

	EUROPEAN COMMISSION RESEARCH AND INNOVATION DG	Periodic Report
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Project No: 603121

Project Acronym: DIVERSIFY

Project Full Name: Exploring the biological and socio-economic potential of new/emerging candidate fish species for the expansion of the European aquaculture industry

Periodic Report

Period covered: from 01/12/2014 to 31/05/2016

Start date of project: 01/12/2013

Project coordinator name:

Dr. Constantinos Mylonas

Version: 1

Date of preparation: 22/07/2016

Date of submission (SESAM): 29/07/2016

Project coordinator organisation name:

HELLENIC CENTRE FOR MARINE RESEARCH

Periodic Report

PROJECT PERIODIC REPORT

Grant Agreement number:	603121
Project acronym:	DIVERSIFY
Project title:	Exploring the biological and socio-economic potential of new/emerging candidate fish species for the expansion of the European aquaculture industry
Funding Scheme:	FP7-CP-TP
Date of latest version of Annex I against which the assessment will be made:	12/11/2015
Period number:	2nd
Period covered - start date:	01/12/2014
Period covered - end date:	31/05/2016
Name of the scientific representative of the project's coordinator and organisation:	Dr. Constantinos Mylonas HELLENIC CENTRE FOR MARINE RESEARCH
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Declaration by the scientific representative of the project coordinator (1)

I, Dr. Constantinos Mylonas HELLENIC CENTRE FOR MARINE RESEARCH , as scientific representative of the coordinator of the project DIVERSIFY and in line with the obligations as stated in Article II.2.3 of the Grant Agreement declare that:

The project has fully achieved its objectives and technical goals for the period.

The attached periodic report represents an accurate description of the work carried out in this project for this reporting period.

The public website is up to date.

To my best knowledge, the financial statements which are being submitted as part of this report are in line with the actual work carried out and are consistent with the report on the resources used for the project (section 6) and if applicable with the certificate on financial statement.

All beneficiaries, in particular non-profit public bodies, secondary and higher education establishments, research organisations and SMEs, have declared to have verified their legal status. Any changes have been reported under section 5 (Project Management) in accordance with Article II.3.f of the Grant Agreement.

Name	Dr. Constantinos Mylonas HELLENIC CENTRE FOR MARINE RESEARCH
Date	29/07/2016

This declaration was visaed electronically byConstantinos MYLONAS(ECAS user name nmylocon) on 29/07/2016

1. Publishable summary

Summary description of project context and objectives

The European aquaculture sector is a modern industry employing 190,000 people (directly or indirectly), with a €7 billion ex-farm value. Many world-class researchers and facilities exist in research centers and universities throughout Europe, while the private sector employs highly skilled and educated personnel, with modern production facilities. This sector is well situated to be among world leaders in the efficient and sustainable production of safe seafood of the highest quality and nutritional value, taking into account consumer preferences and lifestyles, and the immense diversity of aquatic products from the wild, to which the consumer is accustomed.

Aquaculture is undertaken in all EU states, and plays an important role in the supply of high quality seafood to the European consumer. Europe has an increasing demand for a diverse range of fish products especially for fish fillets or processed products. However, while the worldwide contribution of aquaculture towards fish consumption is just shy of 50%, in the EU only 10% of the seafood consumption originates from EU aquaculture and the consumption of imported seafood is currently at 65% today. This situation can be attributed partially to a lack of diversity of aquaculture products and, perhaps more importantly, a lack of processed aquaculture products.

Even though some 35 aquatic species are cultured in Europe, finfish aquaculture production is dominated both in volume and value by a handful of species --such as Atlantic salmon (*Salmo salar*), rainbow trout (*Oncorhynchus mykiss*), common carp (*Cyprinus carpio*), European sea bass (*Dicentrarchus labrax*) and gilthead sea bream (*Sparus aurata*)-- that in turn limit the number of aquaculture products available in the market. An efficient, sustainable and market-oriented expansion of the EU aquaculture sector based on new species and products will reduce the dependence of the EU consumer on imports from countries of questionable, often, production, health, environmental and social standards, and reduce the pressure on over-exploited fisheries in the EU.

DIVERSIFY will provide knowledge where needed to solve bottlenecks in juvenile production, grow-out, nutrition and feeding husbandry, new product development and marketing of six new/emerging species. DIVERSIFY focuses on meagre (*Argyrosomus regius*) and greater amberjack (*Seriola dumerili*) for marine warm-water cage culture, wreckfish (*Polyprion americanus*) for warm- and cool-water marine cage culture, Atlantic halibut (*Hippoglossus hippoglossus*) for marine cold-water culture, grey mullet (*Mugil cephalus*) a euryhaline herbivore for warm-water pond, extensive and integrated culture, and pikeperch (*Sanders lucioperca*) for freshwater intensive culture using Recirculation Aquaculture Systems (RAS). These species were selected based both on their biological and economical potential, and to cover the entire European geographic area and stimulate different aquaculture types. Given their large size and/or fast growth, these species provide for high dress-out and fillet yield, short time to market and suitability for product diversification and development of value-added products. The expertise in the consortium and lessons learned could provide in a 5-year period what took the Atlantic salmon industry 20 years of development.

A strong socioeconomic component is also included in DIVERSIFY, in order to address issues that are presently important bottlenecks in aquaculture consumption and diversification --which are beyond biological/production issues. The socioeconomic part of the project has an applied market development approach. In this component the perception of aquaculture products in general and products specifically, market demand, consumer and professional buyer preferences, new product development, value adding to raw products and market development have a central role. An important bottleneck in aquaculture consumption is that in many countries and/or segments of the EU market, aquaculture fish have a weaker image than wild fish. This threat to the expansion of the aquaculture sector must be recognized and addressed in parallel to any technological improvement of production methods or the addition of new fish species or products by the aquaculture industry.

The combination of biological, technological and socioeconomic research activities planned in DIVERSIFY are expected to support the diversification of the aquaculture industry and help in expanding production, increasing aquaculture products and development of new markets.

Description of work performed and main results

In the area of Reproduction & Genetics, spawning was obtained from all species for which the aim was to improve reproductive control. A protocol for paired spawning with male rotation and in vitro fertilization methods has been developed in meagre, in order to enable the implementation of breeding programs. The study of wild and captive-reared greater amberjack showed that under some rearing conditions severe impairment of gametogenesis occurred in captivity. In other cases, greater amberjack produced good quality eggs from spontaneous natural and GnRHa-induced spawnings, either when maintained in tanks (Atlantic broodstocks) or in sea cages (Mediterranean broodstocks). Treatment of Atlantic halibut F1 breeders with GnRHa implants induced and synchronized ovulations without any effect on egg quality or quantity, and provides an approach to ensure predictable ovulations. In wreckfish, we obtained spontaneous natural spawning in tanks, GnRHa induced spawning in tanks and stripped gametes for in vitro fertilization, though egg production and quality is still not considered optimal. Grey mullet recombinant follicle stimulating hormone was produced and was used to enhance and synchronize gametogenesis.

In the area of Nutrition, studies with meagre demonstrated that weaning diets must be optimized increasing HUFA levels, as well as vitamins E and C to spare these essential fatty acids from oxidation. Maximum growth of greater amberjack larvae was achieved in the range of dietary 8-16% EPA when low dietary DHA was provided. Rotifers enriched marine lecithin combined with carotenoids resulted in a significant advantage in larval growth, survival and welfare. For greater amberjack broodstock nutrition, histidine supplementation increased the number of eggs, percentage of fertilization, hatching rate and larval survival. In pikeperch larvae, the combination of high phospholipid (PL) content and high DHA content improved larval growth. A protocol for weaning of Atlantic halibut at 28 days post first-feeding has been developed, while growth and juvenile quality was not improved by feeding on grown Artemia. For grey mullet, a significant effect of taurine enrichment of rotifers on larval and juvenile growth from 12 to 44 days post hatching (dph) has been described, while there appears to be no added benefit of feeding taurine enriched Artemia on larval weight.

In the area of Larval husbandry, very significant achievements have been made during this period. In meagre, our studies concluded that larvae can be weaned from live feed to an artificial diet as early as 10 dph. A great success was achieved in the greater amberjack larval rearing season of 2016 (Mo 31-32). Even though the complete analysis is pending, the results are significant because the very high survival rates achieved are reported for the first time in greater amberjack, indicating a significant technological step in the larval rearing of this species, which will enable its commercial production. The study of pikeperch larvae recommended a light intensity of 50 lux, water renewal rate of 100%, afternoon tank cleaning and water entering the tank from the bottom for best larval performance. Although experiments with wreckfish were limited by few and poor quality spawns, we succeeded for the first time to rear wreckfish larvae to 22 dph. In grey mullet, a study concluded that rotifer consumption and survival of larvae and juveniles were dependent on algal turbidity, but independent of algal type.

More work in the area of Grow out husbandry has been implemented during this period. In meagre, different net depth in cages resulted in no differences in growth, but mortality and feed conversion ratio (FCR) were lower in deep nets. Behavioral studies demonstrated that (a) meagre is able to be trained and to remember specific stimuli that are associated with feeding time and (b) light is an acute stimulus to which the fish respond very quickly (from the second day of its application). Environmental temperature affected significantly the performance of greater amberjack juveniles, as fish held at 26°C grew better than those held at 22°C. Regarding the stocking density, fish at high density exhibited lower growth rate, condition index and feed intake. Pikeperch juveniles prefer sinking feed than floating one, but a strong synergy was observed with the feed type and light spectrum, temperature, photoperiod and oxygen saturation levels. In grey mullet, fishmeal substitution up to 75% by a mixture of plant protein in weaning diets did not affect fish growth, survival, digestive capacity or the innate antioxidative stress response.

In the area of Fish health, a study of Systemic Granulomatosis (SG) of meagre showed that vitamin D did not affect the development of SG. Histological assessment of all fish gave new insights into the development of the disease including the possible implication of rodlet cells and the unique

inflammatory response of the fish. In addition we have seen that both high inclusions of Phosphorus and astaxanthin have beneficial effects concerning the severity of SG. In the study of Chronic Ulcerative Dermatopathy (CUD), results confirm the hypothesis that the disease is related to the use of borehole water. Further, qPCR analysis has indicated that there is overexpression of the genes that are connected with the specific osteolytic enzymes showing that the mechanism of the disease involves the activation of the osteoclasts by the increased CO₂ in borehole water. We also carried out work on the characterization of the immune system. In meagre, several incidences have been recorded with an outbreak of monogeneans in broodstock and of mycobacteriosis in cage cultured fish being the most significant. Work with greater amberjack during the current reporting period included a) morphological studies on the incidence of monogenean parasites in greater amberjack skin, b) determination of environmental conditions that can modulate greater amberjack resistance to parasitic infection, c) formulation of a diet supplemented with mucus stimulation products, and d) standardization of monogenean cultures. In Atlantic halibut, we have managed to express the nodavirus capsid protein in all three systems. However, it was only in the E. coli system that we achieved sufficient and high expression for further use of the protein as antigen for vaccination purposes.

In the area of socioeconomics, work indicates that sector experts have difficulty to identify the market opportunities, since not all species are well-known in all markets. However, the analysis shows that most countries have a stimulation program to consume more fish. A main obstacle for acceptance of new products in the chain is that buyers and category managers of supermarkets are no longer experts of the category they cover. Therefore the difference between local for local and global sourcing is difficult to explain. What is anyhow necessary is positioning of the species towards other animal proteins, since these are dominant in some of the EU markets. In the development of new products, fish seems to be a food category that does not have a saturated market yet. New product introductions in the market already explain that retailers also see possibilities in this food category for growth. Of the selected products, prototypes have been produced that have been sensory tested. The segmentation study has identified a clear group of consumers that could be early adopters of these aquaculture species in the five selected countries and the market size of these segments. Especially the research regarding the institutional and organizational context shows that in the past there has been hardly any consumer research done in positioning of products. Given the dominance of salmon, trout, Pangasius and carp in the EU market, all other products have to be positioned around these market leaders.

Expected final results and potential impacts

DIVERSIFY is expected to advance the current knowledge beyond the state-of-the-art and impact on the current and near future activity of the European aquaculture industry. The diverse and complementary nature of the consortium will allow a number of key basic questions of various fields such as reproduction, development, growth, nutrition, adaptation and immunity to be addressed for a multitude of species. DIVERSIFY was designed to solve the main bottlenecks identified by the sector with regards to the incorporation of new fish species. These improvements will be set up on the conjunction of two sources of information: i) basic knowledge on biological processes affecting fish culture and ii) applied knowledge on the development of species-specific protocols for fish culture optimization. In particular, expected results and their potential impact on aquaculture science include:

Reproduction: The controlled availability of gametes is imperative for sustainable aquaculture. DIVERSIFY will provide improved understanding of the regulation of reproduction, as well as define optimal broodstock management conditions and broodstock diets in order to assure optimal gamete quality, and will develop species-specific spawning induction protocols. Improved reproductive function may, in turn, reduce the occurrence of skeletal deformities and poor larval and juvenile performance. In addition, specific tools such as ELISA assays for reproductive hormones will be developed with multiple scientific and industrial applications.

Genetics: DIVERSIFY will focus on the genetic characterization of actual broodstocks of meagre and pikeperch, the two species with current relevant industrial production, in order to overcome future inbreeding problems in these two species and solve current problems with variable growth rates (meagre) and stress sensitivity (pikeperch). Thus, the genetic characterization of fast and slow

growing meagre (SNP approach) and the genetic diversity and stress sensitivity in pikeperch (microsatellite approach) will provide useful tools for improvement of actual culture practices, and establishing the basis for selective breeding programs that will serve to scale-up and improve their production in terms of quantity and quality.

Nutrition: The cost of feeding in aquaculture production is around 40-70% of total production cost. New species in aquaculture are fed with available diets designed for other species, which may constraint their growth performance and general condition. For this reason, it is important to develop species-specific feeds that consider the nutritional requirements of each species at different stages of development and that can improve their performance (e.g. FCR, growth rate), quality (e.g. morphology, fillet yield and product composition, and egg viability) and health condition (e.g. prevention of metabolic disorders). To achieve this goal, DIVERSIFY will establish the unknown nutritional requirements of several macro- and micronutrients and dietary energy needs for most of the species considered in the proposal. In addition, in order to fit larval needs, specific live prey enrichment products will be developed. Development of specific formulated feeds, live prey enrichment products and feeding protocols will result in new products that may be commercialized worldwide.

Growth and husbandry: A larval and juvenile rearing system is a complex environment, with numerous factors influencing larval development and performance, as well as behavior and survival. These factors can be environmental (light intensity, temperature, salinity, tank color, water current), nutritional (feed composition and availability, feeding frequency), social (fish density) and genetic. For species such as meagre, pikeperch, grey mullet and Atlantic halibut, improvements in terms of fish growth and husbandry will be addressed to refine the existing protocols (e.g. weaning schedule), procedures and facilities (e.g. semi-intensive and intensive rearing procedures, cage culture, RAS and flow-through systems) in order to solve existing bottlenecks (e.g., large size dispersion and high variable growth rates in the case of meagre, high cannibalism rates in pikeperch, low survival and larval quality in halibut and grey mullet). In contrast, emphasis will be given to developing new species-specific larval rearing protocols in the case of greater amberjack and wreckfish, since these are species with important knowledge gaps in these areas. This approach will increase our knowledge on the development of fish larvae in greater amberjack, wreckfish, Atlantic halibut, grey mullet and pikeperch that will serve to synchronize the state of development of the fish under different rearing conditions with the new or existing rearing technology. Finally, the output of these tasks will be the development and refining of rearing protocols for selected species that will result in the improvement of current practices, and an increase in production yields.

Health: Fish health is a key trait to be optimized in cultured fish. The effect of the developmental stage, rearing conditions and nutrition on the capacity to modulate specific immune responses will help predict vaccine responsiveness and fish health. DIVERSIFY will characterize the immune system of meagre and greater amberjack to identify key immune molecules as potential markers of immune system development, and induction of antiviral and antibacterial responses in preparation for vaccine development for disease management. In addition, potential solutions for specific bacterial infections and parasitoses will be investigated, providing means to prevent and/or minimize these issues at an industrial scale.

Also related, transport of live animals across large distances and introduction of allochthonous species to new geographic regions is a continual source of introduced and emerging diseases, and potentially zoonotic ones as well. A primary goal of this project - the improved efficiency of fish culture for the food sector - means that autochthonous species can be produced locally and reduce market drives for other aquatic species, and thereby eliminate the risks associated with the introduction of allochthonous species for cultivation that may do harm to local species diversity in the region of introduction. While preventing emerging or introduced aquatic diseases is not a goal or the focus of this project, it is an added positive impact that may have on the sector.

Sustainability: Sustainability of aquaculture production has a strong uphold in DIVERSIFY and has been considered from different points of view, most of them already mentioned above. To summarize, these concerns have been addressed by i) supporting the growth and expansion of the sector based on different production systems that can be regarded as more sustainable (cage culture – no competition with land resources; RAS- ecologically friendly, with efficient use of water; extensive pond-lagoon culture, with very low environmental effects and in some cases even

contributing to the restoration of ecosystems – e.g., abandoned “Salinas”/salt marshes); ii) introduction of a herbivorous fish into the aquaculture sector, with positive influence in the environment where it is cultured (improving sediment quality, avoiding oxygen depletion and reducing ammonia levels) and requiring low or close to none input from marine-based feedstuffs; iii) an important focus of the proposal resides on the determination of species-specific dietary requirements, including the investigation of more sustainable ingredients, as well as feeding behaviour, which will result in less waste of diets and nutrients into the environment; iv) research will be conducted that will hopefully enable anticipated potential disease problems to have veterinary solutions prepared in time and, finally, v) considering consumer requirements, including changes in societal and ethnic demands, to enable a market-orientated growth of the aquaculture sector. Altogether, these factors will ensure a sustainable growth and expansion of aquaculture within the EU and EEA member states.

So, overall, the main expected impact of DIVERSIFY will be the identification of the most appropriate new/emerging fish candidates for the future growth of the European marine and inland aquaculture and the improvement of production technologies for the selected species. Furthermore, DIVERSIFY is expected to have also a significant impact on removing bottlenecks in markets and consumer's perception and preferences. This will be achieved through identification of innovative opportunities for growth of the industry and increase of the EU consumption of aquaculture products through diversification of products and marketing approaches directed to improve consumer perception of aquaculture and develop new markets. Such an integrated combination of biological, technological and socioeconomic activities will lead to a reduction in the dependence of the EU on imports from third countries of questionable, at times, production, health, environmental and social standards.

Project public website address:

www.diversifyfish.eu

2. Core of the report

Project objectives, Work progress and achievements, and project management during the period

The Project Summary Pdf document contains the core of the report.

3. Deliverables and milestones tables

Deliverables (excluding the periodic and final reports)										
Del. no.	Deliverable name	Version	WP no.	Lead beneficiary	Nature	Dissemination level	Delivery date from Annex I (proj month)	Actual / Forecast delivery date	Status	Comments
1	Kick-off meeting	1.0	1	HELLENIC CENTRE FOR MARINE RESEARCH	Other	RE	2	10/02/2014	Submitted	
2	Consortium Agreement	2.0	1	HELLENIC CENTRE FOR MARINE RESEARCH	Other	CO	3	13/03/2015	Submitted	
3	Annual Coordination Meeting for Y2	1.0	1	HELLENIC CENTRE FOR MARINE RESEARCH	Other	RE	13	28/11/2014	Submitted	
4	Periodic Report, including financial and administrative reports for Mo 1-12	1.0	1	HELLENIC CENTRE FOR MARINE RESEARCH	Report	CO	14	23/01/2015	Submitted	
5	Interactions with other projects	1.0	1	HELLENIC CENTRE FOR MARINE RESEARCH	Report	RE	18	29/05/2015	Submitted	
6	Annual Coordination Meeting for Y3	1.0	1	HELLENIC CENTRE FOR MARINE RESEARCH	Other	RE	25	07/03/2016	Submitted	
7	Mid-term evaluation of progress	0.0	1	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	30	31/05/2016	Not submitted	
8	Periodic Report, including financial and administrative reports for Mo 13-30	0.0	1	HELLENIC CENTRE FOR MARINE RESEARCH	Report	CO	32	31/07/2016	Not submitted	
9	Annual Coordination Meeting	0.0	1	HELLENIC CENTRE FOR MARINE RESEARCH	Report	RE	37	31/12/2016	Not submitted	

	meeting for Y4			ENTRE FOR MARINE RESEARCH						
10	Annual Coordination Meeting for Y5	0.0	1	HELLENIC CENTRE FOR MARINE RESEARCH	Report	RE	49	31/12/2017	Not submitted	
11	Periodic Report, including financial and administrative reports for Mo 31-48	0.0	1	HELLENIC CENTRE FOR MARINE RESEARCH	Report	RE	50	31/01/2018	Not submitted	
12	Annual Coordination Meeting (Final)	0.0	1	HELLENIC CENTRE FOR MARINE RESEARCH	Report	RE	60	30/11/2018	Not submitted	
13	Periodic Report, including financial and administrative reports for Mo 49-60	0.0	1	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	60	30/11/2018	Not submitted	
14	Final Report	0.0	1	HELLENIC CENTRE FOR MARINE RESEARCH	Report	RE	60	30/11/2018	Not submitted	
1	SNP library and chip to genetically characterise meagre or to use in marker assisted breeding programs (M18)	2.0	2	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	18	01/06/2015	Submitted	
2	Genetic characterisation of different meagre captive broodstocks and evaluation of a available variability (M12)	1.0	2	FUNDACION CANARIA PARQUE CIENTIFICO TECNOLÓGICO DE LA UNIVERSIDAD DE LAS PALMAS DE GRAN CANARIA	Report	PU	12	15/12/2014	Submitted	
3	Protocol for paired spontaneous tank spawning of meagre	1.0	2	INSTITUT DE RECERCA I TECNOLOGIA AGROALIMENTARIES.	Report	PU	21	22/09/2015	Submitted	

4	Construction of a genetic linkage map in meagre	0.0	2	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	36	30/11/2016	Not submitted	
5	Identification of genetic markers related to growth for use in marker assisted breeding programs for meagre through QTL mapping	0.0	2	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	36	30/11/2016	Not submitted	
6	Description of sperm characteristics and cryopreservation protocol of meagre sperm	0.0	2	INSTITUT FRANCAIS DE RECHERCHE POUR L'EXPLOITATION DE LA MER	Report	PU	36	30/11/2016	Not submitted	
7	Protocol for the stripping spawning of meagre females and in vitro fertilization	0.0	2	INSTITUT DE RECHERCHE TECHNOLOGIQUE AGROALIMENTAIRES.	Report	PU	36	30/11/2016	Not submitted	
1	Establishment of quantitative PCR assays to measure transcript levels of target genes in greater amberjack (i.e., LH#, FSH#, leptin, Vg and Vg receptor)	1.0	3	ISRAEL OCEANOGRAPHIC AND LIMNOLOGICAL RESEARCH LIMITED	Report	PU	12	17/03/2015	Submitted	
2	Establishment of hormone specific ELISAs for measuring LH, FSH and leptin in greater amberjack	1.0	3	ISRAEL OCEANOGRAPHIC AND LIMNOLOGICAL RESEARCH LIMITED	Report	PU	18	31/05/2015	Not submitted	
3	Identification of possible reproductive dysfunction of gametogenesis of greater amberjack reared in captivity based on the comparative evaluation of fish sampled in the wild, in terms of proliferating	1.0	3	UNIVERSITA DEGLI STUDI DI BARI "ALDO MORO"	Report	PU	24	26/01/2016	Submitted	
4	Establishment of a Co	1.0	3	INSTITUT F	Report	PU	32	22/07/2016	Submitted	

	Computer Assisted Sperm Analysis (CASA) for the evaluation of greater amberjack sperm			RANCAIS DE RECHERCHE POUR L'EXPLOITATION DE LA MER					
5	Description of the processes of oogenesis in captive greater amberjack, including (a) aspects of growth and body indices, (b) histological evaluation of ovarian development, (c) pituitary levels of FSH	0.0	3	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	46	30/09/2017	Not submitted
6	Description of the processes of spermatogenesis in captive greater amberjack, including (a) aspects of growth and body indices, (b) histological evaluation of testicular development, (c) pituitary level	0.0	3	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	46	30/09/2017	Not submitted
7	Comparative effectiveness of a GnRHa injection vs GnRHa implant treatment for the induction of spawning of greater amberjack in the eastern Atlantic	0.0	3	FUNDACION CANARIA PARQUE CIENTIFICO TECNOLÓGICO DE LA UNIVERSIDAD DE LAS PALMAS DE GRAN CANARIA	Report	PU	48	30/11/2017	Not submitted
8	Dose response of GnRH a implant therapy for the induction of spawning in F1 generation broodstock of greater amberjack in the eastern Atlantic	0.0	3	INSTITUTO ESPAÑOL DE OCEANOGRAFIA	Report	PU	54	31/05/2018	Not submitted
9	Development of a spawning induction therapy for captive reared broodstock in the Mediterranean Sea based on the use of GnRH a in the correct mode of administration (hormone /implant), dose and timing	0.0	3	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	54	31/05/2018	Not submitted

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10	Method for inducing spawning and collecting greater amberjack eggs in sea cages	0.0	3	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	54	31/05/2018	Not submitted
1	Genetic analysis of domesticated pikeperch broodstocks	1.0	4	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	12	19/11/2014	Submitted
2	Population genetic analysis of wild and comparison with domesticated pikeperch populations to be applied in future breeding programs of the species	1.0	4	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	16	19/03/2015	Submitted
1	Documentation of reproductive performance in wild-captured vs cultured female Atlantic halibut	0.0	5	HAVFORSKNINGSINSTITUTTET	Report	PU	30	31/05/2016	Not submitted
2	An optimised GnRH therapy protocol to improve spawning performance of F1/F2 Atlantic halibut, and to increase availability of eggs of stable and predictable quality	1.0	5	HAVFORSKNINGSINSTITUTTET	Report	PU	30	12/05/2016	Submitted
3	Identification of potential disturbances in reproductive development in F1/F2 Atlantic halibut females	0.0	5	HAVFORSKNINGSINSTITUTTET	Report	PU	48	30/11/2017	Not submitted
1	Computer Assisted Sperm Analysis (CASA) for wreckfish sperm	1.0	6	INSTITUT FRANCAIS DE RECHERCHE POUR L'EXPLOITATION DE LA MER	Report	PU	24	27/11/2015	Submitted
2	Cryopreservation method for wreckfish	1.0	6	INSTITUTO ESPANOL DE OCEANOGRAFIA	Report	PU	24	27/11/2015	Submitted

3	Spawning induction methods with in vitro fertilization of wreckfish	0.0	6	INSTITUTO ESPANOL DE OCEANOGRAFIA	Report	PU	36	30/11/2016	Not submitted	
4	Establish reliable collection methods and protocols to form new wreckfish broodstocks	0.0	6	CONSELLERIA DO MAR - XUNTA DE GALICIA	Report	PU	36	30/11/2016	Not submitted	
5	Description of the reproductive cycle of wreckfish	0.0	6	INSTITUTO ESPANOL DE OCEANOGRAFIA	Report	PU	48	30/11/2017	Not submitted	
6	An in vitro fertilization protocol to be employed by the industry to spawn wreckfish	0.0	6	INSTITUTO ESPANOL DE OCEANOGRAFIA	Report	PU	48	30/11/2017	Not submitted	
7	Spawning induction method for spontaneous spawning of wreckfish in large tanks	0.0	6	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	54	31/05/2018	Not submitted	
1	Establishment of a Computer Assisted Sperm Analysis (CASA) for the evaluation of grey mullet sperm	1.0	7	INSTITUT FRANCAIS DE RECHERCHE POUR L'EXPLOITATION DE LA MER	Report	PU	12	12/12/2014	Submitted	
2	Production of recombinant bioactive LH and FSH assay for grey mullet	1.0	7	ISRAEL OCEANOGRAPHIC AND LIMNOLOGICAL RESEARCH LIMITED	Report	PU	18	12/06/2015	Submitted	
3	Comparative effectiveness of hormonal treatments for spawning induction in captive grey mullet	1.0	7	ISRAEL OCEANOGRAPHIC AND LIMNOLOGICAL RESEARCH LIMITED	Report	PU	24	27/11/2015	Submitted	
4	Protocol for shipping grey mullet eggs	1.0	7	ISRAEL OCEANOGRAPHIC AND LIMNOLOGICAL RE	Report	PU	24	30/11/2015	Submitted	

				SEARCH LIT					
5	Description of the processes of oogenesis in captive-reared vs hatchery-produced grey mullet, including aspects of growth, body indices, and histological evaluation of ovarian development	0.0	7	UNIVERSITA DEGLI STUDI DI BARI "ALDO MORO"	Report	PU	48	30/11/2017	Not submitted
6	Culture procedure that identifies the on-growing period for the production of grey mullet roe (bottarga) from wild and hatchery juveniles	0.0	7	ISRAEL OCEANOGRAPHIC AND LIMNOLOGICAL RESEARCH LIT	Report	PU	54	31/05/2018	Not submitted
7	Development of a breeding protocol for captive-reared grey mullet broodstock based on optimized hormonal treatment, group structure and photo-thermal regime	0.0	7	ISRAEL OCEANOGRAPHIC AND LIMNOLOGICAL RESEARCH LIT	Report	PU	60	30/11/2018	Not submitted
1	Improvement of larval weaning diets	1.0	8	FUNDACION CANARIA PARQUE CIENTIFICO TECNOLÓGICO DE LA UNIVERSIDAD DE LAS PALMAS DE GRAN CANARIA	Report	PU	24	03/12/2015	Submitted
2	Recommended essential fatty acids contents in diets to promote meagre growth, welfare and health	0.0	8	FUNDACION CANARIA PARQUE CIENTIFICO TECNOLÓGICO DE LA UNIVERSIDAD DE LAS PALMAS DE GRAN CANARIA	Report	PU	48	30/11/2017	Not submitted
1	Optimum levels and ratios of essential fatty acids in relation to Tau	1.0	9	FUNDACION CANARIA PARQUE CIENT	Report	PU	24	16/12/2015	Submitted

	and combined PUF A-carotenoids in greater amberjack enrichment products			IFICO TECNOLÓGICO DE LA UNIVERSIDAD DE LAS PALMAS DE GRAN CANARIA						
2	Lys requirements of greater amberjack juveniles	0.0	9	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	36	30/11/2016	Not submitted	
3	Performance of grow-out diets for greater amberjack developed in order to maximize growth potential	0.0	9	CANARIAS EXPLOTACIONES MARINAS SL	Report	PU	58	30/09/2018	Not submitted	
4	Recommended protein, carotenoids, Tau and EPA levels in greater amberjack broodstocks	0.0	9	INSTITUTO ESPAÑOL DE OCEANOGRAFIA	Report	PU	58	30/09/2018	Not submitted	
1	Recommended Ca/P, vitamins and phospholipids to improve larval development and reduce skeletal alterations in pikeperch	0.0	10	DANMARKS TEKNISKE UNIVERSITET	Report	PU	36	30/11/2016	Not submitted	
2	Protocol for optimal early fatty acid enrichment to reduce stress sensitivity in pikeperch	0.0	10	DANMARKS TEKNISKE UNIVERSITET	Report	PU	36	30/11/2016	Not submitted	
3	Formulation for a diet better adapted to pikeperch requirements	0.0	10	ASIALOR SARL	Report	PU	48	30/11/2017	Not submitted	
1	Report on nutrient profile of Artemia nauplii and ongrown Artemia from IMR and SWH	1.0	11	HAVFORSKNINGSINSTITUTTET	Report	PU	24	27/11/2015	Submitted	
2	Report on optimal characteristics of feed particles and feeding environment for early weaning of Atlantic halibut larvae	0.0	11	HAVFORSKNINGSINSTITUTTET	Report	PU	36	30/11/2016	Not submitted	
3	Report on the nutrient retention and digestive phy	0.0	11	NASJONALT INSTITUTT FOR	Report	PU	36	30/11/2016	Not submitted	

	biology in Atlantic halibut larvae fed Artemia nauplii and on-grown Artemia			ENAEERINGS-OG SJOMATFO RSKNING					
4	Report on the nutrient retention and digestive physiology in Atlantic halibut larvae reared in RAS vs FTS	0.0	11	NASJONALT INSTITUTT FOR ENAEERINGS-OG SJOMATFO RSKNING	Report	PU	36	30/11/2016	Not submitted
5	Report on the effect of dietary phospholipids on Atlantic halibut juveniles	0.0	11	NASJONALT INSTITUTT FOR ENAEERINGS-OG SJOMATFO RSKNING	Report	PU	48	30/11/2017	Not submitted
1	Effect of live prey enrichment products on wreckfish larval performance	0.0	12	CONSELLERIA DO MAR - XUNTA DE GALICIA	Report	PU	54	31/05/2018	Not submitted
2	Recommendations for wreckfish broodstock feeds	0.0	12	CONSELLERIA DO MAR - XUNTA DE GALICIA	Report	PU	57	31/08/2018	Not submitted
1	Determine changes in the essential fatty acid requirement as a function of developmental stage and ambient salinity in grey mullet	0.0	13	ISRAEL OCEANOGRAPHIC AND LIMNOLOGICAL RESEARCH LIMITED	Report	PU	18	31/05/2015	Not submitted
2	Determine a developmental stage ability to synthesize key enzymes in Tau and bile acid synthesis in grey mullet	0.0	13	ISRAEL OCEANOGRAPHIC AND LIMNOLOGICAL RESEARCH LIMITED	Report	PU	18	31/05/2015	Not submitted
3	Determine the effects of pigments, essential fatty acids and Tau in grey mullet broodstock diets on egg quality, fecundity, hatching success, larval first feeding and vitellogenin expression accumulation	0.0	13	ISRAEL OCEANOGRAPHIC AND LIMNOLOGICAL RESEARCH LIMITED	Report	PU	36	30/11/2016	Not submitted

4	Determine the effects of essential fatty acids and Tau in non-fish meal feeds on flesh and bottarga quality in grey mullet	0.0	13	ISRAEL OCEANOGRAPHIC AND LIMNOLOGICAL RESEARCH LIMITED	Report	PU	48	30/11/2017	Not submitted	
5	Evaluate and maximize the dietary incorporation of a non-GMO genetically selected soybean meal that will increase nutrient absorption and reduce DT inflammation	0.0	13	UNIVERSITA DEGLI STUDI DI BARI "ALDO MORO"	Report	PP	55	30/06/2018	Not submitted	
1	Improved larval rearing protocol for meagre that includes weaning at an earlier age leading to reduced cost in live feed production and better quality juveniles	1.0	14	INSTITUT DE RECERCA I TECNOLOGIA AGROALIMENTARIES.	Report	PU	18	11/05/2016	Submitted	
1	Effective greater amberjack larval stocking densities	2.0	15	FUNDACION CANARIA PARQUE CIENTIFICO TECNOLOGICO DE LA UNIVERSIDAD DE LAS PALMAS DE GRAN CANARIA	Report	PU	16	10/05/2016	Submitted	
2	Efficient prey density and protocol of using immune modulators in greater amberjack larval rearing	0.0	15	INSTITUTO ESPANOL DE OCEANOGRAFIA	Report	PU	27	29/02/2016	Not submitted	
3	Optimum hydrodynamics and light conditions during greater amberjack larval rearing	0.0	15	FUNDACION CANARIA PARQUE CIENTIFICO TECNOLOGICO DE LA UNIVERSIDAD DE LAS PALMAS DE GRAN CANARIA	Report	PU	27	29/02/2016	Not submitted	
4	Ontogeny of greater a	2.0	15	HELLENIC C	Report	PU	27	24/06/2016	Submitted	

	amberjack larval visual and digestive system			ENTRE FOR MARINE RESEARCH						
5	An industrial protocol for greater amberjack larval rearing	0.0	15	INSTITUTO ESPANOL DE OCEANOGRAFIA	Report	PU	48	30/11/2017	Not submitted	
1	Determine effect of environmental factors on pikeperch larval rearing	1.0	16	Université de Lorraine	Report	PU	12	30/11/2014	Submitted	
2	Determine effect of nutritional factors on pikeperch larval rearing	0.0	16	Université de Lorraine	Report	PU	24	30/11/2015	Not submitted	
3	Determine effect of population factors on pikeperch larval rearing	0.0	16	Université de Lorraine	Report	PU	36	30/11/2016	Not submitted	
4	Identification of optimal combinations of factors for pikeperch larval rearing	0.0	16	Université de Lorraine	Report	PU	48	30/11/2017	Not submitted	
5	Evaluation of selected rearing combinations for pikeperch on farm condition	0.0	16	Université de Lorraine	Report	PU	57	31/08/2018	Not submitted	
6	Proposition of an industrial protocol for pikeperch rearing	0.0	16	ASIALOR SARL	Report	PU	57	31/08/2018	Not submitted	
1	Production protocol of on-grown Artemia	1.0	17	HAVFORSKNINGSINSTITUTTET	Report	PU	24	25/11/2015	Submitted	
2	Determine if RAS is a more effective protocol than FT for Atlantic halibut larvae	0.0	17	HAVFORSKNINGSINSTITUTTET	Report	PU	36	30/11/2016	Not submitted	
3	The effect of probiotics on Atlantic halibut larval microbiota and survival	0.0	17	HAVFORSKNINGSINSTITUTTET	Report	PU	36	30/11/2016	Not submitted	
4	Comparison of feeding on-grown Artemia versus Artemia nauplii on Atlantic halibut larval performance	0.0	17	HAVFORSKNINGSINSTITUTTET	Report	PU	36	30/11/2016	Not submitted	

	mance								
5	Development of an industrial protocol for probiotic treatment of halibut larvae	0.0	17	HAVFORSKNINGSINSTITUTTET	Report	PU	48	30/11/2017	Not submitted
1	Development of the digestive system of wreckfish	0.0	18	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	36	30/11/2016	Not submitted
2	Determine optimum temperature conditions for rearing wreckfish larvae	0.0	18	INSTITUTO ESPANOL DE OCEANOGRAFIA	Report	PU	36	30/11/2016	Not submitted
3	Develop a feeding protocol for wreckfish larvae	0.0	18	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	36	30/11/2016	Not submitted
4	Determine the most effective culture system (RAS vs flow-through) for wreckfish larvae	0.0	18	INSTITUTO ESPANOL DE OCEANOGRAFIA	Report	PU	48	30/11/2017	Not submitted
1	Determine most effective type and concentration of algae used in grey mullet larval rearing	0.0	19	ISRAEL OCEANOGRAPHIC AND LIMNOLOGICAL RESEARCH LIMITED	Report	PU	24	30/11/2015	Not submitted
2	Determining the effect of co-feeding ciliates and rotifers on digestive tract maturation and enzyme production	0.0	19	ISRAEL OCEANOGRAPHIC AND LIMNOLOGICAL RESEARCH LIMITED	Report	PU	36	30/11/2016	Not submitted
3	Determine weaning time and type of feed according to the shift from carnivorous to omnivorous feeding	0.0	19	ISRAEL OCEANOGRAPHIC AND LIMNOLOGICAL RESEARCH LIMITED	Report	PU	36	30/11/2016	Not submitted
4	Evaluate the effectiveness of replacing live algae	0.0	19	INSTITUT DE RECERCA I TEC	Report	PU	48	30/11/2017	Not submitted

	with lyophilized algae during grey mullet larval rearing			NOLOGIA AGROALIMENTARIAS.					
5	Evaluate an improved grey mullet larval rearing protocol in a commercial hatchery	0.0	19	VAS. GEITONAS & CO LTD EE	Report	PU	55	30/06/2018	Not submitted
1	Methodology to avoid size variability in meagre juveniles	1.0	20	INSTITUT DE RECERCA I TECNOLOGIA AGROALIMENTARIAS.	Report	PU	24	25/11/2015	Submitted
2	Definition of the optimum conditions for cage culture of meagre (Report)	0.0	20	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	39	28/02/2017	Not submitted
3	Methodology for meagre feeding	0.0	20	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	42	31/05/2017	Not submitted
1	Definition of optimum feeding methods for greater amberjack grow out	0.0	21	INSTITUTO ESPANOL DE OCEANOGRAFIA	Report	PU	42	31/05/2017	Not submitted
2	Definition of optimum conditions for cage culture of greater amberjack	0.0	21	FUNDACION CANARIA PARQUE CIENTIFICO TECNOLOGICO DE LA UNIVERSIDAD DE LAS PALMAS DE GRAN CANARIA	Report	PU	57	31/08/2018	Not submitted
1	Effects of multiple variables on stress, immune response and growth performances and recommendations of optimal conditions for pikeperch grow out	1.0	22	UNIVERSITE DE NAMUR ASBL	Report	PU	24	17/05/2016	Submitted
2	Validation of optimal rearing variables under	0.0	22	ASIALOR SARL	Report	PU	42	31/05/2017	Not submitted

	commercial farm conditions								
3	Effects of domestication on level and geographical origin on stress, immune response and growth performances and strain recommendation	0.0	22	UNIVERSITE DE NAMUR ASBL	Report	PU	48	30/11/2017	Not submitted
1	Cost-effective weaning strategies for wild-caught grey mullet grow out and their effect on growth and health status	1.0	23	INSTITUT DE RESEARCH I TECHNOLOGIA AGROALIMENTARIAS.	Report	PU	18	01/10/2015	Submitted
2	Stocking protocols for pond monoculture grow out of F1 and wild caught grey mullet	0.0	23	ISRAEL OCEANOGRAPHIC AND LIMNOLOGICAL RESEARCH LIMITED	Report	PU	30	31/05/2016	Not submitted
3	Comparison of the project's improved grey mullet grow-out feed under the different environmental and water conditions in Israel, Greece and Spain	0.0	23	ISRAEL OCEANOGRAPHIC AND LIMNOLOGICAL RESEARCH LIMITED	Report	PU	40	31/03/2017	Not submitted
1	The effect of vitamin D inclusions in diets in the development of Systemic Granulomatosis in meagre	1.0	24	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	20	08/01/2016	Submitted
2	The effect of Ca/P ratio in the diet in the development of Systemic Granulomatosis in meagre	1.0	24	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	24	15/06/2016	Submitted
3	Cloning of key marker genes of innate and adaptive immune responses in meagre	1.0	24	THE UNIVERSITY COURT OF THE UNIVERSITY OF ABERDEEN	Report	PU	26	20/01/2016	Submitted
4	Isolation and characterization of Nocardia from in	0.0	24	HELLENIC CENTRE FOR	Report	PU	36	30/11/2016	Not submitted

	fected meagre			MARINE RES EARCH					
5	The effect of high plant protein diets in the development of Systemic Granulomatosis in meagre	0.0	24	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	36	30/11/2016	Not submitted
6	Experimental vaccine for Nocardia for meagre	0.0	24	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	42	31/05/2017	Not submitted
7	Diagnostics protocol for Chronic Ulcerative Dermatopathy in meagre, aetiological factors and solutions	0.0	24	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	44	31/07/2017	Not submitted
8	Report on the prevention/treatment of Chronic Ulcerative Dermatopathy in meagre	0.0	24	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	44	31/07/2017	Not submitted
9	Determination of effective treatments for common monogenean parasites in meagre	0.0	24	INSTITUT DE RECERCA I TECNOLOGIA AGROALIMENTARIES.	Report	PU	48	30/11/2017	Not submitted
10	Kinetics of antibody and cytokine production established post-pathogen exposure or stimulation with PAMPs	0.0	24	THE UNIVERSITY COURT OF THE UNIVERSITY OF ABERDEEN	Report	PU	48	30/11/2017	Not submitted
11	Recommended levels of pro- and anti-oxidant nutrients to prevent Systemic Granulomatosis in meagre	0.0	24	FUNDACION CANARIA PARQUE CIENTIFICO TECNOLÓGICO DE LA UNIVERSIDAD DE LAS PALMAS DE GRAN CANARIA	Report	PU	54	31/05/2018	Not submitted
12	Determination of efficacy of vaccination of meagre against Nocardia	0.0	24	INSTITUT DE RECERCA I TECNOLOGIA AG	Report	PU	54	31/05/2018	Not submitted

				ROALIMENTA RIES.					
13	Description of immune gene expression pre- and post-immunization of meagre with Nocardia	0.0	24	INSTITUT DE RECERCA I TECNOLOGIA AGROALIMENTARIES.	Report	PU	54	31/05/2018	Not submitted
14	Diagnostics protocol for Systemic Granulomatosis, causes and solutions in meagre	0.0	24	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	54	31/05/2018	Not submitted
15	Report on the prevention/treatment of Systemic Granulomatosis in meagre	0.0	24	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	54	31/05/2018	Not submitted
16	Report of the major bacterial and viral diseases found in meagre, and where useful treatments have been developed, complete protocols for their implementation by the industry will be provided	0.0	24	FUNDACION CANARIA PARQUE CIENTIFICO TECNOLOGICO DE LA UNIVERSIDAD DE LAS PALMAS DE GRAN CANARIA	Report	PU	57	31/08/2018	Not submitted
17	Diagnostic-recommendation manual for meagre fish health	0.0	24	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	57	31/08/2018	Not submitted
1	Marker genes of mucosal immunity in greater amberjack cloned and ways to increase their expression level determined	0.0	25	THE UNIVERSITY COURT OF THE UNIVERSITY OF ABERDEEN	Report	PU	39	28/02/2017	Not submitted
2	Mucus defences of greater amberjack analysed and immune potential characterized	0.0	25	FUNDACION CANARIA PARQUE CIENTIFICO TECNOLOGICO DE LA UNIVERSIDAD DE LAS PALMAS DE GRAN CANARIA	Report	PU	39	28/02/2017	Not submitted

3	Impact of dietary regime on parasite resistance and mucosal defences of greater amberjack juveniles	0.0	25	THE UNIVERSITY COURT OF THE UNIVERSITY OF ABERDEEN	Report	PU	42	31/05/2017	Not submitted	
4	Protocol for early diagnosis of epitheliocystis during early stages of greater amberjack culture	0.0	25	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	44	31/07/2017	Not submitted	
5	Impact of oral administration of greater amberjack with mucus stimulation products on immune resistance to parasitic infections and development of molecular markers for its evaluation	0.0	25	FUNDACION CANARIA PARQUE CIENTIFICO TECNOLOGICO DE LA UNIVERSIDAD DE LAS PALMAS DE GRAN CANARIA	Report	PU	57	31/08/2018	Not submitted	
6	Rearing protocol against monogenean parasites	0.0	25	INSTITUTO ESPANOL DE OCEANOGRAFIA	Report	PU	57	31/08/2018	Not submitted	
7	Report on the major bacterial and viral diseases found in greater amberjack, and where useful treatments have been developed, complete protocols for their implementation by the industry will be provided	0.0	25	FUNDACION CANARIA PARQUE CIENTIFICO TECNOLOGICO DE LA UNIVERSIDAD DE LAS PALMAS DE GRAN CANARIA	Report	PU	57	31/08/2018	Not submitted	
8	Diagnostic-recommendation manual for greater amberjack fish health	0.0	25	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	57	31/08/2018	Not submitted	
1	Assess the use of two eukaryotic expression systems; microalgae and a protozoa (Leishmania tarentolae) for production of nodavirus capsid protein	1.0	26	HAVFORSKNINGSINSTITUTTET	Report	PU	24	13/11/2015	Submitted	
2	Testing of the delivery of vaccine candidates through	0.0	26	HAVFORSKNINGSINSTITUTTET	Report	PU	36	30/11/2016	Not submitted	

	ugh Artemia to Atlantic halibut larvae			TTET						
3	Determine immune response and effectiveness of orally delivered VNN capsid protein on protection of Atlantic halibut larvae	0.0	26	HAVFORSKNINGSINSTITUTTET	Report	PU	40	31/03/2017	Not submitted	
1	Report on external environmental factors that affect or will affect the production chains of meagre, greater amberjack, pikeperch, Atlantic halibut, wreckfish and grey mullet	1.0	27	STICHTING DIENST LANDBOUWKUNDIG ONDERZOEK	Report	PP	3	22/05/2014	Submitted	
2	Report on current certification schemes and standards and their business dynamics in the fish supply chain	1.0	27	STICHTING DIENST LANDBOUWKUNDIG ONDERZOEK	Report	PP	3	07/03/2014	Submitted	
3	Report on competitive analysis for the supply chains of meagre, greater amberjack, pikeperch, Atlantic halibut, wreckfish and grey mullet	1.0	27	STICHTING DIENST LANDBOUWKUNDIG ONDERZOEK	Report	PU	12	23/01/2015	Submitted	
4	Report on trend mapping for the European aquaculture, seafood sector and protein market in the (near) future	1.0	27	STICHTING DIENST LANDBOUWKUNDIG ONDERZOEK	Report	PU	12	05/12/2014	Submitted	
5	Report with results of international survey on industrial buyers' attitudes and perceptions regarding cultured fish	1.0	27	STICHTING DIENST LANDBOUWKUNDIG ONDERZOEK	Report	PU	12	28/11/2014	Submitted	
6	List of critical success factors for market acceptance	1.0	27	STICHTING DIENST LANDBOUWKUNDIG ONDERZOEK	Report	PU	12	20/02/2015	Submitted	
7	Report on the analysis of the business models and	1.0	27	STICHTING DIENST LAN	Report	PU	12	28/11/2014	Submitted	

	supply chains of the participating SME's			DBOUWKUNDIG ONDERZOEK					
1	Report with results of focus groups with consumers and experts regarding ideas for new products	1.0	28	AARHUS UNIVERSITET	Report	PU	14	14/04/2015	Submitted
2	List of ideas for new product development	1.0	28	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	16	21/07/2015	Submitted
3	Report on product and process solutions for each species based on technological, physical and sensory characteristics	1.0	28	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	18	05/10/2015	Submitted
4	Physical prototypes of new products from the selected species: meagre, greater amberjack, wreckfish, pikeperch and grey mullet	1.0	28	INSTITUT DE RECERCA I TECNOLOGIA AGROALIMENTARIES.	Report	PU	26	19/04/2016	Submitted
5	Report on results of quality evaluation study on basic quality characteristics of the developed products	0.0	28	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	54	31/05/2018	Not submitted
6	Report on results of sensory descriptive analysis of the developed products	0.0	28	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	54	31/05/2018	Not submitted
7	Report on correlation of technical quality with nutritional - rearing history	0.0	28	UNIVERSIDAD DE LA LAGUNA	Report	PU	54	31/05/2018	Not submitted
8	Technical assessment of selected species	0.0	28	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PP	58	30/09/2018	Not submitted
1	Dataset of consumers' perceptions, attitudes, buying intentions, consumption, willingness to buy and	1.0	29	STICHTING DIENST LANDBOUWKUNDIG ONDERZOEK	Report	PU	9	27/08/2014	Submitted

	pay, and value perceptions towards the selected species in the five									
2	Report on the segmentation analysis based on consumer value perceptions about the selected species in the five countries investigated (value-based segmentation task)	1.0	29	AARHUS UNIVERSITET	Report	PU	24	07/10/2015	Submitted	
3	Development of the actual product samples from the selected species for the sensory testing with consumers in the five countries investigated	1.0	29	INSTITUT DE RECERCA I TECNOLOGIA AGROALIMENTARIES.	Report	PU	28	04/04/2016	Submitted	
4	Report on the actual products' sensory profiling in the five countries investigated	0.0	29	INSTITUT DE RECERCA I TECNOLOGIA AGROALIMENTARIES.	Report	PU	29	30/04/2016	Not submitted	
5	Development of the product mock-ups for use in the experimentation with consumers in the five countries investigated	1.0	29	AARHUS UNIVERSITET	Report	PP	30	22/07/2016	Submitted	
6	Report on the experimentation with product mock-ups in the five countries investigated and identification of the optimal intrinsic-extrinsic product quality profiles for targeted segments	0.0	29	AARHUS UNIVERSITET	Report	PU	36	30/11/2016	Not submitted	
7	Development of the stimulus (i.e. written and broadcasted information material) that will be used in the communication experiments in the five countries investigated	0.0	29	AARHUS UNIVERSITET	Report	PP	42	31/05/2017	Not submitted	
8	Report on the experimentation with the com	0.0	29	AARHUS UNIVERSITET	Report	PU	44	31/07/2017	Not submitted	

	communication stimulus and evaluation of their effectiveness in changing consumers attitudes and behaviour towards the products coming from the selected									
1	Report on value propositions for the producers and Partners	0.0	30	TECHNISCHE UNIVERSITEIT EINDHOVEN	Report	PU	46	30/09/2017	Not submitted	
2	Report on indications of resources for creating customer value for the specific products	0.0	30	TECHNISCHE UNIVERSITEIT EINDHOVEN	Report	PU	46	30/09/2017	Not submitted	
3	Guidelines to cultivate buyer-supplier relationships per species	0.0	30	TECHNISCHE UNIVERSITEIT EINDHOVEN	Report	PU	48	30/11/2017	Not submitted	
4	Revenue (pricing & costs structures) model per species	0.0	30	TECHNISCHE UNIVERSITEIT EINDHOVEN	Report	PU	48	30/11/2017	Not submitted	
5	New product marketing strategies per species and product	0.0	30	TECHNISCHE UNIVERSITEIT EINDHOVEN	Report	PU	52	31/03/2018	Not submitted	
6	Report on results of test markets per species	0.0	30	TECHNISCHE UNIVERSITEIT EINDHOVEN	Report	PU	54	31/05/2018	Not submitted	
7	Feasibility study	0.0	30	STICHTING DIENST LANDBOUWKUNDIG ONDERZOEK	Report	PU	60	30/11/2018	Not submitted	
8	Report on EU and international market development plans and recommendations	0.0	30	TECHNISCHE UNIVERSITEIT EINDHOVEN	Report	PU	58	30/09/2018	Not submitted	
1	Establishment of website (fishDIVERSIFY.eu)	1.0	31	FUNDACION CENTRO TECNOLOGICO A CUICULTURA DE ANDALUCIA	Report	PU	4	02/04/2014	Submitted	
2	Project logo and broc	1.0	31	FUNDACION	Report	PU	6	24/06/2014	Submitted	

	hure			CENTRO TECNOLÓGICO AGRICULTURA DE ANDALUCÍA						
3	Publication of the first of two articles in Food Today	1.0	31	EUROPEAN FOOD INFORMATION COUNCIL AISBL	Report	PU	6	30/05/2014	Submitted	
4	Production and release of audiovisual material	1.0	31	FUNDACION CENTRO TECNOLÓGICO AGRICULTURA DE ANDALUCÍA	Report	PU	6	24/06/2014	Submitted	
5	Collaboration agreement with food industry and consumer organization; linkage of websites	1.0	31	FUNDACION CENTRO TECNOLÓGICO AGRICULTURA DE ANDALUCÍA	Report	PU	9	18/11/2014	Submitted	
6	Annual presentation of DIVERSIFY (Y1) at a relevant conference (mainly Aqua Europe meetings, EU Forum) by the Project Coordinator	1.0	31	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	9	27/10/2014	Submitted	
7	Production and release of audiovisual material	1.0	31	FUNDACION CENTRO TECNOLÓGICO AGRICULTURA DE ANDALUCÍA	Report	PU	12	15/01/2015	Submitted	
8	Production and release of audiovisual material	1.0	31	FUNDACION CENTRO TECNOLÓGICO AGRICULTURA DE ANDALUCÍA	Report	PU	18	21/08/2015	Submitted	
9	Annual presentation of DIVERSIFY (Y2) at a relevant conference (mainly Aqua Europe mee	1.0	31	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	21	29/10/2015	Submitted	

	tings, EU Forum) by the Project Coordinator									
10	Presentations of DIVERSIFY at the Aqua Europe meetings (Diversification Sessions) by the Species leaders (Y2)	1.0	31	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	21	16/11/2015	Submitted	
11	Scientific publications in relevant journals	0.0	31	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	60	30/11/2018	Not submitted	
12	Production and release of audiovisual material	1.0	31	FUNDACION CENTRO TECNOLÓGICO A CUICULTURA DE ANDALUCIA	Report	PU	24	30/11/2015	Submitted	
13	Production and release of audiovisual material	1.0	31	FUNDACION CENTRO TECNOLÓGICO A CUICULTURA DE ANDALUCIA	Report	PU	30	27/06/2016	Submitted	
14	Annual presentation of DIVERSIFY (Y3) at a relevant conference (mainly Aqua Europe meetings, EU Forum) by the Project Coordinator	0.0	31	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	33	31/08/2016	Not submitted	
15	Production and release of audiovisual material	0.0	31	FUNDACION CENTRO TECNOLÓGICO A CUICULTURA DE ANDALUCIA	Report	PU	36	30/11/2016	Not submitted	
16	Promotional workshops for specialized audience in fish market sector (Spain, Greece, U K or Italy) (1st workshop)	0.0	31	FUNDACION CENTRO TECNOLÓGICO A CUICULTURA DE ANDALUCIA	Report	PU	37	31/12/2016	Not submitted	
17	Production and release of	0.0	31	FUNDACION	Report	PU	42	31/05/2017	Not submitted	

	audiovisual material			CENTRO TECNOLÓGICO A CUICULTURA DE ANDALUCÍA					
18	Promotional workshops (2nd) for specialized audience in fish market sector (Spain, UK, Italy or Greece)	0.0	31	FUNDACION CENTRO TECNOLÓGICO A CUICULTURA DE ANDALUCÍA	Report	PU	43	30/06/2017	Not submitted
19	Annual presentation of DIVERSIFY (Y4) at a relevant conference (mainly Aqua Europe meetings, EU Forum) by the Project Coordinator	0.0	31	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	44	31/07/2017	Not submitted
20	Presentations of DIVERSIFY at the Aqua Europe meetings (Diversification Sessions) by the Species leaders (Y4)	0.0	31	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	44	31/07/2017	Not submitted
21	Presentation of DIVERSIFY at the European SEA FOOD Expo	0.0	31	FUNDACION CENTRO TECNOLÓGICO A CUICULTURA DE ANDALUCÍA	Report	PU	44	31/07/2017	Not submitted
22	Production and release of audiovisual material	0.0	31	FUNDACION CENTRO TECNOLÓGICO A CUICULTURA DE ANDALUCÍA	Report	PU	48	30/11/2017	Not submitted
23	Promotional workshops for specialized audience in fish market sector (Spain, Greece, UK or Italy) (3rd workshop)	0.0	31	FUNDACION CENTRO TECNOLÓGICO A CUICULTURA DE ANDALUCÍA	Report	PU	49	31/12/2017	Not submitted
24	Technical leaflets	0.0	31	FUNDACION CENTRO TECNOLÓGICO A	Report	PU	54	31/05/2018	Not submitted

				CUICULTURA DE ANDALUCIA					
25	Audio-visual document with the project's activities and main achievements	0.0	31	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	54	31/05/2018	Not submitted
26	Audio-visual popularization document and publication of the second article in Food Today, electronic journal of EUFIC	0.0	31	EUROPEAN FOOD INFORMATION COUNCIL AISBL	Report	PU	54	31/05/2018	Not submitted
27	Promotional workshops for specialized audience in fish market sector (Spain, Greece, U K or Italy) (4th workshop)	0.0	31	FUNDACION CENTRO TECNOLÓGICO A CUICULTURA DE ANDALUCIA	Report	PU	55	30/06/2018	Not submitted
28	Annual presentations of DIVERSIFY at the Aquaculture Europe meetings (EU Forum) by the Project Coordinator (Y5)	0.0	31	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	57	31/08/2018	Not submitted
29	“Know-how Transfer” seminar for the aquaculture industry (Spain), presenting the progress achieved in DIVERSIFY in the technology for meagre, greater amberjack, wreckfish and/or grey mullet	0.0	31	INSTITUT DE RECERCA I TECNOLOGIA AGROALIMENTARIES.	Report	PU	57	31/08/2018	Not submitted
30	“Know-how Transfer” seminar for the aquaculture industry (Greece), presenting the progress achieved in DIVERSIFY in the technology for meagre, greater amberjack, wreckfish and/or grey mullet	0.0	31	HELLENIC CENTRE FOR MARINE RESEARCH	Report	PU	57	31/08/2018	Not submitted
31	Pikeperch “Know-how Transfer” seminar for the aquaculture industry (po	0.0	31	Université de Lorraine	Report	PU	58	30/09/2018	Not submitted

	tential location: France, Belgium, Denmark), presenting the progress achieved through DIVERSIFY in the production technology									
32	Atlantic halibut “Know-how Transfer” seminar for the aquaculture industry (potential location: Norway), presenting the progress achieved through DIVERSIFY in the production technology	0.0	31	HAVFORSKNINGSINSTITUTTET	Report	PU	58	30/09/2018	Not submitted	
33	“Know-how Transfer” seminar for the aquaculture industry (Spain), presenting the progress achieved in DIVERSIFY in the technology for meagre, greater amberjack, wreckfish and/or grey mullet	0.0	31	INSTITUTO ESPANOL DE OCEANOGRAFIA	Report	PU	59	31/10/2018	Not submitted	
34	“Know-how Transfer” seminar for the aquaculture industry (Italy), presenting the progress achieved in DIVERSIFY in the technology for meagre, greater amberjack, wreckfish and/or grey mullet	0.0	31	UNIVERSITA DEGLI STUDI DI BARI "ALDO MORO"	Report	PU	59	31/10/2018	Not submitted	
35	Production and release of audiovisual material	0.0	31	FUNDACION CENTRO TECNOLOGICO A CUICULTURA DE ANDALUCIA	Report	PU	60	30/11/2018	Not submitted	

Milestones

Milestone no.	Milestone name	Work package no	Lead beneficiary	Delivery date from Annex I	Achieved Yes/No	Actual / Forecast achievement date	Comments
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1	Kickoff and annual coordination meeting (for Y1)	1	1	31/12/2013	Yes	30/01/2014	P1. HCMR, Crete, Greece
2	Consortium agreement	1	1	31/01/2014	Yes	20/03/2014	
3	Annual coordination meeting for Y2	1	1	31/01/2015	Yes	06/11/2014	P13. UNIBA, Bari
4	Periodic Report (Mo1-12) to DG RTD, including financial and administrative reports	1	1	31/01/2015	Yes	30/12/2014	
5	Annual coordination meeting (for Y3)	1	1	31/01/2016	Yes	04/02/2016	P.9. UL, Nancy, France
16	SNIP library with candidate SNIPs potentially associated with growth in meagre	2	2	30/05/2015	Yes	30/05/2015	
17	Database of genetic variability of pikeperch	4	1	30/11/2014	Yes	30/11/2014	Excel database completed
18	Documentation of ovulatory cycles in wild and F1 halibut broodstock	5	7	31/05/2016	Yes	31/05/2016	
19	Basic diet formulation for meagre grow out studies	8	2	30/11/2014	Yes	30/11/2014	
20	Digestive utilization of experimental weaning diets for meagre	8	2	30/11/2015	Yes	30/11/2015	
21	Basic diet formulation for greater amberjack grow out studies	9	2	30/11/2014	Yes	30/11/2014	
22	Definition of reproductive quality parameters to be studied in amberjack	9	2	30/11/2014	Yes	30/11/2014	Literature search completed
23	Definition of parameters for skeleton study in pikeperch	10	21	30/11/2014	Yes	30/11/2014	Definitions and analytical parameters for skeleton studies have been included in the experimental protocols

27	Definition of methodology to study cost-benefit of grey mullet weaning studies	13	4	30/11/2014	Yes	30/11/2015	
28	Protocol for weaning meagre larvae	14	2	31/05/2015	Yes	16/05/2016	
29	Successful maturation and spawning of eastern Atlantic or Mediterranean Sea wild, F1 generation greater amberjack producing good quality eggs	15	2	31/05/2014	Yes	30/06/2014	Provision of eggs for larval nutrition and rearing experiments in Greece and Spain.
30	Successful maturation and spawning of eastern Atlantic or Mediterranean Sea wild, F1 generation greater amberjack	15	2	31/05/2015	Yes	30/06/2015	Egg production has been achieved in both Mediterranean and Atlantic broodstocks, as well as in F1 broodstocks in Y2
31	Protocol for tank design, lighting and probiotics of larval rearing of greater amberjack	15	2	31/05/2015	Yes	30/07/2016	
32	Successful maturation and spawning of eastern Atlantic or Mediterranean Sea wild, F1 generation greater amberjack	15	2	31/05/2016	Yes	30/06/2016	
34	Successful maturation and spawning of wreckfish to produce good quality eggs	6	8	30/04/2014	No	30/06/2014	Eggs were produced both in Greece and Spain, but their quality was poor and did not allow implementation of larval rearing experiments.
35	Successful maturation and spawning of wreckfish to produce good quality eggs	6	8	30/04/2015	Yes	30/06/2015	Eggs were produced both in Greece and Spain, and allowed a limited implementation of the larval rearing experiments.
36	Successful maturation and spawning of wreckfish to produce good quality eggs	6	8	30/04/2016	Yes	31/05/2016	Eggs were produced in Spain, and allowed a limited implementation of the larval rearing ex

							periments
38	Successful maturation and spawning of grey mullet broodstock to produce good quality eggs and larvae	19	4	30/08/2014	Yes	31/10/2015	Millions of eggs of high quality were produced, allowing the start of larval rearing experiments.
39	Successful maturation and spawning of grey mullet broodstock to produce good quality eggs and larvae	19	4	30/08/2015	Yes	31/10/2015	
42	Results on feeding stimuli of meagre	20	3	01/06/2015	Yes	01/06/2015	
43	First cage trials (different volume and light conditions) with meagre implemented	20	3	30/11/2015	Yes	01/12/2015	
44	Results on feed distribution method in cages with meagre	20	3	30/11/2015	No	01/12/2016	Experiments delayed and redesigned in response to results from MS43
45	Feeding pattern of greater amberjack fry available	21	1	31/08/2015	Yes	31/08/2015	
46	First results on optimum husbandry practice (thermal ranges, stocking density) of greater amberjack	21	1	31/03/2016	Yes	31/03/2016	
47	First experiment on cage culture condition (net volume, cage type) of greater amberjack implemented	21	1	31/05/2016	No	31/08/2016	There have been some licensing delays in obtaining permission to use the P28. CANEXMAR sea cage for this species.
48	Experiment on the definition of optimal conditions for pikeperch on growing implemented	22	16	31/05/2016	Yes	31/05/2016	
50	Experimental trials of grey mullet in the three locations implemented	23	4	28/02/2015	Yes	31/05/2016	Unexpected Israeli customs bureaucracy delayed the arrival of the extruded mullet feed fro

							m P31. IRIDA and did not arrive in time for the growth trial planned for 2015. The other two partners started on time their Tasks.
51	Design of primers for amplification of meagre target gene DNA sequences	24	5	30/11/2014	Yes	30/11/2014	
52	Grow-out of larvae and collection of samples from immune ontogeny time-line	24	5	30/11/2015	Yes	30/11/2015	
53	Amplification and sequencing of target gene sequences from stimulated tissues	24	5	31/05/2016	Yes	31/05/2016	
58	Design of primers for amplification of greater amberjack target gene DNA sequences	25	5	31/05/2016	Yes	31/05/2015	
59	Successful Chlamydia screening and sequencing	25	5	31/05/2016	Yes	01/05/2016	
60	Samples collected from stimulated primary cultures/explants, ready for immune gene expression analysis	25	5	31/05/2016	Yes	30/11/2015	PhD student Douglas Milne of P5. UNIABDN visited P1. FCPCT in November 2015 to undertake the work
61	Ideas for new products	28	1	31/05/2015	Yes	21/07/2015	
62	Optional physical new products	28	1	31/03/2016	Yes	19/04/2016	
63	Insights in the consumer and B2B market for cultured fish	29	1	30/11/2014	Yes	30/11/2014	
64	Selection of new products, with good sensory perception	29	1	31/05/2016	Yes	30/07/2016	
70	Agreement on project	31	1	01/06/2014	Yes	01/06/2014	

	logo for website and publications, this will provide a recognizable image of DIVERSIFY						
71	Design and printing of project brochure (hard-copy) including the project logo, inserts with project	31	18	01/06/2014	Yes	24/06/2014	
72	Agreements with food industry and consumers associations for web linkage	31	18	31/08/2014	Yes	20/11/2014	Considerable difficulties have been faced in reaching an agreement with the organizations proposed in the DOW.

4. Explanation of the use of the resources

The **explanation on the use of resources** was removed from the scientific periodic reports in SESAM. These details now have to be entered in the cost statement forms in FORCE instead.

Attachments	2nd PR DIVERSIFY 20160728.pdf
Grant Agreement number:	603121
Project acronym:	DIVERSIFY
Project title:	Exploring the biological and socio-economic potential of new/emerging candidate fish species for the expansion of the European aquaculture industry
Funding Scheme:	FP7-CP-TP
Project starting date:	01/12/2013
Project end date:	30/11/2018
Name of the scientific representative of the project's coordinator and organisation:	Dr. Constantinos Mylonas HELLENIC CENTRE FOR MARINE RESEARCH
Period covered - start date:	01/12/2014
Period covered - end date:	31/05/2016
Name	
Date	29/07/2016

This declaration was visaed electronically by Constantinos MYLONAS (ECAS user name nmylocon) on 29/07/2016