators, HS carcasses (dies after spawning) are polluting rivers. The number of HS is increasing exponentially with possible spread to other coastal states.

To address the critical situation in Norwegians rivers, the Berlevag Hunter and Fishermen's Association together with Huawei Norway partnered with other tech companies such as Simula Consulting and Troll Systems, experienced in technology used in aquaculture

Together they developed sorting mechanism connected with AI application to single out and separate HS from AS. 80% recognition was expected, but 99,8% was the result. The system also takes advantage of different behavioral characteristics of the two species (HS would squeeze through fences while AS would not. AS normally migrates back through the original river, while HS goes up any rivers.)

The system analyses 10 images/sec with 8 milisec needed to determine the species. For pink salmon, 3300 pics fed into the machine learning tool were sufficient to detect it.

There are currently 500 rivers invaded by HS in North of Norway. So far, 30 out of 500 rivers have been cleaned. The Norwegian Government supported and launched a project - currently in developmental phase with testing expected next year.

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AI.Fish project on Computer vision for fisheries and oceans was presented by Justin Kay, Massachusetts Institute of Technology.

AI.Fish company, established in 2019, was initially focused on longline tuna fishery in Hawaii. It comprises AI and fisheries expertise.

Computer vision is a subfield of AI and it involves machine learning: object detection, image classification, and object tracking.

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AI.Fish translates cutting-edge AI research into usable tools for fisheries and ocean stakeholders. EM systems with onboard camera are used for catch accounting and ETP monitoring, detecting abandoned fishing gear with sonar, and salmon migration monitoring.

The data sets are trained to capture different challenges (weather, lighting, different perspectives, human interaction etc.) allowing to determine how the models do on these challenges. They are the largest annotated dataset for training AI, with algorithm similar to other systems – object detection (boxes around fish), then object tracking step, boxes with the same fish, and then species identification box.

Operationalisation: the case of Alaska fixed gear found 48% reduction in verification time just due to training.

AI in trawls fishing for groundfish use Human-in-the-Loop system, where fishers give the final accounting of the catch with the help of the algorithm. Here the goal was the accuracy of catch registration rather than efficiency/time-saving.

In Canada, the Environmental Defense Fund also used AI.Fish to estimate fishing activity by monitoring vessels entering and leaving ports with cameras placed at those ports (**EDF Smart Pass at the Edge**).

Another pilot project was also the **DFO Canada Ghost Gear Detection**, where ghost gear would be detected by sonars.

3.1 Q&A: Fisheries conservation and management

Q: The are difficulties in differentiating between some flatfish such as plaice, flounder, dab. How to overcome this?

A: High quality image is important to identify the characteristic spots on flat fish for the AI to be able to differentiate those.

Q: What's the cost of Salmon sorting grid?

A: Costs of unit: 150.000 EUR. Funding is a problem (even in Norway).

Q: Who owns the data collected in Salmon project and do you/would you share it with governments and scientists?

A: Project owns the data but no issues with sharing as the cameras are placed under water thus not at risk of privacy breaches.

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Q: Is AI for Ghost Gear being scaled up and used in projects retrieving ghost gear?

A: Not applied yet, so far only feasibility study.

Q: Is Dutch FDF applied to many vessels at present? Why (not)? In the NSAC's workshop on the functioning of the LO we came to the conclusion that an obligation to register instead of LO would be the final stage in discards management, with special consideration given to elimination of "sticks" and provision of "carrots". Any thoughts on this?

A: FDF is not widespread as there are currently no clear incentives for fisheries. Registration obligation would indeed constitute a massive incentive.

Q: When is AI accurate enough and when is there enough data so that the managers could release some of the regulations?

A: The sufficiency of data is a management decision. The baseline should be the amount of data and related error inherent in traditional systems compared to the AI system. If the error is lower, then the application of AI makes sense. However, humans should be involved at some point to monitor potential data drift and ensure cross-verification of human-derived vs AI-derived data.

Building trust in technology is essential for scale-up, but also between technology providers, policy-makers and stakeholders. Standards, safeguards for errors etc. need to be developed. Close cooperation with fisheries is necessary to build trust, solve potential technical issues, and test system errors and uncertainties.

When considering new technology scale-up, it is important not only to estimate benefits but also the opportunity costs of not acting.

B. Benefits and challenges for fishermen

Presentations:

- OPTIFISH project, by Jade Maes and Els Torreele, ILVO
- Game of Trawls**/**Marine Beacon project by Robin Faillettaz, Ifremer
- Fish-X project by Jana Stünkel, Transmartech and Anna Conchon, Collecte Localisation Satellites

OPTIFISH project is focused on the optimisation of the digital catch monitoring and reporting in European Fisheries. One of the challenges is getting fisheries to implement AI in their

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daily work. How to approach this? Optifish Academy could be used to enhance data sharing to ensure everyone is up to date with developments and ways to implement AI.

Benefits of AI:

- Can help with sustainable fisheries management, climate change etc.
- Identify and avoid non target species to reduce bycatch
- Enhanced regulatory compliance, which also helps to reduce administrative burden
- Data-driven decision-making by fishers

Obstacles of AI:

- Integration with existing systems
- Uncertainty in AI predictions: data need to be reliable
- Technological Infrastructure Gaps: still many gaps, but need more research, cooperation of fishing sector to cover these gaps.
- Regulatory and Legal uncertainty: AI is developing quicker than legislation
- Resistance to Change: change is big tumblestone, but there will be no good AI system without change
- Environmental and ethical concerns
- High initial costs: implementation and maintenance cost money

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Game of Trawls / Marine Beacon project was presented by Robin Faillettaz, Ifremer.

Focus on application of AI to trawls. So far there are 2 prototypes, one for bottom trawling and one for the pelagic. Database has more that 100.000 annotated frames with a growing number of species. The project is also developing a communication system to be able to communicate with the vessel. Case studies: beam-trawl case study and pelagic trawl.

Limitations:

Turbidity
Motion
Low light
Uneven illumination
Backscattering
Occlusions
Database for training
Fish behavior

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There is increasing interest from fishers. As of now, 1 hardware and 1 software are developed, allowing for many applications. Currently a full AI system is being developed for the red fish fisheries in Canada.

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Fish-X project was presented by Anna Conchon, Collecte Localisation Satellites. Fish-X is a Horizon Europe project that started some years ago and will end in June 2025. Project was developed for large scale fishing, but efforts underway to adapt it to SSF.

Key take-away messages from the breakout session:

The boundary between science and operations on the ground. Science depends on cooperation with fishers - how can this be bridged? Three key elements are needed:

- Tangible benefits for fishers
- Policymakers should be involved as well – element of trust between science-policy and fishers
- Provision of funding

C. Data collection and analysis

Presentations:

- AI in fisheries data collection and analysis by Anton Ellenbroek, FAO
- SMARTFISH & EVERYFISH projects by Rachel Tiller, Sintef Ocean

Key take-away messages:

- Data collection, sources and ownership
- New sensor technologies
- Adoption of these 8echnologies, adoption by fishers, and possible incentives
- Importance of data sharing, access and interpretation of data, data limitations
- Data quality and preparation when developing AI solutions to mitigate bias
- Data anonymization and cross-use for different applications
- Standardisation and quality of data
- Input and output application of AI: AI data collection and AI analytics
- Need to rethink the approaches to fully leverage new technologies and new data

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D. Online breakout-session – key take-away messages:

How can AI support fisheries? Authorities should take the lead in the application of AI.

What are the key factors needed? Trust in AI, acceptance by fishers, accuracy of data.

What actions are needed? Standardisation, quality control and assurance.

5 Closing remarks: Kestutis Saudaskas, Deputy Director-General at DG MARE

AI can enhance the monitoring and assessment of fish stocks, and environmental factors. Enhanced collaboration between science-policy society is paramount, and training and education must be ensured. In addition, improving data-sharing activities is crucial.

Identified **actions for Member States**:

- More funding for R&I
- Ensuring EU's tech sovereignty
- Sharing findings
- Clear rules on the use of AI while protecting SSF
- Collaborative projects across borders, between MS, data sharing

Identified **challenges:**

- High initial cost of using AI,
- data quality,
- Considerations of fisheries absent in current AI policies,
- Lack of understanding of fisheries by computer scientists undermines mutual trust and trust in the fishing industry.

Application of AI likely to feature in the new fisheries strategy/vision for 2040 to be developed by the new Commissioner Kadis.

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