

“Piloting of eco-innovative fishery supply–chains to market added–value Adriatic fish products”

Priority Axis: Blue innovation

1.1 - Enhance the framework conditions for innovation in the relevant sectors of the blue economy within the cooperation area

D4.4.2. Certification scheme for new innovative products and process

WP4 - INNOVATING TOOLS AND PROCESSES FOR ADDED-VALUE ADRIATIC FISHERY PRODUCTS/ A 4.4. CAPITALIZING BLUE INNOVATION: TRACEABILITY AND CERTIFICATION OF ECO-INNOVATIVE FISHERY PRODUCTS

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1. INTRODUCTION

The WP4 of the PRIZEFISH project aims to create a basis for eco-innovative products and processes' development as an example and demonstration of real opportunities to increase the market value of fishery products. Innovations are in the field of onboard handling, processing and packaging, fish handling and best practices in seafood production. Activity 4.4 deals with the capitalization of eco-innovations implemented by the POs (producer organizations).

In order for eco-innovative products and processes to be further recognized and accepted in the market, but also to protect the intellectual property, it is necessary to propose and implement the most favorable certification scheme.

The Adriatic Responsible Fisheries Management (ARFM) certification scheme has been suggested for the development in the framework of the PRIZEFISH project (*see D3.2.3. Sustainability guidelines*). This scheme will assess wild-capture fisheries against Fisheries Standard (developed by the National Research Council – Institute for Biological Resources and Marine Biotechnologies (CNR-IRBIM)) and Chain of Custody (CoC) Standard, including Quality Assurance and Operational Efficiency criteria (presented in this document). To ensure needed compliance with all requirements, certification should be granted by an independent body after a successful third-party audit.

The Standards developed in this deliverable were based on leading FAO guidelines, specifically the FAO Guidelines for the Ecolabelling of Fish and Fishery Products from Marine Capture Fisheries (2009) and Code of Conduct for Responsible Fisheries (1995). Furthermore, the international legal framework was complemented by the rules of the Common Fisheries Policy (CFP) and the Common Market Organization (CMO). There have been a number of EU regulations covering compliance with the food safety and hygiene rules, and these legal requirements will be presented in detail in the upcoming deliverable D4.3.2. *Report on standards' qualification*.

In addition, for developing the CoC Standard, best practices models and traceability principles were considered, for example the ones based on the global membership association for credible sustainability standards - ISEAL Alliance's Sustainability Claims Good Practice Guide, or WWF's wild seafood principles as a benchmark. The CoC Standards of the globally leading Marine

Stewardship Council (MSC) and the Friend of the Sea (FoS) certification schemes were also taken into account, and our proposed standards also align well with the more regional schemes, such as Iceland Responsible Fisheries or Alaska Responsible Fisheries Management Certification Program. Nevertheless, other non-fisheries standards were looked upon as well, and these included Forest Stewardship Council (FSC) Certification, Fair Trade USA CoC management systems, The Rainforest Alliance practices and so on. General audit requirements proposed by the International Sustainability & Carbon Certification (ISCC) were used as a basis for the CoC auditing system in fishing industries.

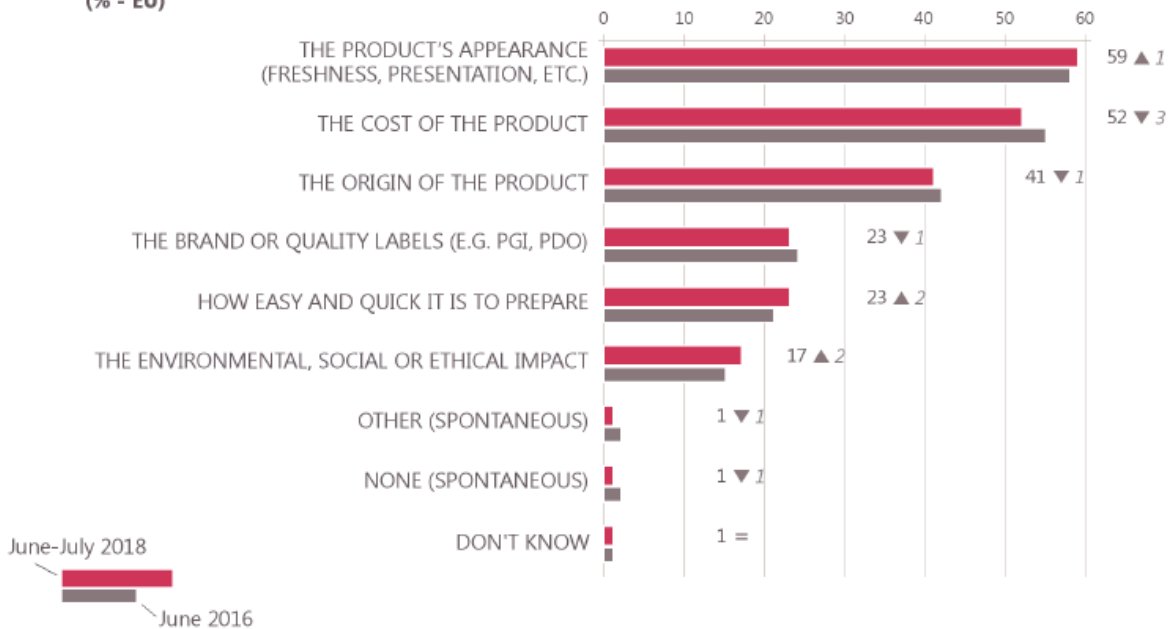
The purpose of the proposed standards is to provide the fishing industry with the statement of requirements needed to achieve the standard certification. Through licensed use of the ARFM certification mark or label, the adherence to the scheme requirements is ensured and the claims on the certified source can be made.

The preparation of the eco-certification scheme basis for fishery products originating from the Adriatic Sea opens the possibility of placing such recognized and certified products in the EU and the world market. According to the Common Market Organization, producers must meet all the prescribed obligations regarding consumer information, and they should be informed about the same. When buying the products, consumers will receive the past product certification information – why a certain product is marked with an eco-certificate stamp or label and how it differs from others.

1.2. MARKET RESEARCH

Survey Eurobarometer carried out in 2018, which has encompassed more than 27.000 EU residents, showed that 77% of respondents were buying fishery products in shops and supermarkets and that the main factor in choosing and buying products was the appearance of the product (59%) – meaning freshness and presentation (Figure 1).

QB10 When you buy fishery and aquaculture products, which of the following aspects are the most important for you?
(MAX. 3 ANSWERS)
(% - EU)



Base: Respondents who buy FAPs (N=21,865)

Figure 1. Respondents' answers to the question which is the most important aspect when buying fishery and aquaculture products (Source Eurobarometer 475 Report, 2018)

In addition to the price of the product, the third most important factor that was chosen was the geographical origin of the product. This indicates that the design of the packaging is very important and that in the case of the PRIZEFISH project it would be convenient to place a mark of the Adriatic Sea as the geographical origin in a visible place of the product package.

From the mentioned survey results, it can be concluded that the selectivity of the supermarkets looking exclusively for products from sustainable fishing and farming does not originate too much from customer pressure, but from other factors.

In all EU countries, customers most often buy fish in the supermarkets, except for Greece, Malta and Italy, where customers most often buy in the fish markets. Even in Croatia, fish is mostly bought in the supermarkets (69%).

Moreover, the "epidemic" of eco-labelling stems from the competition between supermarket chains, but also from the influence of various environmental organizations.

Nowadays, almost all shopping is done in retail chains and supermarkets, which are fighting for the trust of customers. Customers have no time to visit a large number of stores, so when they choose one, they usually keep coming back there.

The new anti-consumerism movement, in a milder version turned into "conscious consumerism", and retail chains started the trend of responsible retail. Customer awareness is focused on environmental protection, social responsibility and sustainability, yet sustainable products make up only about 15% of the market offer. This group of products has had the highest growth in the last five years or so, which represents the change in shopping culture led by the so-called Generation Z and Millennials. It is not easy for large companies to achieve such rapid turnaround, and the first step would be choosing the right benchmark for sustainability.

Supermarkets prefer eco-certificates specifically for this reason, because they can show share of the product offer which satisfies the sustainability settings and, in that way, gain the trust of conscious or green consumers.

2. REGIONAL PRODUCT PROTECTION AND PROMOTION

The idea materialization, which is the product of the human intellect, belongs to its creator and, under certain conditions, represents their intellectual property. Intellectual property has all the characteristics of any other property, so it can be bought, sold, licensed, exchanged, donated or inherited¹.

The most common forms of industrial property protection:

- Patent
- Trademark

¹ <https://www.dziv.hr/hr/intelektualno-vlasnistvo/>

- Protected industrial design
- Protected geographical indications and designations of origin

Business methods or instructions for doing business (for example, a quality system in a company) **cannot be patented.**

In the case of the responsible and sustainable operations in fish production, related to the PRIZEFISH project and WP4, the protected geographical indications and designation of geographical origin with a trademark could be important, which is why we will present these in more detail in the following sections.

2.1. GEOGRAPHICAL INDICATIONS AND DESIGNATIONS OF ORIGIN

2.1.1. QUALITY SCHEMES AT EU LEVEL

PDO/PGI/GI of agricultural and food products

The European Union established a unique system in the 1990s to protect the names of traditional products whose quality and special characteristics are influenced by human or natural factors specific to a geographical area or produced according to traditional recipes or production methods. Such products are marked with a protected designation of origin, a protected geographical indication or a guaranteed traditional specialty. That sign on the product packaging, next to the name, guarantees the consumer the purchase of an authentic and controlled product, of recognized quality and local origin.

For the agricultural and food products there are 3 types of quality schemes:

- Geographical Indications (GI)
 - Protected Geographical Indication (PGI)
 - Protected Designation of Origin (PDO)

- Traditional Specialties Guaranteed (TSG)

The protected mark or protected name displayed on the product may only be used by those producers who have produced the product according to the official product specification and have a valid certificate of conformity with the specification issued by the authorized control body. By issuing a Transitional National Protection Decision, the product name becomes protected from any direct or indirect commercial use of the name, any misuse, imitation or reminder, or any other practice that may mislead the consumer about the product. Fines are envisaged for abuse of the name and violation of the provisions related to protection. The protected name may be used by any manufacturer who has met all the requirements prescribed by the official Product Specification, which includes, inter alia, the geographical area of production, production methods, main characteristics of the finished product such as its shape and dimensions or characteristic sensory properties. The manufacturer must also have a valid certificate of the product compliance with the specification or a certificate issued by an authorized inspection body.

Product specifications are publicly available documents (eg, for the Republic of Croatia they can be found on the website of the Ministry of Agriculture in the section *Product protection*). Also, next to each listed protected product name, which is available in the same sections as Protected Designation of Origin or Protected Geographical Indication or Guaranteed Traditional Specialty, there is a valid Product Specification certificate.

If the producer places a product on the market with its name protected and registered by the European Union, then the European mark for a protected designation of origin, a protected geographical indication or a guaranteed traditional specialty must be displayed next to the product name. Those products must have valid Certificate of Conformity of the product with the Specification, issued by an authorized inspection body. The sign must be printed in a certain color and size, as provided by Law.

After the adoption of the Decision on transitional national protection of the name of an agricultural or food product as PDO, PGI or GI, the applicant submits the documentation to the Ministry as a request for registration of the name PDO, PGI or GI at the European Union level. The Ministry then forwards this documentation to the European Commission, thus initiating the procedure of registration of the mark at the level of the European Union. The successful

registration procedure of the label ends with the adoption of the Implementing Regulation on the registration of names in the register of protected designations of origin and protected geographical indications or the register of guaranteed traditional specialties, which protects the product name throughout the European Union.

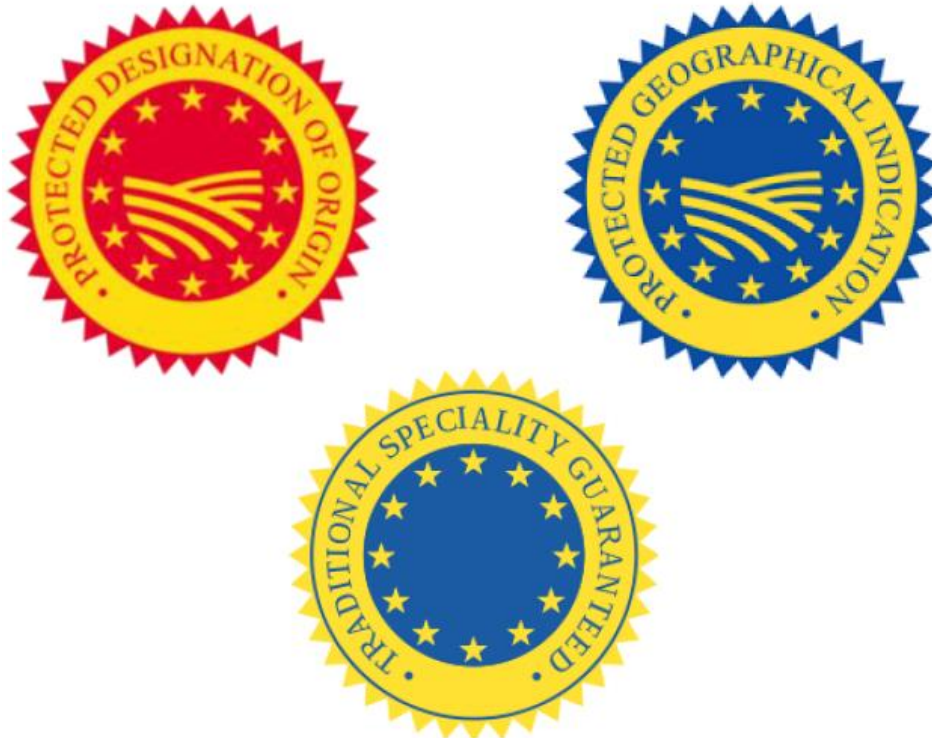


Figure 2. Appearance of the mark for marking products with the registered name ZOI, ZOZP or JTS at the level of the European Union

EU mark for PDO, PGI and GI

The name protection procedure may be initiated only by a group of producers in which at least half of the members are registered producers of that product, registered in the appropriate registers of food business operators or establishments, or other appropriate registers kept by the competent authorities.

Exceptionally, the application may be made by an individual, who must prove that they are the only producer who wishes to apply for protection whether protected designations of origin or protected geographical indications. To fulfill the requirements, geographical area of production has to have characteristics significantly different from those adjacent or the properties of the products are different from those produced in neighboring areas.

According to data from 2019 (source: EUMOFA, The EU Fish market 2019 edition) 53 products in the fisheries and aquaculture sector are registered under EU quality schemes.

The largest number of certified products bear the label of protection of geographical origin (two thirds of the products), about 25% of them bear the label of origin, and the smallest part of the products (only 3 products) carry the label of traditional specialties (these are mussels in France, herring in Dutch and Portuguese cod)².

2.2. ARFM TRADEMARK

2.2.1. TRADEMARK PROTECTION

A trademark is an exclusive right which is recognized for a mark used to distinguish the products and/or services of one (or more) persons from other persons in commercial transactions. A trademark may protect the name, logo, emblem, label or other distinguishing features of a product and/or service.

Trademark registration means obtaining exclusive rights over distinctive marks, such as names, logos, colors, images, patterns, shapes, sounds or product packaging, which serve to identify products and distinguish goods or services from others.

Certification marks are a new kind of trade mark at EU level, although they have existed for years in certain national level systems in the EU.

² https://ec.europa.eu/info/food-farming-fisheries/food-safety-and-quality/certification/quality-labels/quality-schemes-explained_en#logos

An EU certification mark is defined as a mark “which is capable of distinguishing goods or services which are certified by the proprietor of the mark in respect of material, mode of manufacture of goods or performance of services, quality, accuracy or other characteristics, with the exception of geographical origin, from goods and services which are not so certified.” Basically, an EU certification mark is a guarantee of the specific characteristics of certain products and services.

It indicates that the products and services bearing that mark comply with a certain standard contained in the regulations of use and control, for which the holder of the certification mark is responsible, regardless of the identity of the company that actually produces the products or services to which it relates and uses a certification mark.

Applicants for the registration of certification marks must include in their application a statement that they are applying for an EU certification mark.

The most important part of a certification mark are the regulations of its use. They must be filed within two months of the submission of the application and need to contain the following:

- characteristics of the products or services being certified;
- conditions of use of the certification mark;
- testing and monitoring measures applied by the holder of the certification mark.

There are two important limitations to the EU certification mark. First, its holder cannot be a person conducting business that includes offering products and services that are being certified. The holder of a certification mark is excluded from the use of the mark for certified products or services covered by it. Second, it cannot be submitted for the purpose of distinguishing products or services certified according to geographical origin.

Applications for the registration of certification marks should be submitted in relation with products and services to be certified by the trademark holder. The regulations of use must also include a list of products and services covered by an EU certification mark applied for³.

The fee for a certification stamp is EUR 1,500 if the application is submitted electronically.

³ <https://euipo.europa.eu/ohimportal/en/certification-marks>

Guidelines for the trademark use

- For trademark protection purposes in all EU countries, the trademark needs to be registered with the European Union Intellectual Property Office (EUIPO). For international protection, a trademark must be registered with the World Intellectual Property Organization (WIPO);
- In most countries, trademark protection is valid for 10 years, commencing from the moment the trademark application is submitted. Trademark protection can be renewed an unlimited number of times for periods of 10 years. The trademark owner may sell or grant permission to use it through a licensing agreement;
- In most countries, a trademark is obtained by registration based on a test performed by an appropriate competent authority, while in the Republic of Croatia test is performed by the State Intellectual Property Office;
- The basic conditions that a sign must meet in order to become a trademark are that it is different and that it is not like an earlier trademark;
- Any sign that can be represented graphically, particularly words, including personal names, drawings, letters, numbers, product shapes or packaging, three-dimensional shapes, colors, as well as combinations of all the above signs, may be protected as a trademark, provided that they are appropriate to distinguish the products or services of one entrepreneur from the products or services of another entrepreneur.

Among other things, it will not be possible to register as a trademark:

1. Marks which do not have any distinctive character in relation to the products or services for which registration is requested;
2. Marks consisting exclusively of marks or which, in trade, may be used to indicate the type, quality, quantity, purpose, value, geographical origin or time of manufacture of a product or provision of a service, or to indicate other characteristics of a product;
3. Marks consisting exclusively of signs or which have become commonplace in everyday speech or in good faith and established commercial practice;

4. Marks consisting exclusively of a shape deriving from the type of product itself, or a shape of the product necessary to achieve a technical result, or a shape which gives the products essential value;
5. Marks that are contrary to the public interest or accepted moral principles;
6. Marks containing the name or abbreviation, state coat of arms, emblem, flag or other official emblem of a State.

A trademark approved by the competent institution does not cover all existing products and services in the world, i.e., when registering a trademark, it is necessary to decide which type of product or service it refers to. Therefore, for optimal protection, it is usually enough to determine three classes of products and services to which the trademark applies, but, if necessary, more classes can be determined, which provides a greater scope of protection. The goods and services for which a trademark may be registered are classified in classes according to the Nice Classification, which contains 34 classes of goods and 11 classes of services. The trademark guarantees the owner the exclusive right to place on the market the products and/or services marked by it.

Trademark protection is an effective market tool by which producers and service providers protect the funds they have invested in the promotion and marketing of their products and/or services. The protection of the creation of a sign, logo or label may be a copyright work that is protected as copyright, thus protecting the interest of the author or creator.

2.2.2. TRADEMARK USE

The use of a trademark owned by the others needs to be strictly regulated. If a third party, for example an independent processor, wants to sell seafood products with the ARFM label on packaging, it needs to comply with the basic rules set out by the guidelines. As the ARFM label and associated claims would be a registered trademark, any kind of its usage will need to be approved.

Guidelines for the ARFM trademark use

- The name of the ARFM, its logo and certified seal shall all be registered trademarks of the organization/institute/partnership that will set the standards.
- No Company may claim that the product in question is certified without prior written approval of the certifying standard-setting organization. The records of such approvals shall be obtained and kept in possession of the Company, as well as any other approvals for the use of the trademark on communication and marketing materials (on/off certified product).
- The Companies may only use the ARFM trademark in accordance with the rules defined by the standard-setting organization, by providing applicable supporting documentation. This can be achieved through signing of a License Agreement prior to the trademark use.
- The Company shall have evidence that any product bearing the ARFM certified seal meets the claims on the product package.

3. SUPPLY CHAIN TRACEABILITY SYSTEM PROCEDURES

3.1. TRACEABILITY REQUIREMENTS

According to Regulation (EC) no. 178/2002 "traceability" is defined as the possibility of tracing food, feed, food-producing animals or substances intended for incorporation or expected to be incorporated into food or feed, through all stages of production, processing and distribution. This means that business entities must have information about the step before and the step after, that is, about the person who supplied them and the person to whom they delivered their products.

The traceability system can serve different purposes, and the Applicants can have different benefits from implementing it:

- ensuring rapid withdrawal or recall of products and rapid consumer protection;

- reducing the impact of product withdrawal on the market supply of a given product (withdrawal of only a certain series);
- strengthening consumer confidence, through the industry's ability to immediately identify and recall potentially defective products;
- providing internal logistical support regarding the quality of information and improving efficiency;
- establishing a feedback loop of information and its impact on improving product quality, conditions and delivery;
- ensuring transparency in the distribution of routes and improving the efficiency of supply chains and cooperation between food trade partners;
- providing reliable information:
 - ❖ company to company
 - ❖ companies to consumers
 - ❖ companies to state inspection bodies
 - ❖ companies to financial or technical auditors;
 - determining responsibilities and obligations for a particular problem;
 - providing protection to the company and/or product brand.

In accordance with the principle of consumer protection, consumers must be completely and accurately, but also clearly and unambiguously informed about the food placed and offered in the market in order to enable them to choose the food they will buy and consume.

The responsibility for information on packaged or prepackaged food lies with the entity under whose name or company name the food is put on the market, which is usually the producer or owner of the brand. In the case of the food imported into the European Union market from third countries, the importer for the European Union market is responsible for the food information.

The food business operator that offers or sells food to the final consumer, i.e., the retail store and public catering establishments, is responsible for informing consumers about unpackaged or non-prepacked food.

Council Regulation (EC) No 1224/2009 states that all batches of fishery products need to be traceable at all stages of distribution, which includes identification marks on cassettes or boxes during transport. The minimum required data is the identification number of each batch; external identification number and name of fishing vessel; FAO three-letter code for each species; date of catch; the quantity of each species, expressed in kilograms net weight or, where appropriate, the number of individuals; name and address of the supplier; consumer information provided for in Article 8 of Regulation (EC) No 2065/2001: trade name, scientific name, relevant geographical area, method of production and information on whether fishery products have been previously frozen.

For each batch of fishery products, when unique identification or a LOT number is applied, it usually includes L marking and document type designations (LOG - electronic register of commercial fishing at sea, LB - register of commercial fishing at sea, CR - catch report). It is a numerical code consisting of: the last two digits of the year, the last five digits of the CFR number of the vessel; in the case of an electronic register - the last three digits of the serial number, or in the case of a paper register or report - the last four digits of the serial number of the register or report; FAO species codes.

3.1.1. ON-BOARD TRACEABILITY GUIDELINES

Basic criteria

Professional qualification

- The Applicant shall prove that the person responsible for fishing is familiar with the following:
 - legal regulations in the field of fisheries, obligations on the submission of catch data, delivery;

- all technical measures and restrictions on fishing (spatial and temporal) related to their fishing practice;
- technical characteristics and manner of using fishing gear;
- regulations on nature and environmental protection, minimum sizes for certain species, non-hunting season, etc.

Compliance of fishing gear with the prescribed conditions

- Applicants must prove that their fishing gear complies with the legal framework and EU regulations (measure mesh, length, width, etc.).

Ensured traceability system

- Applicants should have a system on board to ensure traceability:
 - either printed labels with LOT numbers, *or*;
 - labels written on the containers, that can be used to identify their catch during the landing stage;
- If the vessel is at sea for more than one day, the batches should be separated and marked with a date in order to know how many hours the fish spent stored on ice.

Additional criteria for vessels

- The Applicant shall:
 - whenever possible use the most modern available data collection methods (electronic registers, mobile applications and other real-time catch displays);
 - use more selective tools than the prescribed minimum;
 - eliminate catches of species below the minimum protected sizes;
 - sample catches, measure the sizes of caught species and commercial catch, keep records of sampling;
 - keep records of inspections;
 - keep records of tool replacement and procurement of new tools.

3.2. CHAIN OF CUSTODY STANDARD

ARFM Chain of Custody (CoC) Standard and requirements

A supply chain covers different stages of product transformation. From the point of origin, processing and handling by various owners (i.e., change of custody) to distribution and labelling, products need to be tracked to the final costumers. Simultaneously, the final certified product should be traced back to its original source (and fishing vessel) so that the claims of its legality could be verified.

Chain of Custody aims to provide accountability and improve transparency throughout the supply chain. The product is tracked to verify its quality and origin, but also to improve other factors that follow the production system such as human rights and environmental conditions. Thus, a set of measures and requirements for controlling the movement of raw materials and products is needed, at each stage of the supply chain.

The ARFM CoC Standard is developed to ensure the traceability of ARFM certified products throughout the supply chain, support the responsible fisheries practices and maintain the credibility of the certification mark. This is a second important component of the whole ARFM certification process, complemented by the Fisheries Standard.

A unique certification mark which can demonstrate compliance of the certified product to the CoC Standard will be developed as part of the ARFM program. The outlined requirements will be subjected to continual review and improvement based on the latest updates and innovative solutions.

The CoC Standard contains four principles:

1. CoC Management System
2. Traceability
3. Labelling

4. Multi-site Requirements

Each of the principles includes a set of different criteria, consisting of multiple performance indicators.

Conformance evaluation

During the auditing, all performance indicators are evaluated so that the Applicant organization can demonstrate full compliance with the corresponding requirements. The findings from the audits are classified as conformities and nonconformities, and serve as a benchmark for certification decisions. A certification body could either allow or prevent certificate issuance, and in case of any nonconformities (major or minor) certain corrective actions will need to be demonstrated for certificate approval.

The requirements of the Standard are classified as Crucial, Relevant and Recommended, according to their level of importance.

Crucial Requirements: Full conformance to the corresponding indicator is mandatory, with demonstrable evidence or information by the Applicant organization. In case of lack of compliance with crucial requirements, Major Non-Conformity is generated and the organization has to undertake corrective actions which, if implemented, may lead to correction of all major non conformities.

Relevant Requirements: Full conformity to these requirements is mandatory, with enough evidence or information provided by the Applicant organization. In case of lack of compliance with relevant requirements, Minor Non-Conformity is generated and the organization needs to propose corrective actions (with implementation plan) to be submitted to the certification body.

Recommended Requirements: For the product to be certified, full conformity to these requirements is not mandatory, but is advisable. Any lack of compliance shall be included in the Audit Report as recommendation, and during the following audit organization may advise certification body of any implemented corrective actions.

Certification guidelines

Here, the minimum requirements for achieving chain of custody certification are presented. Their objective is to demonstrate that the material and products purchased from ARFM certified fisheries, processed, labelled and sold, really originate from well-managed and responsible sources.

The certification is applicable both to single-site operators, as well as to multi-site organizations where a company has more than one site which are individually audited and a single CoC certificate is issued defining all the sites/locations.

1. CoC Management System

The Operator's Chain of Custody Management System consists from centrally controlled documentation and responsible key personnel that monitors inputs/outputs of certified products and oversees the traceability operations.

1.1. The Operator shall document the control procedures to ensure the integrity of the certified products and applicability to all certification requirements, using:

- flowchart that includes all steps in the process where certified products can enter or leave the system;
- records of potential mixing, or any other transformation of the certified raw material;
- documentation of personnel's responsibilities towards CoC management.

Level: Crucial

1.2. The Operator is compliant with applicable laws (national, regional, international) concerning handling, processing and any other relevant operations in the product's life cycle while owning the custody.

Level: Crucial

1.3. The personnel handling and processing certified seafood products is trained for proper implementation of the CoC management and this shall be ensured by including at least one of the following:

- documentation for acknowledging skills and knowledge gained during the training (e.g., certificate);
- records of training/coaching.

Level: *Relevant*

1.4. The Operator shall implement internal inspection at their premises at least once a year, covering all products under the same certification scope, to monitor conformance with all requirements of the ARFM Chain of Custody system, and to eliminate any nonconformities;

1.4.1. records of those internal audits shall be kept, maintained and available in case that any potential correction action is needed. These records may include, but not limited to the following:

- documentation with detailed description of non-conformities;
- clearly stated corrective action and time-scale for correction;
- stated responsible person addressing non-conformities;
- verification of the implementation of the corrective actions, within 28 days from the start of the procedure.

Level: *Recommended*

1.5. The Operator shall have a binding agreement with all contractors next in chain to which the custody is transferred. The contractor or subcontractor shall be certified against the ARFM Chain of Custody standard.

Level: *Relevant*

1.6. All the documents and up-to-date records that demonstrate the conformity with all applicable certification requirements shall be kept for a minimum period of three (3) years or more so that it exceeds the shelf life of the certified product, and this documentation includes but not limited to, the following:

1.6.1. maintained procedures, training records, purchase/sales documents, control of non-conforming products, records of suppliers and outsourcing, complaints.

Level: *Relevant*

2. Traceability

There is a traceability system in place to ensure that only fish⁴ caught by the ARFM certified fishers is sold as certified. Seafood products are traceable throughout Operator's supply chain by established procedures that allow for documenting movement and location of such products.

2.1. **The Origin** - raw material is sourced from certified suppliers

- 2.1.1. The Operator has a process in place to ensure that only the seafood products that are sourced from the certified ARFM vessels shall carry the official certified seal.

Level: *Crucial*

- 2.1.2. The Operator keeps the documentation received with the certified products for identifying their origin, including vessel name, gear used, country of origin and fishing area.

Level: *Crucial*

- 2.1.3. A record of all inputs of certified material/products is maintained to trace back those incoming products to certified fisheries/suppliers, showing the following information:

- supplier's name, their CoC certificate number and evidence of certificate validity

Level: *Crucial*

2.2. **Identification** - each certified product or batch of products is identifiable at each step of the supply chain

- 2.2.1. The Operator shall implement a system for the identification of certified products by visual or physical recognition at all stages from the purchase to final sale.

Level: *Crucial*

⁴ The term *fish* is used for the sake of simplicity, and it refers to finfish, shellfish and other seafood.

2.2.2. The Operator shall demonstrate the existence of internal procedures for handling certified products in their facilities, in accordance with the certification claims.

Level: *Crucial*

2.2.3. Seafood products that are sold as certified shall be identifiable on the receipts and sales invoices, except to the final consumers. This may be done by using acronym (i.e. ARFM), the Chain of Custody code, unique product code or similar system of identification.

Level: *Crucial*

2.3. **Segregation** - mixing of certified seafood with non-certified is not allowed

2.3.1. There is a system in place to ensure that certified and non-certified products are not mixed during the transportation and storage.

Level: *Crucial*

2.3.2. If non-certified seafood is mixed as an ingredient in certified product, such final product shall not be able to carry the ARFM certification, except for the compound products (eg. ready-to-cook meal) where there is 5% or less of non-certified seafood in the total seafood content.

Level: *Crucial*

2.3.3. Where necessary, certified products will be clearly separated from non-certified products, by physical or temporal separation.

Level: *Relevant*

2.3.4. The Operator has a recall system in place that is activated if the mixing of certified and non-certified seafood occurs. The certified product shall be recalled and the relevant certification body is notified within 3 working days. The recall system will be tested once per year and the relevant documentation will be kept for inspection purposes.

Level: *Relevant*

2.4. **Volume calculation** - input and output volumes of certified products are recorded and maintained

2.4.1. The Operator shall maintain the records of bought and sold quantities for them to be calculated.

Level: *Relevant*

2.4.2. The records of volumes purchased/received need to be maintained, but the records of volumes sold/served to final consumers do not have to be recorded.

Level: *Recommended*

2.4.3. If there are any changes to internal or external records, this needs to be clearly documented.

Level: *Relevant*

2.4.4. If the certified product is transformed at any stage (processed, re-packed and similar) and at any given time, records need to allow for conversion rates (factor describing the change in quantity of a material) to be calculated.

- It is up to the Operator how this conversion rate will be calculated upon the explanation of the methodology used and reasons behind it.

Level: *Relevant*

2.4.5. The Operator has a process in place to ensure that the output volumes with the ARFM claims at any time do not exceed the input volumes.

Level: *Crucial*

2.4.6. The traceability records shall be kept unchanged, complete and accurate.

Level: *Relevant*

3. Labelling

As a method of identifying and distinguishing of certified products at any stage of the supply chain, labelling techniques are used to mark such products on the package, containers, pallets or similar.

3.1. The certified product shall be labelled or otherwise be identified in a manner that demonstrates maintenance of traceability during processing, storage and delivery to the final customer.

Level: *Crucial*

3.2. The minimum labelling requirements will include the following necessary information:

- Commercial or Latin species name
- Country of origin
- Fishing area
- Product description
- Production code number/product code

Level: *Crucial*

3.3. Each output of batches/lots of certified products shall be identified as ARFM certified on packaging or associated documentation (e.g., sales invoice).

Level: *Crucial*

3.4. The Operator shall use the ARFM logo only on the products originating from the raw material supplied by the ARFM certified fishers and other certified suppliers.

Level: *Crucial*

3.5. A secure system for production, storage and application of product labels with the ARFM mark exists, to ensure correct labelling of the certified seafood products.

Level: *Relevant*

3.6. The Operator may apply the ARFM label on the ARFM-certified seafood products following the requirements for use of the trademarks specified in the subsection *Trademark use* of this document.

Level: *Relevant*

3.7. The Operator shall have a system in place that ensures only certified products are labelled as such on packaging, menus and other materials associated with these products, to prevent misuse and mislabelling.

Level: *Crucial*

3.8. Certified products shall not be mislabelled by species, origin, catch area, or certification trademark.

Level: *Crucial*

4. Multi-site Requirements

If the Operator has more than one site or activities carried out in multiple locations, the requirements for Chain of Custody certification shall apply to all locations, with one application to multi-site certification, if certain rules are followed.

4.1. A multi-site organization of an Operator is considered as such if it fulfills the following criteria:

4.1.1. All registered sites shall have a contractual (signed agreement) or legal (eg. common ownership) link with a central office of the named multi-site organization. Register of sites shall include the following:

- Name of each site/location;
- Full address;
- Contact details, including contacts of responsible staff;
- Handled products;
- Scope.

Level: *Crucial*

4.1.2. The sites are subjected to internal audits by the central office;

Level: *Recommended*

4.1.3. Centrally administered and common controlled management system is applied to all sites, as laid down in the central documentation system.

Level: *Crucial*

4.2. A documented policy exists to ensure that the multi-site organization is committed to the ARFM CoC standard requirements, and it is communicated to all sites within the organization.

Level: *Crucial*

- 4.3. A sampling plan for the multiple sites for the initial and re-certification audits may be done based on the square root of the total number of sites within the scope of the Operator's application for certification.

Level: *Recommended*

- 4.4. The Operator shall assign one trained person responsible for coordinating multi-site activities with respect to the Standard.

Level: *Recommended*

- 4.5. If the multi-site organization outsources transport or storage services, the third-party company shall ensure product traceability during transportation, distribution, storage, using documentary evidence (contract or similar).

Level: *Relevant*

- 4.6. Each output of the certified products shall be clearly identified as the ARFM certified on packaging and/or associating documentation.

Level: *Crucial*

- 4.7. The certification body will be informed about any changes in multi-site organization (eg. change of the ownership, exclusion or inclusion of one or more sites and similar), within 10 days from the registration.

Level: *Relevant*

- 4.8. Any new sites added to the organization shall be subjected to an internal audit to the Standard before being recognized by the member site register.

Level: *Recommended*

4. FOOD SAFETY AND SANITARY PROCEDURES GUIDELINES

Risk assessment is a systematic approach to the detection and control of food hazards and risks, to ensure that food reaches consumers without any contamination and to ensure food is safe for human consumption. Food in general and food of marine origin, as a raw material or as a finished product, is subject to very rapid microbiological spoilage. Therefore, hygienic - sanitary food protection measures (cleaning, washing and disinfection) are extremely important in seafood production.

In every part of the fishing operations, from sorting, screening, rinsing, shocking to packing and unloading:

- ❖ hazards are detected - physical, chemical or biological contaminants that could lead to the catch being unfit for human consumption and health;
- ❖ control measures are proposed to prevent these problems from occurring.

There are three main forms of risk of contamination: physical, chemical and biological (bacterial).

Physical risks include various dangerous and unwanted bodies such as pieces of glass, wood chips, rust, pieces of net or pieces of peeled paint.

Examples of *chemical contaminants* are diesel fuel, oils, grease and cleaning chemicals. In addition, there are biotoxins derived from plankton (a danger to shellfish), poisonous fish, and histamine (formed from the amino acid histidine in blue fish). Fish can also be contaminated with environmental chemicals (heavy metals, hydrocarbons, herbicides, pesticides), but this is most often the case in polluted areas near the coast, where trawling is prohibited.

Sources of *bacterial contamination* are dirty fish tanks, equipment, cassettes and poor hygiene standards by the vessel's crew. Bacteria, which are already present in the fish, will multiply much

faster if the fish's entrails are not removed and if they are not shocked and cooled as soon as possible after being removed from the sea. Bacterial spoilage is a major factor affecting the freshness of white fish. Other forms of biological pollution are parasites, which are most common in red mullet, hake, whiting and blue fish.

Vessel operations guidelines

- The Applicant shall prove that the responsible persons in charge of fishing on individual vessels are familiar with the legal regulations related to hygiene and food safety and that they implement good hygiene practice;
- All equipment on board that serves to maintain the quality of the catch (refrigerators, ice machines, etc.) shall be in operation and records of servicing/maintenance and cleaning of these devices are kept and accurate;
- All means of cleaning and maintaining the ship shall be used in the prescribed manner and for the purpose for which they are intended;
- The vessel has a schedule and records of cleaning in place;
- The fishing vessel complies with the rules of good hygiene practices in such a way that all areas that receive the catch are adapted for cleaning;
- Contamination of the catch by exhaust fumes, pests, wastewater, foreign bodies and so on shall be prevented;
- The vessel has special hygiene rooms for the crew;
- Only potable or clean seawater is used on board for rinsing the catch;
- Any surfaces on the vessel where the fish is being handled, shall be made of non-toxic materials and regularly cleaned;
- The ice used on board to store catches shall be made from clean seawater for drinking water and shall be clean, fresh, and of good quality, crushed or flaked;
- The ice shall be stored in a way to protect it from contamination;

- All the catch shall be stored on board in hygienic conditions;
- The crew shall be equipped with the appropriate and clean protective clothing that can be washed, and their hands or gloves shall be clean when handling fish;
- The fish tanks and cassettes on board shall be clean and in good condition;
- The fish handling area shall be separated from the storage area for cleaning products and other chemicals, e.g., for the maintenance of the propulsion machine;
- Applicant shall ensure the preservation of the cold chain and monitor the temperature during storage of fish and add ice as needed and on time;
- Applicant shall take care of contamination control, preservation of the cold chain and quality of catch during landing;
- Applicant shall use the devices that record the temperature (loggers, sensors) in storage rooms, refrigerators and containers that contain the fish (e.g., term boxes with ice water, ice machines and fish cassettes);
- The records of veterinary inspections and inspections shall be kept, especially for products for export.

General provisions on hygiene for primary production (Annex I to Regulation (EC) No 852/2004)

- All food contact surfaces, and equipment should be clean and safe and made of non-toxic materials;
- Pest control and personal hygiene should be carried out;
- Good practice means that the vessel uses materials that can meet the previous requirements and that are intended for the purpose of the food production;
- Regular cleaning, washing and disinfection of everything that encounters food (such as equipment, tanks, rooms) are mandatory, as well as the hygiene of staff and the use of clean water and ice;
- All items, utensils and equipment with which food comes into contact shall be:
 - effectively cleaned and, where necessary, disinfected. Cleaning and disinfection shall be performed frequently enough to avoid any danger of contamination;
 - be so constructed, of such material and maintained in such good condition as to minimize the risk of contamination;
 - excluding disposable containers and packaging, made of such material and maintained in such good condition that they can be cleaned and, if necessary, disinfected;
 - placed in a way that allows adequate cleaning of the equipment and the surrounding area.

Clean water may be used for complete fishery products and for external washing, while pure sea water should be used for shellfish, thorns, mantles and sea snails.

Requirements for fishing vessels (Annex II to Regulation (EC) No 853/2004)

- Rooms where fishery products are located shall be separated from the boiler room and sanitary facilities;
- Adequate and enough natural or artificial air exchange shall be ensured:
 - Artificially induced airflow which can go from a contaminated area to a clean area shall be avoided;
 - The air exchange system shall be designed in such a way that the filters and other parts that need to be cleaned or replaced are easily accessible;
- Wastewater drainage systems shall be suitable for the purpose for which they are intended:
 - The systems shall be designed and constructed in such a way as to avoid the risk of contamination;
 - If the drainage channels are fully or partially opened, they shall be designed in such a way as to ensure that water does not flow from the contaminated area towards the clean area or into a clean area, especially into the area where food is handled;
- The materials or coatings from which the tanks, equipment and surfaces that encounter the fish are made should be: smooth, waterproof, resistant to abrasion, deterioration and chemicals; shaped in such a way as to prevent the accumulation of dirt and facilitate drainage;
- Painted surfaces shall not be in such a state that the paint peels in a way that poses a risk of contamination;
- Refrigerated storage facilities for fishery products should be equipped with a temperature data recording device, which is connected to a computer in the wheelhouse for continuous monitoring. Such rooms should be adequately insulated to prevent fish from heating up and heat from entering from the engine room, the surrounding air and sea or from the cabins;

- When building a vessel, it is important to use stainless steel, aluminum or food-safe plastic resistant to sea water conditions when making space and equipment that will be in contact with fishery products;
- Storage tanks shall have enough drainage openings while water flushing hoses must be of sufficient length to be able to reach all areas which need to be cleaned and they need to have sufficient jet pressure for effective flushing;
- Cleaning should be carried out in the prescribed order in which the required chemicals and the manner of their use are listed;
- The cooling space should be cooled down from 0 °C to 4 °C before the fish is caught. If the temperature is too low, the catch might freeze;
- If there are no cooling devices, it is necessary to provide enough ice for the duration of the entire voyage. In case the vessel does not have a special storage room, containers and covers with thermal insulation should be used;
- Stale or contaminated ice should be discarded immediately, and the storage area cleaned;
- Ice shall be kept in a clean space, covered with a clean cover such as foil or plastic. Under no circumstances should the possibility of ice contamination with bird droppings, chemicals on deck or glass be allowed;
- Larger ships can be fitted with ice machines, which shall be cleaned regularly;
- Ice containers and shovels that distribute ice shall be clean and disinfected;
- Ice can also be made from seawater, however ice made from drinking water is recommended, as the temperature of seawater ice can be as low as -6 °C, which can lead to partial freezing of the fish;
- Rinsing shall be done under running water long enough as to be thoroughly performed;
- The crew shall use clean hands, gloves and clothing, and smoking is strictly prohibited;
- Under no circumstances should the catch be allowed to be left unattended for long periods of time;
- Any delay in unloading and loading can lead to heating and spoilage of fishery products.

Specific requirements for individual fleet segments and species

For fishing vessels that catch shrimps and prawns:

- the products for the prevention of melanosis shall be used in precisely prescribed concentrations and duration, and it is desirable to use products without sulfate presence;
- there should be an indication on the product whether it has been treated and by what;
- the crew shall be trained about accurate concentrations achieving;
- the crew shall use safety protective equipment (gloves and, if necessary - respirators) when handling solutions.

For fishing vessels that catch blue fish:

- a cooling and icing system to prevent the formation of histamine is needed;
- special attention is paid to the preservation of the cold chain and recording of the temperature in the tanks.

For shellfish vessels:

- purification system with running water shall be provided;
- the records of toxicological analyses shall be kept.

Crew personal hygiene

As persons who handle food, fishers have a legal and moral responsibility to treat fishery products in a way that prevents their spoilage.

The risk in the fish treatment at this stage is considered low, because it is the very beginning of the food production, which then undergoes further processing. However, in the event of poor crew hygiene, the fish will spoil faster, so the crew must be aware of their main role in ensuring product quality. Crew education is beneficial for their morale and efficiency, and crew members instructed in the basic hygiene measure implementation will need less supervision, which will lead to better quality and price of the fish.

The hygiene rules apply to all crew members during the handling, storage and unloading of the fish:

- All crew members shall wear protective clothing and keep it clean;
- To work in a stall or on a motorcycle, you need to have special clothes and change it before stepping onto deck where the fish is being unloaded;
- It is not advised to wear chains or pendants that could fall off into the catch;
- The crew shall wear a hat or scarf that covers the hair;
- The crew shall not eat, drink or smoke in the area where the fish is handled;
- The crew shall keep their hands clean and tidy at all times when handling fish;
- Gloves shall be washed regularly;
- The crew shall not blow their nose, cough, sneeze or spit over the fish;
- Injuries or scratches on the skin shall be covered with a waterproof patch;
- If a crew member gets diarrhea, vomiting or fever, they are obliged to inform their superior immediately and shall be excluded from the process of preparing and handling the catch, until healed.

Production procedures guidelines

Most seafood factories in EU countries already implement HACCP based quality systems that apply controls to the production line, from raw material to the finished products. The prerequisite programs, such as Good Manufacturing Practices (GMP) and Good Hygienic Practices (GHP), provide minimum sanitary and hygiene practices recognized by the FAO. Also, The Codex Alimentarius General Principles of Food Hygiene are used for the products intended for the export trade. Here, some basic requirements are outlined and additional recommendation guidelines are presented.

- The Applicant shall determine the critical points (CCPs) where control can be applied, which is essential to eliminate or prevent a food safety hazard, or reduce it to an acceptable level;

- Monitoring shall be established to determine if there is a loss of control or deviation at CCPs:
 - corrective actions shall be taken if the indications show loss of control;
- The Applicant shall establish verification procedures for evaluations;
- The Applicant shall ensure record-keeping and documentation procedures;
- The facilities are provided with clean potable water in sufficient quantities for processing operations;
- The Applicant shall ensure that all the handlings of fish are done under good hygiene practices in order to minimize/eliminate spoilage;
- The staff of the Operator shall be trained in personal hygiene and operating procedures;
- All products shall be processed according to specifications required by the buyers or the further processing;
- The seafood products are produced in facilities which only handle fish and other marine organisms such as shellfish, and no other types of animals;
- The Operator shall withdraw or recall any food item unsafe for use:
 - They shall notify the competent national authorities to monitor appropriate measures taken for reducing/eliminating a food safety risk;
- Final seafood products are safe and meet all legal requirements for contaminants, and are free of pathogens and toxins;

The facility shall:

- have a documented risk assessment system and procedure in place to identify and address food defense risks;
- have in place an effective pest control program that prevents and eliminates risk of pest infestation inside the facility and on facility grounds:

- litter and discarded equipment shall be properly disposed of to avoid the creation of pest-infested areas;
- have food contact areas constructed only of food-grade materials:
 - bare wood, corrosive and flake materials are strictly prohibited;
- have toilets and other personal hygiene areas opened directly into transition areas with proper sanitation controls and not directly into processing areas;
- have internal floors and walls made of smooth easily-cleaned material;
- have corners between walls and floors either rounded or properly sealed to avoid accumulation of unnecessary waste;
- have floors with adequate drainage;
- have overhead lights shielded or made of shatterproof material to prevent glass contamination in case of broken bulbs;
- ensure that painted surfaces in primary storage and/or production areas are free of chipping and in good condition;
- have all work surfaces that come in contact with food products adequately cleaned and sanitized before use;
- have a documented personal hygiene standard and program that prevents product contamination;
- have an effective training program for all personnel on the personal hygiene standard and program and records of training shall be maintained;
- have no evidence of condensation which has the potential to contaminate products, packaging materials, ingredients or food contact surfaces;
- have procedures in place to ensure that raw materials, packaging, cleaners and ingredients are used within the allocated shelf life (if applicable).

5. QUALITY ASSURANCE RECOMMENDATIONS

Quality assurance guidelines will be covered in D4.3.3. *Report on Products' certification*, for the selected three sustainable ARFM products developed in the PRIZEFISH project. The quality procedures undertaken during processing and other operations at production stage of wild-capture fisheries' supply chains, will be briefly described here as recommendations for the operators that wish to be certified against all ARFM Standard's requirements.

Seafood quality requirements shall include, as appropriate, one or more of the following division parameters:

- classification, categorization and name of food;
- physical, chemical, physio-chemical and sensory properties and composition of food;
- type, physio-chemical and sensory properties of certain ingredients used in food production and processing;
- procedures applied in production and processing;
- additional food labelling requirements;
- methods established by the European Union to control the prescribed food quality requirements.

Quality assurance at supply stage

The Applicant shall:

- ensure the preservation of the cold chain and monitor the temperature during fish storage and add ice in timely manner if needed;

- take care of contamination control, preservation of the cold chain and catch quality at landing;
- use devices that record the temperature (loggers, sensors) in storage rooms, refrigerators, containers containing fish (terms boxes with ice water), ice machines and fish cassettes;
- keep quality records of unloaded fish, that shall be filled in by processing plants, customers or cooperatives;
- keep records of sales and prices for market progress monitoring.

Demersal catch procedure recommendations

When fishing with a bottom net trawl, it should be ensured that the net is emptied quickly. If the pull continues for a long time, the fish is crushed in the net, the tissue is damaged, spine-cracking and bleeding may occur, leading to poorer fish quality. While the net is in the water, due to the thrust force, the content is seemingly lighter, but when the net is taken out on deck, the true catch weight comes to the force. Therefore, the bag should be emptied as soon as possible, and crabs and other spiky or horned animals should be picked up immediately so that they do not stab the catch. Throwing or squeezing should be avoided when handling fish, and equipment should be shaped so as not to damage the fish.

For the fish descending down a ramp - the slope of the ramp should be slight enough so that the fish does not get physically damaged.

Sorting and storing the catch should be done as soon as possible after the fish is pulled onto the deck. If this is not possible, the deck must be covered. Tanks containing fish can be covered with thermal insulation covers.

Recommendation is to eviscerate and release the blood of the fish within one hour after the catch. When opening the abdominal cavity, only one incision should be made, taking care not to damage the meat/fillet. Knives need to be extremely sharp and rinsed regularly during the use.

Pelagic catch procedure recommendations

Temperature control is extremely important when handling small pelagic fish because of the prevention of histamine development in the fish. Consumption of histamine by humans in larger quantities can have a toxic effect causing symptoms of poisoning. In addition, small pelagic are more susceptible to bacterial spoilage for several reasons. First, the tissue contains large amounts of fat which soon after the fish is taken out of the sea begins to oxidize and significantly changes the organoleptic properties and quality of the fish meat. If the fat content in the tissue is high, this can lead to delicate fish processing. After spawning, small pelagic are usually in poorer condition and low-fat. The amount of fat varies during the fishing season and it is important to know when it is best to fish in order to increase quality and financial gain. Second, small pelagic fish have a relatively larger surface area than body volume and are thus more exposed to bacteria. Third, pelagic species feed on plankton and have increased activity of digestive enzymes, which leads to rupture of the abdominal cavity and decomposition of the surrounding tissue, which can be seen in the discoloration of the meat/fillet.

Temperature also affects the occurrence of rigor in caught fish. Rigor is a natural process of muscle contraction, which occurs after dying. At lower temperatures, the contractions are milder, and the rigor lasts longer, so enzymatic activity and spoilage are slowed down. At higher temperatures, rigor occurs abruptly and strongly, which can lead to the separation of muscle tissue in the fish fillet, which is visible during further processing. It follows from all the above that small fish are particularly vulnerable to ill-treatment and inadequate storage, but with good production practice, spoilage at all stages of production and processing can be assessed and minimized.

Depending on the sea temperature, the temperature of the caught fish is usually 11-14 °C, and it should be lowered to 2-3 °C as soon as possible by rapid cooling in the tanks. For this purpose, the seiners are equipped with either pools with a refrigerated seawater system (RSW) or tanks in which a mixture of ice and water (CSW - chilled seawater) is prepared immediately before the fish is pulled onto the deck. Such equipment makes it easier to keep the catch in the best condition. On vessels that are equipped with pools for cooling fishery products in chilled clean sea water, the pools need to have devices to achieve a uniform temperature throughout the pool. The water should be cooled down to 0 °C and the ratio of fish to water should be 80:20. These devices need to achieve a cooling rate which ensures that the mixture of fish and clean

seawater reaches a temperature of not more than 3 °C for six hours after loading the fish and not more than 0 °C after 16 hours and should be able to monitor and, if necessary, record the temperature. Proper setting and maintenance of the temperature in the tanks is essential if we want to maintain the quality of the product and prevent the appearance of histamine.

Premium quality of small pelagic fish can be achieved only when the catch does not exceed 75% of the maximum capacity of the vessel and quality shocking and transport of fish is enabled, without the danger of the tank's overcapacity.

The best practice is to transport the fish together with the covered isothermal tank to a processing plant and sort it there. Thus, the fish is best preserved from contamination and heating. In case the sorting of the small pelagic fish is done on the vessel, the deck should be covered with an awning or tarpaulin to protect the fish from the sunlight, bird attacks and face contamination. Ice should be placed in cassettes directly on the boat, to preserve the cold chain. In addition, filled cassettes should be covered and protected from seagulls and exposure to sunlight while standing on deck and waiting to board.

Shrimp catch procedure recommendations

When fishing for shrimp, the Applicants shall:

- pay attention to preserving the cold chain;
- use products to prevent melanosis in precisely prescribed concentrations and duration;
- if possible, use sulfate-free products;
- indicate on the product whether it has been treated and by which ingredients;
- educate the crew on achieving accurate concentrations;
- the crew handling sea solutions has protective equipment (gloves and, if necessary, respirators).

Weighing, transport, marking and packaging process

Weighing

- Weighing is performed at the unloading point, at the approved facility or on a vessel if it is approved. Weighing and marking in the refrigerator is recommended;

- It is necessary to ensure that the scales reflect the weight of the fish cassette;
- Calibration weights must be kept on board and the accuracy of the balance checked daily. If possible, a record of each calibration or scales check should be kept;
- Before weighing, the fish should be rested for a while, in order for the excess water to be drained;
- Care should be taken to fill the cassette to the minimum target weight;
- Targeted weights must include the allowable amount of water that will be drained from the cassette over time, to ensure a minimum weight when unloading;
- The crew should be instructed not to fill the cassettes significantly more than the minimum target weight, as overfilling might result in fish mashing and loss of quality;
- Persons responsible for weighing shall submit the weighing records in electronic form if such delivery is possible within 24 hours, exceptionally for weighing in an approved facility within 48 hours from the end of weighing;
- Each weighing record must contain the following information: CFR number, external vessel identification number, vessel name, logbook or catch report number, FAO three-letter code for each species with trade name and scientific name of each species, weighed quantities by species expressed in kilograms, LOT number, purpose, approved facility number if applicable, PIN of the person responsible for weighing, serial number of the scales, date of weighing and time of weighing.

Transport

- Fishery products need to be accompanied by a transport document during transport from the unloading point to the destination;
- Transport of fishery products should be performed by specialized means of transport - refrigerators that maintain the temperature of the cold chain intended for the transport of food;
- Vehicles should be constructed of suitable materials to allow for cleaning and/or disinfection;
- Means of transport and containers are used exclusively for the transport of food and may not be used for the transport of anything else;
- The landing site and catching device should be protected to minimize the risk of contamination.

Transport data delivery

- The transport document is filled in - if possible, in electronic form, after taking over the fishery products at the unloading point, and before the start of the transport;
- Transport documents should contain vehicle registration number and a unique serial number;
- For each batch of fishery products, a unique LOT number is provided, which is transferred from the weighing records;

Labelling and packaging

Boxes or cassettes used for storing fish should have a layer of ice on the bottom before the fish is placed in them. The fish is then covered with foil to prevent it from drying out and another layer of ice is added. Some believe that it is better not to use foil, but to allow the fish to cool with water created by melting ice. This last layer of ice must not cross the edge of the cassette, so as not to knead the product when stacking the cassettes on top of each other. The goal is to keep the product at a temperature between 0 °C and + 2 °C.

If the fish's entrails have been removed, then the fish needs to be placed belly down to facilitate draining and at the same time prevent the accumulation of water in the abdominal cavity. The fish needs to be folded to prevent bending, warping and pressing.

Wrapping and packaging material should not be a source of contamination and it shall be stored in such a way that it is not exposed to the risk of contamination. Containers shall be clean and undamaged, and if used repeatedly they shall be suitable for cleaning and, where necessary, for disinfection.

Quality assurance at production stage

The processing factors that most affect fish quality are: time, temperature, damage/deterioration, hygiene and packing. In that sense basic recommendations are as follows:

- The raw material and seafood products need to be processed quickly. It is useful to specify maximum allowable times for fish processing to keep spoilage to a permitted level:

- there shall be measurement and control of operation time;
- In order to reduce spoilage to a minimum, during handling, processing and distribution, wet fish should be kept as much as possible near 0°C;
- Temperatures of cold storage, freezing, cooking and heat processing shall be stated in a process specification;
- Protective measures for preventing the fish to be bruised, squashed, bent in rigor, shall be undertaken;
- Permitted manner of use that prevents deterioration of fish meat shall be specified;
- Cleaning and sanitation procedures shall be specified in the process specification;
- Packing for product appeal shall be covered by process specification, with instructions on how to cut, trim, arrange product in the pack and the specified weight, number and size of the fish.

The Applicant shall:

- ensure homogeneous batches with products free of defects;
- retain cold chain maintenance during their product custody and ownership;
- preserve the product from possible contamination during transportation and storage;
- maintain sufficient separation of space between finished and unfinished products to prevent cross contamination;
- exclude any products that do not comply with the specified requirements.

6. SUSTAINABLE PRACTICES IN SEAFOOD PRODUCTION

6.1. OPERATIONAL EFFICIENCY GUIDELINES AND REQUIREMENTS

A large-scale growth in sustainability operations in the fish processing industry should be followed by and accompanied with sustainable practices within the whole supply chain. Business innovation is thus needed to provide this value at each step along the chain and among connections between pieces. Up and down the supply chain, such integrity should be applied by all actors (for example between processor and distributor) so it can get recognized in the end by the final consumer who appreciates a sustainable product and recognizes it. If these pieces do not fit perfectly and are not in mutual coherence - a sustainable product is indistinguishable from a traditional one, so it becomes difficult to make final claims and compete on the market.

Packaging

For perishable products and items, such as fish and seafood, highly sensitive to damage and temperature fluctuations, it is essential to apply packaging that at the same time preserves food quality, withstands humid and cold conditions, but is also sustainable and appropriate for storage and distribution. As packaging plays a key role in maintaining quality of the food items throughout the supply chain, it primarily needs to be food-safe and moisture-resistant.

One of the main aims of all food processors is to extend shelf life of their products. The high-quality design and use of cost-efficient material (e.g., recycled paper or board), coupled with environmentally-friendly processing, may secure the optimum advantage in shelf-life extension. Furthermore, if the packaging is circular - produced from recycled fibers and with minimal CO₂ emissions, the seafood companies can claim sustainability performance in their practices.

Here, the proposed packaging frameworks for preserving quality and freshness of products, produced in D4.2.1. *Brochure of product lines*, will be analyzed and recommendations in terms of guidelines for sustainable and innovative alternatives for packaging will be given. In addition, other packaging solutions will be included as best practice models for possible inclusion in the ARFM certification framework.

Modified Atmosphere Packaging (MAP)

The variety of gasses and gas mixtures for food use includes nitrogen, oxygen, carbon dioxide and argon which, either separately or as components of a mix, are added to the packaging so as to increase the shelf-life of foodstuffs. The role of these gasses is to block or at least significantly reduce, the enzymatic or biochemical deterioration of products, as well as that caused by natural bacteria present. Apart from prolonging the period over which food products can be kept, protective atmospheres also produce other advantages such as cost savings due to a decrease in product deterioration and the resulting longer shelf life of the product allowing better production planning.

Reusable/recyclable packaging

The fisheries sector is particularly reliant on plastics (for fishing gear, aquaculture equipment, fish boxes, packaging, etc.). Due to its rot-proof nature, plastic has proved to be remarkably useful in the marine environment. Nevertheless, it also presents a non-biodegradable material, produced from fossil fuels, that exhibits bad impact on marine ecosystems. Certainly, the devastating outcomes of microplastics on marine organisms, larger plastic objects being ingested by fish or ghost nets trapping non-targeted fish and marine mammals are widely known to fisheries communities. Although challenging, the research for viable alternatives to plastics is, therefore, urgent. Initiatives already exist to replace plastics, for example materials based on parts of algae, shells, fish scales and sugar cane waste.

Moreover, under the new EU plastic strategy⁵, all plastic packaging in the EU should be recyclable by 2030, the consumption of single-use plastics will be reduced and the intentional use of microplastics restricted. This is also included in the communication *Towards a circular economy: a program for a zero waste Europe*⁶, proposed to aim at "reducing marine litter by 30% by 2020, for the ten types of litter that most commonly pollute beaches, as well as fishing gear abandoned at sea, and adapt priorities according to the four marine regions of the EU".

⁵ https://ec.europa.eu/commission/presscorner/detail/en/IP_18_5

⁶ <https://ec.europa.eu/environment/circular-economy/pdf/circular-economy-communication.pdf>

It is not just the environmentally-conscious consumers that are striving to reduce plastic use daily, but also retailer market and processing companies that are using new solutions and emerging technologies to tackle this problematic issue.

Other innovative options in fishery supply chains

ECOFISHBOX



EcoFishBox, for example, is an award-winning and patented fish packaging solution with environmental benefits. It is made by a recyclable and renewable fiber-based package, which can also reduce costs of transportation. The volume of packages, in fact, has decreased by more than 50% according to the company's feedback.

Source: <https://www.storaenso.com/en/newsroom/news/2020/3/sustainable-fish-packaging-helps-business-and-the-environment>

Packaging guidelines

The Applicants should buy or use the packaging of the producers that use the solutions which optimize packaging use and design, in order to preserve the product properly and protect it effectively.

- Use the tamper-proof and packages that are easy-to-use and distribute;
- Provide the information of effective packaging to the end consumer;
- If the Applicant is using external packaging services, they should give preference to the products that are already certified against ecolabelling Standards;
- Prevent any wastage and spoilage of the product during distribution and storage by avoiding under-packaging;

- Prevent unnecessary waste production and cost increase by avoiding over-packaging;
 - If possible, source renewable materials from the region to avoid pollution;
 - Improve your carbon footprint by choosing more light-weight materials.
- Modified Atmosphere Packaging (MAP)
- The Applicant should option for the MAP technology in order to preserve quality and nutritional value of the product and prevent food waste;
 - It is recommended to use noble gas (such as argon) in order to preserve the product in a MAP;
 - Use only the plastic MAP packaging that is "climate positive" - saving more carbon emissions than are generated in the lifecycle of the plastic packaging (e.g., StePac⁷);
 - Apply lean packaging formats and avoid bulk packaging liners;
 - Use the products that were chemically recycled, i.e., where plastic materials were converted into their initial monomers from which new products were made;
 - For some packaging formats, such as films, use mechanically recyclable packaging;
- Reusable/recyclable packaging
- Use packaging materials that improve product quality and are good for the environment;
 - Rely more on products for which the life cycle assessment (LCA) was conducted, to improve sustainability of food packaging in seafood supply chain;
 - Use as little resources and produce as little waste as possible;
 - Use the packaging that has reduced plastic-film content;

⁷ <https://www.packaginginsights.com/news/ice-free-stepac-launches-climate-positive-packaging-for-fresh-produce-long-haul-transit.html>

- If the operator from which you procure the packaging uses recycled fibers or fibers of known and safe origin, that packaging should be made from certified raw materials (e.g., FSC certified).

- Other innovative options in fishery supply chains
 - The Applicants shall try to procure packaging produced with microbial biodegradable polymers from agro-food waste residues or other forms of bio-packaging;
 - Companies should update their supply chains, establishing connections with other partners involved in sustainable practices' implementation, trying to avoid the use of plastic materials as much as possible;
 - Take initial steps towards circular packaging economy.

Transport

Seafood industry is heavily dependent upon efficient and successful transporting methods of large quantities of food, in many cases at large distances around the world. The transportation of fresh, chilled and frozen seafood products also requires the maintenance of the cold chain, which means the use of insulated containers, coolants and mechanical refrigeration, which all adds up to bulkier cargo. As almost all seafood transportation methods contribute to an increase in greenhouse gas emissions, it is important to incorporate carbon footprints and other indicators into seafood sustainability certification and eco-labels.

Fuel efficiency

Seafood products "leave" carbon footprints during their production (i.e., fishing and farming), transportation and storage, processing in plants, and in case of fresh, chilled and frozen packed products - at retail level, before reaching the plate of the end consumer.

Fuel use in fishing often requires travel to remote parts of the sea or ocean, as they become increasingly depleted in resources. As a result, fishing vessels consume more energy for long

distance travel. Smaller ships and vessels and the ones taking shorter routes, may use hybrid propulsion and liquefied natural gas as the alternative fuel. The optimization in maneuvering techniques can also potentially lead to decreased fuel usage. Improved fuel consumption should also be made by implementation of eco-efficient technologies and equipment (e.g., advanced hull coatings).

Regarding transportation and storage, it is important that the production facilities are in proximity to the landing sites, in order to minimize the need of covering long distances when transporting the catch. The transport from landing to processing/storage sites is usually done by trucks, which are mostly run-on fossil fuels. Alternatives to fossil fuel transport may include clean diesel, together with other low-emission vehicles like natural gas vehicles or electric vehicles (EV).

GHG emissions reduction

Fish processing plants use great amounts of energy for seafood preparation, packaging, freezing and storage. Energy uses and costs could be generally saved by implementing several potential solutions: self-generation with alternative energy sources (e.g., solar hot water heating or bio-gas), improving energy performance (by e.g., replacing outdated boilers with upgraded ones), optimizing refrigeration operation (e.g., reducing the minimum discharge pressure setpoint on the high-stage compressors), etc.

Companies should calculate their carbon footprint and find innovative ways to reduce their impact by implementing off-setting measures with the help of specialized companies (e.g., re-wilding or forestry companies) or sustainability consultancies. It is also possible to find other innovative options to reduce the impact of GHG emission.



Aqualife is a Danish cleantech logistics company that specializes in the global fishing industry moving the fish by sea freight using specially designed containers and Novozymes' microorganisms. Novozymes selected a group of microorganisms that adjust the ammonia levels in water, lengthening the amount of time that sturgeon can stay in the same water without getting harmed by waste buildup. As a result, the company was able to perform the largest-scale transport of live fish ever, all while slashing 90% of CO₂ emissions compared to conventional live fish transportation methods.

Source: <https://www.novozymes.com/es/news/news-archive/2011/03/sturgeon-around-the-world---the-sustainable-way->

Transport efficiency guidelines

Fuel efficiency

- Apply reductions in energy consumption to make savings and cut carbon emissions;
- Production facilities should be in proximity to the landing sites, minimizing the need of covering long distance when transporting the catch;
- Optimize maneuvering techniques in order to decrease the fuel usage;
- Implement eco-efficient technologies and equipment (e.g., advanced hull coatings).

At supply stage

- The Applicant shall keep records of fuel consumption.

GHG emissions reduction

- Latest technology should be considered when buying new equipment, in order to apply high-efficiency and energy-smart systems, leading to reductions in energy use and costs;

- The equipment and machinery used should be regularly serviced and maintained to enable it to run more energy efficiently;
- The refrigeration plants and freezing utilities are regularly inspected, maintained, insulated and leaks are prevented in order to decrease energy use and lessen environmental impact;
- Cooling equipment is periodically improved, moderated, and defrosted to maintain high level cooling efficiency;
- Companies apply smart equipment or apply smart solutions for energy saving, e.g., switching to modern LED lighting in their premises to decrease emissions;
- Companies need to calculate their carbon footprints in order to offset their emissions;
- Companies should update their GHG emissions plan according to the innovative best practices.

At supply stage

- If possible, solar panels, photovoltaic cells or wind turbines should be installed on vessels to charge batteries;
- The use of LED lighting on vessels shall be prioritized;
- The Applicant shall establish a plan for better energy efficiency and reduction of fuel consumption;

Waste Management

The waste production occurs at different stages of the fishery supply chains. Sometimes, up to 75% of the landings (raw product entering the plant) can be composed of the processing waste. Thus, it is crucial to differentiate sustainable seafood from wastefully processed products. Preventing waste through circular processes in production can possess a particular challenge, but with increasing consumer pressure towards sustainability, operators need to find a value for waste by-products.

Solid waste reduction

Biodegradable materials should be favored over others such as plastics. It is important to mention that the novel waste standards are included in the strategy of the EU⁸. According to the strategy, the rate of recycling for municipal waste should rise to 55% by 2025 and 65% by 2035. Moreover, companies need to use some of the discards (like offal, scales etc.) as secondary products and develop a circular system for waste. Some examples of innovative options are provided here:



Testing natural materials for oyster spat collectors, French FLAG Marennes Oléron is supporting the research and testing of a new bio-based, biodegradable and industrially-compostable bioplastic compound partly made from oyster shells. This material would be used to make oyster spat collectors which are currently made of non-recycled plastic and contribute to marine litter and waste.

Source: https://webgate.ec.europa.eu/fpfis/cms/farnet2/sites/farnet/files/3b_ecodesign_biosourced-coupele-en.pdf



Another innovative option is given by **hemp nets**. Hemp nets have been in use for centuries now. Due to the fiber length, hemp nets are extremely resistant having 8 times more tensile strength than cotton.

Source: <https://hempwiki.com/product/hemp-nets/>

⁸ https://ec.europa.eu/info/news/new-waste-rules-will-make-eu-global-front-runner-waste-management-and-recycling-2018-apr-18_en



Moving to cotton-based mussel ropes - in the area of South Ireland, the plastic mesh in the rope used for breeding mussels has been replaced with biodegradable cotton. This solution was copied from New Zealand's "Hairy Rope System" and besides being environmentally-friendly, is more efficient for longline seeding and harvesting mussels.

Source: https://webgate.ec.europa.eu/fpfis/cms/farnet2/sites/farnet/files/3c-ecodesign_cotton-ropes.pdf

Wastewater disposal

Protecting the water resources from pollution and depletion represents one of the most critical environmental targets today. Fish processing requires massive amounts of water. The wastewater that results from seafood production/processing usually has a high organic content, and consequently, a high chemical oxygen demand (COD), due to the presence of dissolved protein, blood, and tissue. It also usually has a high content of nitrogen and phosphorus. Methods for treating industrial wastewater in this sector involve various processes and equipment combination such as the use of the hybrid membrane technology of ultrafiltration under vacuum (UFV) and low-pressure nanofiltration (NF) for concentrated brines treatment as well as the wastewater treatment plants (WWTP). The continuous development of the membrane and vacuum technologies makes it feasible to imagine compact high-performance water and wastewater treatment facilities with low power consumption and zero working costs.

Waste management guidelines and recommendations

The waste disposal is treated in a way that poses no harm to human health or the environment.

Solid waste reduction

- The Operator shall monitor production in order to minimize and prevent waste accumulation;

- The Operator shall carefully determine the quantities placed on the market in order to avoid market saturation and withdrawal of expired batches;
- The efficiency of raw materials shall be monitored in order to identify possible production inefficiencies;
- The employees shall be properly trained to perform better processing;
- Packaging waste shall be reduced by means of rectifying faulty packing machines, storing packages properly, finishing plastic films until the end before moving to new ones.
- Biodegradable materials shall be favored over others such as plastics;
- If possible, companies shall use certain discards (e.g., offal, scales etc.) as secondary products:
 - omega-3 fatty acids, proteins, vitamins and minerals, chitosan from crab shells, fish skin gelatin or shellfish shells;
- The processing downtime that can result in spoilage and reduced quality of raw materials shall be minimized as much as possible;
- The areas for disposal and storage of waste are provided and designated;
- Companies shall apply circular economy principles for waste, in order to reduce it by at least 15% in the factories;
- The procedures used in processing facilities for handling waste are in line with respected legal requirements and regulations;
- Potential and real risks to human health and the environment are assessed and an action plan is in place to be implemented in order to reduce and later eliminate any possible risk.

Wastewater disposal

- Water consumption in the plants is reduced by at least 20% compared to initial state;

- Wastewater that leaves the processing system, including the contaminated and sanitary waters, is treated in a way that does not possess negative impact to human health and the environment;
- Wastewater is not directly discharged into aquatic ecosystems unless it meets the industrial wastewater parameters of the nationally applied law;
- Wastewater tests are conducted at least four times a year and parameters are recorded regularly;
- Processing operations do not allow for contamination of soil or waters;
- Wastewater shall not be directly applied to the soil unless it has been previously treated for reduction or removal of particulates, potential pollutants and similar;
- Untreated sewage is not directly discharged into local aquifers;
- It is recommended to use the most innovative wastewater treatments.

Additional guidelines for fishing vessels

- The Applicant shall prove that they are familiar with legal regulations related to waste disposal, environmental protection and strictly protected species and sensitive habitats;
- Lost fishing gear should be retrieved whenever possible and for this purpose there shall be necessary equipment on board;
 - If the lost tools cannot be found, the fishermen shall record the last known location of these tools and inform the relevant persons authorized for navigation safety and/or environmental protection;
- The practices shall be harmonized with all legal regulations regarding waste disposal and control of environmental pollution;
- Waste records should be kept;

- Waste and fishing gear shall be recycled;
- Waste should be collected from the sea, if such waste is caught in nets or encountered while sailing;
- The Applicant should participate in voluntary marine litter collection projects and programs;
- The biodegradable and "marine-friendly" cleaning agents should be prioritized and used only in the minimum required quantities;
- The new technologies shall be used to protect the hull from fouling;
- The selectivity of fishing gear shall be increased and by-catch and catch of unwanted species shall be reduced:
 - by increasing the mesh size on the net, using cameras or sonar, choosing a fishing location, fishing sea management regimes, etc.;
- A good hygiene practice on board shall be applied and discards due to poor catch quality shall be eliminated;
- A good fishing practice shall be applied:
 - shorter the duration of the haul, shorter the retention of nets or longlines in the sea - the catch is fresher and of better quality and less likely to be attacked by predators;
- The Applicant should find new markets for unwanted and low commercial value species:
 - Such catch may be sold instead of becoming waste. Buyers are usually pickier in developed countries than in underdeveloped ones, where the entire catch is consumed.

7. HUMAN RIGHTS AND WORKING CONDITIONS

In the scope of D3.2.3. *Sustainability guidelines*, socio-economic dimension in terms of fair and responsible fishing were covered. Special attention was given to human rights and safety on board. Here, the social and economic pillar will be represented by similar indicators, covering the production part of the chain.

Socially responsible practices are developed and promoted in the seafood production and processing. The criteria selected for fair and equitable labor practices and safe working conditions will directly benefit workers, their families and local and regional communities.

1. Discrimination, abuse, forced and child labor

- 1.1. Any form of forced labor, child labor and abuse are strictly prohibited;
- 1.2. There is no discrimination against workers on any basis and any form of workplace harassment is prohibited;
- 1.3. There shall be a staff person administered for addressing the above issues and for awareness raising among the management and staff on their rights and responsibilities;
- 1.4. There is a monitoring and record system in place to identify potential risks and to assess the effectiveness of the mitigation activities in risk reduction;

2. Fair wages and employment conditions

- 2.1. The employees are paid adequate salaries which are meeting or exceeding applicable legal minimum wages;
- 2.2. The employer shall have specified wages for all functions;
- 2.3. All workers are informed about their duties and rights, salaries, work and payment schedules;

- 2.4. Permanent workers that are employed full-time or part-time have a legally binding written contract describing terms of hire, signed by both the employer and the worker;
- 2.5. Verbal agreements of employment conditions are possible, if agreed upon and if the employment relationships are legally binding under national law;
- 2.6. All payments are documented with a pay slip or any other suitable record of wage, to allow for verification and access to information upon request at any time;

3. Health and safety

- 3.1. All personnel is enabled to work under safe conditions using appropriate PPE (Personal Protective Equipment), for which use they are trained on workplace hazards and have free access to, as described by the Regulation (EU) 2016/425;
- 3.2. Work areas with potential risk and hazards are clearly identified by warning signals in all relevant languages;
- 3.3. Workers operating machines are familiarized with the instructions on their safe usage, and are appropriately trained for handling them;
- 3.4. Female workers who are either pregnant or have recently given birth or are nursing, shall not be given tasks that pose certain risk to their health or health of their infants/fetus. In case they are given reassignment, there shall not be a reduction in remuneration;
- 3.5. There is a written health and safety policy in place, required by the law, to identify and minimize workers' occupational risks;
- 3.6. All workers have access to clean and safe drinking water during their working period, from protected sources and with stored water protected from contamination;
- 3.7. Clean sanitary facilities are provided for use, with hand washing stations included, provided separately by gender;
- 3.8. First aid boxes are readily available to all workers for treatment of potential work-related injuries;

3.9. The incident reports are submitted annually to relevant authorities to provide information on occupational health and safety incidents.