# Fully Documented Fisheries

## E-governance promising a new era of sustainable fishing?

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## Fully Documented Fisheries

The Danish Fisheries Commission defined Fully Documented Fisheries (FDF) as "real-time electronic monitoring of catches on vessels, as well as precise GPS registration of the fishing vessel's or gear's positions during fishing" (Hegland, 2024, p.8) and recommended in its 2023 report this for implementation in the Danish fisheries sector.
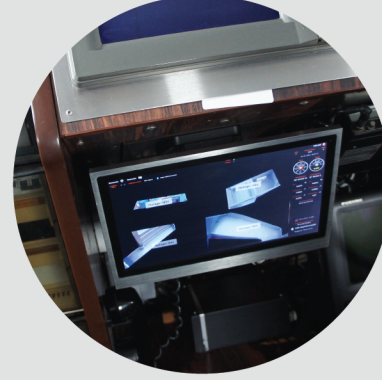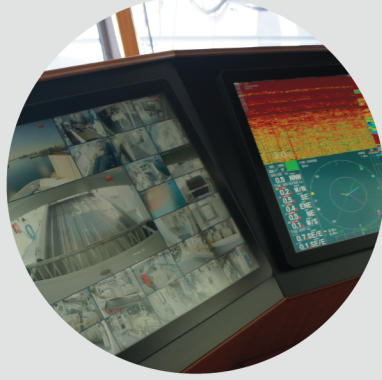
FDF incorporates hardware and software tools to provide fishers and policy-makers with accurate information on what is being caught (and discarded), how, and when. FDF represents an advanced e-governance solution that facilitates greater system integration, automation, and data-driven decision-making.

FDF is a technology-driven approach that could lay the foundation for a paradigm shift in how fisheries are managed, by enabling more 'results based management', where fishers are evaluated on outcomes and are granted greater flexibility in gear and gear configuration than is currently the case.

## Current technological possibilities with FDF

FDF offers deeper integration of technology into the governance process with the potential of automatic recording and monitoring of catches (target species and wanted and unwanted bycatch), typically by means of:

- **Onboard cameras** capturing video of fishing activity and catch handling
- **Sensors and other electronics** monitoring gear use and the position and movement of the vessel
- **Artificial Intelligence and Machine Learning** assisting in species recognition and detection of discards
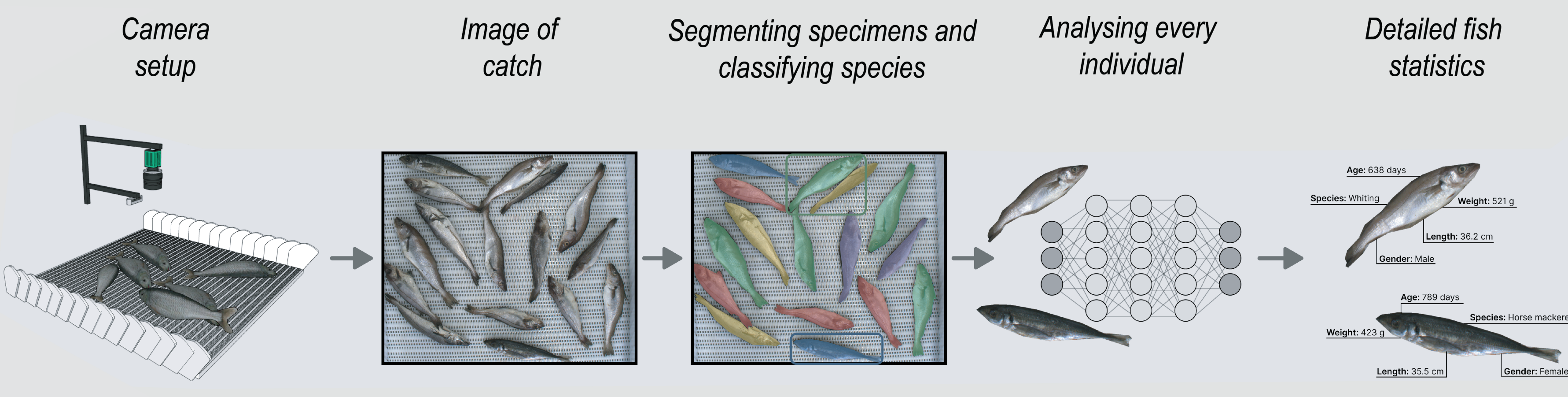


## Automated documentation and analysis: A lab setup

State-of-the-art research shows promising results with respect to species identification and length estimation in controlled environments; validating the performance of the systems on real fishing vessels is an on-going process.
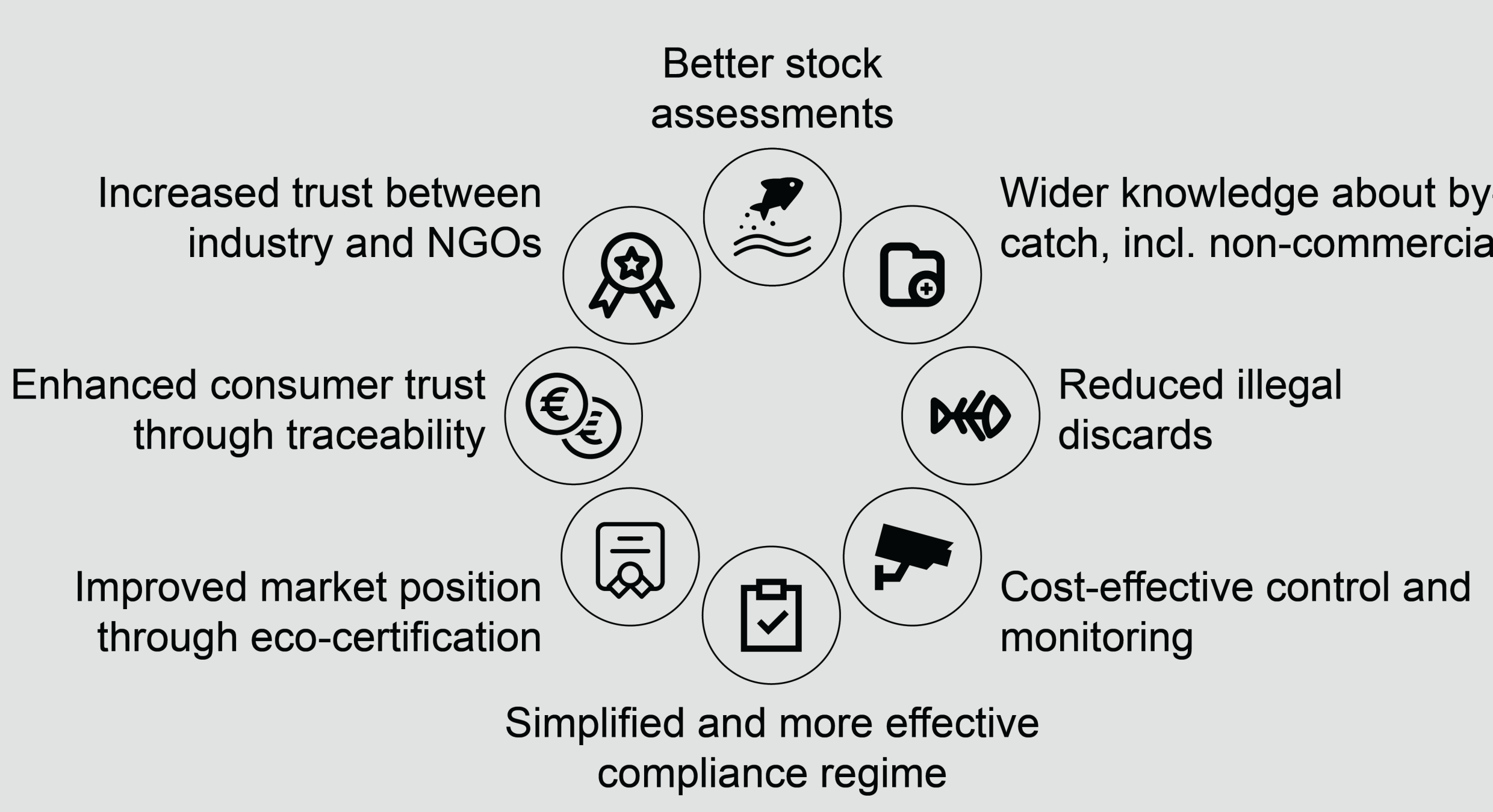
Extracting further fish characteristics, such as age, gender, and health condition, is currently a research problem that could provide valuable insights in the future.

Illustration adapted from Bengtson et. al, WACVW 2025.



*Camera setup* → *Image of catch* → *Segmenting specimens and classifying species* → *Analysing every individual* → *Detailed fish statistics*

## Potential benefits



- Better stock assessments
- Wider knowledge about by-catch, incl. non-commercial
- Reduced illegal discards
- Cost-effective control and monitoring
- Simplified and more effective compliance regime
- Improved market position through eco-certification
- Enhanced consumer trust through traceability
- Increased trust between industry and NGOs

## Challenges

*Technical (How to...)*
- Ensure reliable video/data storage and transmission at sea?
- Identify fine-grained characteristics of every fish (e.g. age, weight, gender)?
- Implement FDF on different vessel types in terms of fishing practices and sizes?



*Social and regulatory (How to...)*
- Address fishers' concerns about surveillance, and responsibility (if tech fails)?
- Regulate data ownership, usage and access?
- Practically implement FDF without it becoming yet another layer of control?

## Moonshot: Future possibilities with FDF+

*Intelligent fishing gear*
- Dedicated sensors monitor catches (in trawls, longliners, traps, etc.) and present real-time statistics to fishers
- Automated escape systems release unwanted catch unharmed
- Sonars monitor the environment to map the seafloor and intelligently steer trawls away from fragile or harmful environments. The same data is used to map the sea floor for scientific and conservation purposes

*Fully automated documentation onboard the vessel*
- Dedicated cameras monitor the incoming catch on dewatering stations, sample rooms, and conveyor belts, classifying all species and marine organisms, including starfish, seagulls, and sea anemones, and their characteristics (length, weight, age)
- Real-time analysis and data is shared with all stakeholders: fishers, authorities, supply-chain actors, scientists

*Informed regulatory decisions based on FDF*
- By combining catch data with GPS, weather, season and other parameters, fisheries and authorities are able to coordinate and regulate fishing in real time to minimise fuel and fishing time, optimise catch and conservation efforts, and preserve fragile marine ecosystems and fish stocks

*Moonshot benefits*
- Less unwanted bycatch
- Lower CO2 emission
- Reduced bottom-impact
- Better data for science
- Less administration
- Better economy
- More transparent and trustworthy data
- Extensive use of real-time management

**References**

Hegland, T. J. (2024). Unofficial translation of the summary (pages 9-21) of the report of the Danish Fisheries Commission 2022-2023 (https://tinyurl.com/ypc9cuj2)

Bengtson, S. H., Lehotský, D., Ismiroglou, V., Madsen, N., Moeslund, T. B., & Pedersen, M.. AutoFish: Dataset and Benchmark for Fine-grained Analysis of Fish. In Proceedings - 2025 IEEE Winter Conference on Applications of Computer Vision Workshops, WACVW 2025 (https://tinyurl.com/k3ny8zkx)