Final report

for the project funded in the ERA-Net COFASP

"New methodologies for an ecosystem approach to spatial and temporal management of fisheries and aquaculture in coastal areas - ECOAST"

Period covered: 01/03/2016 to 31/08/2019

COFASP
ERA-net

Project acronym	ECOAST		
Project title	New methodologies for an ecosystem approach to spatial and temporal management of fisheries and aquaculture in coastal areas		
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Start of Project	01/03/2016	**End of project**	31/08/2019

Project partners and contact persons

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***** PC: Project coordinator, WPM: Work package manager, WPCM: Work package co-manager, P: Participant

Project website: http://www.e-coast.eu/wp/
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CONTENTS

1. Final project summary suitable for web publication

During the period of 42 months of ECOAST Project a number of important results have been achieved. The primary aim of the project was to identify, develop and test new methodologies for spatial and temporal management of fisheries and aquaculture in coastal areas. Through GRID software ECOAST assessed synergies and conflicts between human activities in seven case studies across Europe: 1) Adriatic Sea, 2) Ionian Sea, 3) Black Sea, 4) Tyrrhenian Sea, 5) Baltic Sea, 6) Norwegian Fjords and 7) NE Atlantic Coast. In addition, in such case studies ECOAST evaluated the impact of fisheries and aquaculture on coastal ecosystems, including essential fish habitats and conservation priority habitats.

Focusing on fisheries, a tool for scenario evaluation study rating the costs and benefits of alternative coastal MSP plans and including displacement scenarios has been produced and expanded to include entry points for other sectors than fisheries (i.e. accounting for the dynamics of the aquaculture production and its revenues, the dynamic of windmill parks energy production and the footprint of the shipping lanes). The tool is developed to be able to project the likely income from fisheries form different fishing activities active in different zones and time, and is developed to track the main fisheries economic indicators used to describe national fishing fleet performances of European fleets. In this context DISPLACE now provides scenario-based assessment and projections of the amount of income generated by national fishing fleets (or other finer fleet segments level economics and fishing harbour communities) over months, quarters and years as long as national input data are available. On this issue, important results have been obtained in the Adriatic Sea CS and a paper summarizing such study has been published on Ecosphere journal (Bastardie et al., 2017). The work and scenario testing and reporting have been completed for the Ionian Sea, the Black Sea and the Baltic Sea CSs, the Norwegian Fjords and NE Atlantic Coast.

Focusing on aquaculture, several evaluations have been done in order to establish local and regional impacts of organic load. Several sampling cruises were undertaken at different stages during the production cycle in Norwegian fjord as well as sampling cruise respectively in Adriatic Sea, Tyrrhenian Sea, and Black Sea This was done in order to quantify possible changes in the release of organic and inorganic material and to assess the alterations of the benthic community structure causing possible loss of ecosystem functioning near the selected production site. The spatial distribution of chemicals was used to track the cumulative-long term (trace elements) versus short term (polyaromatic molecules) impact of the aquaculture in the surrounding environment. Results have been integrated with the biological responses obtained by exposing collected sediments with representative organisms of the microbenthic community. The flux of energy was monitored, parametrized in terms of characterization and quantification and linked with the recorded mass production. Identifying novel tools to monitor anthropogenic changes was one of the goals of the project. Although conventional parameters documenting environmental impact are informative, our results show that a direct measure of sediment organic matter reactivity represents a superior discriminator of fish-farm derived organic matter. The outcome of WP 3 was in fact successful and has already been published in 2 per-reviewed papers and two manuscripts which will be submitted for publication.

Official management objectives were identified for five case studies (Adriatic Sea, Black Sea, Ionian Sea, Norwegian fjords, and NE Atlantic coast). Maps showing areas allocated to different sectors were compiled. Identification of spatial and temporal potentials and limitations for the integration of fisheries and aquaculture in coastal areas of the five case studies was carried out through stakeholder consultations using an on-line, map-based questionnaire and workshops. The five case studies differ in the degree of development of the aquaculture sector, from being in its infancy to highly developed. The questionnaire was filled out by stakeholders mainly from the fisheries and aquaculture sectors, but also from management, trade organizations and academic research. Competition over space between fisheries and aquaculture exists in most case study areas. In all areas, there was a general agreement that the fisheries sector will decrease in the

future, while the aquaculture sector will increase. This opinion was held also in areas presently dominated by fisheries.
By using an ecosystem approach, ECOAST contributed to fisheries and aquaculture sustainability in different CS areas, and developed and tested innovative tools for zoning, for management of spatial conflicts and for the assessment of potential environmental impacts. Stakeholder consultations and thematic workshops were further carried out on future development and integration of fisheries and aquaculture activities in selected CS coastal areas.

2. Full proposal summary

ECOAST aims to identify, develop and test new methodologies for spatial and temporal management of fisheries and aquaculture in coastal areas. The overall approach is aimed at assessing the impact of fisheries and aquaculture on coastal ecosystems, including essential fish habitats and conservation priority habitats, as well as synergies and conflicts between human activities. Building on previous methodologies and experiences the project has evaluated marine spatial planning in seven coastal case study areas having different ecological and socio-economic characteristics: 1) Adriatic Sea (ADR), 2) Ionian Sea (ION), 3) Black Sea (BLK), 4) Tyrrhenian Sea (TYR), 5) Baltic Sea (BAL), 6) Norwegian Fjords (NOR) and 7) NE Atlantic Coast (ATL). The project outcomes produced case specific evaluation of the impact of aquaculture and fisheries in coastal areas, maps of optimal areas for fisheries and aquaculture, evaluation of compatibility between fisheries, aquaculture and other human activities in coastal areas, as well as implementation of holistic methods and an operational modelling framework to evaluate and predict stakeholder responses to coastal spatial management options covering marine cross sector occupation of space. Several methodologies already exist to assess the impacts on the ecosystem and the socio-economic effects of some spatial management measures, as well as to spatially manage some cross sector marine activities, but none of them integrate all relevant management aspects for coastal areas. Therefore, the holistic methodology covered in a single system different approaches and management aspects, identifying realistic spatial and temporal potentials and limitations for the integration of fisheries and aquaculture in coastal areas, in order to allow policy makers and stakeholders to evaluate management measures from different points of view and share decisions in a transparent manner on case specific basis. ECOAST results can support the EU and national policies through the provision of tools and data for an ecosystem based allocation of space and sustainable use of marine resources in coastal areas on case specific basis.

3. Main results, conclusions and fulfillment of objectives

3.1. Summary of main results and conclusions

ECOAST project focuses on seven coastal case study areas having different ecological and socio-economic characteristics through mapping productive marine areas and priority areas for fisheries and aquaculture: 1) Adriatic Sea, 2) Ionian Sea, 3) Black Sea, 4) Tyrrhenian Sea, 5) Baltic Sea, 6) Norwegian Fjords and 7) NE Atlantic Coast. For each Case Study, a collection of available spatial data on anthropic activities was made, in order to store and produce spatial analysis using GRID (GeoReference Interactions Database). The main output produced in different case studies was related to producing maps that visualize the spatial extent of each anthropic activity, mainly represented by fishing activities, aquaculture activities and other activities, such as related to energy industries (oil and gas), commercial shipping routes etc. The same tool produced for each

case study was a matrix of interactions, which allowed the users to identify the conflicts and synergies among all activities. In addition, maps of conflicts and cumulative conflict scores were produced in order to better understand and analyze the distribution and intensity of interactions between anthropic activities, especially related to fishing, aquaculture and other human activities in different marine areas.

Work Package N. 3 performed a review of the current ecological footprint analyses (EFA) approaches to implement a methodology combining the principles of a carbon footprint oriented life cycle assessment (LCA), with a new modeling parametrization of nitrogen, phosphorus fluxes as well as energy and matter fluxes, both inside and outside an aquaculture cage (Hall et al., 2011). Several case studies evaluations have been done in order to establish local and regional impacts of organic load and nutrients caused by the feeding material. Two sampling cruises at different stages of the aquaculture production have been carried out In Norway and one sampling cruise have been carried out respectively in Adriatic Sea, Tyrrhenian Sea and Black Sea, in order to quantify possible changes in the release of organic and inorganic chemicals and to assess the alterations of the benthic community structure causing possible loss of ecosystem functioning near the selected production site. The spatial distribution of chemicals has been used to track the cumulative-long term (trace elements) versus short term (polyaromatic molecules) impact of the aquaculture in the surrounding environment. Results have been integrated with the biological responses obtained by exposing collected sediments with representative organisms of the microbenthic community. The flux of energy is being monitored, parametrized in terms of characterization and quantification and linked with the recorded mass production. Identifying novel tools to monitor anthropogenic changes is one of the goals of the project. Although conventional parameters documenting environmental impact are informative, the results showed that a direct measure of sediment organic matter reactivity represents a superior discriminator of fish-farm derived organic matter. Larger amounts of reactive carbon are encountered close to cage and the impact from aquaculture does not extend more than 400 m. This was not evident in bulk organic carbon content and the Reference station was a sink for refractory organic matter. To verify these results, the sediment organic matter reactivity and the analysis of surface sediment molecular based biodiversity, have been conducted at selected sites of the project's partners, and applied to sites of contrasting trophic status.

Work Package N. 4 finalized the methodological approach that would be followed for assessing the cumulative impacts of human activities on ecosystem components of the case study areas. This approach is based on previous well-established methodologies (Halpern et al., 2008; Korpinen et al., 2012; Micheli et al., 2013; Stelzenmüller et al., 2010) however, some critical limitations have been highlighted. More explicitly, during this period spatial data necessary for the assessment of pressures exerted by fisheries and aquaculture on coastal ecosystem components for each case study area have been compiled and developed according to the following structure: polygon of the study area (shape file), the fishnet (grid) of the study area (shape file) in 1 km * 1km cell size (grid resolution), the raster datasets of ecosystem components to examine for each case study (as presence or absence grid layers and then converted to raster datasets), raster datasets of activities (grid layers with pressure intensities and then converted to raster datasets) and a matrix of what activity interact with which ecosystem component and weight factors according to experts' judgement based on Halpern's criteria (scale 0-4). Indeed, data development has been accomplished and different thematic layers (shapefiles) have been created as described above and stored in a geodatabase in ArcGIS software for the Adriatic Sea (Case study 1), the Ionian Sea (Case study 2), the Black Sea (Case study 3), the Tyrrhenian Sea (Case study 4) and the Baltic Sea (Case study 5), while in the following period this process will be finalized for the remaining case studies.

Work Package N. 5 produced documentation and guidelines for collecting the relevant spatial data to be used in the modelling approaches and disseminated to other partners through online documentations and together with a workshop organized around the tool and its use (a DISPLACE workshop). The investigation of potential drivers in fishermen´s decision-making explaining the current distribution of fishing effort has been covered by developing a standard fishermen´s

questionnaire survey approach made within WP6 and used where possible within CSs. This information is however only supplementary to the achievement of WP5 given that the actual spatial distribution of fishing effort is likely most of the time sufficient input for modelling the spatiotemporal fishing activities within a scenario-testing approach for plausible alternatives. A tool for scenario evaluation study rating the costs and benefits of alternative coastal MSP plans and including displacement scenarios has been produced and expanded to include entry points for other sectors than fisheries i.e. accounting for the dynamics of the aquaculture production and its revenues, the dynamic of windmill parks energy production and the footprint of the shipping lanes. The tool is developed to be able to project the likely income from fisheries form different fishing activities active in different zones and time, and is developed to track the main fisheries economic indicators used to describe national fishing fleet performances of European fleets (indicators followed by the EU STECF annual economic reports) i.e. Income, Costs, Economic Indicators, Capital value, Profitability and development trends. In this context DISPLACE now provides scenario-based assessment and projections of the amount of income generated by national fishing fleets (or other finer fleet segments level economics and fishing harbour communities) over months, quarters and years as long as national input data are available. Programming tools for delineating locations and space limits that ensure certain levels of production to local fishers and farmers has been developed (by volume, by value of catches, or by spatial dependencies) and applied to identify the main fishing grounds of various fishing vessels that are getting mapped and processed to be further used as input data layer to the modelling tools. Programming routines and modelling tools are made available online to the entire scientific community being hosted on GitHub public repository. The definition and runs of spatial fisheries scenarios by CS using the WP spatial modelling tools have mainly been done during the second half of the project period, after each of the CS responsible have completed the conditioning of DISPLACE on its own set of data. The tool applied to CS analyzed and predicted the likely responses of fisheries to spatial management options also by measuring economic and ecological performance of alternative spatial plans. The work and scenario testing and reporting has already been completed for the Adriatic Sea CS, Greek Ionian Sea, Romanian EEZ in the Black Sea and the Danish Western Baltic fisheries CS.

Work package N. 6 proposed to use InVEST as a framework to integrate the results from multiple ECOAST work packages and thus promote ecosystem approaches to the management of coastal fisheries and aquaculture. InVEST can be used to answer a broad range of questions relating to ecosystems goods and services and the connections between different parts and/or regions of an ecosystem. However, it was soon realized that the “spatial allocation” type of question stated in the project description did not fit well with the kinds of questions that InVEST has been designed to address. Instead of abandoning InVEST in favor of another tool, the question was changed. We decided to use the InVEST Fisheries model, a final service type of model, to explore the effects of increased salmon farming on total food obtained from the fisheries in the Norwegian cs area. The intensity of salmon farming was thus considered a scenario. The question of interest was: What are the effects of varying levels of aquaculture intensity on total fish production in the Hardanger fjord greater area? The question was narrowed down to consider only the northern shrimp (*Pandalus borealis*) fishery. The total economic value of the fishery was the output of interest. InVEST is only used to its full potential when multiple objectives and/or multiple ecosystem services are in focus. The Fisheries model specifically is designed for looking at the effects of habitat change, change in fishing behaviour, or changes in environmental conditions, features which were not exactly relevant to our fishery of interest and question of interest.

Management objectives have been identified for the CS. Maps with spatial restrictions on use (e.g. coral reefs, natural protection areas etc.), and maps showing areas allocated to different sectors have been compiled. The identification of spatial and temporal potentials and limitations for the integration of fisheries and aquaculture in coastal areas of the various CS was carried out through stakeholder consultations using an on-line, map-based questionnaire (http://geosurvey.geo-bytes.de/). Five CS were studied (Black Sea, Ionian Sea, Adriatic Sea, North-East Atlantic coast and Norwegian fjords), which differ in the degree of development of the aquaculture sector, from being in its infancy to highly developed. The questionnaire was filled out by stakeholders mainly

from the fisheries and aquaculture sectors, but also from management, trade organizations and academic research. Workshops for discussing the results with the stakeholders were organized. In all five cs there was a general agreement that the fisheries sector will decrease in the future, while the aquaculture sector will increase. This opinion was held also in areas presently dominated by fisheries. Competition over space between fisheries and aquaculture exists in most CS, and areas with conflicts were mapped. Potential new areas for aquaculture were also mapped.

3.2. Fulfilment of objectives

ECOAST project fully achieved its objectives and followed the work planned for the whole period (36 months + 6 months of extension).

4. Milestones and deliverables status

Milestones

No[1]	Milestone name	Planned delivery month[2]	Actual delivery month[2]
M 1.1	Kick off meeting	1	2
M 1.2	Project website launched	4	4
M 1.3	Project meetings	7, 13, 19, 25, 31	10, 15, 19, 25, 30, 39
M 1.4	Activity reports	6 - 36	6-36
M 1.5	Project synthesis report	6 - 36	6-36
M 1.6	International workshop	33	39
M 2.1	New version of GRID optimized for case studies	3	3
M 2.2	Data storage inside GRID	6	6
M 3.1	List of currently used tools in Norway for assessing impact of aquaculture	10	10
M 3.2	List of currently used tools in European aquaculture	10	10
M 3.3	List of needs from policymakers and regulators	14	14
M 3.4	Information from policymakers and regulators on their needs for improved tools	18	18
M 4.1	Consultation of experts on setting fisheries and aquaculture impact scores on selected ecosystem components	8	8
M 5.1	Guidelines for collecting the relevant spatial data to be used in the modelling approaches	6	6
M 5.2	Tools for the investigation of the drivers in fisher´s decision making explaining the current distribution of fishing effort	12	12

1 Please indicate the according WP number. For example, milestone 4.2 would be the second milestone from work package 4
2 Measured in months from the project start date (month 1)

M 5.3	Tools for scenario evaluation study rating the costs and benefits of alternative coastal MSP plans and including displacement scenarios	18	18
M 5.4	Tools for delineating locations and space limits that ensure certain levels of production to local fishers and farmers	20	20
M 5.5	Define and run spatial fisheries scenarios for the BS case using the WP spatial modelling tools	24	24
M 6.1	Stakeholder workshops in case study areas to define management objectives for fisheries, aquaculture and other key marine sectors (in collaboration with WP2)	14	14
M 6.2	Build models for the key case study areas based on data and analyses in WP1-4 using Integrated Valuation of Ecosystem Services and Tradeoffs (InVEST)	18	18
M 6.3	Refine, revise and finalized spatial management options in the case study areas based on the spatial analysis	24	24

Deliverables

No	Deliverable name and language	Nature[3]	Dissemination level[4] and link to the document	Planned delivery month[2]	Actual delivery month[2]
D 1.1	Project website	Website	PU	4	4
D 1.2	Periodic activity report	Report	INT	6 - 36	6 - 42
D 1.3	Synthesis report and scientific publication on major findings	Report	INT	24 - 36	18 - 42
D 2.1	Maps of aquaculture, fisheries, other activities, productive marine areas, and priority areas for aquaculture and fisheries of each case study stored in GRID database	Database	RE	6	6

3 Please indicate the nature of the deliverable. For example Report, Paper, Book, Protocol, Prototype, Website, Database, Demonstrator, Meeting, Workshop
4 Please indicate the dissemination level using one of the following codes: PU = Public; INT= Internal (Restricted to other project participants); RE = Restricted to a group specified by the consortium; CO = Confidential, only for members of the consortium

D 3.1	Report on ecological impact of aquaculture at selected case study sites and present current tools (procedure for gaining knowledge related to a policy aim) used in EU and Norway to assess such impact. (in connection with WP2) (20)	Report	INT	20	41
D 3.2	Report on needs for knowledge about ecological impact detection as defined by regulators and policy makers at selected sites. Assess need for new tools to meet demands of regulators and propose relevant tools	Report	INT	24	37
D 3.3	Guidelines for operators about ecological impact assessment and requirement for production growth	Protocol	PU	30	37
D 4.1	Thematic maps of cumulative impact assessment of aquaculture and fisheries on selected ecosystem components in the seven case studies	Demonstrator	PU	12	12
D 4.2	Report on the cumulative impact assessment of aquaculture and fisheries on selected ecosystem components in the seven case studies	Report	INT	18	18
D 4.3	Thematic maps of spatial interactions between activities and spatial compatibility matrix indicating conflicts and synergies among uses of the marine environment in the seven case studies	Demonstrator	PU	18	18
D 4.4	Report on spatial interactions of marine uses in the selected case studies	Report	INT	28	28

D 5.1	Guidelines and tools for explaining the current distribution of fishing effort from the data collection of spatial layers and random utility models	Protocol	PU	12	12
D 5.2	Parameterization of the static evaluation (RUM) or the dynamic evaluation (DISPLACE) depending on the CS	Prototype	INT	16	16
D 5.3	Scenario testing and summary of the costs and benefits of the set of MSP scenarios and scientific publications on major findings	Paper	PU	24	24
D 6.1	Defined management objectives for fisheries, aquaculture and other key marine sectors for the case studies	Report	PU	16	41
D 6.2	Report (publication) of results of INVEST spatial analysis of management scenarios	Report	PU	24	41
D 6.3	Final report from stakeholder process on what spatial management options are recommended to best achieve management objectives	Report	PU	31	41

Additional comments (in case of major changes or deviation from the original work plan)

- ICBAS (Partner 8) signed the contract with the Portuguese Foundation for the Science and Technology (FCT) in October 2016. Despite this delay in the contract signature, the work was started in March 2016, as accorded with FCT, mainly by providing information for the project website, and to start the search, compilation and preparation of information and data relative to the NE Atlantic Coast needed for the first part of the work, and producing the first data sets and maps of this region for WP2, in close collaboration with the WP leader and other partners. Due to the delay in the contract signature and researcher profile issues, there was delay in the recruitment of the first post-doc researcher and in sending part of the information to some WP leaders, and the ATL covered area was reduced with no negative impact on the objectives of the project.

- The contract between the HCMR (Partner 6) and the Greek funding party (GSRT) has still to be signed. Despite this, HCMR carried out all the work planned in WP4 (Responsible Partner HCMR), in the Case Study 2 Ionian Sea (Responsible Partner HCMR) and for all the WPs related with CS2.

- The project started the 1st March 2016 and officially finished the 28th February 2019. A 6 months extension was asked, the new ending date is 31st August 2019. This time extension was needed in order to complete our work, as the general lag in signing the national contracts has generated a common delay on project activities. In addition, the time extension has been employed to deepen and develop some new issues which are transversal among Work Packages, which represented an added value for the overall project outcomes.

- In September 2018 the Lead Partner (P1) CNR-ISMAR (Institute of Marine Sciences) changed the name in CNR-IRBIM (Institute for Biological Resources and Marine Biotechnologies), this change has not influenced the results of the project.

5. Work package description and results

WP 1	"Project management and dissemination"
Responsible partner: "partner no 1, IRBIM – CNR, WP manager Fabio Grati"	
Original description of work: Objectives: • to coordinate internal and external ECOAST activities including the organisation of the Steering Committee meetings; • to synthesize and disseminate major project findings; • to organise an international workshop on practical experiences of spatial planning with fisheries and aquaculture. WP1 includes project coordination and administration, arranging meetings, budget control, consolidated periodic reports, and monitoring project progress in accordance with specified milestones and time schedule. The coordinator chairs the Steering Committee with the WP leaders. Steering committee meetings will be organized on a bi-annual basis by the coordinator and once a year will coincide with the general assembly meeting. All periodic reports and their annexes will be written with input from all participants. ECOAST objectives will be addressed to various extents in the seven CSs through work of WP2, WP3, WP4, WP5 and WP6. WP1 will lead dissemination activities including the synthesis of major projects findings in relevant (peer reviewed) journals. An international workshop on practical experiences of spatial planning with fisheries and aquaculture will be organised.	
Report on results obtained and changes to the original work plan/WP aims: **A- results obtained:** The WP1 monitored project progress according to specified milestones and time schedule. The coordinator chaired the Steering Committee with the WP leaders. Steering committee meetings were organized on a bi-annual basis, and were held at: 1. ECOAST kick-off meeting, *Ancona* (Italy), 4-6 April 2016 2. ECOAST 2nd Steering Committee Meeting, *Athens* (Greece), 1-2 December 2016 3. ECOAST 3rd Steering Committee Meeting, *Stavanger* (Norway), 11-12 May 2017 4. ECOAST 4th Steering Committee Meeting, *Dubrovnik* (Croatia), 21 October 2017 5. ECOAST 5th Steering Committee Meeting, *Constanta* (Romania), 8-9 May 2018 6. ECOAST 6th Steering Committee Meeting, *Porto* (Portugal), 8-9 October 2018 7. ECOAST 7th Steering Committee Meeting, *Copenhagen* (Denmark), 5 June 2019 WP1 led dissemination activities included the synthesis of major project findings in relevant (peer reviewed) journals. A detailed list of dissemination activities and product up to date was published in section 6. An international workshop on practical experiences of spatial planning with fisheries and aquaculture was organized back to back with the 7th SCM in Copenhagen. **B- comments on deviations from the original plan:** Guldborg Søvik took over the task as the IMR project leader and work package leader (WP6) in autumn 2017. Erik Olsen, the original IMR project leader, is fully occupied running a new large project at IMR. An application for change of project leader was sent the Norwegian Research Council in October 2017.	

WP 2	"Description of selected case studies in European Regional Seas. Mapping of productive marine areas and priority areas for fisheries and aquaculture (Responsible: Luca Bolognini IRBIM-CNR, Italy) "
Responsible partner: "partner no 1, IRBIM – CNR, WP manager Luca Bolognini"	
Original description of work:	

Objectives:
• to collect maps and georeferenced ecological, social and economic data on aquaculture (e.g., farms' production, chlorophyll and nutrient concentration, number of employees) fisheries (e.g., catches, fleet and gear characteristics) and other relevant activities carried out in the coastal areas, productive marine areas and priority areas for fisheries and aquaculture in seven European Case Studies to feed the models;
• to coordinate and support Case Studies data storage within the GRID database. Seven case studies will provide data for further analysis and evaluation. Maps and data of aquaculture, fisheries, other activities, productive marine areas, and priority areas for fisheries and aquaculture will be stored in GRID (GeoReference Interactions Database, see at: http://www.seagrid.an.ismar.cnr.it/grid), which is a web-based flexible database connected with a GIS interface. Data concerning each Case Study will be managed separately in the database even if they are stored in the same tables. The access to these data will be regulated by specific privileges that are associated to different profiles.

Report on results obtained and changes to the original work plan/WP aims:

A- results obtained:

The aim of Work Package No. 2 was to describe selected case studies in European Regional Seas through mapping productive marine areas and priority areas for fisheries and aquaculture. The Case Studies were:
1) Adriatic Sea (ADR),
2) Ionian Sea (ION),
3) Black Sea (BLK),
4) Tyrrhenian Sea (TYR),
5) Baltic Sea (BAL),
6) Norwegian Fjords (NOR) and
7) NE Atlantic Coast (ATL).

For each Case Study, a collection of available spatial data on anthropic activities was made, in order to store and produce spatial analysis using GRID (GeoReference Interactions Database). This tool is a web-based flexible database and tool for analyzing interactions (conflicts and synergies) in marine coastal areas. With GRID it was possible to fix interactions between activities, to represent them using matrix, and maps. Furthermore, it allowed to calculate the total conflict score for a specific area and to compare stress levels from different scenarios.
The main output produced in different case studies was related to producing maps that visualize the spatial extent of each anthropic activity, mainly represented by fishing activities, aquaculture activities and other activities, such as related to energy industries (oil and gas), commercial shipping routes etc. The same tool produced for each case study was a matrix of interactions, which allowed the users to identify the conflicts and synergies among all activities. In addition, maps of conflicts and cumulative conflict scores were produced in order to better understand and analyze the distribution and intensity of interactions between anthropic activities, especially related to fishing, aquaculture and other human activities in different marine areas.

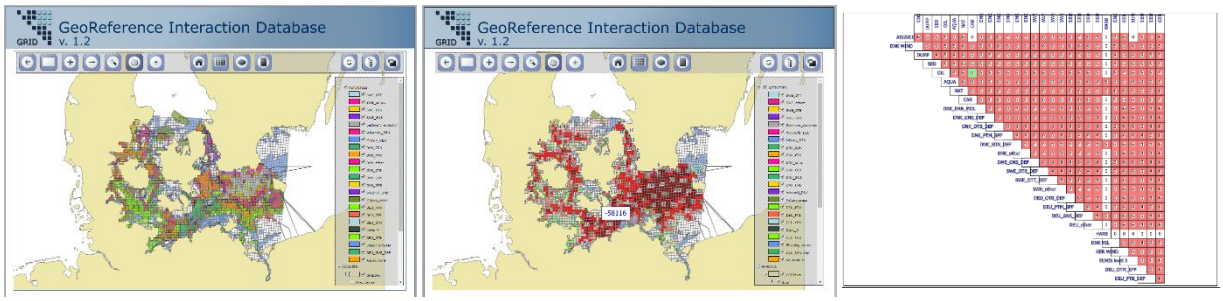

Fig. 1 - Example of GRID output: map of activities, map of interactions and cumulative conflict score, and matrix of interactions.

B- comments on deviations from the original plan:

Delays in delivering some results were met for some Case Studies, which may be attributable to some technical problems related to the proper functioning of the GRID tool and the availability of useful data for the analyses in question. In addition, in agreement with the partners of Norwegian Case Study members affiliated at IMR and IRIS Institutes, it was decided to modify the study area of the aforementioned case study, from the Fjord system in Rogaland to the Hardanger Fjord greater area.

WP 3	**"Ecological footprint of fish farming in coastal areas: identification and response for improved management"**
Responsible partner: "partner no 4, IRIS, WP manager Thorleifur Agustsson"	
Original description of work: Objectives: • to identify the knowledge needs concerning the ecological impact of the aquaculture at the selected case study sites in order to meet criteria set by regulators and policymakers; • to establish guidelines for operators to assess ecological impacts of operations and to suggest new diagnostic tools to improve the quality of information. In WP3 the aim is to characterize the needs for improved monitoring/diagnostic/detection tools to quantify the ecological impact of aquaculture. A better quantification of ecological impacts allows a more comprehensive evaluation of the ecological footprint of the aquaculture industry. So far, existing methods have been used to describe or quantify specific impacts; now a more holistic approach is required to identify the real carrying capacity of this industry (Liu et al., 2016; Venetoulis & Talberth, 2008; Wiedmann & Barrett, 2010). A common objective for a sustainable aquaculture is to maintain a dynamic ecosystem as well as adapting to a new and more demanding market where increased revenue and environmental protection go hand-in-hand. For fish-farmers and producers, the drive towards improved sustainability demands flexibility to adapt to economic and ecological pressure; at the same time there is the need to improve knowledge in all aspects concerning the ecological impact of their operations. A review of the state-of-the-art detection methods is necessary to highlight the needs in assessing the ecological, societal and economic impacts of the aquaculture industry (Ertör & Ortega-Cerdà, 2015). Current diagnostic methods will be revised and the possibility of utilising new tools evaluated (knowledge exchange with different disciplines). Several scenarios with increasing aquaculture growth will be evaluated and the impacts on the system carrying capacity studied.	
Report on results obtained and changes to the original work plan/WP aims: **A- results obtained:** An initial review of the current ecological footprint analyses (EFA) approaches has been performed to implement a methodology combining the principles of a carbon footprint oriented life cycle assessment (LCA), with a new modeling parametrization of nitrogen, phosphorus fluxes as well as energy and matter fluxes, both inside and outside an aquaculture cage (Hall et al., 2011; fig.2). To quantify the fluxes nutrients and chemicals as well as their impact on the ecosystem, it is necessary to integrate several parameters such as the mass balance between supplied and uneaten food in a cage, the biotic analysis the organic and inorganic sediments chemistry, the estimation of parasite treatments and the quantification of organic compounds and nutrients computed from supplemented food and excretion products. In our analysis, a special focus is dedicated towards the nutrients' fluxes from medicated and/or supplemented feed used in the marine aquatic production, affecting the seabed and the water column. The standard footprint calculation (Henriksson et al., 2012, Liu et al., 2016) focuses on the quantification of carbon fluxes; the addition of phosphorous and nitrogen to the equation as well as the energy balance represent a more comprehensive way to express the EFA and the carrying capacity of a system. The project implemented an integrated ecological-chemical and ecotoxicological biomonitoring to assess both the short and long term environmental impact of aquaculture farm site within different stages of the production. The implemented EFA wasapplied to a case study located in Boknafjord (South-	

Western Norway; fig. 3). The Boknafjord is a 92-km long fjord system in the Rogaland county where the aquaculture production is in constant expansion. Several Atlantic salmon farming companies operate in this area, with a total harvest of more than 50,000 tons per year. At the same time, several activities in the same area are increasing the pressure in the fjord ecosystem, such as recreational activities, transport, tourism, local fisheries, Oil & Gas related services. The improved EFA will be tested in the aquaculture facility owned by Grieg Seafood AS.

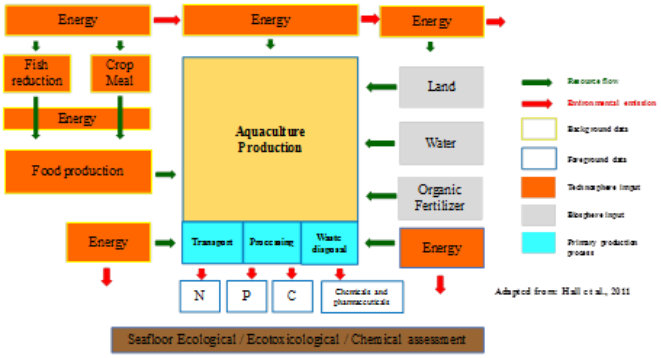

Fig. 2 - Scheme of the suggested boundaries in the Ecological Footprint Analysis.

Fig. 3 - Case study location in Rennesøy island (Norway) and sampling grid at farming site.

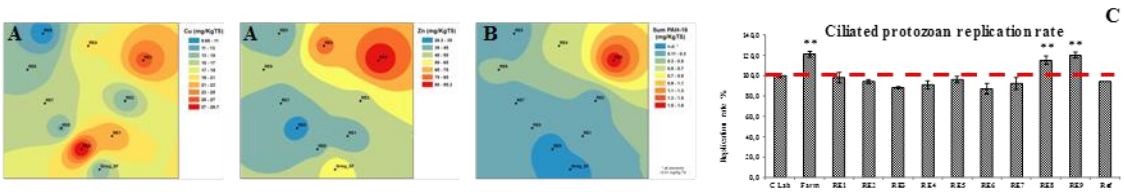

Fig. 4 - Spatial distribution of chemicals (A, B) and results of ecotoxicity assessment with marine protozoan (C) in collected sediments (0-2 cm layer).

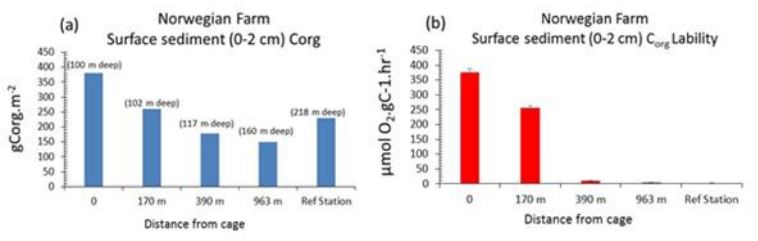

Fig 5 - Different measures of impact of aquaculture derived matter on sediment carbon content.

Local and regional impacts of organic load and nutrients caused by the feeding material have been established. Several sampling cruises at different stages of the aquaculture production have been carried out to quantify possible changes in the release of organic and inorganic chemicals and to assess the alterations of the benthic community structure causing possible loss of ecosystem functioning near the selected production site. The spatial distribution of chemicals has been used to track the cumulative-long term (trace elements; fig. 4A) versus short term (polyaromatic

molecules; fig. 4B) impact of the aquaculture in the surrounding environment. Results have been integrated with the biological responses obtained by exposing collected sediments with representative organisms of the microbenthic community (fig. 4C). Although conventional parameters documenting environmental impact are informative, our results show that a direct measure of sediment organic matter reactivity represents a superior discriminator of fish-farm derived organic matter. Larger amounts of reactive carbon are encountered close to cage (Fig 4B) and the impact from aquaculture does not extend more than 400 m. This was not evident in bulk organic carbon content and the Reference station was a sink for refractory organic matter (Fig 5A). To verify these results, the sediment organic matter reactivity and the analysis of surface sediment molecular based biodiversity, were conducted at selected sites of the project's partners, and applied to sites of contrasting trophic status. P2 contributed to the WP3 performing a survey on sea bass/sea bream farming site in the Tyrrhenian CS. Samples of sediment were analyzed for IRIS investigations of EFA and analyzed to assess the benthic community structure of Norwegian samples. The TYR CS represents an interesting area of comparison as it falls in a biogeochemical region characterized by an higher background of trace elements

B- comments on deviations from the original plan:
In the starting phase of the project IRIS and colleagues decided that it was necessary to change locations for sampling (Case studies for Norwegian fjords). This was approved by NRC.

WP 4	**"Identification of spatial synergies/conflicts between fisheries, aquaculture and other human activities and assessment of cumulative impacts of fisheries and aquaculture on coastal ecosystem components with special focus on priority conservation features"**
Responsible partner: "partner no 6, HCMR, WP manager Vassiliki Vassilopoulou "	
Original description of work: Objectives: • to assess and map the cumulative impact of fisheries and aquaculture on coastal ecosystems including essential fish habitats and conservation priority habitats in seven case study areas; • to identify and map the spatial interactions among human activities visualizing arisen conflicts and synergies in seven case study areas. WP4 aims to assess the cumulative impact of aquaculture and fisheries and to identify and map their spatial interactions with other human uses of the marine and coastal environment in the seven case studies. The assessment of cumulative impacts will capitalize on previous well-established methodologies (Halpern et al., 2008, Korpinen et al., 2012, Micheli et al., 2013) which will be implemented in the seven case studies areas of the European regional seas. WP4 will examine which human pressures derived from aquaculture and fisheries could constitute critical threats to important for conservation coastal and marine habitats including essential fish habitats, according to their vulnerability (Halpern et al. 2008). The assessment of the cumulative impacts of different combinations of pressures and coastal ecosystems contributes to the identification of potential ecological and socio-economic mechanisms that can enhance the resilience of natural systems to multiple stressors (Halpern et al., 2008, Stelzenmüller et al., 2010). The appropriate spatial data will be provided by national bodies (ministries, environmental management bodies, statistical agencies, port authorities), institutions for marine research and universities. Moreover, this task will be carried out through a systematic analysis over the whole region of ISI journals, reports, gray literature and direct contact with the scientific community and local experts. All partners will be involved in providing georeferenced data and their expert opinion. The mapping of spatial data will be carried out in Geographic Information System (GIS) environment. Within the framework of WP4 thematic maps with the spatial distribution of impacts from aquaculture and fishing activities will be produced in order to illustrate the most and the less affected areas by using color gradation schemes. The identification of the spatial extent and distribution of their activities is also crucial not only for the protection of the marine resources but also for the mitigation of spatial	

conflicts between human activities in cases of co-location. WP4 will evaluate interactions between these two activities and among other ones based on a methodology developed within the COEXIST project (http://www.seagrid.an.ismar.cnr.it/grid). The visualization of compatibilities and incompatibilities of sea uses is crucial in order to depict areas where conflicts or synergies between sectors are arising. This methodology will take into consideration specific factors that characterize each activity and in sequence will indicate the gradation of conflicts or synergies in the case studies areas. The computation of conflicts or synergies is made by using a grid with corresponding cell size value equal to 1km and producing thematic maps in ARCGIS environment. The spatial data will be collected by national bodies (ministries, environmental management bodies, statistical agencies, port authorities), institutions for marine research and universities. The outcomes of this analysis will contribute to the development of management scenarios and marine spatial planning processes.

Report on results obtained and changes to the original work plan/WP aims:
A- results obtained:

WP4 has started in month 6 and will finish in month 31 of the project implementation period. Hence during the aforementioned period covered by the midterm report (01/09/2016 to 31/08/2017) the methodological approach that would be followed for assessing the cumulative impacts of human activities on ecosystem components of the case study areas was finalized and then was presented to the partners. This approach is based on previous well-established methodologies (Halpern *et al*., 2008, Korpinen *et al*., 2012, Micheli *et al*., 2013), however, some critical limitations have been highlighted.

More explicitly, during this period spatial data necessary for the assessment of pressures exerted by fisheries and aquaculture on coastal ecosystem components for each case study area have been compiled and developed according to the following structure:

- A polygon of the study area (shape file)
- The fishnet (grid) of the study area (shape file) in 1 km * 1km cell size (grid resolution).
- The raster datasets of ecosystem components to examine for each case study (as presence or absence grid layers and then converted to raster datasets)
- Raster datasets of activities (grid layers with pressure intensities and then converted to raster datasets)
- Matrix of what activity interact with which ecosystem component and weight factors according to experts' judgement based on Halpern's criteria (scale 0-4).

Indeed, data development has been accomplished and different thematic layers (shapefiles) have been created as described above and stored in a geodatabase in ArcGIS software for the Adriatic Sea (Case study 1), the Ionian Sea (Case study 2), the Black Sea (Case study 3), the Tyrrhenian Sea (Case study 4) and the Baltic Sea (Case study 5), while in the following period this process will be finalised for the remaining case studies.

As an example of some key results provided through this analysis we have selected the Adriatic Sea case study to be presented in brief in the frame of the mid-term report. Different maps for each ecosystem component under pressure have been developed, as well as a map with impact scores calculated for each cell showing the total pressure exerted on the ecosystems under study (Fig. 6). According to this, the highest impact score (15.92) appears at the north east part of the study area where fishing activities (hydraulic dredges and small scale) and aquaculture are the dominant activities, while the habitats that seem to be under pressure are:

- Nursery areas of *Pagellus erythrinus*,
- Nursery areas of *Mullus barbatus*
- Nursery areas of *Solea solea*
- Distribution of macrobenthos assemblage C
- Distribution of macrobenthos assemblage B

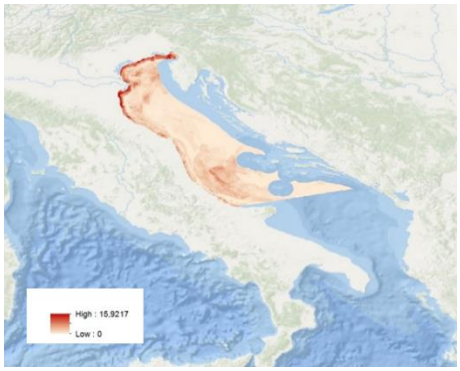

Fig. 6 - Cumulative Impact Assessment map of the Adriatic Sea (Case study 1).

WP 5	**"Analysis of fishermen's behaviour to spatial management options and assessment of the economic and ecological performance of alternative spatial plans"**

Responsible partner: "partner no 3, DTU-Aqua , WP manager Francois Bastardie"

Original description of work:

Objectives:

• to develop an operational modelling framework to analyse fishermen's behaviour and predict their likely responses to spatial management options;

• to measure economic and ecological performance of alternative spatial plans by scenario evaluations including delineating locations and space limits that ensures certain levels of production to local fishers and farmers;

• to identify recommendations for a better integration of fisheries and aquaculture in MSP (link to WP6).

WP5 will develop an operational modelling framework to analyse fishers´ decision making and predict likely responses of fisheries to spatial management options. The WP should assess whether actual MSP measures could have adverse effects on important fisheries and further document potential best placements for priorities areas for fisheries that would minimize the effects on fishing or harbours communities. The developed tools operate with MSP-relevant resolution in time, space and fishing units with specific exploitation patterns and come together with a set of parameterization routines incorporated to a user-friendly interface handling high amounts of quantitative data in a unified modelling framework. A first step will develop the fine-scaled mapping and the investigation of the determinants of the spatial distribution of fishing effort (random utility models, RUM), including data or predictive models on the distribution of the harvested resources. The WP may further measure how well the existing spatial patterns fit the optimal allocation of the fisheries predicted by spatial optimization tools e.g. MARXAN or given by site suitability index studies. In a second step, the WP framework will use and apply the identified drivers to predict the static spatial effort reallocation induced by the drivers in response to various spatial MSP settings. Wherever possible, a dynamic approach will be developed and further apply a discrete-time simulation tool (DISPLACE, a dynamic, spatial individual vessel-based modelling approach) (Bastardie et al., 2014) to further gain insights in predicting the displacement of the fishing effort and pressure in response to the alternative spatial plans. A dynamic approach include by nature the cumulative propagated effects that may arise from the interlinked interactions of the ecological-economic fishery dynamics system such as displacement toward sensitive habitats, concentration of the pressure in a narrow space and consequences in cost for fishing, underlying stock developments, landing composition, etc. By including the fish and shellfish population dynamics and the responses of the fish populations to fishing the approach also evaluates the sustainability

of the harvesting under spatial plan alternatives and potential external risks (low productivity scenarios, increased fuel prices, etc.). By accounting for parameters determining the fisher and vessel´s behaviour in each region, the framework could adapt to each case studies if the model builds upon flexible decisions trees and flow charts that fit to what drive and motivate the fishers during the fishing operations, possibly informed from the RUM, the regional stakeholder´s consultations and surveys. The GRID web-application GIS tool platform managing information from CSs will provide the spatial information to both the static and the dynamic views. The WP will adopt a hierarchical analysis (e.g. GRID, RUM, DISPLACE) depending on the quality of available data from CSs and in cooperation with the other WPs. The WP will eventually support a quantitative analysis for the generalization of the impacts of the micro-decisions at the regional scale and document the analysis of costs and benefits from the perspective of the various fishing communities at stake when restrained by other utilization of the seas (aquaculture sites, shipping lanes or offshore constructions). In each CSs the alternative scenarios from ongoing regional spatial plans and alternatives will be ranked against fishery economic performance indicators and the essential areas and fishing locations that ensure certain levels of production to local fishers and farmers identified.

Report on results obtained and changes to the original work plan/WP aims:

A- results obtained:

Documentation and guidelines for collecting the relevant spatial data to be used in the modelling approaches (M5.1) developed within WP5 has been produced and disseminated to other partners through online documentations and together with a workshop organized around the tool and its use (a DISPLACE workshop).

The investigation of potential drivers in fishermen´s decision-making explaining the current distribution of fishing effort (M5.2) has been covered by developing a standard fishermen´s questionnaire survey approach made within WP6 and used where possible within CSs. WP5 is expecting WP6 to deliver on this to refine the conditioning of WP5 decision-making sub-models when necessary. This information is however only supplementary to the achievement of WP5 given that the actual spatial distribution of fishing effort is likely most of the time sufficient input for modelling the spatiotemporal fishing activities within a scenario-testing approach for plausible alternatives.

A tool for scenario evaluation study rating the costs and benefits of alternative coastal MSP plans and including displacement scenarios (M5.3) has been produced and expanded to include entry points for other sectors than fisheries i.e. accounting for the dynamics of the aquaculture production and its revenues, the dynamic of windmill parks energy production and the footprint of the shipping lanes. The tool is developed to be able to project the likely income from fisheries form different fishing activities active in different zones and time, and is developed to track the main fisheries economic indicators used to describe national fishing fleet performances of European fleets (indicators followed by the EU STECF annual economic reports) i.e. Income, Costs, Economic Indicators, Capital value, Profitability and development trends. In this context DISPLACE now provides scenario-based assessment and projections of the amount of income generated by national fishing fleets (or other finer fleet segments level economics and fishing harbour communities) over months, quarters and years as long as national input data are available.

Programming tools for delineating locations and space limits that ensure certain levels of production to local fishers and farmers (M 5.4) has been developed (by volume, by value of catches, or by spatial dependencies) and applied to identify the main fishing grounds of various fishing vessels that are getting mapped and processed to be further used as input data layer to the modelling tools. Programming routines and modelling tools are made available online to the entire scientific community being hosted on GitHub public repository.

The definition and runs of spatial fisheries scenarios by CS using the WP spatial modelling tools (M5.5) will mainly be done during the second half of the project period starting now, after each of the CS responsible will be completing the conditioning of DISPLACE on its own set of data. The tool applied to CS will then analyse and predict the likely responses of fisheries to spatial

management options also by measuring economic and ecological performance of alternative spatial plans. The work and scenario testing and reporting has already been completed for the Adriatic Sea CS, is under good progress for the Greek Ionian Sea, the Romanian EEZ in the Black Sea and the Danish Western Baltic fisheries CS, still at the start for the Norwegian CS and Portuguese Waters CS, and finally will not be applied for the Tyrrhenian Sea CS where the fisheries is not found to be the main issue in this area.

WP 6	**"Identification of spatial and temporal potentials and limitations for the integration of fisheries, aquaculture and other activities in the coastal areas (through stakeholder consultation)"**

Responsible partner: "partner no 5, IMR, WP manager Erik Olsen "

Original description of work:

Objectives:

• through a stakeholder process identify spatial management goals for the project case studies; • apply state of the art stakeholder involved spatial use and trade-off analyses based on a natural capital approach, using open-source tools such as InVEST to identify optimal (best compromise) spatial area allocation;

• develop maps for scenarios on integrating human activities in the coastal zone, including social indicators and ecosystem-impacts.

The main goal of WP6 will be to synthesize key results, specifically the identification of spatial and temporal potential and limitations for the integration of fisheries and aquaculture in the coastal areas. WP6 will evaluate possible scenarios taking into account the results produced by WPs 3-5, as well as the stakeholder consultation. Maps of spatial management scenarios may also include in the next future a new module for social indicators. Broadly, we aim to follow the approaches of Arkema et al. (2014) and Arkema (in press) for conducting a stakeholder involved trade-off analysis of spatial management options for the various case studies using freely available computer tools like Integrated Valuation of Ecosystem Services and Tradeoffs (InVEST, see: http://www.naturalcapitalproject.org/InVEST.html) (Nelson et al., 2009). The InVEST approach is based on stakeholder involvement, both for scoping the management question(s) and for interpreting the model results. Various InVEST models templates exist to be customized to the specific requirements of each case study area. The InVEST models combine biophysical and economic models of a study areas to run a range of future management scenarios developed through stakeholder interactions at workshops and correspondence. The models will yield maps of interactions in addition to trade-off curves and balance sheets between fisheries and aquaculture, as well as monetary values of the different scenarios. The maps, trade-off curves and balance sheets and associated monetary value of the various scenarios will be presented to and discussed with stakeholders to give guidance on which scenario options should be prioritized in future management.

Report on results obtained and changes to the original work plan/WP aims:

A- results obtained:

Management objectives (national/EU level) have been compiled for the CS from EU and national legislation and official, strategic documents. Maps showing spatial restrictions on use (e.g. coral reefs, no-go zones around fish-pens, natural protection areas etc.) and areas allocated to different sectors and human uses (aquaculture, pipelines, shipping lanes etc.) have been compiled per cs. The identification of spatial and temporal potentials and limitations for the integration of fisheries and aquaculture in the various CS were carried out through stakeholder consultations using an on-line, map-based questionnaire (http://geosurvey.geobytes.de/). Five CS were studied (Black Sea, Ionian Sea, Adriatic Sea, North-East Atlantic and Norwegian fjords), which differ in the degree of development of the aquaculture sector, from being in its infancy (Portugal and Romania) to highly developed. Aquaculture species differ between the CS as do the main fisheries. The questionnaire was filled out by stakeholders mainly from the fisheries and aquaculture sectors, but also from management, trade organizations and academic research. Workshops for discussing the results

with the stakeholders were carried out. An interesting result was that in all five cs areas there was a general agreement that the fisheries sector will decrease in the future, while the aquaculture sector will increase. This opinion was held also in areas presently dominated by fisheries and with little or no aquaculture. Results from the questionnaires revealed regions per CS with presently high spatial conflicts between fisheries and aquaculture, as well as perceived future conflict areas. Potential new areas for aquaculture were also mapped. In both Norway and Portugal, stakeholders pointed to offshore areas, which will require new technologies.
The project description proposed to use InVEST as a framework to integrate the results from several ECOAST work packages and thus promote ecosystem approaches to the management of coastal fisheries and aquaculture. InVEST can be used to answer a broad range of questions relating to ecosystems goods and services and the connections between different parts and/or regions of an ecosystem. However, it was soon realized that the “spatial allocation” type of question stated in the project description did not fit well with the kinds of questions that InVEST has been designed to address. Instead of abandoning InVEST in favor of another tool, the question was changed. We decided to use the InVEST Fisheries model, a final service type of model, to explore the effects of increased salmon farming on total food obtained from the fisheries in the Norwegian CS area. The intensity of salmon farming was thus considered a scenario. The question of interest was formulated as follows: What are the effects of varying levels of aquaculture intensity on total fish production in the Hardanger fjord greater area? The question was narrowed down to consider only the northern shrimp (*Pandalus borealis*) fishery. The total economic value of the fishery was the output of interest. Results from the model were unrealistically low, which may be due to errors in some of the parameter settings. Furthermore, the question of interest is a question which, though handled appropriately enough by the InVEST Fisheries model, would have been better dealt with by a more traditional stock assessment/population dynamics model. InVEST is only used to its full potential when multiple objectives and/or multiple ecosystem services are in focus. The Fisheries model specifically is designed for looking at the effects of habitat change, change in fishing behaviour, or changes in environmental conditions, features which were not exactly relevant to our fishery of interest and question of interest. The InVEST suite of models comprises two final-service models that are tightly aligned with the specified goals for the Norwegian cs within WP6, namely the Fisheries model and the Marine Finfish Aquacultural Production model. We only used one because we decided to regard aquaculture as a way of defining scenarios.
B- comments on deviations from the original plan:
While the potential of InVEST is enormous, it was the wrong tool for WP6. The question of interest explored with InVEST was changed and InVEST was only tried for one cs. The identification of spatial and temporal potentials and limitations for the integration of fisheries and aquaculture in the various cs’s were therefore carried out through stakeholder consultations

6. Dissemination, networking and impact

6.1. Publications and communications

Please indicate THE NUMBER & TYPE of publications and communications in which **COFASP support was acknowledged**. Publications prior to the start of the project should not be included.

6.1.1. Number of publications and communications

Type of publication	Total N°
Peer reviewed articles	5
Communications at scientific congresses/in proceedings	57

6.1.2. Peer reviewed articles

Please list the **peer review articles** that resulted from the funded project, underlining the name of the funded partners. In column 2, please point out the project partners involved by using the numbering employed in the project proposal (*e.g.* partner 1 or P1).

Authors, title, journal, year, issue, pp.	Partner(s) involved	Impact factor	h-index
Francois Bastardie, Silvia Angelini, Luca Bolognini, Federico Fuga, Chiara Manfredi, Michela Martinelli, J. Rasmus Nielsen, Alberto Santojanni, Giuseppe Scarcella, and Fabio Grati. “Spatial Planning for Fisheries in the Northern Adriatic: Working toward Viable and Sustainable Fishing.” Ecosphere, 2017; 8 (2): 1–26.	P1, P3	2.49	28
Floris M. Van Beest, Lotte Kindt-Larsen, Francois Bastardie, Valerio Bartolino, and Jacob Nabe-Nielsen. “Predicting the population-level impact of mitigating harbor porpoise bycatch with pingers and time-area fishing closures.” Ecosphere, 2017; 8 (4): e01785.	P3	2.49	28
Gomiero A, Øysæd KB, Agustsson T, van Hoytema N, van Thiel T, Grati F. First record of characterization, concentration and distribution of microplastics in coastal sediments of an urban fjord in south west Norway using a thermal degradation method. Chemosphere. 2019;227: 705–714. doi:10.1016/j.chemosphere.2019.04.096	P1, P4	5.108	212

van Beest FM, Mews S, Elkenkamp S, Schuhmann P, Tsolak D, Wobbe T, Bartolino V, Bastardie F et al.. Classifying grey seal behaviour in relation to environmental variability and commercial fishing activity - a multivariate hidden Markov model. Sci Rep. Nature Publishing Group; 2019;9: 5642. doi:10.1038/s41598-019-42109-w	P3	4.525	149
Bechmann RK, Arnberg M, Gomiero A, Westerlund S, Lyng E, Berry M, Agustsson T et al. Gill damage and delayed mortality of Northern shrimp (Pandalus borealis) after short time exposure to anti-parasitic veterinary medicine containing hydrogen peroxide. Ecotoxicol Environ Saf. Academic Press; 2019;180: 473–482. doi:10.1016/J.ECOENV.2019.05.045	P3	4.527	110

6.1.3. Communications at scientific congresses/in proceedings

Please list the **communications at scientific congresses/in proceedings** that resulted from the funded project, underlining the name of the funded partners. In column 2, please identify the project partners involved by using the numbering employed in the project proposal (*e.g.* partner 1 or P1).

Authors, title, meeting name & place, year	Partner (s) involved	Oral Communication	Poster
Eric Olsen, Fabio Grati, Spatial and temporal potentials and limitations for the integration and management of fisheries, aquaculture and other activities in the coastal areas – the ECOAST project, ICES MSEAS .2016, Brest (France), 2016	P1, P5		X
Alexander Christian Beck, Øivind Bergh. ANALYSIS OF CONFLICTS WITH LARGE SCALE AQUACULTURE IN A NORWEGIAN FJORD. 35th Annual Conference of the Working Group "Geography of Seas and Coasts", Kiel, Germany. April 19-22, 2017.	P5		X
Simion Nicolaev, *Marine Fisheries under the Frame of Sustainable Development and Marine Spatial Planning- the MARSPLAN BS project*, Marsplan International Conference: Maritime Spatial Planning in the Black Sea, Constanta (Romania), 03- 04.05.2017	P7	X	
Laura Alexandrov, *Maritime Spatial Planning Romania- Bulgaria – the MARSPLAN BS project*, Marsplan International Conference: Maritime Spatial Planning in the Black Sea, Constanta (Romania), 03- 04.05.2017	P7	X	

Gheorghe Radu, Maria Yankova, Laura Alexandrov, Aurelia Totoiu, Alexandru Nicolaev, Bulgarian and *Romanian marine fisheries. Transboundary Study Case* - Marsplan International Conference: Maritime Spatial Planning in the Black Sea, Constanta (Romania), 03- 04.05.2017	P7	X	
Alina-Daiana Spinu, Razvan Mateescu, Danut Diaconeasa, Silica Petrisoara, Emanuela Mihailov, *Shoreline changes on Romanian coast in the context of maritime spatial planning process* - Marsplan International Conference: Maritime Spatial Planning in the Black Sea, Constanta (Romania), 03- 04.05.2017	P7	X	
Mariana Golumbeanu, Alina Daiana Spinu, Magda Ioana Nenciu, Mihail Costache, *New methods for the improvement of the integrated coastal zone management (ICZM) indicators and Maritime Spatial Planning (MSP) in the Romanian coastal zone*, - Marsplan International Conference: Maritime Spatial Planning in the Black Sea, Constanta (Romania), 03- 04.05.2017	P7	X	
Razvan Doru Mateescu, Dragos Niculescu, Elena Vlasceanu, Laura Alexandrov, *Analysis of the coastal erosion risk on the Romanian littoral, its implication on the Marine Spatial Planning`s implementation*, - Marsplan International Conference: Maritime Spatial Planning in the Black Sea, Constanta (Romania), 03- 04.05.2017	P7	X	
Laura Boicenco, Laura Alexandrov, Simion Nicolaev, Valeria Abaza, Alina Spinu, Luminita Lazar, Andra Oros, *MSFD implementation in Romania strengths, weaknesses and interconnection with MSP*, - Marsplan International Conference: Maritime Spatial Planning in the Black Sea, Constanta (Romania), 03- 04.05.2017	P7	X	
George Sirbu, Magda Ioana Nenciu, Tania Zaharia, Gheorghe Radu, *Applying the Ecosystem Approach to the manegement of valuable commercial Black Sea fish species,* - Marsplan International Conference: Maritime Spatial Planning in the Black Sea, Constanta (Romania), 03- 04.05.2017	P7	X	
Victor Nita, Alina Spinu, Magda Ioana Nenciu, Tania Zaharia, *The principles of sustainability on the process of site selection and allocation zones for aquaculture in Romania,* – Environmental sustainable engineering development International UAB- BENA Conference, Alba Iulia (Romania) 25- 27.05.2017	P7		X
Laura Alexandrov, Alina Daiana Spinu, Iulian Nichersu, Eugenia Marin, Razvan Mateescu, Victor Nita, Elena Vlasceanu, Mariana Golumbeanu, *Stakeholders and land sea interaction analyses. Eforie study case*, - Environmental sustainable engineering development International UAB- BENA Conference, Alba Iulia (Romania) 25- 27.05.2017	P7		X

Alina Daiana Spinu, Laura Alexandrov, George Sirbu, Alexandru Nicolaev, Cristian Danilov, Dragos Niculescu, Gheorghe Radu, Eugen Anton, Aurelia Totoiu, *New methods for maritime spatial planning analyses of marine fisheries in ecosystem approach – the ECOAST Project,* Environmental sustainable engineering development International UAB- BENA Conference, Alba Iulia (Romania) 25- 27.05.2017	P7		X
Laura Alexandrov, Alina Spanu, Nicolaev Simion, Zaharia Tania, Abaza Valeria, Anton Eugen, Boicenco Laura, Coatu Valentina, Diaconeasa Dan, Golumbeanu Mariana, Lazar Luminita, Marin Oana, Mateescu Razvan, Mihailov Manuaela, Niculescu Dragos, Nita Victor, Oros Andra, Radu Gheorghe, Elena Vlasceanu, *An integrated analysis of marine environment aiming Maritime Spatial Planning data base, "*Danube Delta" National Institute for Research and Development, Tulcea, the 25th International Symposium "Deltas and Wetlands", Tulcea, (Romania) 18-21.05.2017	P7		
Gheorghe Radu, Maria Yankova, Laura Alexandrov, Tania Zaharia, Aurelia Totoiu, Alexandru Nicolaev, Victor Nita, Alina Spinu, *Bulgarian and Romanian Marine Fisheries and Aquaculture,* Danube Delta" National Institute for Research and Development "Danube Delta" National Institute for Research and Development, Tulcea, (Romania) the 25th International Symposium (http://www.ddni.ro/index.php?page-id=442&siteSection=2&sectionTitle=Regular%20Annual%20Events, "Deltas and Wetlands", Tulcea, 18-21.05. 2017	P7		
Alina Spinu, Laura Alexandrov, George Sarbu, Alexandru Nicolaev, Cristian Danilov, Dragos Niculescu, Gheorghe Radu, Eugen Anton, Aurelia Totoiu, *Maritime Spatial Planning. New methodologies for spatial analyses of marine fisheries, "*Danube Delta" National Institute for Research and Development, Tulcea, (Romania) the 25th International Symposium (http://www.ddni.ro/index.php?page_id=442&siteSection=2&sectionTitle=Regular%20_Annual%20Events, "Deltas and Wetlands", Tulcea, 18-21.05. 2017	P7		
Laura Alexandrov, *New Methodologies for an Ecosystem Approach to Spatial and Temporal Management of Fisheries and Aquaculture in Coastal Areas (ECOAST*) - Constanta Stakeholder Workshop, The International Symposium Protection of the Black Sea Ecosystem and Sustainable Management of Maritime Activities – PROMARE, 2017 8th Edition, 7-9 September 2017, Constanta (Romania)	P7		

Laura Alexandrov, Simion Nicolaev, Gheorghe Radu, Eugen Anton, Alina Spinu, Dragos Niculescu, Alexandur Nicolaev, Gheorghe Sarbu, Madalina Rosca, Adrian Filimon, Cristian Danilov, Victor Nita – *New Methodologies for Temporal and Spatial Analysis of Fish Stocks at the Romanian Black Sea Coast*, The International Symposium Protection of the Black Sea Ecosystem and Sustainable Management of Maritime Activities – PROMARE, 2017 8th Edition, 7-9 September 2017, Constanta, (Romania)	P7		
Gheorghe Radu, Maria Yankova, Laura Alexandrov, Tania Zaharia, Alina Spinu, Alexandru Nicolaev, Aurelia Totoiu – *Marine Fisheries under the Maritime Spatial Planning Framework in Romania,* The International Symposium Protection of the Black Sea Ecosystem and Sustainable Management of Maritime Activities – PROMARE, 2017 8th Edition, 7-9 September 2017, Constanta, (Romania)	P7		
Laura Alexandrov, *Maritime Spatial Planning for Blue Growth: EU support for Visions, Indicators, Examples, Navigation. Romanian Experiences*, Conferinta *Blue Economy* pentru Factorii de Interes (stakeholderi) din Marea Neagra, 15 septembrie 2017, Batumi, (Georgia)	P7		
Elena Vlasceanu, Dragos Niculescu, Razvan Mateescu, Laura Alexandrov, *The effectiveness of the UAV imagery in complementarity of the satellite high resolution remote sensing imagery for Danube Delta's marine lagoons monitoring,* MedCoast Conference, 31 October – 4 November 2017, (Malta)	P7		
Gheorghe Radu, Laura Alexandrov, Maria Yankova & altii, *Marine Fisheries and Aquaculture under Maritime Spatial Planning, Approach toward integration – 2017,* ISBN 978-606-642-165-2, (Romania), in Eng.	P7		
Laura ALEXANDROV Case study Aquaculture and fisheries, Conference *"Challenges and opportunities for maritime spatial planning of the Black Sea in Romania and Bulgaria*", 11 January 2018, Bucharest, (Romania)	P7		
Laura Alexadrov*, Progress registered in Maritime Spatial Planning research in the Black Sea Region,* International Conference GlobMar-Global Maritime Conference, Section 4, *Maritime Spatial Planning* 19-20 April, 2018,Gdansk-Sopot, (Poland)	P7		
Simion Nicolaev[1], Laura Alexandrov[1], Victor Nita[1], Adrian Filimon[1], Thorleifur Agustsson[2], Alessio Gomiero [2], Alina Spinu[1], Luminita Lazar[1], Andra Oros[1], Valentina Coatu[1] ,*Ecological footprint under marine aqua-farms aiming impact - response assessment and management improvement for mariculture development in the Black Sea basin,* Deltas and Wetlands Symposium, 15-20 May, 2018, Tulcea, Romania	P7		

Laura Alexandrov[1], Alina Spinu[1], Razvan Mateescu[1], Victor Nita[1], Elena Vlasceanu[1]Iulian Nichersu[2], Eugenia Marin[2], Florentina Sela, [2]*Maritime Spatial Planning – Coastal erosion, vulnerabilities and public consultation on Case Study Eforie,* Deltas and Wetlands Symposium, 15-20 May, 2018, Tulcea, (Romania)	P7		
Laura Alexandrov[1], Alina Spinu[1], Dragos Niculescu[1], Fabio Grati[2], Francois Bastardie[3], Luca Bolognini[2], Celia Vassilou[4], Elena[4], Eugen Anton[1], Gheorghe Radu[1], Alexandru Nicolaev[1], Valodia Maximov[1] *Spatial synergies/conflicts between fisheries, aquaculture and other human activities evaluated in Romania by DISPLACE, GRID and cumulative impacts methodologies,,* Deltas and Wetlands Symposium, 15-20 May, 2018, Tulcea, (Romania)	P7		
Laura Alexandrov, *Maritime Spatial Planning for the Black Sea Romanian-Bulgarian Experience aiming transboundary approach,* European Maritime Day, Workshop: Supporting Internationally accepted Marine Spatial Planning Guidance (UNESCO), 31.05.2018, Bourgas, (Bulgaria)	P7		
Laura Alexandrov, *MSP Data Base in the Black Sea Basin,* European Maritime Day, Workshop: Data Availability for MSP: from Jungle to Structure (WASAB), 31.05.2018, Bourgas, (Bulgaria)	P7		
Laura Alexandrov, *Maritime Spatial Planning in Romania – Black Sea,* Coast to Ocean Conference: Priority actions and investments, Section Maritime Spatial Planning si Building Coastal and Marine Networks, 17 February 2019, Alexandria, (Egypt)	P7		
Alexandru Nicolaev*, Alina Spinu*, Dragos Niculescu*, Francois Bastardie**, Laura Alexandrov*, Eugen Anton*, Gheorghe Radu*, Victor Nita*, Madalina Rosca *Analysis of fishermen's behavior to spatial management options and assessment of the economic and ecological performance of alternative spatial plans, under COFASP - ECOAST Project, "*Deltas and Wetlands" Symposium 05-09 June, 2019, Tulcea, (Romania)	P7		
Madalina Rosca*, Laura Alexandrov*, Dragos Niculescu*, Alexandru Nicolaev*, Erik Olsen**, Søvik Guldborg**, Victor Nita*, Eugen Anton*, Gheorghe Radu*, Irina Cernisencu*, Alina Spinu*, Cristian Danilov*, George Tiganov**Identification of spatial and temporal potentials and limitations for the integration of fisheries, aquaculture and other marine activities through stakeholder consultation, under COFASP - ECOAST Project, "*Deltas and Wetlands" Symposium 05-09 June, 2019, Tulcea, (Romania)	P7		

Dragos Niculescu*, Victor Nita*, Alina Spinu*, Laura Alexandrov*, Celia Vassilopoulou**, Irida Maina**, Mairi Maniopoulou**, Eugen Anton*, Gheorghe Radu*, Alexandru Nicolaev*, Madalina Rosca**Assessment of cumulative impacts of marine fisheries and aquaculture on Romanian coastal ecosystem components with special focus on priority conservation features, under COFASP - ECOAST Projec, "*Deltas and Wetlands" Symposium 05-09 June, 2019, Tulcea, (Romania)	P7		
Laura Alexandrov, Simion Nicolaev, Victor Nita, Gheorghe Radu, Eugen Anton, Dragos Niculescu, *Maritime Spatial Planning in Romania – Black Sea, support for the marine fisheries and aquaculture development, "*Deltas and Wetlands" Symposium 05-09 June, 2019, Tulcea, (Romania)	P7		
Ribeiro, D.; Vieira, L.R.; Guilhermino, L. 2017. Gestão de produtos e serviços nas áreas costeiras e marinhas - Projeto Internacional ECOAST. Poster presented in the "2º Encontro de Saúde, Ambiente e Trabalho". Porto, Portugal.	P8		X
Bastardie F, Höffle H, Vigier A, Nielsen JR, Farnsworth KD, Pedreschi D, Reid D, *Eliciting spatial approaches to avoid unwanted catches in an EU Landing obligation context: A bio-economic evaluation in the Celtic Sea; Talk given to FUTURE OCEANS2 IMBeR 2019 session "Investigating and modelling linkages between biology and fleet behaviour in multi-species*	P3	X	
Fabio Grati, "Ipotesi alternative per la gestione spaziale della pesca demersale in Adriatico: sperimentazione del modello bio-economico", 14 June 2016, Lesina (Italy)	P1, P3	X	
Fabio Grati, "Ipotesi alternative per la gestione spaziale della pesca demersale in Adriatico: sperimentazione del modello bio-economico", 15 June 2016, Molfetta (Italy)	P1, P3	X	
Fabio Grati, "Ipotesi alternative per la gestione spaziale della pesca demersale in Adriatico: sperimentazione del modello bio-economico", 16 June 2016, Porto Cesareo (Italy)	P1, P3	X	
Luca Bolognini, "Alternative planning measures of maritime spaces for fishing in the Adriatic basin, and their bio-economic impact", 8 July 2016, Bologna, (Italy)	P1, P3	X	
Luca Bolognini, "The bio-economic DISPLACE model for the Adriatic Sea. Results concerning GSA 18 and a comparison between GSA17 and GSA18", 27 September 2016, Bari (Italy)	P1, P3	X	

Vieira, L.R., Ribeiro, D., Bolognini, L., Grati, F. Guilhermino, L. 2018. Maritime activities from the Northwest Portuguese coast: the Georeferenced Interactions Database (GRID). In: Departamento de Ciências da Terra da Universidade de Coimbra (Ed.). Proceedings of the IX Symposium on the Iberian Atlantic Margin, Coimbra, 4-7 September 2018, ISBN: 978-989-98914-2-5, 161-162.	P1, P8	X	
Bastardie F., Rufener MC, Nielsen JR, Maina I, Kavadas S, Vassilopoulou C, Alexandrov LM, Niculescu D, Spinu A, Nicolaev A, Rosca M, Höffle H, Farnsworth KD, Pedreschi D, Reid D, Bolognini L, Martinelli M, Grati F, Fuga F2018. Modelling spatial interactions among fish communities, fishers and other marine activities: comparing five European case-studies, Conference of the International Institute of Fisheries Economics and Trade (IIFET), July 14-20, Seattle, US, 2018.	P1, P3, P6, P7	X	
Gomiero A., Moodley L., Ravagnan E., Provan F., Bamber S., Bergheim A., Eiríksson T., Helgason G.V., Strømskag R.E., Aarseth L.M., Petochi T., Marino G., Finoia M.G., Bolognini L., Grati F., Agustsson T. 2017. Implemented ecological footprint analysis for aquaculture: conceptual model development and case study application. Aquaculture Europe 17, 17-20 October 2017, Dubrovnik, Croatia. Abstract Book	P1, P2, P4		X
Øivind Bergh, Alexander Christian Beck, Eva Marie Skulstad, Guldborg Søvik and Erik Olsen. 2017. Analysis of conficts with large scale salmonid aquaculture in a Norwegian fjord using GIS and stakeholder surveys. Aquaculture Europe 2017: Dubrovnik, Croatia, October 17-20, 2017.	P5		X
Øivind Bergh, Alexander Christian Beck, Eva Marie Skulstad, Guldborg Søvik, Erik Olsen, Trude Thangstad, Genoveva Gonzalez and Fabio Grati. 2018. GIS analysis of spatial conflicts with large scale salmon aquaculture in a Norwegian Fjord ecosystem. Aquaculture Europe/World Aquaculture Soc. 2018: Montpellier, France, August 25-28, 2018.	P1, P5	X	
Øivind Bergh, Alexander Christian Beck, Guldborg Søvik, Erik Olsen, Trude Thangstad, Genoveva Gonzalez, Fabio Grati and Luca Bolognini. 2019. Spatial conflicts of coastal fisheries with large scale salmonid aquaculture in a Norwegian fjord environment analyzed by GIS and stakeholder surveys. Aquaculture Europe: Berlin, Germany, October 7-10, 2019.	P1, P5	X	

Guldborg Søvik, Erik Olsen, Øivind Bergh, Alexander Christian Beck and Trude Hauge Thangstad. 2019. New Methodologies for an Ecosystem Approach to Spatial and Temporal Management of Fisheries and Aquaculture in Coastal Areas (ECOAST): Stakeholder Workshop as part of Work Package 6: Bergen, Norway, May 6, 2019	P5	X	
Ribeiro, D., Vieira, L.R., Guilhermino, L. 2017. Gestão de conflitos de atividades marinhas na costa Noroeste Portuguesa – Projeto ECOAST. 16th Meeting of the Portuguese Society of Ecology, 9-10th November 2017, Lisbon, Portugal. Abstract Book (P19), page 102.	P8		X
Grati, F., Bolognini, L., Martinelli, M., Finoia, M.G., Archina, M., Petochi, T., Vassilopoulou, V., Maina, I., Gadolou, E., Alexandrov, L., Spinu, A., Agustsson, T., Gomiero, A., Ravagnan, E., Olsen, E., Beck, A., Søvik, G., Guilhermino, L., Ribeiro, D., Vieira, L.R., Bastardie, F., Nielsen, J.R. 2017. Spatial planning for aquaculture: the Georeferenced Interactions Database (GRID). Aquaculture Europe 17, 17-20 October 2017, Dubrovnik, Croatia. Abstract Book, page 469.	P1, P2, P3, P4, P5, P6, P7, P8		X
Vieira, L.R., Ribeiro, D., Oliveira, P., Bolognini, L., Grati, F., Guilhermino, L. 2018. Methodologies for the spatial management on the Northwest Portuguese coast. 48th Conference of the West European Fish Technologists´ Association (WEFTA), 15-18 October 2018, Lisbon, Portugal. Abstract Book, page 133.	P1, P8		X
Salas-Leiton, E., Vieira, L.R., Ribeiro, D., Guilhermino, L. 2018. Suporte ao planeamento e gestão sustentável de atividades humanas e recursos biológicos na costa noroeste de Portugal. 6º congresso da Rede de Comunicação de Ciência e Tecnologia de Portugal – SciComPT, 9-13 October 2018, Figueira de Castelo Rodrigo, Portugal. Abstract Book, pages 96-97.	P8		X
Guilhermino, L. 2019. Abertura e breve introdução ao projeto ECOAST. Workshop “Desenvolvimento e sustentabilidade da pesca e aquacultura na Região Noroeste de Portugal”. Porto, Portugal, 7th May 2019.	P8	X	
Salas-Leiton, E. 2019. Apresentação dos resultados do projeto ECOAST com relevância para a discussão. Workshop “Desenvolvimento e sustentabilidade da pesca e aquacultura na Região Noroeste de Portugal”. Porto, Portugal, 7th May 2019.	P8	X	

Salas-Leiton, E., Guilhermino, L. 2019. Role of fisheries and aquaculture activities in Northwestern region of Portugal for national Blue Economy. EEF Lisbon 2019 – 15th European Ecology Federation Congress and 18th Meeting of the Portuguese Society of Ecology (SPECO): Ecology across borders – Embedding Ecology in Sustainable Development Goals, 29th July – 2 August, Lisbon, Portugal.	P8	X	
Vieira, L.R., Guilhermino, L. 2019. An overview of ecological status and vulnerability of the Nothwest Portuguese coast. EEF Lisbon 2019 – 15th European Ecology Federation Congress and 18th Meeting of the Portuguese Society of Ecology (SPECO): Ecology across borders – Embedding Ecology in Sustainable Development Goals, 29th July – 2 August, Lisbon, Portugal.	P8	X	

6.1.4. Other Publications/Dissemination products

Please list the **other publications/dissemination products** (e.g. websites, interviews, short videos/movies, material for webinars, etc.) that resulted from the funded project, underlining the name of the funded partners. In column 2, please point out the project partners involved by using the numbering employed in the project proposal (*e.g.* partner 1 or P1).

Authors, title, year (when applicable)	Partner(s)
https://www.msp-platform.eu/projects/ecoast-new-methodologies-ecosystem-approach-spatial-and-temporal-management-fisheries	P1,P2, P3, P4, P5, P6, P7, P8
http://www.ismar.cnr.it/projects/international-projects/copy5_of_project-001/ecoast-project?set_language=en&cl=en	P1,P2, P3, P4, P5, P6, P7, P8
https://www.msp-platform.eu/events/ecoast-project-new-methodologies-ecosystem-approach-spatial-and-temporal-management	P1,P2, P3, P4, P5, P6, P7, P8
https://www.researchgate.net/project/ECOAST-New-methodologies-for-an-ecosystem-approach-to-spatial-and-temporal-management-of-fisheries-and-aquaculture-in-coastal-areas	P1,P2, P3, P4, P5, P6, P7, P8
Guldborg Søvik 2019. Article about the project on IMR's website: https://www.hi.no/hi/nyheter/2019/juli/opplever-lite-konflikt-mellom-fiskeri-og-oppdrett-i-vest	P5
https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/support-measure/new-methodologies-ecosystem-approach-spatial-and-temporal-management-fisheries-and	P1,P2, P3, P4, P5, P6, P7, P8
"Ambiente, Saúde e Sociedade". 2018. Science/Society dissemination activity that included poster introducing the research team and on going projects such as the ECOAST project, observation of marine organisms, microplastics collected from the marine environment and biota, other types of pollution, videos and images from marine biodiversity and ecosystem services provided by marine ecosystems, research equipments, and didactic games and other materials for children. Open Day of CIIMAR, Matozinhos, 15th September 2018. Organisers: Luís R. Vieira, Joana Costa and Lúcia Guilhermino.	P8
Guilhermino, L.; Vieira, L.S.; Ribeiro, D. 2017. New methodologies for an ecosystem approach to spatial and temporal management of fisheries and aquaculture in coastal areas – ECOAST. Printed short summary of the project distributed to the general public in several dissemination activities.	P8

In the period 2016-2019, the ECOAST project and its results were also disseminated through: 1) talks and seminars to university students, teachers and researchers (University of Porto); 2) and to the general public in other dissemination actions promoted by ICBAS, the University of Porto and CIIMAR.	P8
http://msp-platform.rmri.ro/ecoast.html	P7
Simion Nicolaev , Valodia Maximov , Victor Niță , Tania Zaharia, Magda-Ioana Nenciu *Marine Protected Areas Management: Interaction with Commercial Fisheries in Natura 2000 Sites along the Romanian Black Sea Coast,* Revue Reserches Marines, vol 41, pg.5-25, http://www.marine-research-journal.org/index.php/cmrm/article/view/41	P7
Valodia Maximov, Simion Nicolaev, Eugen Anton, Gheorghe Radu, George Țiganov, Cristian Danilov, Magda Nenciu, Madălina Galațchi, *Dynamics of Fish and Marine Mammal Populations at the Romanian Black Sea Coast in the Past 10 Years and their Evolution Trends ,* Revue Reserches Marines, http://www.marine-research-journal.org/index.php/cmrm/article/view/42 vol 41, pg. 26-49,	P7
Aurelia Țoțoiu, Tania Zaharia, Magda-Ioana Nenciu, Victor Niță, Alexandru Nicolaev, Cristian Danilov, Mădălina Galațchi, Mariana Golumbeanu, Gheorghe Radu, Valodia Maximov, *Specific Diversity of the Romanian Black Sea Fish Fauna ,* Revue Reserches Marines, vol 41, pg. 50-58, http://www.marine-research-journal.org/index.php/cmrm/article/view/43	P7
George Țiganov, Simion Nicolaev, Valodia Maximov, Eugen Anton, Mădălina Galațchi, Alexandru Nicolaev, Cristian Danilov, Cătălin Păun, *Current Situation of Small-Scale Fisheries in the Romanian Black Sea Area during 2012- 2017,* Revue Reserches Marines, http://www.marine-research-journal.org/index.php/cmrm/article/view/44 , vol 41, pg. 59-66,	P7
Alexandru Nicolaev, Eugen Anton, George Țiganov, Cristian Danilov, Valodia Maximov, Cătălin Păun, *Analysis of the Balance between the Fishing Fleet Capacity and the Fishing Opportunities in the Romanian Black Sea Sector in 2015,* Revue Reserches Marines, http://www.marine-research-journal.org/index.php/cmrm/article/view/45, vol 41, pg. 67-74	P7
Laura Alexandrov, Gheorghe Radu, Eugen Anton, Alina Daiana Spînu, Dragoș Niculescu, Victor Niță, Magda-Ioana Nenciu, Alexandru Nicolaev, Adrian Filimon, Elena Vlăsceanu, Mădălina Gabriela Roșca, *Steps Forward in Maritime Spatial Planning in Romania,* http://www.marine-research-journal.org/index.php/cmrm/article/view/46 , Revue Reserches Marines, vol 41, pg. 75-91,	P7

Victor Niță, John A. Theodorou, Simion Nicolaev, Valodia Maximov, Magda-Ioana Nenciu *Capacity building and expert training in the frame of the Constanta Shellfish Aquaculture Demonstrative Center,* Revue Reserches Marines, vol 41, pg. 92-99, http://www.marine-research-journal.org/index.php/cmrm/article/view/47	P7
Laura Alexandrov, Eugen Anton, Gheorghe Radu, Alina Spinu, Dragos Nicuilescu, *Noi metodologii pentru analize spatiale si temporale in pescuit si acvacultura marina in zonele costiere / New methodologies for a spatial and temporal analyses of fisheries and aquaculture in coastal,* ISBN 978-606-642-179-9	P7
ISPRA 2019. National Guidelines for spatial planning of marine aquaculture. The ECOAST project and results contributed to the definition of contents and publication of the document.	P2

6.2. Collaboration and consortium sustainability

6.2.1. Did the partners of this project collaborate before applying for the COFASP Joint Transnational Call?

No.

6.2.2. Were there any collaborations with groups outside the consortium during the lifetime of the project?

Yes, on-line questionnaires for storing spatial data from interviews with coastal fishers and stakeholders have been developed through a collaboration between IMR and Christian Galonska at Geobytes in Germany.

6.2.3. Did the collaboration and results obtained in this project lead to new initiatives/applications to national or international funding programmes (*e.g.* grants, grant applications)? YES

The results obtained within ECOAST have been capitalised in the project “Capitalization actions for Adriatic marine environment protection and ecosystem based management – DORY” in the framework of 2014 - 2020 Interreg V-A Italy - Croatia CBC Programme Call for proposal 2017 Standard+.

6.3. Networking & education: collaboration meetings, mobility of human resources & training within the consortium

6.3.1. Collaboration meetings

Please list below the **collaboration meetings** undertaken within the framework of the current project. In column 2, please identify the project partners involved by using the numbering employed in the project proposal (e.g. partner 1 or P1).

Meetings involving at least two of the project partners (*e.g.* consortium meetings, WP meetings, workshops, or others)	**Partner involved**
Kick off meeting and 1st Steering Committee (Ancona)	P1, P2, P3, P4, P5, P6, P7, P8
2nd Steering Committee (Athens)	P1, P2, P3, P4, P5, P6, P7, P8
GRID Workshop (Athens)	P1, P2, P3, P4, P5, P6, P7, P8
DISPLACE Workshop (Athens)	P1, P2, P3, P4, P5, P6, P7, P8
3rd Steering Committee (Stavanger)	P1, P2, P3, P4, P5, P6, P7, P8
WP3 and InVEST Workshops (Stavanger)	P1, P2, P3, P4, P5, P6, P7, P8
Project meeting on Norwegian CS work in WP5 (Copenhagen)	P3, P5
4th Steering Committee (Dubrovnik)	P1, P2, P3, P4, P5, P6, P7, P8
DISPLACE Workshop (Ancona)	P1, P3
5th Steering Committee (Constanta)	P1, P2, P3, P4, P5, P6, P7, P8
6th Steering Committee (Porto)	P1, P2, P3, P4, P5, P6, P7, P8
7th Steering Committee (Copenhagen)	P1, P2, P3, P4, P5, P6, P7, P8
International Workshop (Copenhagen)	P1, P2, P3, P4, P5, P6, P7, P8

6.3.2. Training within the consortium

Please list below the training within the consortium undertaken within the framework of the current project. In column 2, please identify the project partners involved by using the numbering employed in the project proposal (e.g. partner 1 or P1).

Training within the consortium (*e.g.* workshops, courses, on-field training, or others)	**Partner involved**
Workshop: GRID – GeoReferenced Interaction Database (2 December 2016, Athens).	P1,P2, P3, P4, P5, P6, P7, P8
Workshop: DISPLACE – A spatial model of fishery to help maritime spatial planning (2 December 2016, Athens; 5-9 March 2018, Ancona).	P1,P2, P3, P4, P5, P6, P7, P8
Workshop: Desenvolvimento e sustentabilidade da pesca e aquacultura na Região Noroeste de Portugal. ECOAST	P8

workshop with stakeholders from the NW Region of Portugal to discuss the results of the questionnaires conducted in the scope of WP 6 and the implementation of the Portuguese strategy for the development of fishery and aquaculture in the region (7 May 2019, Porto).	
Workshop: Ecological footprint of fish farming in coastal areas: identification and response for improved management & InVEST(12 May 2017, Stavanger).	P1,P2, P3, P4, P5, P6, P7, P8
Workshop: ECOAST INTERNATIONAL WORKSHOP Practical experiences of spatial planning with fisheries and aquaculture (6 June 2019, Copenhagen).	P1,P2, P3, P4, P5, P6, P7, P8
NIMDR (P7) young members of the team had one half day training back to back with each Steering Committee, to learn and apply the new methods involved in the project. In addition, NIMRD scientists took more lessons: in ANCONA, for marine fish stocks assessment coordinated by the project leader IRBIM and in Athens, for Cumulative Impact method application, coordinated by HCMR (WP4).	P1,P2, P3, P4, P5, P6, P7, P8

6.4. Socio-economic impact

6.4.1. Please list below the number of jobs created within the framework of the current project

(Post-Doc Fellowships & Contracts)

Partner Number	Type (Fellowship/ Contract)	Name	Gender		Duration of the fellowship/contract months/years
			F	M	
P7	Permanent Contract NIMRD	Cristian Danilov		X	Permanent on the Project Development
P7	Permanent Contract NIMRD	Alexandru Dan Nicolaev		X	Permanent on the Project Developmen
P7	New Employed	Madalina Gabriela Rosca	X		Prolonged till November 2018
P8	Post-doc Fellowship	Emilio Salas Leiton		x	14 months
P8	Post-doc Fellowship	Luís R. Vieira		x	6 months
P8	Research fellowship (Master degree)	Luís Gabriel Barboza		x	5 months

6.4.2. How about valuables that could be generated outside the project. Are any of the partners of the consortium planning a creation of a job that can exceed the project?

Two young employed of NIMRD which were contracted under ECOAST project are now evaluated to became permanent. The third one has also chances to be evaluated after two years of work.

6.4.3. Has the result of the project been implemented by the industry to some extent?

The results from WP3, new tools to estimate organic load, have been introduced to fish farmers in Iceland. In an Icelandic funded study the methodology was to some extend tested out with success (Eiriksson et. al, 2017). Further discussion is now being conducted in Iceland if this method should be implemented as a standard tool for measuring AOM.

6.5. Impact / achievements

6.5.1. Have the results of the COFASP funded project allowed the development of new strategies for:

Preliminary spatial plans to be integrated in the National Maritime Spatial Plan in Romania (Black Sea), which is under development.
Aquaculture zoning and identification of allocated zones for aquaculture (AZA). Area management to improve aquaculture sustainability and minimize spatial conflicts end potential enviromental impacts.

6.6. Bioresources exchange

6.6.1. Has the consortium exchanged bioresources (ex. feeds, larvae, by-products)?

NO

6.6.2. Has the bioresource exchanged allowed common studies?

NO

6.6.3. Has the critical mass of samples necessary for publication been reached?

NO

7. Cost overview and deviations from budget

Project budget and costs in €

Partner no.	1	2	3	4	5	6	7	8
TOTAL BUDGET	125,305.00	64,600.00	288,840.00	644,400.00	718,520.00	99,700.00	200,000.00	127,500.00
Spent at Mid term	105,713.67	55,885.00	109,525.86	471,836.19	240,487.00	19,436.98	98,154.00	12,513.00
Spent in 2nd period	39,587.04	6,092.31	178,714.01	175,642.94	452,369.20	47,777.21	101,846.00	88,767.58
TOTAL SPENT	145,300.71	61,977.31	288,239.87	471,836.19	692,856.20	67,214.19	200,000.00	101,280.58
DEVIATION	+19,995.71	-2,622.69	-600.13	3,079.13	-25,663,80 (**)	-34,485.81	0	-26,219.42 (****)

Person months (PM) spent on the project

Partner no.	1	2	3	4	5	6	7	8
TOTAL PM budgeted	61.00	24.00	28.00	30.00	32.00	55.00	94.80	80.20
Spent at Mid term	20.88	18.00	11.20	22.00	16.00	14.76	23.73	31.10
PM spent in 2nd period	5.81	6.00	21.30	8.00	30.60	14.00	16.97	50.10
TOTAL PM SPENT	26.69	24.00	32.50	30.00	46.60	28.76	40.70	81.20
DEVIATION	-34.31(*)	0	+4.50	0	+14.60 (**)	-26.24 (*****)	-54.10 (***)	+1.00 (****)

Reasons for major deviations in spending compared to original budget:

- (*)The reason of CNR-IRBIM deviation in person months compared with the original proposal was due to the sensible increase of the salaries of the permanent scientists working on the project (from 2015 to 2019).
- (**) The reason for the deviation in spending of IMR compared to the original budget is due to fluctuating exchange rates between euro and the Norwegian krone (NOK) throughout the project period. The Norwegian budget is in NOK, and the whole budget will be spent before August 31. The deviation in man months between the budget and what is done is due to different hourly rates of scientists and technicians. More hours have been used by technicians and less by scientists than was put in the original project budget.
- (***) For NIMRD The Person months spent in the project are 54.10 units, smaller than in the project proposal. Since 2017 INCDM salaries started to be paid on projects, with an official established tariff, in relation with national legislative regulations, nominated/given by Government Decision. The limits set by the government are significantly higher than those planned in the ECOAST project. Under these conditions, the number of hours was reduced and the Person Months was 40.70 in total, within the budget limits, without affecting the results and the objectives of the project.

- (****) The reason of ICBAS deviation in spending compared with the original budget, and in person/months spent on the project was due to the delay in contracting the post-doc researcher, and administrative delays regarding other expenses. The delay in contracting the first post-doc researcher resulted from: (i) the delay in signing the project contract with the national funding Agency (FCT) that was signed in October 2016; (ii) administrative procedures required to open the call for application; (iii) in the first call, no candidates applied and thus another call was openned with additional administrative procedures; (iv) in the second applications call, only one candidate applied but he did not have the required skills, thus another call was open and finally a post-doc was contracted and started his work on the 2sd July 2018. The deviation and reasons for it were reported to FCT in the annual reports. After getting permission from FCT, in 2019 we contracted an additional post-doc researcher for 6 months and a researcher with Master degree for 5 months.
- (*****) For HCMR the person months spent in the project are 26.24 units smaller than in the proposal of the project. This is due to the fact that, since 2018, according to the national legislation the only eligible personnel for co-funding projects is strictly based on the additional cost model that only the researchers are allowed to follow. Within this legal framework we did not have the opportunity to declare the scientific and technicians staff person months that was foreseen in the proposal. In addition to this, the major delay in signing the project contract with the national funding Agency (GSRT) that was signed in October 2017 was very critical for the spending of person months.

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