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WPT2- Pilot activities for transnational and regional networking

ADRION SSF AND AQ INNOVATION BROKERING REPORT

WPT2

T2.3 Innovation brokering events

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LIST OF ABBREVIATIONS

AF: Application Form
AQ: Aquaculture
LP: Lead Partner
PP/PPs: Project Partner/s
PTSC: Project Technical Steering Committee
SSF: Small Scale Fisheries
KP: Key Players

PPs ABBREVIATION:

PP number	PP abbreviation	PP name
1 (LP)	CNR-ISMAR	National Research Center
2	REMA	Marche Region
3	IOR	Institute of Oceanography and Fisheries
4	RERA	Public Institution RERA SD for Coordination and Development of Split Dalmatia County
5	HCMR	HELLENIC CENTRE FOR MARINE RESEARCH
6	IMBK	University of Montenegro – Institute for marine biology
7	RESI	Sicily Region - Mediterranean Fisheries Department - Sicilian Region
8	MoARD	Ministry of Agriculture and Rural Development
9	RWG	Region of Western Greece

1. INTRODUCTION

ARIEL is a project co-financed under the 1st call of the INTERREG VB ADRION Programme 2014-2020 under the Priority “Innovation”.

The project is promoted and coordinated by CNR-IRBIM Ancona and involves institutional and scientific partners of Italy, Croatia, Montenegro and Greece. The project aims to promote technological and non-technological solutions for innovation of small –scale fisheries (SSF) and aquaculture (AQ) among scientists-policy-makers-entrepreneurs, acting as a knowledge network and taking into account in a single frame the complex ecological, economic and societal challenges. ARIEL will develop capacity-building actions for policy makers for the adoption of a science-based approach to improve resources co-management and develop appropriate supporting schemes to stimulate actors clustering. Project activities will lead to strategic and operational guidelines to promote open innovation in SSF and AQ led by research institutes, facilitated by policy makers, endorsed by entrepreneurs and recognized by consumers. ARIEL promotes the uptake in small scale fisheries and aquaculture of open innovation led research, facilitated by policy and endorsed by operators involving multiple-skills organizations from Italy, Croatia, Montenegro and Greece able to strategically/operationally tackle the complex challenges of SSF and AQ sectors growth in the Adriatic-Ionian Region and able to identify key innovation drivers for policy and research as well as ensure project results durability and transferability.

To these, the ARIEL foresees a set of actions: from the framework analysis of small-scale fisheries and aquaculture sector in the involve territories to pilot actions and results dissemination and transfer at transnational level.

The first period of project implementation covered the year 2018 and led to the identification and categorization of the SSF and AQ players that were actively involved in consultation activities.

The stakeholder interactive engagement is the bulk of the project, regional and transnational actors are thus involved in the innovation discovery process for the needs and new ideas emersion thanks to the joint efforts of partners working as innovation services providers.

ARIEL pilot actions expected in 2019 have been generally outlined at project designing phase since their further breakdown could be reached only after a better understanding and benchmarking of regional and transnational institutional, socio-economic and technical state of play and trajectories for effective innovation up-take.

In the light of the above, the organization of regional innovation brokering event in all participating countries (Italy, Croatia, Montenegro and Greece) can play its full role, constituting the first block upon which building up:

- ⇒ Training activities for researcher to address new research fields to meet the needs of innovation of operators while preserving sea resources
- ⇒ Training activities for SSF and AQ operators to empower them with new skills for a sustainable and competitive management of day-by-day operations as well as to inform them about funding opportunities for innovation in small-scale fisheries and aquaculture

- ⇒ Capacity building towards technical officers dealing with fisheries and aquaculture for a better governance of innovation speed-up in these two sectors
- ⇒ Pilot testing on vessels and aquaculture farms of new practices quicker to put into practices

The ARIEL interactive approach to innovation

On 2012, the European Commission - within the EU 2020 Strategy and the EIP- European Innovation Partnerships - launched the European Innovation Partnership for Agricultural productivity and Sustainability (EIP- AGRI) initiative to promote an interactive approach for the innovation speed-up and uptake in the agriculture sector. It aims to foster a competitive and sustainable agriculture and forestry sector that "achieves more from less". It contributes to ensuring a steady supply of food, feed and biomaterials, and to the sustainable management of the essential natural resources on which farming and forestry depend, working in harmony with the environment. To achieve this aim, the EIP-AGRI brings together innovation actors (farmers, advisors, researchers, businesses, NGOs, etc) and helps to build bridges between research and practice (<https://ec.europa.eu/eip/agriculture/en>).

In this framework, innovation support services and innovation brokering which work using models that are adapted to local conditions could play a crucial role in bringing the right people into the projects, creating new connections among different actors and helping to identify funding. In short, innovation support services and brokering could play a crucial role in getting many worthwhile projects off the ground and capturing grassroots ideas from practitioners.

Under these premises, ARIEL intends to adapt and apply at transnational level this interactive approach and its operational tools for innovation speed-up to the small-scale fisheries and aquaculture, two key sectors for the Adriatic-Ionian Macroregion.

In particular, the project ambitions are to capitalize the EIP-AGRI best practices of innovation brokering, in particular the experience of "INNOVAMARCHE" project – financed under the Rural Development Programme 2014-2020 of Marche Region which successfully contributed to the innovation governance of the regional agro-food sector.

In fact, innovation support services could have an important role leading initiatives that bring fisheries and aquaculture stakeholders together so that they can each present their needs and jointly find out quick solutions.

The innovation support services and brokering activities carried out within ARIEL by the project partners are expecting to lead to new forms of multi-actors' collaboration for unlocking the innovation potential of small-scale fisheries and aquaculture, for realizing new projects as well as for identifying and putting in place quicker solutions for the concrete day-by-day needs.

The project is expecting to stimulate the regional and transnational actors from very different background, partnering and cooperation around core issues in day-by-day operations so they can put into practice technological and non-technological innovation.

The pilot action consists in the application of an interactive and bottom-up approach to stimulate different actors of SSF and AQ (operators-advisors- academia/research/ policy makers) grouping (in WG working groups) and discussing around core topics for innovation speed-up.

Specifically, it will be realized in the form of events where the regional actors will be grouped according to their specific interest/influence on a topic (e.g. Traceability of seafood...) and will be facilitated by moderators/facilitators in sharing day by day needs to find quick and fit-for-purpose solutions to be put in practices that can be technological and non-technological. This will fully exploit the knowledge and experiences that these different actors from different levels will bring in the groups that will be formed.

The activity aims at connecting SSF and AQ actors to speed-up innovation by the development and implementation of regional innovation brokering events to facilitate the exchange of knowledge and to establish a dialogue between the SSF and AQ sector and research community.

- **Scientific Experts and researchers:**
 - available R&D solutions to SSF and AQ SMEs during the Innovation brokering
- **SSF and AQ SMEs**
 - outline innovation needs
- **Policy makers**
 - get insights for development of fit-for-purpose innovation policies and funding schemes.

The Deliverable consists in the organization of n.1 event at territorial level and moderated by experts providing strategic inputs for ideas generation and facilitating multi-way information exchange.

T.2.3.1. Innovation Brokering Event

- setting-up of regional SSF and aquaculture cross-sectoral working groups (WG)
- to detect innovative solutions that can be more easily put into practice at each territory level for technologies and managerial innovation
- to identify a list of core topics on which stimulating the discussion at the innovation brokering that can also emerged from regional analyses.
- Already listed some common topics in the application form:
 1. **SSF and AQ supply chains operators,**
 2. **environmental sustainability,**
 3. **innovative fishing and AQ technique,**
 4. **traceability and quality,**

5. **seafood products branding**
6. **policies upgrading,**
7. **better governance and clustering initiatives**

*Additional ones can be also fine-tuned on the specific needs of a territory collected during the WPT1 framework analyses.

T2.3.2. Innovation brokering regional report

- Report based on each regional brokering event findings and idea generated with the support of Innovation and Knowledge broker experts.

2. GENERAL INFO

2.1. Key topics extracted from regional swot analysis

Key topics (in total 8: 4 for SSF and 4 for AQ) was extracted from our regional swot analysis. So, basically it is expected that on brokering event invited regional actors (key players, operators, scientists, policy makers and other invited relevant participants, or company representatives) will be grouped according to their specific interest/influence on a specific topic.

Key topics for Innovation brokering events: stimulating discussion and ideas discovery process among different actors (business- academia/research – advisory - policy makers- NGOs) into Operational Groups

- ⇒ Modernisation and improvements in fishing gear (selectivity,.) and vessels (new engines,...) towards environmental and socio-economic sustainability
- ⇒ Modernisation and improvements in production systems
- ⇒ Diversification of activities and income
- ⇒ Short supply and distribution chain, higher prices and added value of seafood products
- ⇒ Traceability, marketing and branding seafood products
- ⇒ Reducing competition with other players (other fishing sectors and animals – dolphins)
- ⇒ Diversification of products
- ⇒ Reducing predation and new disease appearance

2.2. Participants identification, number of invited participants (total and by groups) and distribution of invited participants

a) Identified participants by groups

Identified stakeholders
Key players (defined in WPT1)
Operators (SSF and AQ)
Consultants
Research and Education
Students
SSF and AQ Entrepreneurs (Business)
NGO
Marketing experts
Business Economists
Public Service
Policy makers
Communicologists
Trade associations
Journalists

Table 1. List of Stakeholders attended on the regional Innovation Brokering Events

Stakeholders	Croatia	Italy (Marche)	Italy (Sicily)	Greece (AQ)	Greece (SSF)	Montenegro
Policy makers	7	3	7	4	4	1
Public service	3					1
Trade associations/unions/cooperatives	5		5		8	
AQ/SSF Local action groups	7	1				
AQ/SSF organization	1					
Education and research	23	20	5	13	8	17
Students	4			4	2	
NGO	3	1		3	2	2
AQ operators	9	4		14		1
SSF operators	18	4	13		8	3
Certification and branding experts	1	5	4			
Marketing experts	3					
SSF/AQ entrepreneurs (business)	9	5 + 2	6			3
Others		1*		3**	2**	2***

*Shipbuilding; ** Consultants, ***Key players

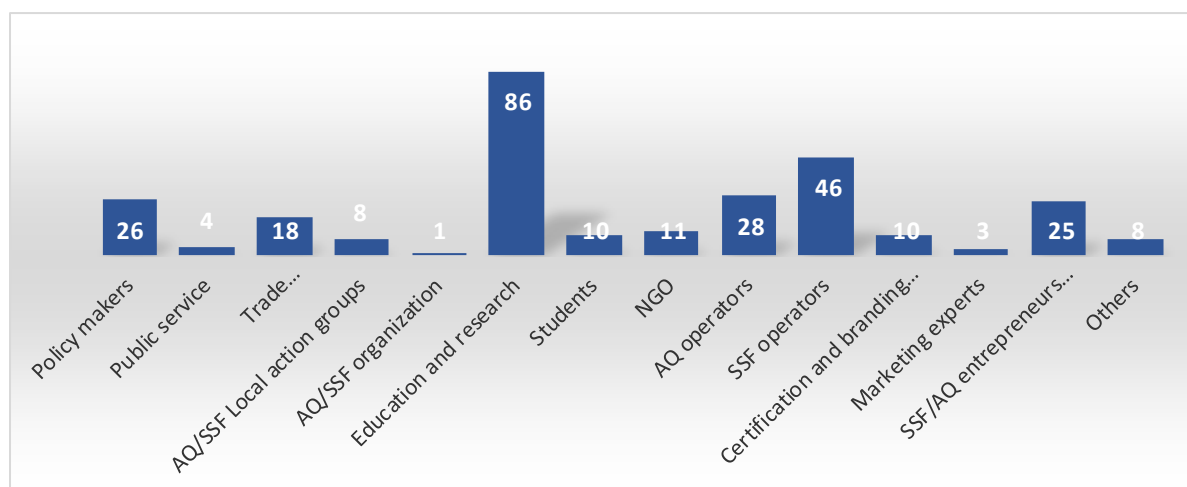


Figure 1. Number of stakeholders on Innovation Brokering Events

2.3. Date and Venue of event

In total 6 Innovation Brokering Events were held, 1 in Croatia, 2 in Italy (Marche Region and Sicily Region), 2 in Greece (one for SSF and one for AQ), 1 in Montenegro.

Region	Date	Location	Organisation	Number of participants
Croatia	21.01.2019	Radisson Blu Resort and Spa, Split,	PP3	93
Italy	22.02.2019	Largo Fiera della Pesca Ancona	LP and PP2	58
Italy	30.01.2019	Territorial Office - Via Luigi Vaccara, 61 - Mazara del Vallo	PP7	36
Greece	07.03.2019	Auditorium of the Administrative Building of Regional Unit, Mesolonghi, for AQ	PP5 and PP9	41
Greece	08.03.2019	Auditorium of the Administrative Building of Regional Unit, Mesolonghi, for SSF	PP5 and PP9	34
Montenegro	28.01.2019	Institute of Marine Biology, University of Montenegro, Kotor	PP6 and PP8	29

2.4. Agenda and Templates for group work

The innovation brokering event agendas, info sheets, presentations and photos for 5 Innovation Brokering Events held in Italy, Croatia, Italy, Greece and Monte Negro are enclosed to Innovation Brokering Event regional reports of each partner.

3. INNOVATION BROKERING EVENT

3.1. Events basic information

Innovation Brokering events were held within the ARIEL Interreg ADRION project, bringing together key stakeholders from the small scale fisheries and aquaculture sector (operators, policy makers and researchers) on the regional levels. In light of project activities referring on pilot activities required an interactive and bottom-up approach to stimulate different actors of SSF and AQ (operators-advisors- academia/research/ - policy makers) grouping (in WG working groups) and discussing around core topics for innovation speed-up. At each event, stakeholders were divided in several groups according to previously determined core topics, setting-up of regional SSF and aquaculture cross-sectoral working groups in aim to detect innovative solutions that can be more easily put into practice at each territory level for technologies and managerial innovation. Scientific experts and researchers made available R&D solutions, SSF and AQ operators outlined innovation needs and policy makers got insights for development of fit-for-purpose innovation policies and funding schemes. Each group draw findings, with included short discussions, conclusions and recommendations and proposed pilot studies across working groups. A framework agreement has been reached as well as plan for further stakeholder engagement on project activities.

Broker identification, per each project partner was done prior event according to their proven expertise in the interactive and bottom-up engagement of stakeholder under different projects implementation (based on list of references). Each broker was supported by the team of each project partner. Based on the Open Space Technology approach (already tested for the Innovation brokering events carried out at Marche Region level for the innovation speed-up in the agro-food sector in previous project) and taking into account the overall goal of the ARIEL project and its event, the one-day meeting on regional level was structured in the following steps:

1. Participants invitation (weeks before event)
2. Participants registration and categorization (at the very beginning of the event itself)
3. Plenary session (one day)
4. Working Group discussion (Open Space Technology)
5. Instant reports from each Working Group and discussion in plenary

3.2. Information about the number of participants

In total, on transnational level, more than 290 participants were involved in 6 innovation brokering events in Croatia (93), Italy (94), Greece (75) and Montenegro (29). The structure of participants was presented above. Although, the number of participants from research sector was predominant, a respective number of operators and policy makers were involved both on transnational and regional level.

3.3. Work group evaluation

Findings from each groups were presented per each region and innovation brokering event and separated in several bullets as listed below:

1. Main problems listed according to importance
2. Proposals for solving problems
3. Solutions
4. Need for specific innovations
5. Pilot studies
6. Probability of implementation

3.3.1. Working groups Croatia

At Innovation Brokering Event in Split, stakeholders were divided in 6 groups according to previously determined core topics, setting-up of regional SSF and aquaculture cross-sectoral working groups: (1) Modernisation and improvements in fishing gear (selectivity,..) and vessels (new engines,...) towards environmental and socio-economic sustainability, (2) Modernization and improvements in production systems; (2) Diversification of activities and income and Diversification of products; (3) Short supply and distribution chain, higher prices and added value of seafood products; (4) Traceability, marketing and branding seafood products, (5) Reducing competition with other players (other fishing sectors and animals – dolphins) and (6) Reducing predation and new disease appearance in aim to detect innovative solutions that can be more easily put into practice at each territory level for technologies and managerial innovation.

In first group, most fishermen are having problems with outdated vessels and equipment and are struggling to deal with bidding and measures to improve vessel conditions. Vessels and propulsion engines are over 30 years old and require changes and improvements. The problem is with the machine power because by entering the EU the power of all propulsion machinery must not be increased the power of the machine due to increased fishing effort. They saw solutions in new gear employment, technical modification of existing fishing gears, higher fishing gear selectivity, ... The diversification of the fishing activities into tourist activity during the summer was also proposed. Changing activities (from fishing to tourism) contributes to reducing fishing effort and competition among fishermen. When changing activities, the minimum technical requirements prescribed for passenger ships or boats have to be taken into an account.

Second group highlighted insufficient capital for upcoming projects co-financed by the EU, application to the measures (calls) of the Operational Program for Maritime Affairs and Fisheries for both sectors and unawareness of SSF and AQ operators about available possibilities (fishing tourism, procurement of technical equipment, meeting the technical conditions of the Law on renaming vessels for economic purposes, etc.). They are interested in new sophisticated solutions (software, mobile applications) but also some solutions are proposed through diversification of sea products; optimization of the invasive species

catches and their supply on market (for example blue crab, *Callinectes sapidus*). Without doubts, they need education, particularly on on possibilities of introducing a new aquaculture species in Europe.

Participants in third group were mainly from the fish trade sector. During the introductory discussion, most participants recognized the problem of the small and unorganized Croatian market. Mostly, fish trade is oriented towards export. A significant problem is the low consumption of fish and fish products in Croatia, except for the purpose of tourism. Stakeholders believed that it was necessary to change the awareness and habits of citizens and educate them from the earliest age on the positive effects of seafood consumption. Fundamental problems in the sense of organization of shorter chains of supply and distribution were noticed in the lack of adequate infrastructure, in particular the lack of adequately supplied and equipped landing sites. Also, there is a lack of employers, causing a delay in delivery, and consequently delivery chain slowdown has effects on the product quality itself. As a problem in delivery and distribution timeframe, the unnecessary but required fulfilment of the documentation of the complex administration and inadequate involvement of local authorities in addressing the infrastructure needs of this branch were recognized. The solution to most of the above mentioned problems has been seen in investing in improving the infrastructure regarding wholesale market and landing ports that will ultimately improve sea products quality. It was suggested that the fisherman on board the vessel also have a self-adhesive printing device with basic data to solve the problem of reprinting the documentation, which would undoubtedly shorten the chain of supply and distribution. Group participants from their perspective considered these to be key issues and stated that there was no point in discussing the added value of the sea products until a functional chain of supply and distribution has been established.

Main findings of fourth group is fact that there is an inequality of supply of consumers and fish consumption with regard to daily, monthly and seasonal fluctuations in the catches in the Republic of Croatia. In addition, consumption has seasonal pattern, with peak during the summer and during religion holidays, when habits require additional consumption (Christmas and Easter). Furthermore, fish consumption is extremely regional by nature. Compared to other EU members, the Republic of Croatia has no regulated wholesale fish market system, with auction sales, to ensure the price stability of the bidding system and ensure the credibility regarding the origin of the fisheries products. At present, a large number of brokers and commissioners are participating in the market, whose participation significantly disturb the traffic of fish and increases the huge disproportion of redemption and selling prices at the expense of producers. Fishery / Aquaculture, domestic and foreign trade brokers, traders and consumers, are part of the distribution chain of fishery products. Most of Croatian producers sell their products through commercial intermediaries that are further distributed to fish farms, large shopping malls, hotels and hospitality sectors. Thus, AQ / SSF operators loose contact and do not know what product is expected of the ultimate seller, which is of particular importance since the end consumers' preferences are of a highly regional character. Today, large shopping centers become an inevitable market segment. The growing distribution of fish to end consumers has a "catering" industry, which is increasingly becoming a consumer of fishery products compared to the trade sector. Today, the activity of aquaculture, with import, becomes an indispensable component of the sector, as it offers

continuous supply of fishery products throughout the year. Unlike farming, the oscillatory motion of the catch and the seasonality of the fisheries are unreliable for the hotel-catering industry, which must have secured products during the summer season, when the consumption of seafood and fish is the largest. Catering industry is a tremendous potential for Croatian fishery products and it is to be expected that AQ and SSF through marketing, promotion and adequate prices will try to place their products in hotels and restaurants, enriching the gastronomic offer of coastal tourism.

In fifth group, competition of SSF and AQ with several other sectors as well as with dolphins were recognized. The use of traditional noise-producing dissuasors has been proven to be, in general, quite ineffective. Either they increase the anthropogenic noise without a specific effect on dolphins, or they act as “dinner bell” attracting skilled (and smart) dolphins towards the fishing locations. Similar effects are produced by the noise of specific fishing activities, being the dolphins able to recognize a fishing boat from a navigating one. More recently, a new generation of dissuasors is becoming more and more in use. They detect the echolocation sounds produced by dolphins and react by generating random noise. An accurate and quantitative description of the hunting strategies actuated by dolphins and by a proof-of-concept description of the efficacy of new-generation dissuasors will be interesting. The increase in recreational and subsistence fisheries is altering the classic features of coastal fishing and placing increasing pressure on vulnerable coastal species, some of which are being intensively targeted by fishers. In many places this is leading to an increase of competition for coastal resources between recreational and SSF. There are also complaints by professional fishers that recreational fishers sell their catch to local restaurants. Although the sale of catches from recreational fishing is not all participants are aware of the existence of the illegal sale of catches by recreational fishers. SSF also face competition from other fishing activities such as commercial trawling and recreational activities such as scuba diving or aquaculture. Among these uses, trawling appears to be an increasing source of conflicts with SSF. For example, there is strong competition between SSF and trawling in gulfs and coastal areas within 3NM.

The participants of the sixth group recognized the problem of large economic losses in mollusk farming and the trend of withdrawing from this production activity due to the problem of predation. Predation is a general problem for all AQ operators in the Adriatic Sea. The intensity of the predation is growing in recent years, related to increasing of the sea bream fish farming, global warming and other changes that are present in the environment. Problems of the sea bream predation has been recognized on the international level (in the western Mediterranean and the East Atlantic). From existing solutions in terms of mechanical protection mentioned were the following: the nets around the concession fields (net-“španjolica”). This mode of protection is not fully applicable due to hydrological and geomorphological specificities of the Adriatic Sea. Except the above-mentioned, AQ operators addressed existing solutions for predation prevention, including gas guns that have not yet been tested in Croatia. Targeted catch for *Sparus aurata* has been proposed by the AQ operator, as the only way to reduce the number of this species. In addition, protection by sound was proposed; there are pingers that are used to prevent damage on aquaculture farms. The recommendation was to test the pingers through pilot activities and track the predation situation during the period of use of these innovations.

3.3.2 Working groups Italy (Marche Region)

At Innovation Brokering Event in Split, stakeholders were divided in 6 groups according to previously determined core topics, setting-up of regional SSF and aquaculture cross-sectoral working groups: (1) Process Innovation (2) Product Innovation; (3) Energy efficiency – AQ, SSF and (4) Traceability, marketing and branding seafood products.

Within the Working Group 1, the participants presented ideas and solutions for process innovation both in small-scale fisheries and aquaculture. The participants were asked to rank the key issues according to priority of interest. The modernization of fishing gears such as the use of traps for *Sepia officinalis* and the adoption of best practices to manage the biological resources has already demonstrated the efficacy in restocking activity. The innovation brokering activities such as those promoted by ARIEL can trigger the aggregation within the small-scale fisheries and aquaculture operators, favouring new collaboration and exchange of knowledge and the provision of private and public technical advisory. The forthcoming ARIEL platform can serve the purposes together with the public innovation broker (ASSAM in the case of Marche) that can facilitate and accompany the process. Cooperation with academia and research is perceived as a strength but it shall be tailored on day-by-day needs of SSF and AQ operators. On the other hand, it looks good for operators their engagement in scientific activities.

From the Working Group 2 dedicated to process innovation, it emerges the need of preserving the bargaining power of small-scale fisheries and aquaculture enterprises, working to shorten the supply chain and to set up “Producers Organization”. The setting-in up of multi-level and multi-actors network should be supported also through traceability as well new marketing and branding tools that shall be put in place to inform and raise consumers’ awareness on the inherent added value of the seafood.

Working Group 3 was dedicated to market-oriented innovation, it emerges the need of setting-up a multi-functional cooperation network, gathering all the small-scale fisheries and aquaculture operators. The goal of the network is to ensure a strict regulation and access to grants, a unique selling point for both final customers and large retailers, bridging to other sectors such as tourism and similar activities. The network should foresee profiles with to marketing and selling skills as well able to inform and raise consumer’s awareness about the seafood products sustainability. The adoption of a common strategy for implement the seafood products value represents a pivotal challenge that needs to be reach as soon as possible, both in order to avoid overexploitation of the biological resources and in parallel sustain the economy of fishery enterprises. The network shall also support vocational training for young workers operating in aquaculture farms.

The group 4 mainly focused on the SSF needs for associating. As a matter of fact, SSF is composed by micro-companies being most of operators are not affiliated in organizations associations and this situation tends to affect its own economic development and marginalize SSF in decision making processes.

Maritime spatial planning with SSF is challenging because of the lack of realistic data on the number of active vessels. In fact, the official data are not updated and, hence, a detailed census of active SSF vessels would be needed. Another challenge is the lack of

control of illegal fishing. The Coast Guard doesn't have appropriate tools and effort capacity to control every illegal fishing in the coastal area (e.g. illegal trawling, illegal recreational fishing, spatial conflicts with hydraulic dredges, etc.). This also lead to environmental and socio-economic sustainability. The group also focused on the spatial conflicts existing between SSF and recreational fishers using pots/traps for cuttlefish. In the Marche region up to 1,000 recreational fishers target cuttlefish during the spawning season using 2 pots/fisher. Rumors refer that they illegally use more than the allowed number of gears, creating big spatial conflicts with SSF. The group agrees that leisure fishing should not use the same fishing gears of commercial fishing, but this is something that should be imposed/ruled by administrations/policy makers. Possible solution for controlling illegal fishing is the adoption of automatic systems as AIS and VMS, which are currently installed on large vessels (AIS on vessels having LOA>15m and VMS on vessels having LOA>12m) and that should be used also by small-scale vessels.

Another important and topical issue raised by the group was the predation of dolphins on set nets. This problem causes two economic losses: a) the decrease of catch; b) damages at the fishing gears. A number of devices exist to reduce the dolphin predation on fishing gears, but it seems that these cetaceans are able to adapt their predatory behaviour to such devices after a while and afterwards they could also be attracted by them. The group proposes to shoot a video/documentary in order to sensitize people on this issue. As a matter of fact, up to date documentaries have only focused on conservation matters without considering the negative interactions between cetaceans and commercial activities at sea. A pilot study will be carried out in the framework of ARIEL project in order to test possible solutions to this problem.

3.3.3 Working groups Italy (Sicily Region)

At Innovation Brokering Event in Mazara del Vallo, stakeholders were divided in 3 groups according to previously determined core topics: Group 1: Traceability, quality and consumers' perspectives (SSF and AQ); Group 2: Common branding products/services under traceability and quality criteria (SSF and AQ) and Group 3: Biological cycle of the species targeted by their fishing activity (SSF).

In Group 1, many of the SSF operators have taken the floor, expressing a profound scepticism in the adoption of computer systems that can solve the problem of traceability and traceability of the fish product upstream. It has been recalled that labelling is a practice that must be carried out correctly and that it is a characteristic of the product that, if well executed, produces added value. It is proposed to carry out pilot studies on the genetic characterization of the species involved in the fish trade, and to carry out an awareness campaign with the fishing operators to encourage the implementation of good practices.

In Group 2, many of those present operators showed interest in the discussion finding many points of agreement and agreeing that for the valorisation of the local fish product, within the global market, undoubtedly a labelling that satisfies the expectations of the consumer who considers the local product better than that imported. In fact, the globalization of the markets has led to the need to have certainty about the origin of fish

products, their traceability, hygienic quality, but also to have more and more information on their total quality. Furthermore, it has been said by many that besides the quality certification, the disciplinary would need a control of the whole production chain. From the discussion it emerged from the consideration of the quality relative to the product alone that we arrive at the application of the concept of total quality applied to the entire production chain. Optimizing and therefore being able to control production procedures is the only possibility to guarantee the consumer the safety and total quality of the product, which therefore becomes a logical consequence of the validity of the process. Given these assumptions and the growing interest of consumers for a healthy diet, the world of research and the markets have to increase dealt with the quality of aquatic productions, with the ways of certifying them, also giving a lot of space to increasingly advanced communication models.

In Group 3, the SSF operators and ship owners have animated an interesting discussion in which several problems related to fishing waste have emerged. The latter, composed mainly of fish with little commercial value or undersized, could have been thrown back into the sea. Now with the new European legislation it must be transferred to the quay and properly disposed of. This creates additional costs for fishermen and owners. The realization of projects that aim at the valorisation of the discarded fish and its consumption, will allow the operators to be able to commercialize a product that once had no market and that constituted an expense with an element of profit. Therefore, it asks research institutions and policy makers to provide planning ideas and funding to carry out this activity. Project of nutritional and qualitative characterization of neglected species and their enhancement for food consumption is proposed as pilot action.

3.3.4 Working groups Greece (AQ)

At first Innovation Brokering Event in Mesolonghi, organised for AQ operators, stakeholders were divided in 3 groups according to previously determined core topics: Group 1: Modernisation of production systems to enhance environmental and socioeconomic sustainability; Group 2: Improvements in production systems and Group 3: Reducing mortality and morbidity rate.

During the 1. group discussion, several issues arisen, related to the topic of the group. These issues were discussed briefly and stakeholders suggested various innovations that could be applied. Operators highlighted problems related to currents, increased feeding costs, difficulties in sea cages management, application of fallowing, environmental degradation /need to find ways to reassure environmental sustainability, increased bureaucracy and enterprises' weakness to apply innovations/new technologies due to financial distress and obstacles to get EU funding. As solutions they proposed: development of feeding models (cloud-based), development of model regarding currents / mapping of currents (cloud-based), development of fallowing strategies, observatories in various points for environmental degradation indices and traceability / Labelling.

During the 2. group discussion (infrastructure problem e.g. low accessibility to the aquaculture farming areas, problematic legal framework, limited flow of information on new technologies/ innovations, establishment of 'Zones for Organized Development of

Aquaculture' and potential of growing intensity of predation due external factors e.g global warming), the proposed innovation regarding the use of underwater cameras in fish cages get much attention and high feasibility/effectiveness score. This is the reason that this specific innovation will be applied as a pilot study. There are also three other innovations that the stakeholders found very interesting (automatic feeding systems, brass wire used to manufacture fish farm cage mesh, automatic nets' cleaning). However, even though these innovations got high effectiveness score, the time and budget constraints of the project do not allow their pilot implementation.

The idea of improving the health of fish populations through automatic vaccination machines get high attention during the 3. group discussion (low spawn quality, viruses/Bacteria/Parasites/Microbes (e.g. Pasteurella sp.), increased aquaculture farming density) and a high feasibility and effectiveness score. Several other interesting ideas/solutions were proposed (lower fish density, methods to improve immunogenicity, use of (micro)algae, improve of Fish Well-being, cleaning cages more regularly (automatic cleaning), application of modern feeding systems that reduce mortality), which could be considered for implementation in the future.

3.3.5 Working groups Greece (SSF)

At second Innovation Brokering Event in Mesolonghi, organised for SSF operators, stakeholders were divided in 3 groups according to previously determined core topics: Group 1: Modernisation and improvements in vessels and in fishing gears, towards environmental and socio-economic sustainability; Group 2: Traceability, marketing, branding and problems related to market access and Group 3: Diversification of activities and income.

The structure of the small-scale fishing fleet, and especially the fact that it is aged and equipped with outdated equipment, is a main issue in Greek SSF and was the main topic of 1. Group discussion (outdated vessels and equipment (e.g. engines), low engine power, inadequate harbour infrastructure, low flow of information regarding EU measures, increased bureaucracy and limited cash flow tackle the adoption of innovations, inefficient Inputs control/ use of resources). This problem has direct effect in the productivity and efficiency of the sector and therefore it hinders socioeconomic and environmental sustainability. Solutions provided by the stakeholders were focused more on policy-related measures rather than new technologies and innovations (more selective gears, harbour upgrades, processing of low-value landings or landings that cannot absorbed by the fish market, software applications that allow systematic monitoring of income and expenses (e.g. abalobi extensions).

Many stakeholders in Group 2 agreed that traceability, marketing, branding and problems related to market access is the main problem in the small-scale -fishing sector. The market is largely fragmented and the conditions for a healthy/perfect competition are fully absent. There are many structural deficiencies that affect fish market since decades (seasonality issues that affect market (closing fishing periods, demand seasonality due to tourism), fragmented market (market chain is not well-organized, eg. monopsony/oligopsony is common in many areas around Greece), low fish prices (related to the previous bullet), increased competition by large scale fisheries and recreational fishing, illegal fishing that

distort the market) and their effective solution requires the assistance and co-working of all stakeholders' groups. However, during the breakout session the participants mentioned several ideas that can assist fishers to tackle these structural problems and to reach economic sustainability (traceability and quality assurance, vertical Integration (processing industry e.g. salted fish), improve market conditions (especially more buyers to increase competition), change the awareness of consumers on the positive effects of seafood consumption, access to new markets (not only local), marketing tools to shift demand (e.g. labelling)). Traceability and quality certification can provide fishers with access to new more promising markets. In addition, some other interesting ideas for innovation were also reported throughout discussion.

Diversification of activities is considered as an important issue by the stakeholders in 3. Group as it can provide additional income to fishers and decrease risk level through the adoption of a multi-activity portfolio. However, it is important to mention that pluriactivity is a common phenomenon, especially in the regional coastal areas. It usually refers to the combination of fishing with non-fishing activities in the primary sector (e.g. agriculture), and in the tertiary sector (e.g. B&B, taverns). Therefore, diversification of income is a common strategy in Greek regional areas. Operators discussed about low income from fishing activities due to increased competition and low fish prices, legal framework for pesca tourism, difficult to meet conditions for pesca tourism (e.g. safety standards, minimum technical requirements, new species catching and processing of low commercial value species to produce new added value products. Under the present context, diversification of income was focused in two main activities: a) pesca tourism and b) vertical integration through the processing of excessive landings and the exploitation of fish with low commercial value.

3.3.6 Working groups Montenegro

At Innovation Brokering Event in Kotor, initially stakeholders were divided in 6 groups according to previously determined core topics, setting-up of regional SSF and aquaculture cross-sectoral working groups: (1) Modernisation and improvements in fishing gear (selectivity,...) and vessels (new engines,...) towards environmental and socio-economic sustainability and Modernization and improvements in production systems; (2) Diversification of activities and income and Diversification of products; (3) Short supply and distribution chain, higher prices and added value of seafood products (no interests); (4) Traceability, marketing and branding seafood products, (5) Reducing competition with other players (other fishing sectors and animals – dolphins) and (6) Reducing predation and new disease appearance in aim to detect innovative solutions that can be more easily put into practice at each territory level for technologies and managerial innovation. However, due fact that in some groups were not expressed interest for participation, innovation broker invited all participants for joint discussion over all 6 groups topics.

Operators discussed about: damage to gillnets and trammel nets caused by the blue crab, *Callinectes sapidus*, karamote prawn, *Melicerus kerathurus*, a potentially economically important species cannot be targeted with trammel nets with min. mesh size of 56 mm. Smaller mesh size requires derogation from the EU, problems with availability of netting and

other materials for fishing net construction, no fishing port in the Ulcinj municipality, no fish processing factories in Montenegro, threat from invasive species, esp. *Pomatomus saltatrix*, dolphin predation in SSF and *Sparus aurata* predation in AQ farms. Monitoring of bycatch and construction of trammel nets for karamote prawn (*Melicerus kerathurus*) has been proposed as a pilot action. Karamote prawn was previously an economically important species for SSF, as it is highly sought due to the large size of prawns, and can reach high market prices. Currently, the minimum legal mesh size used in trammel net construction is set to 56 mm, which is too large for catching the prawn. Historically, the 44 mm mesh size has been used, but no data on bycatch of such trammel nets exist. The proposed action is to experimentally use 44 mm and 48 mm mesh size, and to monitor the bycatch in the karamote prawn season (20 April – 30 June). The results of this monitoring could be used as the basis for any potential future regulations of such nets. Also, operators proposed was the use of pots for catching of octopus (*Octopus vulgaris*). This type of fishing gear has not been used in Montenegro, and is not recognised under the current Act on Marine Fisheries and Aquaculture. Marinated carp (*Cyprinus carpio*) is a well-recognised freshwater brand in Montenegro. Suggestion to attempt to find a marine species that could fill a similar role. Marinated *Alosa fallax* (twait shad) was selected as the one with most potential, as it is already known and produced in small quantities by some SSF Operators in the Ada Bojana region. Operators proposed pilot action focusing on experimental farming of porifer *Aplysina aerophoba*. Certain porifers produce substances used in biochemical and medicinal research, which can achieve high prices on the open market. Participants expressed general interest in the idea of Virtual Marketplace, a mobile phone app, but the implementation of such a pilot action was brought into question, due to the number of participants that would have to be engaged and the necessity of the participants to agree on common prices of seafood. Discussion on pingers used as a defence against dolphin predation invited significant interest from the participants. Pilot action focusing on the use of pingers in SSF was proclaimed to be of high interest. However, participants expressed reservation against the use of pingers in reducing predation of *Sparus aurata* until they familiarise themselves on the potential effects of ultrasound on mussels (*Mytilus galloprovincialis*) and oysters (*Ostrea edulis*). The increasing presence of invasive species was stressed, particularly *Callinectes sapidus* and, more importantly, *Pomatomus saltatrix*. One of the action proposals was to allow for unlimited catching of *P. saltatrix* along the Montenegrin coast. An emphatic appeal was made towards the MOARD to explore the possibilities of opening one fish processing plant in Montenegro.

3.3.7. Conclusions and Recommendations from Working Groups

The regional innovation brokering events findings enable a better understanding of dynamics and trajectories for the transnational and regional innovation speed-up in small-scale fisheries and aquaculture.

- Innovation may take different forms: from new products and/or services to new organizational schemes and networks for ensuring long-term sustainability as well as competitiveness of small-scale fisheries and aquaculture.

- Innovation deals with new skills development as well as with retrieving traditional knowledge and practices if of proven usefulness.
- Innovation can be effectively speed-up by the setting-up of a multi-level and multi-actors network where each member brings competences, skills and practical know-how.
- Public innovation brokers can effectively accompany and facilitate the Innovation discovery process.

In fact, the active participation of enterprises to the entire events allowed not only the innovative ideas exchange and new insights emersion but demonstrate the usefulness of the public innovation broker also for the fisheries and aquaculture sector. All the enterprises claimed for a systematic adoption of the ARIEL interactive approach since it stimulates ideas and cooperation, reducing conflicts and complaints.

“We are here not to speak about problems but about ideas” said the participants.

4. PROPOSED PILOT STUDIES

After presentation of the findings of each group in each region there was a brief discussion with stakeholders to assess the feasibility of proposed activities. The facilitators proposed a framework agreement on the implementation of the subsequent activities and incorporating them into the project. After listing and describing all proposals from the all working groups, facilitators invited the stakeholders to give their feedback and opinion on the presented proposals of each of the groups. There was almost a uniform opinion on the importance of such project activities at the regional and transnational level and almost all stakeholders stated they were willing to participate in the foreseen activities. In addition to welcoming the idea of the project itself, the stakeholders fully agree on the involvement and intensity of participation in the ARIEL project. Finally, a list of more than 40 pilot studies across all 6 innovation brokering events was created. However, due restricted time and funds framework just few per each region was selected for implementation. Detailed proposals for selected pilot studies per each region follows below.

4.1. Proposed Pilot studies

Modernisation and improvements in fishing gear (selectivity,...) and vessels (new engines,...) towards environmental and socio-economic sustainability and Modernisation and improvements in production systems

- | | |
|----|---|
| 1. | Pots for catching <i>Squilla mantis</i> – innovation (not used in Croatia before) |
| 2. | Gill nets for <i>Atherina boyeri</i> – selectivity |
| 3. | Trammel nets for <i>Sepia officinalis</i> – innovation construction |
| 4. | Trammel nets for <i>Solea vulgaris</i> (selectivity 40mm versus 42mm) |
| 5. | Pesca tourism (SSF) |
| 6. | Regionalisation in policy – non-technological innovation |

7. Pots for catching <i>Octopus vulgaris</i> (currently not used in Montenegro)
8. Trammel net for <i>Melicertus kerathurus</i> (Montenegro; construction, mesh size 44 mm?, bycatch study)
9. The alternative compostable socks for shellfish aquaculture farms
10. Setting up and testing of underwater Akvasmart Camera system in n.2 aquaculture farms (Greece) - Digital images for accurate biomass estimation (fish weight and size)
11. Automatic feeding systems
12. Brass wire used to manufacture fish farm cage mesh
13. Automatic nets' cleaning
Diversification of activities and income and Diversification of products
1. Pesca tourism
2. Aquamanager – software for daily management on aquaculture farms
3. Development and testing of an App for a pilot virtual marketplace for small scale-fisheries on the model of the Abalobi project
4. New species catching and supply on market – blue crab, <i>Callinectes sapidus</i>
5. Spongia Aplysina aerophoba aquaculture (Montenegro)
6. Marinated <i>Alosa fallax</i> as a new product (Montenegro, tie-in with Traceability, marketing and branding seafood products)
Short supply and distribution chain, higher prices and added value of seafood products
1. Virtual market – mobile phone application
2. Sorting and labelling of catches on board
3. Wholesalers and landing places
Traceability, marketing and branding seafood products
1. Know-how workshops on traceability, marketing and branding seafood products
2. Pooling of stakeholders in the co-operative
3. Attempt to certificate 3 SSF fishers as certificated label “friends of the sea”
4. Marinated <i>Alosa fallax</i> as a new branded product (Montenegro, tie-in with Diversification of activities and income and Diversification of products)
Reducing competition with other players (other fishing sectors and animals – dolphins)
1. Acoustic pingers pilot studies against dolphins
2. <i>Pinna nobilis</i> settlement from ports
3. Dolphins watching – pesca tourism
4. Towing gears replacement for 1Nm (from 3Nm on 4NM)
5. NTZ for <i>Solea vulgaris</i> recovery in the Ecological and Fisheries Protection Zone (Croatian: Zaštićeni ekološko-ribolovni pojas, ZERP), a protected fishing area over Croatia's Exclusive Economic Zone.
Reducing predation and new disease appearance
1. Acoustic pingers pilot studies against <i>Sparus aurata</i> on shellfish farms
2. Targeted catching of <i>Pomatomus saltatrix</i> (potentially other invasive species) allowed with no limitations (Montenegro)
3. Automatic vaccination machines
4. Methods to improve immunogenicity
5. Use of (micro)algae
6. Improve of Fish Well-being
7. Cleaning cages more regularly (automatic cleaning)

- | |
|--|
| 8. Application of modern feeding systems that reduce mortality |
| 9. Target catching of <i>Sparus aurata</i> |

4.2. Selected pilot actions on regional level

CROATIA

SSF: Pilot area – West coast of Istria (trammel nets) and Split area (gill nets)

1. Testing pingers to reduce/prevent dolphin bycatch. The pingers we intend to use are <http://www.stm-products.com/prodotti/fishing-technology/dissuasori-per-delfini-green/did-01~54.html>. Testing will involve n.1/2 vessel(s), setting-up and follow-up of a protocol from May to September 2019. Budget line used is "equipment". Protocol: For 1 fisherman working with 400 m length it is needed 2 pingers (Pilot studies have to be performed at least on 3 vessels so min number of pingers for study is N=6). Before using the device, perform a complete battery charge for 20 hours at least. The use is very simple, just hang it to the fishing net (at the beginning and end). The devices have to be placed on the fishing equipment according to the best strategy considering the emission area and type of fishing. Don't place a DiD less than 400 m from another DiD. The DiD behavior may be influenced by the presence of another DiD units in the area so it may continuously produce signals, reducing drastically the battery duration and desired effect on the mammals. The DiD must be placed minimum 20-30 m above fishing gear. The DiD will be activated when it touches the water. After a first sound emission, useful to know the devices battery is charged, it remains in reception mode till the event of a mammal presence recognition, then it reacts by producing special variable ultrasound signals for about 50-60 seconds. The emission of random modulated signals, makes difficult to the mammals to adapt themselves to the signal. Detailed protocol for data analysis will be added later.
2. Setting up and testing n.1 app for virtual market on n. 15/20 users of which at least 5 SSF operators and 5 restaurants. We will also involve consumers 'association, private buyers, "Solidarity Purchase Groups". Testing the app will cover the period June – September 2019. In case of project extension of 6 months it can be extended till December 2019. The app will be development by CNR (using external expertise budget line) in 4 languages and it can be used by all partners involved in pilot testing by purchasing monthly licenses.
3. Testing trammel nets "listara" selectivity mesh size 40mm and 42 mm; Pilot area – West coast of Istria (3 vessels)
4. Testing trammel nets "sipara" special construction to reduce bycatch, Pilot area – West coast of Istria (3 vessels)

AQ: Pilot area – Split/West coast of Istria

2. The alternative compostable socks (DORY results) could be tested into n.2 aquaculture farms of Marche following the same protocol of Veneto (prior “authorization” of Veneto Region). Average costs for equipment purchase (150 EUR X 1000 m of socks). May to September 2019.
3. Testing pingers to reduce/prevent *Sparus aurata* predation on *Mytilus galloprovincialis*. The pingers we intend to use are <http://www.stm-products.com/prodotti/fishing-technology/dissuasori-per-delfini-green/did-01~54.html>.

Testing will involve n.1/2 vessel(s), setting-up and follow-up of a protocol from May to September 2019. Budget line used is “equipment”.

ITALY

SSF: Pilot area - Ancona Maritime District

1. Testing pingers to reduce/prevent dolphin bycatch. The pingers we intend to use are <http://www.stm-products.com/prodotti/fishing-technology/dissuasori-per-delfini-green/did-01~54.html>.
Testing will involve n.1/2 vessel(s), setting-up and follow-up of a protocol from May to September 2019. Budget line used is “equipment”. We have to discuss a common protocol (as much as possible talking to account different fishing gears in IT and HR).
2. Setting up and testing n.1 app for virtual market on n. 15/20 users of which at least 5 SSF operators and 5 restaurants. We will also involve consumers ‘association, private buyers, “Solidarity Purchase Groups”. Testing the app will cover the period June – September 2019. In case of project extension of 6 months it can be extended till December 2019. The app will be development by CNR (using external expertise budget line) in 4 languages and it can be used by all partners involved in pilot testing by purchasing monthly licenses.

AQ: Pilot area - Civitanova Marche, San Benedetto del Tronto

1. Veneto Region shared within DORY the results of using compostable socks. The alternative socks could be tested into n.2 aquaculture farms of Marche following the same protocol of Veneto (prior “authorization” of Veneto Region). Average costs for equipment purchase (150 EUR X 1000 m of socks). May to September 2019.

SSF: Pilot area - Italy _Sicily

Act.2.4 - SSF: Pilot area - Sicily

1. Fishing nets equipped with LED lights. These are able to attract a particular species or reject others. The application of attraction / repulsion lights will allow more selective results and less amount of bycatch. Furthermore, as demonstrated by Wang et al. 2013 the experimentation of UV (ultraviolet) emission LEDs, which exploit the different visual capacities between sea turtles and commercial fish

species, can be an interesting approach for bycatch reduction and predation. It seems, in fact, that in sea turtles the perception of UV light improves the detection of the fishing net and can be of help in navigation.

Wang J. Barkan J. Fisler S. Godinez-Reyes C. Swimmer Y (2013). Developing ultraviolet illumination of gillnets as a method to reduce sea turtle bycatch. Biol Lett. 9: <http://dx.doi.org/10.1098/rsbl.2013.0383>.

The trammel fishery gears will be purchased from local net manufacturer. Each net will be realized in monofilament and 100 mt long and 4 mt high with 10 cm mesh. One will be equipped with lights and consider as “experimental”, the second without lights will be used as “control”. They will be used by fishermen of the SSF from Isola delle Femmine district for experimental fishing trips off the Gulf of Palermo. The nets will be deployed after sunset approximately 1 km of each other and will be retrieved before sunrise. At least the experimental fishing trips will be triplicate and for each trip will be evaluated

All the catches of the network will be classified into three groups: target species (fish sold), by-catch (discarded fish) and others (catches kept by fishermen for consumption or retained for bait in other unrelated fishing activities).

For the three groups systematic recognition will be carried out and the quantities will be obtained for each species. The caught fish will also be evaluated in economic terms.

GREECE

SSF: Pilot area:

Setting up and testing n.1 app for virtual market on n. 15/20 users of which at least 5 SSF operators and 3 restaurants. We will also involve consumers ‘association, private buyers. Main issue: all SSF operators willing to receive the user’s license shall agree on a common price of seafood. To this, a focus group will be arranged to formalize the interest and the involvement of fishermen according to fair criteria. Testing the app will cover the period June – September 2019. In case of project extension of 6 months it can be extended till December 2019. The app will be development by CNR (using external expertise budget line) in 4 languages and it can be used by all partners involved in pilot testing by purchasing monthly licenses.

AQ: Pilot area:

Setting up and testing of underwater Akvasmart Camera system in n.2 aquaculture farms. The main purpose of this system, is to monitor any deviations and abnormalities during feeding and thus to efficiently minimize feed waste and costs. You can find more information at <https://www.akvagroup.com/home-gr>. The average cost to purchase and install the equipment, as well as to train aquaculture employees on how to use it, it is estimated at about 8.000 € incl. VAT. The testing period will be from July to October 2019. We are going to ‘subsidize’ this cost by 50%. After testing period, a cost benefit analysis on the aquafarm level will be initialized to test the effectiveness of such a system.

MONTENEGRO

SSF: Pilot area – Kotor

1. **Study of bycatch in trammel net for *Melicertus kerathurus* (“gamborača”).** Catching of karamote prawn, *Melicertus kerathurus*, represented an important economic activity for the local fishermen using small vessels in the Ulcinj/Ada Bojana area and within the Boka Kotorska Bay. The adoption of new mesh sizes, which limits trammel net to min. 56 mm mesh size, effectively stopped this fishing activity. The prawn was caught in period from mid-to-late April until mid-June, and this would be the time period in which the study would be undertaken. Planned are two locations in the Great beach/Ada Bojana area and one within the Boka Kotorska Bay (Tivat Bay). Nets currently used have a 44 mm mesh size, which is below the legal minimum (56 mm). The plan would be to study the catch effects of such nets, but also nets of similar construction using different mesh sizes (e.g. 48 and 56 mm). Depending on the amount of bycatch and discard (especially regarding the immature/juvenile specimens in the bycatch/discard), the pilot study would ideally provide guidelines for potential basis of future derogation actions, supported by scientific evidence and careful future monitoring plans
2. **Testing pingers to reduce/prevent dolphin bycatch.** The pingers we intend to use are <http://www.stm-products.com/prodotti/fishing-technology/dissuasori-per-delfini-green/did-01~54.html>. Testing will involve n.1/2 vessel(s), setting-up and follow-up of a protocol from May to September 2019. Budget line used is “equipment”.

AQ: Pilot area – Boka Kotorska Bay

Spongia *Aplysina aerophoba* aquaculture (Montenegro) – Cultivation of marine sponges becomes more popular due to wide range of application of their extracted compounds. Secondary metabolites of many marine sponge species showing a significant pharmaceutical potential. Recent attention has been paid to keratose sponges of *Verongida* order, which are known as producers of diverse bromotyrosine related compounds with high biological activity that is similar to that of avarol. Both representatives of the *Aplysinidae* family: *Aplysina cavernicola* and *Aplysina aerophoba*, known to be a source of bromotyrosines, exist in Boka Kotorska Bay. Since discovery of Aeroplysinin-1 in 1970 and after its extraction from *A. aerophoba* sponges, numerous publications have been dedicated to investigations of cytotoxic, antimicrobial, and anticancer activities of this compound. Additionally, to Aeroplysinin-1, *A. aerophoba* sponge is known as a source of a structurally complex bromotyrosine termed Isofistularin. Both substances are commercially available with a price that ranges around 500 Euro per milligram. The high prices for bromotyrosines stimulated researchers to develop different biotechnological approaches for cultivation of *A. aerophoba* and related sponges under laboratory and marine ranching conditions. The major difficulties in processing these secondary metabolites

are limited supply of sponge material for clinical trials. Utilization of bioactive compounds from marine organisms with application in medicine and pharmacology is in compliance with the Strategy for scientific-research activity of Montenegro, defined as priority research within a topic medicine and human health. In this regard, here, we present the pilot project of *A. aerophoba* cultivation in the Boka Kotorska Bay. At early start we are faced with the fact that this species is endangered and protected by national and EU legislatives. Having that in mind, we decide to examine the regenerative potential of *A. aerophoba* and in parallel to establish sponge farm in aquaculture as sustainable source of research material derived from sponges with strong potential in pharmacy and biomedicine. The main idea is based on experience of divers from the Institute of marine biology who observed that after cutting the finger like parts of *A. aerophoba*, the specimen can overcome it by regeneration of lost parts. To further test this assumption and to carry out growth study, we plan to provide more cut material of *A. aerophoba* and to deploy it in specially modeled aquaculture facilities installed in the seawater as their natural environment. The aquaculture facilities will be placed in two locations within the Boka Kotorska Bay. Since the bay is exposed to significant seasonal variations in temperature and salinity, we will conduct the permanent measurements of these parameters by mini log sensors to examine possible influence of environmental parameters on the percent of regeneration and the growth of *A. aerophoba* sponges. The result of this pilot project may give the valuable source of information which can reinforce the institutional capacity to apply for broader EU funds such as H2020. That will be the opportunity for application of scientific approach in economy to meet smart specialization defined by European Commission.

4.3. Innovation Knowledge Community – adds for future tasks on WPT2

The brokering event laid the foundation for the setting-up of a small-scale fisheries aquaculture innovation community where exchanging and transfer knowledge, ideas, solutions and experiences as well where finding new partnership and collaboration. Public authorities and research bodies should facilitate the effective working of the community also beyond the ARIEL project lifespan.

The ARIEL Platform will serve as a virtual meeting and working place of the Innovation Knowledge Community

The innovation brokering activity outcomes will address not only the project pilot actions but also the policy and research framework for an improved governance, closer to real needs of small-scale fisheries and aquaculture operators that shall be informed, trained and mobilized towards a sustainable innovation.

To ensure durability and transferability of project results, ARIEL will deliver technical & policy recommendations for policy science-based uptake in the small-scale fisheries and aquaculture sectors of Adriatic and Ionian Regions. Moreover, the project will lead to the

signature of a Memorandum of Understanding among regional and transnational actors detailing common understanding of cooperation and lines of actions towards the achievements of EUSAIR strategy on small-scale fisheries and aquaculture