

DELIVERABLE D4.4.2

Shared protocol for production of transformed SSF products

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Healthy diet and Mediterranean culture

A healthy diet involves choosing to eat healthy foods, in appropriate portions, to obtain a balanced intake of nutrients and an energy intake capable of maintaining efficient physiological processes in the human body. According to the Healthy Eating Guidelines (CREA, 2019), the choice of food to be brought to the table at every stage of growth should include vegetables and fruit, healthy sources of carbohydrates and fibre, and protein foods that cover individual needs for both macronutrients and micronutrients.

In this context, fish and fish products play a very important role: not only do they help cover the protein quota, but they also contain iron in a highly assimilable form, calcium, phosphorus, magnesium, vitamins A and D. In addition, oily fish is rich in Omega 3 unsaturated fatty acids, which are known to protect against cardiovascular disease, have anti-inflammatory properties and protect nervous system tissue (Wall et al., 2010; Siri-Tarino et al., 2015; Shahidi and Ambigaipalan, 2018; Gammone et al., 2019). Since it is therefore so important for all age groups, especially for maternal and child health (Marszalek and Lodish, 2005; Serhan, 2007), dietary recommendations call for eating fish at least two to three times a week, preferring local fish, both fresh and frozen.

The importance of fisheries products, however, goes far beyond the nutritional side alone. Fish, molluscs and crustaceans are true symbols for coastal populations. They are present, together with the products of the land, as a fundamental element of the Mediterranean diet, globally recognised as one of the best diets in the world and for this reason inscribed on the "List of the Intangible Cultural Heritage of Humanity" (UNESCO, 2013),

While small-scale artisanal fishery is already a tradition and an affirmation of identity, the encounter between the catch and typical preparation methods reinforces the local culture, marking the rhythm of family and community life. On the Adriatic coast, in particular, fish and fish-based recipes play a vital role in festivals and celebrations, regulating recipes, local specialities and preservation methods since long time, according to seasonality. The fish product and the figure of the fisherman himself thus become an anthropological aspect, capable of inspiring even crafts, narratives and iconography (Figs. 1, 2 and 3).



Figure 1: Fish-shaped glass bottle, Ancient Glass Museum, Zara (HR)



Figure 2: Painted majolica riser from 1935, International Museum of Ceramics, Faenza (IT).



Figure 3: Apulian red-figure fish dish; late 4th century BC. Jatta National Archaeological Museum, Ruvo di Puglia (IT). Clockwise, a monkfish, a labrid, a red mullet and a banded bream are recognisable.

Small-scale artisanal fishery is therefore a multi-faceted reality, which is often full of family experiences and relational values that enrich the approach to the sea. It is characterised by attention to the seasons and environmental conditions, the use of selective and size-sensitive fishing gear and the almost total absence of by-catch. These strengths make it an environmentally sustainable fishery par excellence, but at the same time it is unfortunately at a disadvantage because of the low profitability of its catch. This aspect exposes it to criticality, especially in periods when large quantities of landed fish, caught using unselective systems, are available at the markets, which automatically lowers the price of fish for all categories. Considering that a small-scale fishery activity has proportionally higher expenses than an industrial fishing vessel, it follows that in those periods the profitability for artisanal fishery is dangerously reduced, jeopardising the very choices and efforts of small-scale local fishers.

For this reason, the possibility of conserving the catch under the aegis of the label becomes a practice of sustainability and resilience in several respects. Firstly, it gives value to fish that is often undervalued, it makes it clearly distinguishable from fish from less sustainable activities, and it allows small-scale artisanal fishers to avoid, at least in part, putting fresh fish on the market when the supply/demand ratio is too unfavourable, and then selling it at higher margins in more favourable periods. Secondly, providing facilities for the preservation and processing of small-scale fishery products reduces food waste and the impact on fish stocks, especially at a time marked by the Covid-19 pandemic, which has forced us to live with periods of restricted mobility, which, by limiting tourism, has affected the catering and hospitality sector with consequent repercussions on the food, farming and fishing sectors. The possibility of portioning, packaging and preserving local fish allows artisanal fishery to get closer to modern families: not only does it help to provide retail customers with portions of healthy food, which did not need long transport, but it also overcomes the difficulty, reported by many families, of not having time to go shopping at markets or fishmongers and having to resort to frozen food from industrial fleets, distributed in supermarkets. Finally, being able to rely on this mechanism makes small-scale fishery resilient and consequently helps to safeguard the figure of the small-scale fishers, By protecting it as an "asset" not only from a work-related and economic point of view, but also from a cultural point of view, since fishing, its rituals and tools are an integral part of Adriatic culture.

Given all these favourable aspects, the launch of a specialised production line for processing fish products with the “Adriatic small-scale fisheries” label (see D4.2.2) appears to be a natural and desirable goal to achieve the enhancement of fish products from sustainable fishing, as well as an opportunity to educate consumers.

The fisher’s house

The "Fisher's House", located in the Municipality of Cavallino-Treporti (VE), is the pilot structure, foreseen in WP4 - act.4.4 of the Adri.SmArtFish Project, set up by the consortia CIV and CoVePa on behalf of the Lead Partner Regione del Veneto. It is used for the reception, storage, conservation, processing and sale of small-scale artisanal fishery products (Figure 4, top). Considering the strategic position between the sea, landing places and areas of high tourist attraction, the building and its annexes are ideal locations for processing local fish products, guaranteeing short distances and consequently playing in favour not only of sustainability but also of food safety.

In addition to the physical location, there is also the availability of a mobile vehicle that performs the functions of distribution, processing and cooking on the move (the 'Food-Truck'), an innovative element helping small-scale artisanal fisheries operators in finding new market positions (Figure 4, below).

Both at the physical location and on the vehicle, the logos of the Adri.SmArtFish project and of the Veneto Region will be prominently displayed, contributing to the dissemination of the project and the brand. It is to be noted that the consortia has foreseen at the moment only the blast chilling and vacuum packing as typology of fish processing, therefore the present report is a feasibility study of further processing modalities to be implemented at a later stage.

Structure

The building that will serve as the multipurpose centre is located at the operational headquarters of the Consorzio Ittico Veneziano in the municipality of Cavallino-Treporti (VE), Lungomare San Felice n. 7 (Fig. 4). A management agreement was obtained on 24/04/2020 and the building was definitively handed over on 11/09/2020 (documentation already in the possession of the client). The buildings at the facility are organised according to the plan shown in Figure 5. The separation of the rooms is guaranteed by panelling and walls made

of water-repellent, waterproof, washable material. The rooms created include operating offices, transformation rooms and technical rooms, served by plumbing and electrical systems declared compliant by the installers.



Figure 4: above, the *Fisher's House* from S. Felice canal. Below, the *Food truck*.



Figure 5: Planimetry of the building designated as a multipurpose centre.

There is a fixed and stable floor covering consisting of non-slip ceramic tiles laid in a workmanlike manner, with characteristics that comply with the requirements of Legislative Decree 81/2008 and Ministerial Decree 236/89. The rooms are ventilated by means of natural ventilation, illuminated in a functional manner for the activities both by means of natural light and artificial lighting points, proportionate to the volume of the structure. The structure is therefore suitable for preparing the activities in safety for workers and end consumers by applying and respecting the rules laid down in the relevant legislation in force.

Arrangement of work surfaces, tools and equipment

The office area has already been equipped with furniture and part of the hardware, with suitable network cabling. The workbenches, doors and equipment covers are made of stainless steel and washable and/or disinfectable materials. The arrangement of the equipment and apparatus necessary for processing fish products involves positioning them, as far as possible, in a suitable sequence to speed up the processing phases. This is particularly important to prevent interruption of the cold chain and to minimise the risk of contamination of any kind (physical, chemical or biological).

Material already available

At the time of writing, the facility has the above-mentioned premises available, with all the required authorisations, and the following equipment:

- Blast chiller
- Cold room
- Full kitchen with extractor hood
- Dishwasher
- Crockery and cookware
- Vacuum chamber packer
- Detergent cabinet

Material to be acquired

For the processing of fishery products, the following tools will be provided, in a suitable number and proportional to the working needs, listed in a non-exhaustive way and to be updated according to the processing rhythms and volumes:

- Filleting knives with stainless steel blade
- Carving knives with stainless steel blade
- teel tongs
- Hamburger press
- Tools and crockery required for handling
- Cooking utensils made of stainless steel or autoclavable food-grade silicone
- Stainless steel pots and pans (preferably with cast handles, without screws)
- Lids with a diameter compatible with the above tools
- Sinks and wash basins
- Autoclave system
- Cuttlefish and mollusc skinning machine
- Gutting and scaling machine
- Fish crusher
- Smoking oven

Suitable DPI (Individual Protection Devices) appropriate to the risks to be prevented will also be acquired, and will be made available to workers and stored in special areas separate from the work surfaces, in accordance with the Consolidated Law on Safety at Work (Legislative Decree 81/08) and in compliance with the regulations set out in Legislative Decree 475/92. This equipment will make it possible - after training the staff - to start processing the catch and marketing the processed product in a short time.

Transformation processes of the local fish product

Processing systems and product preservation methods

The transformation of small-scale artisanal fishery products will aim both at increasing the spectrum of forms and ways to propose the fish product and at enhancing the product itself according to the degree of elaboration. In fact, the possibility to transform fish, molluscs and

crustaceans can recover traditional recipes, but also lead to the experimentation and the discovery of new processes able to make the products emblematic (Figure 6 and Figure 7).



Figure 6: dried cuttlefish on display in Chioggia, an example of a traditional product. Drying in a controlled plant can offer the typical product with the guarantee of high food safety standards.



Figure 7: The smoked mullet fillet, already popular in the Orbetello area, is an example of a possible processing method that can make the local catch more valuable.

The transformations can be classified into two categories: the first is aimed at portioning and packaging a single product, so that it can be easily preserved even for medium-long periods, transportable and advantageous for the final consumption; the second is aimed at the elaboration of recipes able to combine different products, enhancing ever larger areas of the territory. All processing (Table 1) will involve full compliance with food safety regulations, worker protection rules and rules on safeguarding and providing correct information to consumers (as indicated in the next section).

Table 1. Main processing techniques that may affect fishery products at the facility.

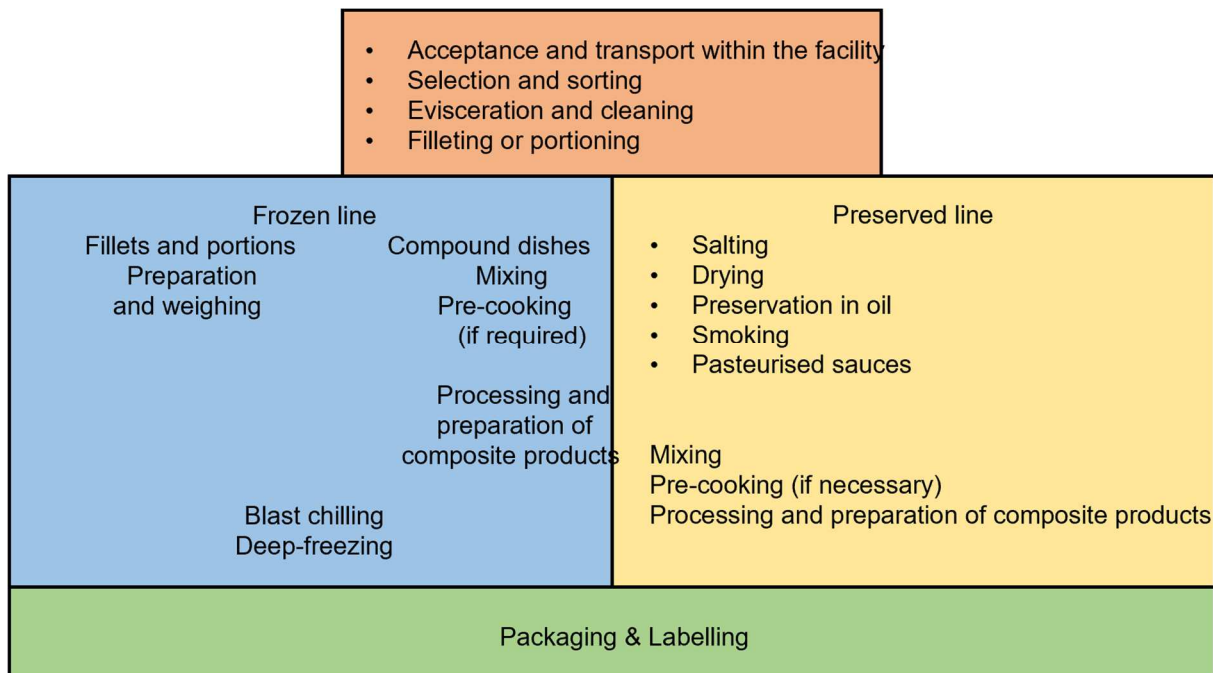
Transformation	<i>Mugil cephalus</i>	<i>Chelon</i> sp. pl.	<i>Solea solea</i>	<i>Mullus</i> sp.	Gobiidae	<i>Merlangius merlangus</i>	<i>Merluccius merluccius</i>	<i>Litognathus mormyrus</i>	<i>Lophius piscatorius</i>	<i>Chelidonichthys lucerne</i>	Other fish	<i>Sepia officinalis</i>	<i>Squilla matris</i>
Filleting or portioning	•						•	•	•	•	•	•	
Drying	•	•									•	•	
Smoking	•						•		•			•	
Mixed and minced preparations (e.g. soup, hamburgers, gravy, broths, ready meals)	•	•	•	•	•	•	•	•	•	•	•		•
Egg extraction (e.g. roe)	•												
Ink extraction												•	
Breeding	•						•		•	•			
Salting		•		•			•				•		
Preservation in oil	•	•			•				•				
Precooking		•	•				•					•	•

The transformation processes can generally be ascribed to the following phases:

- Acceptance and transport within the facility
- Selection and sorting
- Gutting and cleaning
- Filleting or portioning
- Processing and preparation of ready-to-eat, raw or precooked products (both fishery products as they are and those combined with products from the land).
- Blast chilling (rapid freezing at at least -20°C for at least 24 hours)
- Deep-freezing
- Drying
- Smoking
- Salting

- Preserved in oil
- Packaging
- Labelling

The relationships and possible raw material routes between the above steps are illustrated in the process diagram (Figure 8).



Hygiene and health aspects

For the work activities, the hygienic/sanitary aspects are satisfied, according to the request procedure at the local ASL. Even after the positioning of workbenches and equipment, the rooms above ground are suitable for the functions for which they were designed. Lighting and ventilation are adequate, as per the approved design of the facility.

Control of safety and quality of processing of fisheries products

Current legislation

The reference to be followed for the processing and transformation of fish products is the Community and national legislative framework in the field of food safety currently in force, to which reference is made for all regulatory and implementation details (Appendix I).

In particular, for food processing in Italy reference is made to the 'hygiene package', a set of rules governing food hygiene, food safety and related controls. The aim of this legislative framework is to guarantee the protection of the human health of the citizens of the European Community by ensuring the production and placing on the market of safe and healthy food.

In this context, the strategy of European food safety legislation (provided for in EC Regulation No 178/2002, and contained in EC Regulations - EC 852/2004, EC 853/2004, EC 2073/2005, EC 178/2002), is based on the consideration and control of the entire supply chain, according to the "farm to table" philosophy: food safety and the prevention of food-borne diseases depend on the correct performance of all stages of the production process.

The reference legislation to which the process scheme of Casa del Pescatore adheres is therefore Reg. (EC) n. 852/2004, Reg. (EC) n. 853/2004, Reg. (EC) n. 854/2004, Reg. (EC) n. 882/2004 and integration of Reg. (EC) n. 1441/2007. In particular, the processing phases will be carried out according to the details of the Community Regulatory Framework of the "Hygiene Package", concerning food safety and the application of the HACCP system, implemented by Legislative Decree no. 193/2007 and subsequent amendments.

Identification of control points in the Fisher's House product chain

For the purposes of conducting suitable systems of prevention and self-control of processes and products, legislation calls for the identification of risks and dangers according to the HACCP (Hazard Analysis and Critical Control Points) methodology.

In accordance with Directives EC 92/43 and EC 93/99, implemented in Italy by Legislative Decrees nos. 155 and 156 of 26/05/1997, it is therefore expected that the control of the food

chain to be implemented at La Casa del Pescatore respects the seven principles of the HACCP protocol:

- Identification of the hazards to be prevented, with recommendations for elimination
- Identification of hazards to be prevented, with recommendations for elimination or reduction of the risk;
- Identification of the CCPs (Critical Control Points) at the stages where the risk can be prevented, eliminated or reduced;
- Indication of the limits of acceptability;
- Introduction of effective monitoring rules
- Establishment of corrective rules to be applied when limits are exceeded; o
Establishment of procedures to be applied when limits are exceeded.
- Drawing up procedures to be applied regularly to check the effectiveness of the measures
- Provision of documents and records appropriate to the nature and size of the facility.

On the basis of this regulatory framework, without prejudice to the obvious availability for official controls provided by the relevant offices of the Ministry of Health, each critical point identified with the above-mentioned procedure will be subject to self-control procedures, according to the scheme "interventions - controls - analysis" scheme.

Already in this technical report, for indicative purposes and to guide the correct arrangement of equipment in the work environment, the following Critical Points are identified in the processing phases envisaged at the Fisher's House:

- Landing
- Processing (gutting, cleaning and skinning, filleting and portioning)
- Mixing with other ingredients
- Cooking
- Slaughtering
- Deep-freezing
- Packaging and labelling
- Storage
- Transport and distribution
- Packaging and labelling

The hazards to be prevented are identified in the categories "physical hazard", "chemical hazard" and "biological hazard". These are hazards whose risk can be minimised and eliminated by following preventive measures and designing a voluntary control programme, as indicated by the legislative framework (Table 2).

Risk	Description and example of risk	Prevention, mitigation and control measures	Process steps in which to apply the measure
Physical	Exposure to heat and sunlight Interruption of the cold chain	Immediate chilling of catch and storage on ice	Landing
		Transport with refrigerated vehicles and containers	Transport and distribution
		Storage in containers suitable for food contact, with lid or insulation systems	All
		Maintenance of the cold chain	All
		Regular temperature control (by manual recording or datalogger)	All
	Presence of foreign objects	Storage in containers suitable for food contact, with lid or insulation system	All
		Visual control	Processing
		Use of dishes, containers and pots without screws	Processing
Chemical	Exposure to fuels, detergents or disinfectants Contamination with PAHs, PCBs, PFAS	Regular inspection and maintenance of tools and equipment	All
		Storage in containers suitable for food contact, with lid or insulation system	All
		Regular cleaning and sanitising of transport vehicles	Transport and distribution
		Regular cleaning and sanitisation of work surfaces, tools and equipment	All
Biological	Pest infestation Contamination by biotoxins Increase in histamine	Storage of detergents and cleaning products in a separate room from the processing room	All
		Immediate refrigeration of fish and storage on ice	All
		Gutting as soon as possible after fishing	All
		Blast chilling of product intended for raw or marinated consumption	All
		Cold chain maintenance	All
Regular temperature control (by manual recording or datalogger)	All		

	Origin control and tracking of all fish products included in processing stages	All
Contamination by bacteria potentially pathogenic to humans both "autochthonous" (<i>Vibrio</i> spp., <i>Listeria monocytogenes</i> , <i>Clostridium botulinum</i> , <i>Aeromonas hydrophila</i>) and "allochthonous" potentially pathogenic to humans (<i>Salmonella</i> spp., <i>Shigella</i> spp., <i>Escherichia coli</i> , <i>Staphylococcus aureus</i>)	Regular cleaning and sanitising of transport vehicles work surfaces, tools and equipment	All
	Control of the origin of all fish products included in the processing	All
	Periodical microbiological control of surfaces, equipment and tools	Periodically
	Check suitability and conformity of other ingredients and matrices	In case of mixing with other matrices, e.g. flour, earth products
Exposure to or contamination with other potentially pathogenic agents from other food matrices	Suitability and compliance check of other ingredients and matrices	In case of mixing with other matrices, e.g. flour, earth products

The labelling of ready-to-eat products, which are deemed to be compliant, will follow the rules of EU Reg. no. 1169/2011 on the provision of food information to consumers (ptc. art. 9). The label will therefore contain, in legible characters, printed in dark colour on a light background:

- Name of the food
- List of ingredients
- Net quantity of the food
- Expiry date and shelf life
- Storage conditions
- Conditions of use and/or instructions for use
- Nutrition declaration (if the product is listed in Annex V)

In order to safely close the entire supply chain, shelving and positioning in storage rooms and means of transport will only take place after labelling. In the event of anomalies at any Critical Point, an immediate report of the anomaly will be made, with a record of the description of the anomalous event and the tracking of actions to resolve it.

Conclusions

The project to create a multifunctional centre to support the activities of small-scale artisanal fishery is the desirable development of a path able to enhance the value of the catch and give a strong identity and prestige to the brand. Since the premises and equipment already available are functional for the purpose, it is considered that the Fisher's House can be made operational as soon as the physical settlement of the employees of the associated cooperatives takes place. Staff training and training in good practices will follow the necessary steps, so that the valorisation of the products can be combined with the valorisation of the people involved.

The expected favourable impacts concern several aspects. The first impact, from an economic and work-related point of view, involves the possibility of selling the catch at a fair price, supporting small-scale fishers; this can help maintain existing jobs and create new ones. The economic benefits of enhancing the value of small-scale fishery products also extend to the greater knowledge and dissemination of a product that has so far been wrongly considered of little value; it contributes to consumer education, enabling consumers to easily choose local and sustainable products, and reduces waste while expanding supply and market positioning.

The positive impacts of increased resilience, however, go far beyond the economic aspects. The cultural side that is nurtured by this project increases the value of the figure of the fisher who, while maintaining his traditional identity, adapts to the changing needs of society and sees new technologies not as threats, but as allies. Last but not least, all the stages that bring the products from the sea to the table enhance the value of the catch, but also give prestige to the people involved in the processes, creating precious relational assets in the local area.

ANNEX I - LIST OF THE MAIN REGULATIONS IN FORCE CONCERNING THE SAFETY OF PRODUCTS INTENDED FOR FOODSTUFFS

- Legge 30 aprile 1962 n. 283 Disciplina igienica della produzione e della vendita delle sostanze alimentari e delle bevande pubblicata sulla Gazzetta Ufficiale n. 139 del 4 giugno 1962
- Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety
- Regulation (EC) No 852/2004 of the European Parliament and of the Council of 29 April 2004 on the hygiene of foodstuffs
- Regulation (EC) No 853/2004 of the European Parliament and of the Council of 29 April 2004 laying down specific hygiene rules for food of animal origin
- Regulation (EC) No 854/2004 of the European Parliament and of the Council of 29 April 2004 laying down specific rules for the organisation of official controls on products of animal origin intended for human consumption
- Regulation (EC) No 882/2004 of the European Parliament and of the Council of 29 April 2004 on official controls performed to ensure the verification of compliance with feed and food law, animal health and animal welfare rules
- Directive 2004/41/EC of the European parliament and of the council of 21 april 2004 repealing certain directives concerning food hygiene and health conditions for the production and placing on the market of certain products of animal origin intended for human consumption and amending council directives 89/662/EEC and 92/118/EEC and council decision 95/408/EC
- Directive 2003/99/EC of the European Parliament and of the Council of 17 November 2003 on the monitoring of zoonoses and zoonotic agents, amending Council Decision

90/424/EEC and repealing Council Directive 92/117/EEC

- Decreto Legislativo N. 191 del 4/4/2006. Attuazione della direttiva 2003/99/CE sulle misure di sorveglianza delle zoonosi e degli agenti zoonotici. G.U. del 24/5/2006 n. 119
- Decreto Legislativo N. 193 del 6/11/2007. Attuazione della direttiva 2004/41/CE relativa ai controlli in materia di sicurezza alimentare e applicazione dei regolamenti comunitari nel medesimo settore. G.U. del 9/11/2007 n. 261
- Commission Regulation (EC) No 2073/2005 of 15 November 2005 on microbiological criteria for foodstuffs (Text with EEA relevance)
- Intesa, ai sensi dell'articolo 8, comma 6, della legge 5 giugno 2003, n. 131, tra il Governo, le Regioni e le Province autonome di Trento e di Bolzano su "Linee guida relative all'applicazione del Regolamento CE della Commissione europea n. 2073 del 15 novembre 2005 che stabilisce i criteri microbiologici applicabili ai prodotti alimentari"

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