

“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

D4.4.3. Joint cross-border training modules

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. RESULTS RELATED TO INNOVATIVE TECHNOLOGY, TECHNIQUES AND METHODS – CROSS BORDER TRAINING MODULE

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In order to create cross border training, the significant results came out from the activities carried through the WP4 of the Prizefish project. This work package has created an innovative approach in usage of technology and techniques for harvesting/catching and processing for the fishery industry on the Adriatic Sea. The emphasis was to enhance the quality and efficiency in usage of the raw material entering the production cycle, but at the same time ensure advanced work security on operational levels. These results are supported with the successful pilots of the; vacuum pumps for harvesting the small pelagic blue fish transferred directly to the thermal insulation bins, adaptation of the fish deboning machine into deep rose water shrimp de-peeling machine for creating a semi product of high nutrition values, and finally selective tools in harvesting sea clams. These results are visible as environmental and social impacts to the industry.

1. Piloting of the “sea pumps” for improved catching & handling of small pelagic blue fish - PO “Omega 3”

For the piloting of innovative on-board technology, the PO Omega 3 has selected the external company Maribu Ltd to conduct the tests by using the services from French Faivre Group. The main issue was to change transfer and manipulation of fish on board by pumping them to the bins instead of handling them manually. Additionally, the manufacturer made adjustments to the existing aquaculture pump systems after technical evaluation on site. After the modifications, the pump was installed on the first purse seiner boat – “GALO”, owned by official PO member Mr. Damir Mišlov. Once the flock is surrounded with the net, and pulled gently to the side of the boat, the suction process begins. The central part is placed on the main deck next to the winch where it does not interfere with the preparation of the input cable, while the water separation unit is placed on the cabin deck above the pump. All segments are always connected by flexible pipes. The thrust from the pump to the water separation unit must be sufficient to overcome a difference of at least three meters or more, as well as the primary suction. After separating the seawater, the fish is brought into the thermal insulation bins by the free fall. By piloting innovative technology, significant progress has been made in the management of responsible fishing, which is visible in the positive economic, social and environmental indicators. Economic indicators relate to raising the quality of raw materials: reducing damage when transferring fish to thermal insulation bins and avoiding the crushing of fish when attracting the net next to the ship.

Faster transfer of the catch is enabled by releasing large amounts of the sea through the sea separation unit, allowing it to quickly shock the live fish. Such action reduces the accumulation of lactic acid in the meat and deep tissue damage, which directly affects the preservation of the Ph level of the meat and prolongs the shelf life of the raw material. The presence of a smaller number of fishermen on board who are operating with the pump in relation to traditional catching methods on the purse seiner ensures a reduction in operating costs.

By achieving better quality, fishermen benefit with a higher purchase price, while with the reduction in operating costs support higher earnings. Positive social effects are visible through greater safety on board, especially during bad weather conditions. Because of the effective operations on a vessel, fishermen also spend less time at the sea, and more with their families. Special emphasis is placed on the ecological aspect in terms of preserving the population of sardines and anchovies in the Adriatic Sea, because the piloted technology allows further progress in terms of the possibility of separating juveniles from mature populations, through the direct return of a live fish to the sea.

2. Piloting of innovative processing technology for shrimp de-peeling

In order to reduce the falling prices and loss of money due to such outcomes, Istria decided to build a fish and maritime organisms processing factory in Labinci, where the fish surplus was processed, frozen and sold in the summer season when restaurants, hotels and fish markets are working at full capacity. Fishermen's Cooperative Istria decided to make a step forward in production using new innovative technology. In order to start piloting innovative technology in processing, Istra cooperated with external experts, Dalmatia Developers company - which developed guidelines with a technical description of the innovative production process. The innovative production process aimed to repurpose an already existing fish boning machine (German model Bader 601), which is the machine separation of shrimp shell and head from body separation. The technical operating principle of the machine is based on creating pressure with a flexible PVC tape on the perforated drum. For the separation of the Adriatic shrimp the 2 mm perforation is used. The machine is producing highest quality products thanks to the gentle, so-called "soft processing".

It achieves a compact performance in high-quality stainless-steel machine parts, allows easy handling, cleaning and maintenance of the machine (saves time, reduces labor costs), and ensures the highest world-class hygiene standard. The machine is CE/ETL certified and USDA approved. Additionally, using new technology, Istria decided to create a new innovative product – fish burger, made from fresh shrimp meat and minced mullet fillet, as an example of possible business diversification, which will add new market value to its product, reduce the load on resources, reduce labor costs and increase business profitability.

3. Piloting of the innovative clam harvesting tool and improving the cold chain process

The piloting activity of innovative technology of PO Bivalvia involved adopting different modified clam dredges. The main objective of the innovation process is to reduce the physiological stress of the caught clams that are otherwise subject to high water pressure jets and vibrations throughout the fishing process.

Three different alternative configurations of clam dredges were installed on board of three fishing vessels and compared to a standard clam dredge used today. Different configurations of the gear involved modifying the cutting water jets, their shape and location, and also the configuration of the sieving screen, either horizontal or perpendicular. The test was conducted in the same fishing area and monitored by the experts. The goal was to evaluate the selectivity of the dredges, the impact on the environment, and to take clam samples to analyze the biological responses through microbiological tests. The results show that one of the tested fishing gears has consistently contributed to reduction of physiological stress of the clams, observed by lower values of weight loss and clams less subject to microbiological proliferation than compared to clams from the standard fishing gear.

Moreover, this fishing gear also reduces the impact on the environment by visibly decreasing the time of settlement of the sand cloud caused by the fishing activity. The reduction of physiological stress will benefit the fresh product allowing a possibility to extend the shelf life of the product and reduce the quantity of sand that the clams “ingest” during fishing. The undersized clams returned to the sea will also reduce physiological stress by increasing their survivability and therefore improving the conservation of the clam population and increasing the future ecological and economical sustainability of this fishing activity. Goals should also be pursued through the improvement and modernization of the processing sector by:

- improving the balance of the processing with the environment;
- modernizing production at existing processing facilities,
- upgrading the already existing and introducing new processing technologies;
- introduction of new products into industrial processing;
- investing in the opening of new processing plants (construction of facilities and procurement of devices and equipment),
- favoring new process technologies and innovative products
- integrating processing into rural development.

The growing demands of the fish market are partly offset by increased processing capacity. More specifically, fishery processed products give way to more opportunities and more sales channels.

This momentum is a consequence of the growing needs of the world market for this type of production, although gradual growth can be expected due to strict rules in the application and compliance with strict food production standards. Unfortunately, it must be noted that a great opportunity of a different form of marine fish processing in the Republic of Croatia has not been used, and therefore this study opens the possibility of a new approach to the processing processes.

The basic products that we will later detail relate to the production of ready-made appetizers and main courses ready for direct consumption or consumption after a short heat treatment. Categorization of production is included in the food industry. The target markets are partly Eastern and Central European countries, as domestic sales are planned. The marketing channels are catering establishments and larger distribution chains.

2. RESULTS RELATED TO INNOVATIVE PRODUCTS – CROSS BORDER TRAINING MODULE

The other valuable perspective has been added to creation of innovative products, in order to increase shelf life of the fish products, which has a strong economic impact for the industry and producer organizations themselves. Using MAP and HPP treatments in combination with innovative elements such as ozonated water, mixture of noble gasses and recipes which do not affect nutrition means of the product, the pilots have shown significant results in the sense of extended shelf life. Extended shelf life is important for logistic purposes, as with those values a wider market range can be selected. Chilled sardine filets in MAP, HPP burgers from deep water rose shrimp and white fish, sea clams in tomato sauce, they all reached 40-50 % extended shelf life. These products have higher market prices as well, which is another axis hit by the project, boosting the operational income of the fishery sector on the Adriatic Sea.

1. PO “OMEGA 3” CASE – SARDINE FILETS IN MAP

The study has shown that the use of ozone reduces the microbial load making the product much more stable during the storage period. Washing with ozonated water made it possible to keep the values of histamine and total volatile basic nitrogen (TVBN) low. The results obtained are in line with the results of the analyzes of the microbial load which indicate a reduction of the same. Furthermore, products packaged in a modified atmosphere attest to an increase in stability from the point of view of microbial load and color. The products packaged with the Argon - Carbon Dioxide mixture with ratio 60:40 on the thirteenth day underwent a lower weight loss reduction than the products preserved with the Nitrogen - Carbon Dioxide blend.

The analysis of the texture of the sardine filets showed that the products packaged maintained a consistency very similar to the filets just at time zero on the thirteenth day. The results obtained with the panel test show that sardine filets packaged in a modified atmosphere, on average, maintain a higher organoleptic quality than those packaged in air. In particular, it attests a much higher quality than the other thesis in which modified atmospheres are applied with different gasses. The best result was obtained: product washed in ozonated water and packaged with a mixture consisting of 60% argon and 40% carbon dioxide. With this treatment it has been achieved that the color at the level of the pulp and skin remains more vivid until the thirteenth day. The results are supported by the colorimetric analysis. The shelf life has been extended by 5 days in total, from standard MAP procedures.

2. PO ISTRIA CASE – BURGERS FROM DEEP WATER ROSE SHRIMP AND WHITE FISH

The burger subjected to HPP has kept its organoleptic characteristics almost unaltered, both in terms of texture and color. In particular, the HPP treatment has slightly changed the color of the product, much less than what happens with raw red meats, subjected to the same treatment.

Probably, in our testing conditions, this phenomenon is attributable to the presence of astaxanthin in the pulp of the shrimp. This molecule is an antioxidant belonging to the carotenoid family which would appear less susceptible to high treatment pressures. From a microbiological point of view, the quantities have undergone a considerable decrease following the HPP treatment: in fact, the total mesophilic charge at 30 ° C, for example, has gone from 170,000 cfu / g to 7,200 cfu / g, allowing the achievement of a burger with a shelf life of about 30 days.

Regarding the texture, a value between 3,000 g and 4,500 g of peak was determined. Shrimp pulp greatly affected due to its high-water content, probably due to a too thorough mechanical separation process. To overcome this drawback, it was necessary to add thickeners during the preparation phase of the burger. The TVBN showed very high values already in the preparation phase of the burger. This phenomenon may be due to many factors, which must be carefully considered during the preparation of semi-finished products based on mullet and shrimp.

In particular, in conditions of excessive mechanical pulping and / or processing temperatures and the first stages of abatement too high, the endogenous and exogenous reactions responsible for the increase in TVBN are more favored. Even if the treatment with HPP has allowed the achievement of a shelf-life of about 30 days under refrigeration, it cannot be considered decisive in the case of a raw material with too high TVBN values.

3. PO BIVALVIA CASE – Sea clams with and without tomato sauce

The samples of product with the striped venus without sauce were discarded from further analysis because the plastic film was ruptured during the HPP treatment, therefore the product was not sealed anymore. The stripped venus without HPP treatment lasted until day 8, while on the day 15 the package, although still under vacuum but not anymore skin and there were specimens with open valves and with a decaying scent. The tests for the day 22 and 29 were canceled.

On the other hand, the stripped venus with the tomato sauce had their packaging regular, under vacuum and skin on days 1, 8 and 15, while on day 22 the package was under vacuum, but not skin and with a decaying scent. The test for day 29 was canceled. The analysis of the psychrophile bacteria indicated a distinctive improvement by applying the HPP treatment, reducing the number of bacteria up to 10 000 by the 15th day of shelf-life. The non-treated clams had low levels of bacteria only at the 1st day, just 10 higher than the treated samples of the clams with the tomato sauce.

By the 8th day, the untreated sample had already had a significant increase of bacteria, reaching close to the maximum value observed on day 15. The samples of clams with tomato sauce treated with HPP continued to have low levels of bacteria on day 8 and only on day 15 a slight increase, less than an order of magnitude. This indicates how the HPP treatment allowed the creation of a new product with an extended shelf-life.

However, in the samples treated with HPP it was observed that some shells had cracks or were broken, which is an undesirable characteristic for the consumer and the market. This could be due to the rapid change of pressure, where a rapid decompression of the air within the microscopic structure of the shell creates additional pressure and cracks the shells. Additional testing should be performed to investigate this phenomenon.

3. TRAINING MATERIALS USED FOR THE JOINT CROSS BORDER WORKSHOPS

For the purpose of making the workshops more efficient for the targeted audience, a lot of graphic and video materials have been produced. Below is the list for the specific events held in order to present the results from the WP4.

Webinar "New technologies in the fishery sector" 1st of September 2021.

PPT

1. FAIRSEA - Modelling fishing effort with VMS, AIS and AI;
PhD, Tommaso Russo, Associate Professor of Ecology, University of Rome Tor Vergata & CoNISMa, Italy

The integrated platform.

Phd Giuseppe Scarcella and Msc. Francesco Masnadi, FAIRSEA project partners, CNR-IRBIM, Italy

FAIRSEA project was dedicated to the development of an integrated platform for a quantitative ecosystem approach to fisheries that goes across territorial boundaries and across several disciplines. The platform integrates datasets from physics to bioeconomy of fisheries as a state of the art and decision support tool"

2. ITACA - Models and ICT system as a tool for small pelagic sustainable fisheries
MA, Valentina Zambetti – Veneto Agricoltura, ITACA Lead Partner, Italy

As an introductory sentence, you can consider that the ITACA project aims at building a WebAPP that works upon a scientific predictive model and that allows producers organizations and SMEs operating in the fisheries of small pelagic species, to tailor catches to both socio-economic and environmental sustainability. The exploitation of the ITACA WebAPP at whole Adriatic level is supported by the establishment of a cross-border cluster of those producers' organizations and SMEs, contributing factually to the reduction of application of human pressure on marine resources (anchovies and sardines) and to blue innovation.

3. PRIZEFISH - Innovative technology solution for harvesting small pelagic fish (sardine and anchovy)
Innovative technologies adaptation for processing of demersal species (shrimp, mullets)
MBA Ivan Matijašević, project manager, RZ OMEGA 3., Croatia
Innovative technology solution for catching/selection and processing of Bivalve Molluscs,
Phd. Igor Celić – OGS, project partner, Italy

The Prizefish project envisions the responsible fishery actions taken by the 3 private producer organizations assigned to partnership (P.O. Omega 3, P.O. Istria and P.O. Bivalvia), in the sense of applying innovative technology methods in catching/harvesting and processing of target sea species, with the final emphasis of creating innovative value-added products. To achieve goals related to less catch, with better prices, while affecting positively microeconomic ratios in the fishery sector, three P.O. 's have conducted different piloting actions. Thus, ensuring increased quality of the catch and social aspects of each fisherman, as well as welfare of caught species in the future.

4. INVESTINFISH - Efficiency of waste disposal or from waste to value-added second raw materials
Arch. Enrico Segantin, project manager, t2i – technology transfer and innovation, Italy
MA Erika Francescon, external expert, t2i – technology transfer and innovation, Italy

Boosting INVESTments in INnovation of SMEs along the entire FISHERY and aquaculture value chain. Enhance the framework conditions for innovation in the relevant sectors of the blue economy within the cooperation area.

VIDEO

1. Piloting the Sea pumps ([PP1 Zadar County, PRIZEFISH: Innovative tools and processes - OMEGA 3 - YouTube](#))
2. Piloting of the FC Istria shrimp de-peeling machine and shrimp burgers ([PP1 Zadar County, PRIZEFISH : Innovative tools and processes - FC ISTRA - YouTube](#))
3. PO Bivalvia piloting of innovative tools and processing ([OP Bivalvia - Piloting the sea clams catch and innovative processing technology - YouTube](#))

On-site workshop and training session “Valorization of quality and sustainability of Adriatic fisheries” 1st of October 2021., Ancona IT

PPT

1. The ARFM chain of custody standards for the entire chain sustainability (Eva Merloni - University of Bologna)
2. Innovative technologies tested in the project
 - Raising the quality of raw materials entering the processing facility, Omega 3 case.
 - Upgrade of processing technology – gaining more from raw material, Istria case (Ivan Matijašević – Omega 3)
3. Prototyped innovative products tested and results, training on the technologies used:
 - Chilled sardine filets, prolonged shelf life by MAP (with novel gas mixture)
 - Ready-to-cook clams with enhanced shelf-life and quality using high pressure treatment (HHP)
 - Fish and Shellfish Burger with enhanced shelf-life and quality using high pressure treatment (HHP) (Pietro Rocculi - University of Bologna - Department of Agricultural and Food Sciences)

VIDEO

1. Piloting the Sea pumps ([PP1 Zadar County, PRIZEFISH: Innovative tools and processes - OMEGA 3 - YouTube](#))
2. Piloting of the FC Istria shrimp de-peeling machine and shrimp burgers ([PP1 Zadar County, PRIZEFISH : Innovative tools and processes - FC ISTRA - YouTube](#))
3. OP Bivalvia piloting of innovative tools and processing ([OP Bivalvia - Piloting the sea clams catch and innovative processing technology - YouTube](#))

On-site workshop and training session „Innovative projections achieved by the organization of pilot projects in business and market environment through the PRIZEFISH project” 19th – 21st of October 2021., ZADAR and SPLIT, CRO

PPT

1. About PRIZEFISH - prof.PhD Alessia Cariani
2. Principles for certification of Adriatic fisheries: the ARFM certification scheme developed by Prizefish - prof.PhD.sc. Giuseppe Scarcella, prof.PhD Giulia Sandali
3. Piloting of eco-innovative fishery supply–chains to market added–value Adriatic fish products – prof.PhD Eva Merloni, Msc. Nikola Matović
4. Nutritional value of fish dishes - dipl. ing. Dragana Milosavljević
5. Preferences towards innovative fish products on the Italian and Spanish market -prof.PhD Luca Mulazzani
6. Preferences towards innovative fish products on the Croatian market - prof.dr.sc. Marija Cerjak
7. Roads and detours of fishing management targeting small blue fish - PhD Lav Bavčević
8. Innovative process and product projections through the PRIZEFISH Project – mr.sc. Mario Lovrinov
9. Manipulation of fish on board in search of added quality of the final product - dr.sc. Tibor Janči
10. Selection of small pelagic fish as a method of preserving fish stocks in the Adriatic - prof.dr.sc Daniel Matulić

VIDEO

1. Joint Cross Border Training in Croatia (PP1 Zadar County https://www.youtube.com/watch?v=Fz_UF5tx75Q)
2. Clip Cross border training in Croatia Interview (PP1 Zadar County <https://www.youtube.com/watch?v=4PqRTDxeYG8>)

Webinar "From sea to fork. Toward a sustainable cooking using Eco certified seafood" 26th of November 2021.

Moderator: Vasi Piergiorgio – Responsible O.P. for the Development and Valorization of sea fisheries and aquaculture in Emilia-Romagna Region

PPT

1. Welcome to the participants and presentation – Speech from Vasi Piergiorgio about PRIZEFISH project
2. Presentation about "The Adriatic Responsible Fisheries Management (ARFM) scheme to certify Adriatic responsible fisheries" within the WP3 context (PILOTING OF SUSTAINABLE AND ECO-CERTIFIED FISHERY PRODUCTIONS)
Sandalli Giulia (CNR-IRBIM)
3. Presentation about "Innovative products from 3PO's"
Ivan Matijašević (PO OMEGA 3)
4. Speech about "Shrimp Burgers" (not planned in the agenda)
Andrea Bonaca Staric (PO ISTRIA)
5. Speech about "Dal Mare alla tavola a Km 0" - "From the sea to the plate" (not planned in the agenda)
Alberani Alberto (PPM Remo Brindisi)
6. Speech about Eurofishmarket in connection with Prizefish project and results
Tepedino Valentina (Eurofishmarket)
7. Presentation about "Conventional and innovative technologies for the sustainable valorization of seafood from Adriatic"
Rocculi Pietro (Campus of Food Science - DISTAL)
8. Short Speech about the fishery sector
Paesanti Vadis - FederCoopesca President for Emilia-Romagna Region
9. Speech about the use of fish in restaurants and the possibility to cook products with a sustainable label
Leoni Marcello - Chef
10. Final poll

VIDEO

1. Chilled sardine fillets, PO Omega 3 ([PRIZEFISH - Chilled sardine fillets - YouTube](#))
2. Shrimp burger material production, PO Istria ([PRIZEFISH - Ready-to-eat and ready-to-cook fish burger - YouTube](#))
3. Sea clams in tomato sauce, PO Bivalvia ([OP Bivalvia - Piloting the sea clams catch and innovative processing technology - YouTube](#))

4. ONLINE TRAINING MODULES

Webinar "New technologies in the fishery sector" 1st of September 2021.

Panel Organizer: PRIZEFISH WP leader, P.O. Omega 3, Ivan Matijašević

UPDATE ON NEW TECHNOLOGIES, TECHNIQUES AND METHODS IN ADRIATIC FISHERY SECTOR
(Recorded training is available on Croatian language [New technologies in the fishery sector hrvatski - YouTube](#), English [New technologies in the fishery sector English - YouTube](#), and Italian [New technologies in the fishery sector Italiano - YouTube](#))

The event talked about the closed cycle of marine ecosystems, how to apply new technologies, techniques and methods that are important for preserving the Adriatic marine organism population. In order to meet the aim of preservation, it gave an insight on how to closely monitor the fishing grounds, up to raising the quality in catch & handling and processing, and finally covering the efficiency of waste management.

According to Excel participant reports of the online event and profiling subscribers (see the files "reach TG" and others in Drive space), the webinar mostly involved participants from Universities, technology transfer institutions, research institutions - NGOs, associations, innovation agencies, business incubators, cluster management bodies and networks - Local, regional and national public authorities - regional and local development agencies, chambers of commerce and other business support organizations - some SMEs.

Among them FLAG, fishermen SMEs and associations, Italian Ministry of Infrastructure and Transport, Italian and Croatian chambers of commerce, Isprambiente as research institution, Veneto and Friuli-Venezia Giulia Region, Veneto Agricoltura as innovation agency and regional company for the agricultural, forestry and agri-food sector, Italian technology transfer institutions and business incubators, public authorities.

During the webinar online surveys were carried out with Questions & Answers to examine the knowledge of the participants and involve them on the topics talked in the different speeches.

Webinar "From sea to fork. Toward a sustainable cooking using Eco certified seafood" 26th of November 2021.

Panel Organizer: Emilia-Romagna Region, Vasi Piergiorgio

FROM SEA TO FORK. TOWARD A SUSTAINABLE COOKING USING ECO-CERTIFIED SEAFOOD.

(Recorded training is available in Italian language [From sea to fork. Toward a sustainable cooking using eco-certified seafood italiano - YouTube](#), on Croatian [From sea to fork. Toward a sustainable cooking using eco-certified seafood hrvatski - YouTube](#), and English [From sea to fork. Toward a sustainable cooking using eco-certified seafood English - YouTube](#)).

The training webinar was dedicated to operators of the food production and it focused on innovative processing procedures and devices that deliver added-value Adriatic fish products, by involving operators from Italy and Croatia to promote a cross boundary background of such activity.

As showed in Excel participants reports of the event and profiling subscribers (see the files "reach TG" and others in Drive space), the webinar mostly involved participants from the following target groups: Universities, technology transfer institutions, research institutions - NGOs, associations, innovation agencies, business incubators, cluster management bodies and networks – SMEs.

Additional notes

Concerning the final poll, attached as PDF file in RER Material 6th period in the Drive space - https://drive.google.com/drive/folders/1Om8BRU-M7mHOWt2Y1Rdv9zL_tetmmo86?usp=sharing - sent to the participants after the online event, the results showed the following considerations:

- All the interviewees think a sustainability label is useful to certify products fished in the Adriatic Sea;
- All the interviewees would pay more for a fish product with a sustainability label;
- Regarding the third poll question 44,4% of the interviewees don't trust existing sustainability brands; 44,4 % trust this and the remaining part (11,1%) don't know about this.
- Most of the interviewees (77,8%) answered they would prefer buying a product at the fish market with a sustainability label rather than buying a product on the boat (just 22,2%);
- 100% of interviewees would like to see the provenance of the fish listed on a restaurant menu;
- 88,9% prefer a processed product providing the flavor, even without the shape of fish and just 11,1% consider the shape of fish relevant.

5. ON SITE TRAINING MODULES

On site workshop and training session “Valorization of quality and sustainability of Adriatic fisheries” 1st of October 2021., ANCONA, IT

(Recorded training is available on Croatian language [Joint capacity building and cross-border training in Italy hrvatski - YouTube](#), on English [Joint capacity building and cross-border training in Italy English - YouTube](#) and Italian [Joint capacity building and cross-border training in Italy italiano - YouTube](#)).

The workshop was held in hybrid mode, organized by PP3 ASSAM in cooperation with Emilia Romagna Region which provided for on-line translation service in 3 languages (Italian, Croatian and English). The workshop was held in the framework of Tipicità in Blue Initiative that the City of Ancona organizes yearly to promote blue growth and blue economy. The workshop has been conceived as a Joint Cross border training to capitalize, disseminate and foster the transferability of project achievements and results towards several stakeholders: Fisheries’ sector representatives and producers’ organization, enterprises and association, companies dealing with products processing and valorization. With reference to the WP4-INNOVATING TOOLS AND PROCESSES FOR ADDED-VALUE ADRIATIC FISHERY PRODUCTS - during the training session the following issues have been deepened and discussed:

- The ARFM **chain of custody standards for the entire chain sustainability**. The chain of custody developed aims to provide accountability and improve transparency throughout the supply chain.
 - **The Innovative technologies tested in the project by the Producers organizations:**
Raising the quality of raw materials entering the processing facility, Omega 3 case.
Upgrade of processing technology – gaining more from raw material, Istria case
 - **Prototyped innovative products tested and results, training on the technologies used:**
 - Chilled sardine filets, prolonged shelf life by MAP (with novel gas mixture)
 - Ready-to-cook clams with enhanced shelf-life and quality using high pressure treatment (HHP)
 - Fish and Shellfish Burger with enhanced shelf-life and quality using high pressure treatment (HHP)
- Pietro Rocculi - University of Bologna - Department of Agricultural and Food Sciences

Furthermore, during the event, we disseminated a training brochure on the Certification Programme “ARFM - Adriatic Responsible Fisheries Management” which in the second section is focused on the Chain of Custody (CoC) developed to ensure the traceability of ARFM certified products throughout the supply chain, support the responsible fisheries practices and maintain the credibility of certification mark.

After the training session, PP3 ASSAM organized a cooking show for the participants with fresh and processed Adriatic fisheries products.

Places to attend in presence were limited upon invitation due to Covid-19 restrictions. During the training session we had 35 participants attending in presence and 50 on-line participants. Registration of the webinar has been provided in the 3 languages (English, Italian and Croatian) to further disseminate and transfer the project results.

Figures 1. and 2. Training photos, (Source: ASSAM)



On-site workshop and training session „Innovative projections achieved by the organization of pilot projects in business and market environment through the PRIZEFISH project” 19th – 21st of October 2021. ZADAR and SPLIT, CRO

(Recorded training is available on the following link [Joint Cross Border Training in Croatia - YouTube](#))

The Joint cross border was held in hybrid mode from 19th October till 21st October 2021 in Zadar and Split, organized by PP1 Zadar County and in cooperation with PP6 IZOR and PP12 RERA. In collaboration with all the partners, Croatian partners made a 3-day event consisting of hybrid meetings and visiting important SME's and fishery processing companies. Training was provided for on-line translation service in 3 languages (Italian, Croatian and English).

Cross border training started on October 19th 2021 in the Center for Creative Industries – Inovacija in Zadar entitled “Innovative projections achieved by the organization of pilot projects in business and market environment through the PRIZEFISH project”. The cross border brought together scientists, experts, external experts and project partners who presented the achievements of the project through their presentations and opened a discussion with Croatian and Italian fishermen and other stakeholders in the fisheries sector who attended the meeting.

The main goal of the organized event was to bring together decision-makers at national, local and regional level and the scientific and research community and open a discussion on the development of innovative solutions and combining knowledge, experience and information from strategic and operational levels, jointly encouraging the development of new solutions through the innovation ecosystem.

Places to attend in presence were limited upon invitation due to Covid-19 restrictions. During the Cross-border training we had 46 participants attending in presence and 39 on-line participants. Registration of the webinar has been provided in the 3 languages (English, Italian and Croatian) to further disseminate and transfer the project results.

Figures 3. and 4. Training session in Zadar (Source: Zadar County).



Second day, on October 20th was entitled “Tour of the production facilities of the OMEGA 3 and company Mišlov d.o.o.” 18 participants visited facilities in OMEGA 3 and Mišlov d.o.o. who presented the production facility, production technology and markets for these two companies.

Figure 5. Onsite visit Mišlov d.o.o. and 6. FC Omega 3 (Source: Zadar County)



Third day, on October 21st participants visited production facilities in Sardina d.o.o. in Postira on the Island of Brač and in the afternoon in Split PP12 RERA together with partners organized a cooking show with fresh and processed Adriatic fisheries products. The cooking show included 4 course fish menu and a lecture by a nutritionist.

Figure 7. Onsite visit to Sardina d.o.o. factory (Source: Zadar County)



Figures 8. and 9. Cooking show Split (Source: RERA)



6. CONCLUSION

Due to the COVID restrictions, the project cross border training was split among those who were organized online and onsite with limited capacities. However, all the training done in WP4 was very successful.

The trainings served a numerous video material which explained how the innovative fish catch, handling and processing work, as well as what is necessary to expand an assortment production line by creating innovative products.

The Prizefish project has created innovative approaches in usage of technology and techniques for harvesting/catching and processing for the fishery industry on the Adriatic Sea. The emphasis was to enhance the quality and efficiency in usage of the raw material entering the production cycle, but at the same time ensure advanced work security on operational levels. These results are supported with the successful pilots of the; vacuum pumps for harvesting the small pelagic blue fish transferred directly to the thermal-insulation bins, adaptation of the fish deboning machine into deep rose water shrimp de-peeling machine for creating a semi product of high nutrition values, and finally selective tools in harvesting sea clams. These results are visible as environmental and social impacts to the industry.

The other valuable perspective has been added to creation of innovative products, in order to increase shelf life of the fish products, which has a strong economic impact for the industry and producer organizations themselves. Using MAP and HPP treatments in combination with innovative elements such as ozonated water, mixture of noble gasses and recipes which do not affect nutrition means of the product, the pilots have shown significant results in the sense of extended shelf life. Extended shelf life is important for logistic purposes, as with those values a wider market range can be selected. Chilled sardine filets in MAP, HPP burgers from deep water rose shrimp and white fish, sea clams in tomato sauce, they all reached 40-50 % extended shelf life. These products have higher market prices as well, which is another axis hit by the project, boosting the operational income of the fishery sector on the Adriatic Sea.

It is of great importance to mention that the idea of merging several projects that are in synergy into a one online session proved the greater success in dissemination of the achieved results, with a wider audience instead of presenting just one single project. This was the case with the webinar Update on new technologies, which has merged PRIZEFISH, ITACA, FAIRSEA and INVESTINFISH projects. Having this experience, it is warmly recommended for all future projects dissemination to merge the similar thematic in online trainings which are under the same axis.

Positive examples such as this project can bring the desired changes and positive effects in fisheries, but also close and related branches of fisheries, such as tourism and hospitality. Clean, rich and healthy sea, through responsible fishing has a long reach on the economy of the Republic of Croatia and Italy, and it is desirable to become an imperative in the service of all stakeholders, to enable the creation of a sustainable economy related to the Adriatic basin.