Optimisation of digital catch monitoring and reporting in European Fisheries

D3.1: Initial Work Plan for Testing and Validation

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[1] *Please consult the Grant Agreement: R: Document, report; DEM: Demonstrator, pilot, prototype, plan designs; DEC: Websites, patents filing, press & media actions, videos, etc.; DATA: Data sets, microdata, etc; DMP: Data management plan; ETHICS: Deliverables related to ethics issues; SECURITY: Deliverables related to security issues; OTHER: Software, technical diagram, algorithms, models, etc.*

[2] *Please consult the Grant Agreement: PU – Public, fully open, e.g. web (Deliverables flagged as public will be automatically published in CORDIS project's page); SEN – Sensitive, limited under the conditions of the Grant Agreement; Classified R-UE/EU-R – EU RESTRICTED under the Commission Decision No2015/444; Classified C-UE/EU-C - EU CONFIDENTIAL under the Commission Decision No2015/444; Classified S-UE/EU-S – EU SECRET under the Commission Decision No2015/444*

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OptiFish Consortium

No.	Participant organization name	Short name	Country
1	EIGEN VERMOGEN VAN HET INSTITUUT VOOR LANDBOUW- EN VISSERIJONDERZOEK	EV ILVO	BE
2	FUNDACION AZTI - AZTI FUNDAZIOA	AZTI	ES
3	BENCO BALTIC DOO ZA SAVJETOVANJE IUSLUGE	BENCO	HR
4	DANMARKS TEKNISKE UNIVERSITET	DTU	DK
5	REFRAME FOOD ASTIKI MI KERDOSKOPIKI ETAIRIA	RFF	EL
6	SCIO IKE	SCiO	EL
7	STICHTING WAGENINGEN RESEARCH	WR	NL
8	UNIVERSITY OF CUKUROVA	UC	TR
9	FISKERIDIREKTORATET	NDF	NO
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11	ELECTRONIC FISH INFORMATION CENTRE EUROPE B.V	EFICE	NL
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17	ZUNIBAL SL	ZUN	ES
18	DANMARKS FISKERIFORENING PRODUCENTORGANISATION	DFPO	DK

List of abbreviations

EU	European Union
eDNA	Environmental-DNA
ID	Identification
PCR	Polymerase chain reaction
API	Application programming interface
Elog	Electronic logbook
GDPR	General Data Protection Regulation
ETP	Endangered, Threatened, Protected species

1. Introduction

The objective of this document is to provide a structured framework for completing the tasks in Work Package 3 - Data Collection and Validation in EU Fisheries Pilot Studies. It serves as a roadmap that outlines key elements necessary for achieving each of the tasks. It aims to ensure the successful and efficient completion of each task within the specified timelines and allocated resources, while ensuring accountability.

1.1 Scope of Work

This section outlines the main tasks and activities planned for the testing and validation work package. These tasks are designed to ensure data collection, testing, and validation of technologies developed in other work packages under real-world conditions across diverse fisheries in Europe. The activities aim to establish methodologies for improved catch handling, species identification, and compliance monitoring, ensuring engagement across work packages and alignment with the broader project goals. The following section describes each of the tasks in work package 3, and includes the following points for each task:

- A description of the task,
- A list of activities required to complete the tasks,
- Timelines, including status,
- Assigned responsibilities.

Task 3.1: Catch Handling Facilities - Pumping

Task 3.1 focuses on pelagic fisheries, targeting small pelagic species such as herring, mackerel, horse mackerel, and blue whiting where catches are pumped on board (Figure 1). Data collection involves using EM cameras and eDNA analysis onboard pelagic trawlers (Table 1). Due to the unique catch handling processes in these vessels, where species are pumped onboard and stored in water tanks, standard visual monitoring may not capture all individuals. The activity aims to develop and test methods to scale EM data to total catch volumes and compare the accuracy and cost-efficiency of these methods with eDNA-based approaches. The results will contribute to benchmarking the technologies and addressing challenges in estimating catch compositions.

Figure 1. An example of an image acquisition scene from an electronic monitoring camera on board a pelagic vessel.

Table 1. A description of the tasks within Task 3.1 together with task responsibles, key dates and task status.

Task	Responsible	Key dates	Status
Collection of manual ground truth catch data (species ID and length measurement)	DTU and DPPO	Data collection began in M9. Additional data will be collected in Q4 2025	Ongoing
Collection of EM ground truth catch data (species ID and length measurement)	DPPO (lead)	Data collection began in M9. Additional data will be collected in Q4 2025	Ongoing
Collection of eDNA ground truth catch data (species ID and length measurement)	DTU (lead) and DPPO	Data collection began in M9. Additional data will be collected in Q4 2025	Ongoing
Collection of EM ground truth data of simulated catches for testing model performance in various stress scenarios	DTU (lead) and DPPO	Start date (M21)	To be started
Development of deep learning algorithms for detecting species and measuring their lengths from the EM videos	DTU (lead)	Start date (M24)	To be started
Developing methods for calibrating eDNA data and catch composition (experiments to calibrate amplification efficiencies of different species for metabarcoding)	DTU (lead)	Experiments began in M9	Ongoing
Laboratory work to make mock community samples (i.e., genetic samples with known species contributions), PCR amplification of the samples using MiFish_U primers, library preparation and sequencing	DTU (lead)	M9-M13	Ongoing
Data analysis of sequencing reads, including demultiplexing, quality filtering and taxonomic assignment. Statistical analysis to estimate amplification efficiency	DTU (lead)	M12	Ongoing
Laboratory analysis of eDNA samples collected in M9, including DNA extraction, dPCR, PCR amplification with MiFish_U primers, library preparation and sequencing	DTU (lead)	M13	To be started

Bioinformatic and statistical analysis of eDNA samples	DTU (lead)	M14	(To be started)

Task 3.2: Catch Handling Facilities – Sorting Band

This task involves testing technologies for species identification and fish health assessment on sorting bands (Table 2). Multispectral cameras and eDNA will be employed to detect wildlife diseases and assess catch quality. EM cameras (Figure 2) will also be integrated into the system for monitoring fishing activities and identifying suspicious events. These technologies will be tested on Belgian demersal fishing vessels targeting flatfish. The integration with VISTools will enable real-time catch monitoring and decision-making, optimizing fishing operations and ensuring compliance with sustainable practices.

Figure 2. An example of an image acquisition scene from an electronic monitoring camera placed over a sorting band (left) and a still image from the EM camera (right).

Table 2. A description of the tasks within Task 3.2 together with task responsibles, key dates and task status.

Task	Responsible	Due date	Status
Collection of manual ground truth catch data (species ID and length measurement)	WR (lead) and ILVO	Start date (M15)	To be started
Collection of EM ground truth catch data (species ID and length measurement)	ILVO (lead) and WR	Start date (M15)	To be started
Development of deep learning algorithms for fish identification and measuring their lengths	WR (lead), DTU ANCHOR, EV ILVO	Start date (M30)	To be started
Integration of EM cameras and sensors for the detection of anomolous events	WR (lead), DTU, ANCHOR, EV ILVO, SO	Start date (M14)	To be started
Laboratory work to collect data and to define the anomalous events	WR (lead), DTU, ANCHOR, EV ILVO, SO	Start date (M15)	To be started
Analysis of EM to identify anomalous events	WR (lead), DTU, ANCHOR, EV ILVO, SO	Start date (M24)	To be started
Development of technologies for the detection of anomalous events	WR (lead), DTU, ANCHOR, EV ILVO, SO	Start date (M28)	To be started
Laboratory work to test the technologies for the detection of anomalous events	WR (lead), DTU, ANCHOR, EV ILVO, SO	Start date (M36)	To be started
Development of methodology for assessment of fish health and quality based on multispectral cameras.	WR (lead) and BENCO	Start date (M13)	To be started
Laboratory work to collect data from hyperspectral cameras.	WR (lead) and BENCO	Start date (M15)	To be started
Data analysis to define the correlations between spectral data and fish health and quality	WR (lead) and BENCO	Start date (M21)	To be started

Data analysis to define the spectral bands for the multispectral camera	WR (lead) and BENCO	Start date (M21)	To be started
Laboratory work to collect data from multispectral cameras.	WR (lead) and BENCO	Start date (M24)	To be started
Test onshore of the multispectral camera	WR (lead) and BENCO	Start date (M36)	To be started
Development of methodology for assessment of fish health and quality based on eDNA.	AZTI (lead) and DTU	Start date (M13)	To be started
Identify and structure detection technology data streams.	ILVO (lead), WR EFICE, DFPO	Start date (M15)	To be started
Develop methods to link data types.	ILVO (lead), WR EFICE, DFPO	Start date (M18)	To be started
Test and compare data streams for overlap and quality.	ILVO (lead), WR EFICE, DFPO	Start date (M22)	To be started
Integrate quality control and notification system into user dashboard.	ILVO (lead), WR EFICE, DFPO	Start date (M26)	To be started
Integration of EM monitoring into VISTools and CD	ILVO (lead) EFICE, DFPO, ANCHOR	Start date (M13)	To be started
Data-ingest can start when VISIM-case can export data instead of images	ILVO	Start date (M13)	To be started
Decide on data transfer protocol (wireless and/or wired)	ILVO and private partners	Start date (M13)	To be started
Adapt concentrator to ingest new data source	ILVO and private partners (DPTechnics)	Start date (M13)	To be started

Check if changes are needed in transfer server (DBMatic)	ILVO, private partners (DPtechnics and DBMarine)	Start date (M13)	To be started
Adapt ILVO Azure environment for data ingest	ILVO	Start date (M20)	To be started
Adapt VISTools Analytics visualisation	ILVO	Start data (M24)	To be started
Testing primers to detect parasites in eDNA water samples collected during pilot studies	AZTI (lead) and DTU	Start date (M13)	To be started
Map out-put of EM systems to Poseidat	EFICE	Start date (M20)	To be started

Task 3.3: Catch Handling Facilities – Sorting Table

Here, the focus is on improving the field-of-view and performance of EM cameras monitoring catch items on sorting tables (Figure 3). This task aims to enhance species identification accuracy and length measurement (Table 3). The collected data will be integrated with logbook systems to develop enhanced reporting mechanisms beneficial to both fishers and regulatory authorities. This approach ensures accurate and transparent reporting of catch compositions.

Figure 3. An example of an image acquisition scene from an electronic monitoring camera place over a sorting table.

Table 3. A description of the tasks within Task 3.3 together with task responsibles, key dates and task status.

Task	Responsible	Due date	Status
Field trip of vessels in Denmark	VCU R(lead), DFPO, DTU	M7	Completed
Making clear the current vessels situation	VCU R	M13	Completed
Initial concepts of the mechanical system	VCU R, (lead), WR	M13-15	Ongoing
Design of the mechanical system	VCU R (lead), WR	M16–M23	To be started
Production of the mechanical system	VCU R	M24-M28	To be started
In house testing of the mechanical system	VCU R	M29-M34	To be started
Assessing the improvement in species ID and length measuring with the introduction of the mechanical system	DTU (lead), VCU, and ANCHOR, WR	M35-M41	To be started
EM data and Logbook integration	EFICE and ANCHOR	M42-M48	To be started
Identify how data will be collected on the vessel and communicated to the shore	EFICE and ANCHOR	M35 (estimate)	To be started
Identify the different type of logbooks and suppliers	EFICE and ANCHOR	M35 (estimate)	To be started
Present API to different Elog suppliers to integrate	EFICE	M40 (estimate)	To be started

Task 3.4: Catch Handling Facilities – Sorting Deck

This task targets demersal trawl fisheries in the Mediterranean and Black Seas (Figure 4). It focuses on developing algorithms for catch composition estimation, including species recognition for vulnerable species. GDPR-compliant masking algorithms will also be developed. The system will be tested as a proof-of-concept, ensuring anomalous events are identified and reported to promote regulatory compliance and sustainable practices (Table 4).

Figure 4. An example of an image acquisition scene from an electronic monitoring camera placed over a sorting deck.

Table 4. A description of the tasks within Task 3.4 together with task responsibles, key dates and task status.

Task	Responsible	Due date	Status
Initial investigation in the Mediterranean fishing vessels	UC (lead), DTU, and WR	M8-48	Completed
Identification of case studies	UC and DTU	M8-12	Completed
Planning of data collection in Turkey	UC (lead), DTU, and WR	M11	Completed
Collection of EM data from Mediterranean fisheries	UC (lead) and DTU	M14-20	To be started
Development of deep learning algorithms for fish identification	DTU (lead) and UC	M20	To be started
Development of deep learning algorithms for anomalous event detection	WR and UC (lead)	M48	To be started
Development of deep learning algorithms for GDPR compliance (masking)	UC	M20	To be started

Task 3.5: Catch Handling Facilities – Direct Sorting

For artisanal fisheries, this task explores the feasibility of implementing EM systems on vessels smaller than 12 meters (Figure 5). The focus is on developing a trust-based self-reporting system for catch composition estimation, which offers an alternative to EM systems and genetics for economically and technically constrained vessels. The feasibility of EM systems for onboard use in such fisheries will also be assessed, particularly for documenting ETP species and discards. However, the possibility of comparing EM and genetic methods in one or two vessels is being analysed (Table 5).

Figure 5. An example of an image acquisition scene from an electronic monitoring camera place on a vessel where caches are sorted directly.

Table 5. A description of the tasks within Task 3.5 together with task responsibles, key dates and task status.

Task	Responsible	Due date	Status
Scoping of suitable vessels for development and testing in Basque area	AZTI	M10	Completed
Contact with national authorities	AZTI	M12	Initial contact made. However, it is a new team and a longer discussion would be needed.
Planning of data collection	AZTI	M12	Started February 2025. Ongoing
Data collection	AZTI	M24	To be started
Genetics analysis	AZTI	M30	To be started
Evaluation and comparison of methods (EM & genetics)	AZTI	M36	To be started
Development and testing of shelf reporting systems	AZTI	M44	To be started

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