



Deliverable Report

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Task Title:	Annual Coordination meeting			
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P6. SWR (DLO)	P7. IMR	P8. IEO	P9. UL	P10. TU/e
P11. AU	P12. APROMAR	P13. UNIBA	P14. IFREMER	P15. ULL
P16. FUNDP	P17. NIFES	P18. CTAQUA	P19. CMRM	P20. SARC
P21. DTU	P22. SWH	P23. ARGO	P24.	P25. DOR
P26. GEI	P27. FORKYS	P28. CANEXMAR	P29.	P30.
P31. IRIDA	P32. MC2	P33. FGM	P34. BVFi	P35. MASZ
P36. ANFACO	P37. EUFIC	P38. HRH	P39. F2B	P40. GMF
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Objectives

The objectives of the Annual Coordination Meeting (ACM) 2018 were to:

- Present a number of Task-specific results of the accomplished work during Y3 and 4 to the consortium members,
- Review and evaluate closely the work carried out in all Work Packages (WP) in the six Scientific Disciplines,



- (c) Plan the remaining work to be implemented in the WPs in the last year of the project,
- (d) Present the dissemination activities of the consortium (WP 31),
- (e) Plan the Species-specific Knowledge-Transfer workshops (WP 31) which will take place in 2018,
- (f) Inform the consortium of the issues and budget transfers to be covered in the Amendment 4,
- (g) Emphasize to the Partners the importance of preparing and submitting as large a number of scientific articles before the end of the project,
- (h) Address some issues relevant to the 3rd Scientific and Financial Report.

Description

The ACM 2018 was hosted by Drs. José Pérez and Covadonga Rodríguez (ULL), and Salvador Jerez and Virginia Martín (IEO). It was held at two venues between 23-25 January 2018 (**Fig. 1**). The task-specific presentations during Days 1 and 2 took place at the Faculty of Sciences, ULL. The Group Work Package (GWP) workshops took place at the IEO facilities in Santa Cruz. The 3-day meeting was attended by 79 persons: 78 coming from the DIVERSIFY consortium and only 1 invited guest from outside the consortium. No representative attended from Beneficiaries P25. DOR, P26. GEI, P27. FORKYS, P34. BVFi and 35. MASZ, the latter two having previous commitments that they could not modify, while the PI from P2. FCPCT was again missing (having missed four ACMs so far, out of a total of five).

As for all previous ACMs, information regarding the meeting was uploaded continually on the project's web site (<http://www.diversifyfish.eu/2018-annual-coordination-meeting-jan.html>) to ensure that all participants had access to the most updated information. The Agenda (**Tables 1, 2 and 3**) was developed with assistance from GWP leaders and consisted of:

- (a) DAY 1 and 2: A common session for all participants presenting Task-specific presentations from various WPs,
- (b) DAY 2: A presentation of the WP 31 Dissemination presenting the dissemination activities of the consortium, and organizing the preparation of Deliverables as well as of manuscripts for scientific articles,
- (c) DAY 2: Presentations by the Species leaders of the organization of the Species-specific Knowledge-transfer Workshops that will be held during 2018,
- (d) DAY 2: Presentation by the Project Coordinator (PC) dealing with the status of the 3rd Periodic Report, financial issues, the preparation of Amendment 4, various management issues and the preparation of two (2) books from DIVERSIFY research.
- (e) DAY 3: The Group Work Package (GWP) workshops for each scientific discipline, for the coordination of the work during Y5 of the project.



Figure 1. The two venues of the Annual Coordination Meeting 2018, held in Tenerife, Spain. The Faculty of Sciences, University of La Laguna (left) and the IEO facilities in Santa Cruz (right).



Table 1. Agenda of DAY 1 of the Annual Coordination Meeting 2018, which took place on the 23-25 January 2018, at the Faculty of Sciences, University of La Laguna, Spain.

DAY 1		23-Jan		Tuesday (Open Day presentations)	
Start	End		Title	Presenter	Details
8,00	9,00		Registration		Pick up badges
9,00	9,30		Welcome-Logistics	Perez, Jose Antonio & Mylonas, Constantinos	HCMR/ULL
9,30	9,50	1	Induced gametogenesis in flat-head grey mullet using recombinant gonadotropins	Ramos, Sandra	IRTA
9,50	10,10	2	Annual cycles of gonadotropins and sex steroids in plasma of farmed and wild-caught female Atlantic halibut	Norberg, Birgitta	IMR
10,10	10,30	3	Spawning induction of F1 greater amberjack in eastern Atlantic	Jerez, Salvador	IEO
10,30	10,50	4	Broodstock management and spawning induction in greater amberjack in tanks and sea cages in Greece	Mylonas, Constantinos	HCMR
10,50	11,30	Coffee			
11,30	11,50	5	Comparison of programmed and auto-demand type feeding of meagre in tanks	Duncan, Neil	IRTA
11,50	12,10	6	Effect of dietary fatty acids on spawn quality in greater amberjack broodstock	Djellata, Adnane	FCPCT
12,10	12,30	7	Some insights in lipid metabolism of larvae from novel aquaculture candidate species	Rodriguez, Covadonga	ULL
12,30	12,50	8	How to achieve predictable and stable juvenile production in marine fish- an industrial approach	Erstad, Borre	SWH
12,50	13,10	9	Effect of of phospholipids on lipid metabolism in Atlantic halibut	Sæle, Øystein	NIFES
13,10	15,00	Lunch on site (Faculty of Sciences), 10 euro			
15,00	15,20	10	Designing weaning diets based on the ontogeny of digestive tract enzyme activity during the carnivorous-omnivorous transition in grey mullet juveniles	Koven, Bill	IOLR
15,20	15,40	11	Greater amberjack larval rearing in IEO: effect of live prey enrichments and feeding regime	Martin, Virginia	IEO
15,40	16,00	12	Requirements for n-3 HUFA of meagre fingerlings	Carvalho, Marta	FCPCT
16,00	16,20	13	Test of different feeding methods on growth performance and feeding behavior of meagre	Papadakis, Ioannis	HCMR
16,20	17,00	Coffee			
17,00	17,20	14	Identification and expression of type I interferons in meagre	Secombes, Chris	UNIABDN
17,20	17,40	15	Dietary use of prebiotics in greater amberjack juveniles: effects on growth performance, immune gene expression and disease resistance against <i>Neobenedenia girellae</i>	Fernandez Montero, Alvaro	FCPCT
17,40	18,00	16	Epitheliocystis disease; results and progress	Katharios, Pantelis	HCMR
20,30	Dinner at REAL CASINO de Tenerife, Plaza de la Candelaria 12 (consortium dinner)				



The format of the task-specific presentations for DAY 1 & 2 (**Table 1** and **2**), as it was adopted also for the ACM 2017 meeting in Barcelona, Spain, allowed a large number of the RTD partners to present their work (some for the first time) –which in many cases was done in collaboration with the SMEs and Large companies participating in the project, as well as work to be presented from all Scientific Disciplines. In total, 21 presentations from 16 RTD partners were presented, representing collaboration with the two large companies and six SMEs from the DIVERSIFY consortium (**Fig. 3**).



Figure 3. The opening slides from some of the task-specific presentations of some of the RTD partners of the consortium during DAY 1 & 2.

**Table 2.** Agenda of DAY 2 of the Annual Coordination Meeting 2018, which took place on the 23-25 January 2018, at the Faculty of Sciences, University of La Laguna, Spain.

DAY 2		Wednesday (Open Day presentations & Consortium Management)			
Start	End		Title	Presenter	Details
8,00	9,00		Registration		Pick up badges
9,00	9,20	1	Overview of consumer behavior-related affairs in the frame of DIVERSIFY and their key findings	Krystallis, Thanassis	HRH
9,20	9,40	2	The effect of message framing on consumers' attitudes and purchase intentions towards new DIVERSIFY products	Banovic, Marija	AU
9,40	10,00	3	Feasibility study, the contributions of partners needed	Stokkers, Robert / Tacken, Gemma	SWR/DLO
10,00	10,20	4	Business model and marketing strategy development	Nijssen, Ed / van der Borgh, Michel	TU/e
10,20	10,40	5	EU funded projects: why communication matters?	Abundancia, Carlos	EUFIC
10,40	11,30	Coffee			
11,30	12,30		Dissemination activities, articles and species leaflets	Robles, Rocio	CT-AQUA
12,30	13,00		Meagre one-day workshop	Estevez, Alicia	IRTA
13,00	13,30		Greater amberjack one-day workshop	Papandroulakis, Nikos	HCMR
13,30	15,00	Lunch on site (Faculty of Sciences), 10 euro			
15,00	15,30		Pikeperch one-day workshop	Fontaine, Pascal	UL
15,30	16,00		Atlantic halibut one-day workshop	Norberg, Birgita	IMR
16,00	16,30		Wreckfish one-day workshop	Alvarez, Blanca	IEO
16,30	17,00		Grey mullet one-day workshop	Koven, Bill & Corriero, Aldo	IOLR/UNIBA
17,00	17,30	Coffee			
17,30	18,15		Preparation of books on meagre and amberjack biology and culture	Mylonas, Constantinos	HCMR
18,15	19,00		3rd Periodic Report, Amendment 4, Budget and Deliverables - General Asssembly	Mylonas, Constantinos	HCMR
Dinner on your own, explore the city!					

DAY 2 – Management and coordination issues

Dissemination

At the end of the specific task presentations of Day 2, there was a presentation by the WP 31 Dissemination leader, Dr. Rocio Robles. As always, and to remind our partners of the great significance of this WP for our project, the presentation began with a brief reiteration of the WP's many objectives, emphasizing the need for all Partners to participate actively in the preparation of dissemination materials and activities (Fig. 4). Then there was a presentation of the various dissemination activities carried out during the 3rd Reporting Period (2016-2017), which included the publication of Newsletters that are uploaded at the website of the project and two more species-focused articles published at the quarterly magazine of the European



Aquaculture Society (for Atlantic halibut and wreckfish), as well as a special 21-page featured article presenting work from DIVERSIFY in all species published in September 2017, just before the annual EAS meeting in Dubrovnik. There, a special “DIVERSIFY” session was again held (Deliverable 31.20 EAS Special session). The Special Session was titled “DIVERSIFY- New/emerging finfish species (EU project)”. The session opened with a summary presentation for DIVERSIFY, given by the PC of the project -see *Deliverable 31.19 Annual presentation of DIVERSIFY (Y4) at a relevant conference*. Instead of the Species Leaders giving summary presentations, Task-specific presentations were given by a number of researchers from the consortium (15 presentations). The Special Session lasted for the whole day (10:30 to 17:00) and an estimated of 60-120 persons were present at the different presentations in the designated room.

The Dissemination leader also discussed about the scientific articles that have been published so far and the number of manuscripts in preparation. The partners were encouraged to submit their work for publication as soon as the Deliverables are submitted, in order to disseminate the work carried out in the project.

OBJECTIVES

- Disseminate the knowledge acquired to scientific community and aquaculture sector.
- Promote implementation of new husbandry methods, protocols & products developed by DIVERSIFY to the aquaculture industry & the seafood processors.
- Enhance awareness of the diversification efforts of the project to the general public. Special attention to Food industry & Consumer's organizations.
- Promote investment opportunities making available the species feasibility studies to the industry.
- Documented information to fish producers, fish processors & consumers on the new farmed aqua products from DIVERSIFY.

Promotional Workshops Species Workshops

Articles in Aquaculture Europe:

- PIKEPERCH (10/2014)
- MEAGRE (3/2015)
- AMBERJACK (3/2016)
- WRECKFISH (3/2017)
- HALIBUT (9/2016)
- GREY MULLET (MARCH 2018)
- 9/2017

Progress: Task 31.4 Scientific presentations & submission of manuscripts:

Scientific articles:

- 26 papers in preparation
- 4 articles submitted
- 23 articles published**
- 2 PhD thesis

PROGRESS: Task 31.7 Dissemination to the food industry & consumers

Seafood Expo Brussels, 2017 → EU stand

LCM 2018

- NOVEMBER 2018- BRUSSELS

Figure 4. Photos from the presentation of WP31 leader Dr. Rocio Robles on Day 2.



As regards the DIVERSIFY website, the partners were informed that the website of the project (www.diversifyfish.eu) has been modified in order to make it easier for the visitors to located recent findings of the project, as well as the scientific articles that are now being produced and published (Fig. 4). In addition, a new page has been added to the website to provide information on the species-specific knowledge transfer workshops that are planned for 2018.

Once again, the Dissemination WP leader discussed the issue of uploading dissemination activities on the ECAS portal, as well as preparing the work done in DIVERSIFY for submission to scientific magazines (Fig. 5). Currently, we have more than 200 dissemination actions and 23 scientific articles published. The contractual requirements of the DIVERSIFY are 2 articles per GWP per year, which makes for a total of 60 articles. As mentioned earlier, a change was done on the project's website, by moving the "Scientific Publications" page to the main menu bar, so that visitors will have a more rapid and direct access to the scientific work of the Consortium.



Figure 5. Representative slides from the discussion on uploading dissemination activities and publications on the ECAS portal.

In agreement with the intentions of the consortium to be as open as possible and to disseminate the results as promptly as possible, all the presentations of the ACM 2018 were uploaded on the website of the project within a week after the end of the meeting (end of January 2018), to be available to all interested stakeholders.

Species-specific know-how transfer seminars

In WP 31 Dissemination, we have planned to hold six seminars/workshops during the last year of the project, one for each of the species of DIVERSIFY. This was **Task 31.5 Full-day seminars on "Know-how Transfer" of the aquaculture for each of the studied species (led by CTAQUA and the Species Leader Partner)**. According to the DOW, these seminars will include 30 min presentations on selected aspects (e.g., reproduction and spawning induction, final product diversification and quality, socioeconomic issues and marketing, etc.), given by DIVERSIFY Partners, but also from any authorities in the species (European or world-wide depending on the species), whose work was not part of the project. Aquaculturists (mainly), but also European aquaculture support companies (feed, pharmaceutical, equipment, engineering, etc.), researchers and educators, government organizations and other important institutions (FAO, Globefish) will be invited to attend these meetings. The cost of the invited speakers and the registration of the participants



will be covered by the project (max 50 participants). The seminars will be organized by the SLs (HCMR, IRTA, UNIBA, IMR, IEO, UL) in countries where the particular species are cultured --or has the potential to be cultured -- and/or is located centrally in a region with interested aquaculture operations. One seminar will be organized for each of the selected species. The result of this task will be Deliverables D31.29 to 34. Species-specific “Know-how transfer” seminars for the aquaculture industry, presenting the progress achieved through DIVERSIFY in the production technology.

During Day 2 of the ACM 2018, each Species Leader (SL) presented some information regarding the organization of these workshops (Fig. 6). The location and time that each of these workshops will take place have been decided, and the SL begun choosing the speakers that will present, both from within DIVERSIFY and from outside.

Wreckfish one-day workshop
Blanca Álvarez-Blázquez & Montse Pérez
Diversity ACM 2018, Tenerife, Spain
CENTRO OCEANOGRÁFICO DE VIGO 1917-2017

Specific research presentations

10:00-10:30	Reproductive cycle for wreckfish in captivity. Dinos Mylonas (HCMR)
10:30-11:00	Reproduction of hapuku <i>Polyprion oxygeneios</i> in New Zealand. Matthew Wylie (University of Otago)
11:00-11:30	Larval rearing?. Alvin Setiawan (NIWA)
11:30-12:00	Wreckfish fishery in Madeira? Carlos Andrade (Director of AQ Madeira, Portugal)
12:30-13:00	Wreckfish genetics. Pablo Presa (UVIGO, Spain)
13:00-13:30	Industry experiences with wreckfish culture. Antonio Pizarro (Isidro de la Cal, Spain)
13:30-14:00	Tito Peleteiro (ex-IEO)?
16:00-16:30	Recommendations for nutrition of wreckfish breeders. Fátima Linares (Xunta de Galicia, Spain)
16:30-17:00	Advances in wreckfish reproduction and larval husbandry. José Luis Rodríguez Villanueva (IGAFA, Spain)/ Nikos??
17:00-17:30	?????

One-day workshop: Atlantic halibut Aquaculture
Co-funded by the Seventh Framework Programme of the European Union
STERLING White Halibut
CENTRO OCEANOGRÁFICO DE VIGO 1917-2017

Tentative programme

08.30 – 09.15	Coffee and registration
09.15 – 09.30	Welcome
09.30 – 10.00	Halibut aquaculture – the beginning (Viktor Øiestad/??)
10.00 – 10.30	The Diversify Project (Dinos Mylonas, coordinator)
10.30 – 10.50	WP5 Broodstock Management (Birgitta Norberg)
10.50 – 11.10	Coffee break
11.10 – 11.40	WP11 Nutrition (Kristin Hamre/Covadonga Rodriguez)
11.40 – 12.00	WP17 Larval Husbandry (Torstein Harboe)
12.00 – 12.20	WP26 Health (Sonal Patel/Audun Nerland)
12.30 – 13.30	Lunch

DIVERSIFY: WP 31
Dissemination (task 31.5) :
« Know-how transfer on pikeperch - one full day »
UNIVERSITÉ DE LORRAINE

Previsional programme (30 minutes per presentation, including questions)

Part 1 - Introduction

- 9h00 – 9h15 : Presentation of the Diversify programme (C. Mylonas)
- 9h15 – 9h30 : Presentation of bottlenecks / pikeperch (P. Fontaine)

Part 2 – Market, consumers perception and new products

- 9h30-10h00 : Market obstacles and opportunities for pikeperch market (DLO, WP27, ??)
- 10h00 – 10h30 : The market opportunities related to new pikeperch products (HCMR, WP28??)

Coffee break

- 11h00 – 11h30 : The consumer perception of pikeperch products (AU, WP29, ??)
- 11h30 – 12h00 : Business model and marketing strategy for pikeperch products (TU, WP30, ??)

Figure 6. Representative slides from the presentations of the Species Leaders (SL) for the know-how transfer workshops to be held during the last year of the project (2018).



It was agreed that the final program for each workshop should be ready by the end of March, so that we will have ample time to publicize it to the Aquaculture sector throughout Europe, in order to give the chance to as many interested farmers as possible to attend. We have already added a page in our website with the tentative information, and full descriptions will be added as they become available (Fig. 7).

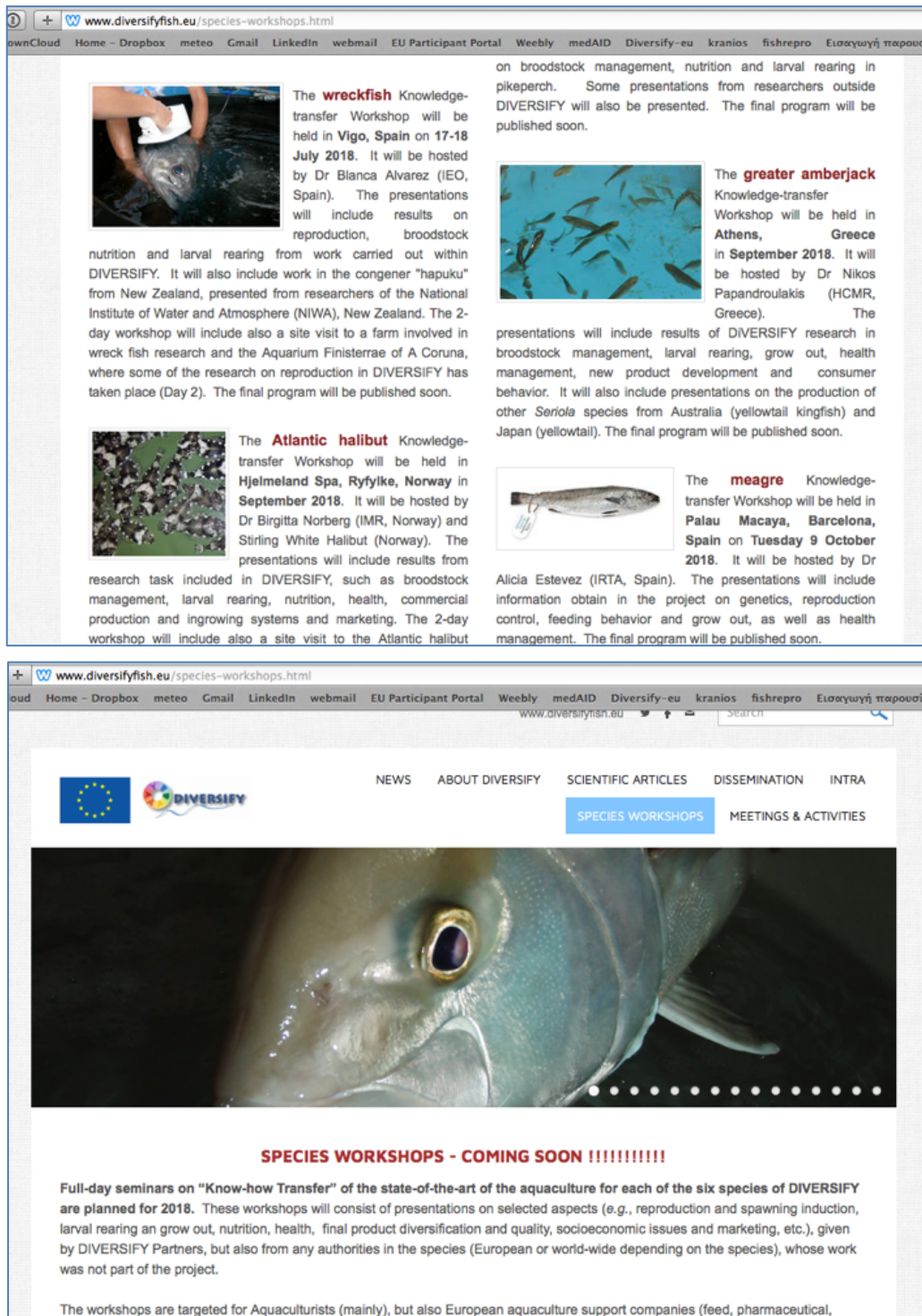


Figure 7. Captions of the DIVERSIFY website, showing the special page developed for the Species Know-how transfer workshops. More information will be added as it becomes available.



Preparation of books from DIVERSIFY work

It has been discussed already during the ACM 2017 in Barcelona, that it would be appropriate to consider publishing 1-2 species-specific books, based on work carried out in DIVERSIFY, but also counting on already published work over the past 10 years. Based on the available work, the PC suggested that the species that could be selected for these books are the meagre and greater amberjack (**Fig. 8**). In the months prior to the ACM 2018, the PC had contacted some partners to function as editors for these books. A preliminary Table of Contents has been prepared, and more work will be done during 2018, in order to (a) finalize the Table of Contents and then (b) identify the leading author for each chapter. We expect that the application for the book will be submitted sometime in 2019 to a publisher, and before the end of that year we will begin preparing the chapters. Expected date of publication of the books should be 2020-2021.

Regarding potential publishers, the PC has already made initial contacts with two companies, Blackwell Publishing and 5M Publishing. Both expressed their great interest to publish these books. The person in charge of the Fisheries and Aquaculture titles of 5M Publishing, Mr Nigel Balmforth was invited and attended the ACMs both in 2017 (Barcelona) and in 2018 (Tenerife). This year he gave also a brief presentation of his role in the process and expressed his support of the tentative Table of Contents. When we have a more final version, we will contact both publishers to see who we will select for the books.

Preparation of books from DIVERSIFY

1. Meagre (*Argyrosomus regius*) Biology and Aquaculture
Editors: Mylonas, C.C., Estevez, A., Duncan, N.
2020
5M Publishing or Wiley-Blackwell

2. Greater Amberjack (*Seriola dumerili*) Biology and Aquaculture
Editors: Mylonas, C.C., Papandroulakis, N., Montero, D.
2021
5M Publishing or Wiley-Blackwell

Meagre book from DIVERSIFY

- 1 Current Status of Sciaenid Aquaculture (IRTA)
- 2 Reproductive Biology (IRTA, HCMR)
- 3 Early Development (HCMR, IRTA, FCPCT, DTU, ULL)
- 4 Nutrition, Feeding and Grow out (FCPCT, IRTA, HCMR)
- 5 Skeletal Deformities and Fry Quality (IRTA, HCMR)
- 6 Stress Physiology (non DIVERSIFY, U Crete, UAB)
- 7 Diseases and Health Management (HCMR, FCPCT, IRTA, UNIABD)
- 8 Genetics and Genomic Research (HCMR, FCPCT, IRTA)
- 9 Final Product Quality (IRTA, HCMR, others?)
- 10 Markets, Marketing and Consumers (SWR, AU, HRH, others?)
- 11 Capture-based aquaculture (Egypt)??
- 12 Fisheries (Portugal, France) ???

Figure 8. Representative slides from the presentation of the PC regarding the preparation of two books, based on work carried out in diversify.

Reporting, Amendment 4, and Budget issues

The final section of Day 2 was dedicated to a presentation by the PC on a number of coordination and management issues. The PC first reported on the status of the deliverables from the project, presenting a list of submitted and delayed deliverables according to partner (**Fig. 9**). It was stressed that some partners seem to have fallen behind in the submission of their deliverables, and they were encouraged to speed up the process of writing them up, to prevent being labeled as “underperforming” by the final review (as it has happened for one partner). Overall, more than 50% of the total number of deliverables has been submitted, with 38 being delayed. We expect that with some rare exceptions, all of these deliverables will be completed and submitted in time, according to their description in the DOW.

Following this discussion, the PC presented the status of scientific manuscript preparation (**Fig. 9**). So far we have only published 22 articles, which is not a very high number for a consortium of this size, after 4 years of research! Obviously, the majority of the work is concluded and it is being submitted for publication at the end of a project (and mainly afterwards). However, it is the belief of the PC that we should manage to publish more than 60 scientific articles before the end of the project in 2018, and then continue to publish more afterwards. It is true that as the project had a duration of 5 years, many tasks were planned to take



DAY 3 – Scientific Discipline-specific workshops

During Day 3 of the meeting, six Workshop Sessions were organized according to Scientific Disciplines with the objective of (a) reviewing and evaluating the work carried out and (b) planning the work to be implemented in the various scientific WPs during the final fifth year (2018) of the project (**Table 3**).

Table 3. Agenda of DAY 3 of the Annual Coordination Meeting 2018, which took place on the 23-25 January 2018, at the IEO facilities in Santa Cruz, Spain.

DAY 3		25-Jan		Thursday (GWP Workshops)			
Start	End	ROOM 1	ROOM 2	ROOM 3	ROOM 4		
9,00	9,30	GWP 2 Repro (wreckfish)	GWP 5 Grow out (amberjack)	GWP 3 Nutrition (mullet)	GWP 7 Socioeco		
9,30	10,00	GWP 2 Repro (wreckfish)	GWP 5 Grow out (amberjack)	GWP 3 Nutrition (amberjack)	GWP 7 Socioeco		
10,00	10,30	GWP 2 Repro (wreckfish)	GWP 5 Grow out (amberjack)	GWP 3 Nutrition (meagre)	GWP 7 Socioeco		
10,30	11,00		GWP 5 Grow out (meagre)	GWP 3 Nutrition (pikeperch)	GWP 7 Socioeco		
11,00	11,30	Coffee					
11,30	12,00		GWP 5 Grow out (meagre)	GWP 3 Nutrition (wreckfish)	GWP 7 Socioeco		
12,00	12,30	GWP 2 Repro (amberjack)	GWP 5 Grow out (mullet)	GWP 3 Nutrition (halibut)	GWP 7 Socioeco		
12,30	13,00	GWP 2 Repro(amberjack)	GWP 5 Grow out (pikeperch)	GWP 3 Nutrition	GWP 7 Socioeco		
13,00	13,30	GWP 2 Repro (amberjack)	GWP 5 Grow out	GWP 3 Nutrition	GWP 7 Socioeco		
13,30	15,00	Lunch on site (IEO), courtesy of IEO					
15,00	15,30	GWP 2 Repro (mullet)	GWP 6 Fish health (meagre)	GWP 4 Larval (wreckfish)	GWP 7 Socioeco		
15,30	16,00	GWP 2 Repro (mullet)	GWP 6 Fish health (meagre)	GWP 4 Larval (wreckfish)	GWP 7 Socioeco		
16,00	16,30	GWP 2 Repro (mullet)	GWP 6 Fish health (amberjack)	GWP 4 Larval (pikeperch)	GWP 7 Socioeco		
16,30	17,00		GWP 6 Fish health (amberjack)	GWP 4 Larval (halibut)	GWP 7 Socioeco		
17,00	17,30		GWP 6 Fish health (halibut)	GWP 4 Larval (mullet)	GWP 7 Socioeco		
17,30	18,00		GWP 6 Fish health	GWP 4 Larval (amberjack)	GWP 7 Socioeco		
18,00	18,30		GWP 6 Fish health	GWP 4 Larval (amberjack)	GWP 7 Socioeco		
Dinner on your own, explore the city!							

As before, the workshops of DAY 3 were running in parallel (4 Scientific Disciplines at a given time) in an attempt to minimize the potential time conflict for most Beneficiaries (**Fig. 11**). The duration of each session was decided by the GWP leader based on the number of WP included in the Scientific Discipline, as well as the amount of work that needed to be presented and discussed, and the workload expected for the upcoming year. As work in some WPs has been concluded (e.g. WP 2 Reproduction & Genetics – meagre, WP 4 Reproduction & Genetics – Pikeperch, and WP 5 Reproduction & Genetics – Atlantic halibut) some GWP sessions did not include work in some of the species included in the DOW. In addition, the Workshops were



organized in a way that the WPs dealing with the same species were planned at different times during the Workshops, to allow all scientists attending all the WPs of the same species. This was also achieved, to a degree, by the participation to the ACM 2018 of more than one scientist from some of the beneficiaries that are involved in many GWPs. Unfortunately, as last year, P2. FCPCT that has the third largest budget in the project was represented only by a single scientist (Dr. Daniel Montero, the GWP leader for Nutrition), while the PI of the organization was not present at this ACM either. More problematic was the absence of the lead beneficiary of WP 9 Nutrition – greater amberjack (P2. FCPCT) and the Principle Investigator of P28. CANEXMAR, as task 9.2.2 includes work in the testing of a new feed for grow-out of greater amberjack that has not been done so far, and it seems unlikely that it will be done, given that we only have one year to complete the project. Unfortunately, there was nobody in the meeting to provide the necessary information. This issue prompted an investigation in the following weeks by the PC of the status of the work, and a notification of both the Scientific Officer (Dr. Marta Iglesias) and the Financial Officer (Mrs. Annemie Van Vaerenbergh).



Figure 11. Photos from the DAY 3 Workshops in the various scientific discipline GWP.



Summary of the work in each Scientific Discipline

More details on the work reported during the ACM were presented in the minutes of the ACM, which were submitted to the Scientific Officer (Dr. Marta Iglesias).

GWP Reproduction & Genetics

All work in reproduction and genetics has been completed in the WPs 2-meagre (*Argyrosomus regius*), 4-pikeperch (*Sanders lucioperca*) and 5-Atlantic halibut (*Hippoglossus hippoglossus*). All deliverables have been completed in WPs 2-meagre and 4-pikeperch. The last deliverable (D5.3) in WP 5-Atlantic halibut will be completed in the next months. Two papers on repeated induced spawning and the transcriptome have been published and one submitted on paired spawning from WP 2-meagre and a further three papers on *in vitro* spawning and genetics are expected to be submitted during 2018. In addition, two papers from the work on Atlantic halibut on spawning and comparing fecundity between wild and cultured breeders, and one paper from pikeperch on genetics are expected to be submitted during 2018.



In the WP 3-greater amberjack (*Seriola dumerili*), all work on the reproductive cycle and dysfunction has been completed. All related deliverables (D3.1 – D3.6) have been completed and three papers have been published. Spawning protocols have been established and tested, and during 2017 millions of high quality eggs were produced both in the Mediterranean and Eastern Atlantic from different broodstocks. The established and tested method in the Mediterranean was to allow broodstocks to undergo gametogenesis in cages and then induce them to spawn and transfer breeders to tanks for a 3-week spawning period. In the Mediterranean, both cage spawning and year-round maintenance of broodstocks in tanks have been discarded. Broodstocks do not mature in tanks and eggs are lost in cages as the eggs have low buoyancy. In 2018, further work in the Mediterranean will be made to test the best timing of the induced spawning (GMF) and if possible to examine the possibility of single pair spawning (ARGO). All work has been finished in the eastern Atlantic. One spawning deliverable (D3.7) has been completed and all other deliverables (D3.8 to D3.10) are being prepared. In relation to publications on amberjack spawning, one publication has been submitted and three are being prepared (F1 spawning, Broodstock management and spawning methods, and comparison of GnRHa injection vs implants).

In WP 6-wreckfish (*Polyprion americanus*), work has been completed on the reproductive cycle, but we are still missing the analysis of FSH/LH in the plasma (IOLR), as well as the nutrient content of the eggs obtained in captivity in relation to gonads from the wild (ULL). Work on spawning continued in 2017. Spontaneous natural spawning has been achieved with increasing regularity from individual breeders and some broodstocks. However, fertilisation success has been low and this method needs to be more predictable and reliable to secure egg production. Monitoring of broodstocks will continue in 2018 and induced spawning protocols will be applied to broodstocks that do not spawn spontaneously. The capture of mature fish from the wild remains a problem. More strategies have been implemented and more effort made. However, stocks are low and pressure continues to increase to obtain live specimens for both display aquariums and aquaculture. All remaining deliverables (D6.3 to D6.7) will be prepared. Three papers on the reproductive cycle, sperm quality and spawning induction methods will be prepared.

In WP 7-grey mullet (*Mugil cephalus*), the spawning protocol was optimised by defining optimal spawning groups, using phase shifted photo-thermal regimes for out-of-season spawning and improving the broodstock diet. A ratio of 3 males to 3 females in a 5-m³ tank gave 100% spawning. The spawning period was shifted to December – January. A broodstock diet containing fish oil in place of soybean oil improved egg colour and larval survival. Further trials will be made in 2018 to test the protocol in Spain (IRTA) and test improvements in Israel (IOLR). In the grow out phase, hatchery stocks matured earlier than wild stocks and



in the 3rd year of grow out 50% of hatchery females obtained a GSI of 10-20%, which can be used to produce bottarga. All remaining deliverables (D7.5 to D7.7) will be prepared. Three to four papers are expected to results from this WP, on recombinant gonadotropins, hormonal control of maturation and maturation in grow out of wild and hatchery stocks.

GWP Nutrition

For meagre nutrition it has been determined that this species showed the ability to selectively conserve key fatty acids (FA), particularly docosahexaenoic acid (DHA) and arachidonic acid (ARA) over other FA, in response to essential FA (EFA)-deficiency. Furthermore, meagre seems to have active $\Delta 6$ desaturases and Elovl5, but their activities were insufficient to produce DHA and EPA from polyunsaturated fatty acid (PUFA) precursors to sustain fast growth. The requirement for n-3 long-chain (LC)-PUFA for meagre fingerlings is at least 2.0% DM in diets containing 16.5% DM lipids, 0.9 EPA/DHA and 0.4% ARA of total FA contents.



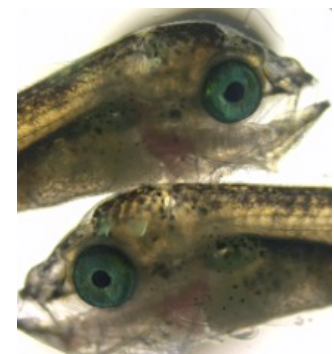
The work done with greater amberjack at the juvenile stage determined the dietary lysine requirement around 2.11% in the diet, based on the Broken-line model. This requirement was calculated for maximum weight gain of greater amberjack juveniles fed on a diet based mainly on plant ingredients, containing 45% protein, 18% lipid and 25% fishmeal inclusion. For broodstocks, a diet containing 1.57% of total FA induced a higher number of eggs per spawn and per kg of female, with the highest percent of fertilization, egg viability, hatching rate and larval survival.

For pikeperch, it has been determined that Ca/P, FAs and their interaction seem to be key nutritional factors influencing pikeperch larval development. Fish fed a diet of 3.7/1.2 (EPA+DHA)/ARA, showed the lowest growth performance compared to the larvae fed 1.8/0.6 (EPA+DHA)/ARA. Pepsin-specific activity was affected by the dietary DHA content, whereas the increase in dietary EPA/ARA levels enhanced the trypsin activity in fish fed low DHA level. The importance of high PL levels of 8% in diets for pikeperch has been also confirmed by IUt. Essential FA may be directly supplemented as triglycerides to have a beneficial effect in pikeperch larvae development. Larvae fed low levels of DHA displayed a tendency towards delayed escape responses (latency time increased) and significantly slower peak acceleration rates during escape responses following a mechano-sensory stimulus.

A comparison of nutrient retention in Atlantic halibut confirming that RAS had a large positive effect on vitamin K (MK6) concentration in the larvae, possibly because it was produced by microorganisms in the system. The inclusion of soy lecithin so that dietary phospholipid increased from 9 to 30% of total lipids had no effect on growth, but changed lipid metabolism in Atlantic halibut juveniles.

The wreckfish diet must contain a big amount of proteins, low level of lipids, a high amount of n-3 PUFA and the EPA/ARA ratio must be similar to that observed in wild females gonads (about 1-1.5).

Using 5.5% DHA in the commercial enrichment "Red Pepper" is sufficient for the growing of grey mullet. Grey mullet juveniles have a minimum 0.5% taurine requirement. At broodstock levels, notable differences were found in the fatty acid profiles when comparing the gonads from wild and domestic adult grey mullet. Differences were particularly marked in EPA in both sexes and DHA in wild males compared to captive cohorts. Hatchery-produced grey mullets showed extensive alpha and beta atresia of vitellogenic follicles, a sign of cessation of the reproductive activity.



GWP Larval husbandry

The representatives summarized their larval studies in each of the 6 species



since the last reporting period.

The tasks and deliverables have been completed in the meagre and are almost completed in the greater amberjack studies, apart from deliverable *D15.5 “An industrial protocol for greater amberjack larval rearing”* where an extension has been requested.

In pikeperch, all deliverables and tasks have been carried out except for deliverable D16.4, which will be submitted in month 54 as the trial will be run in February-March 2018.

In Atlantic halibut, the deliverables *D17.3 “The effect of probiotics on Atlantic halibut larval microbiota and survival”*, and *D17.5 “Development of an industrial protocol for probiotic treatment of halibut larvae”* will be completed by June 2018.

In wreckfish, important advances understanding ontogeny and larval development have been made. How to improve egg quality, as well as larval feeding and survival were extensively discussed. The following deliverables have been delayed: D18.2, D18.3, D18.4 and will be carried out in this final year.

The Tasks 19.3 “Determine the effect of co-feeding ciliates and rotifers on digestive tract maturation and enzyme production” and 19.5 “Testing the improved grey mullet larval rearing protocol in a commercial hatchery” have been postponed to 2018”.

GWP Grow out husbandry

The experiments related to the definition of husbandry and feeding practices for meagre in sea cages were completed. The species was found to be able to feed both during the day and night, with feed distributed in the surface of the cage or submerged without significant differences in performance. It was also shown that feeding behavior may be stimulated by various external stimuli, such as light and air bubbles.



For the greater amberjack, the first trial using industrial scale sea cages was completed and the fish have been harvested and sent to the market, after exhibiting a good growth performance. Several problems were observed during on growing, mostly related to parasite infections that were confronted with efficient methodologies developed during the project. Work on the definition of feeding methods for fry and juveniles, of the optimal ranges of temperature and of stocking density ranges were also implemented.

For pikeperch, the experimentally defined optimum rearing conditions were tested in industrial farm conditions and the work is now focused on assessing the effects of the domestication level and geographical origin on growth and stress sensitivity.

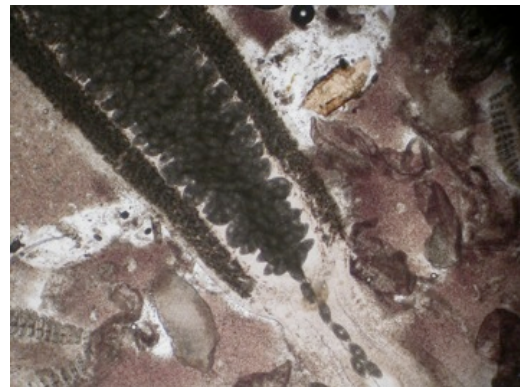
In grey mullet, the experiments with different stocking densities in monoculture and polyculture conditions using wild caught fry were completed in Greece and Spain, and the results are to be analyzed as well as the experiments in monoculture with F1 juveniles in Israel. Furthermore, partners discussed the problems faced during the 4 years of implementation period. All recognized that the collaboration between academia and the private sector has significant problems. In all work packages (i.e. for all species), changes in partnership took place. In some cases, modifications of the original plan were also necessary, while there were cases in which the plan was not implemented at all.

It was agreed that the fact that farms ought to operate with not established and unknown species made the collaboration more difficult, especially as private farms had to adapt to the project’s requirements. It was easier for farms to respond by some adaptations in their standard practice rather than by implementing trials with “difficult” planning. The need for collaboration is evident and more effort should be paid on the proper planning of the work to be implemented based on the experience gained during the DIVERSIFY.



GWP Fish Health

In WP 24 attempts have been made to mitigate against Systemic Granulomatosis (SG) by dietary means. The results from 5 feeding trials show that high inclusion of phosphorus, vitamin C and astaxanthin have beneficial effects concerning the severity of the disease, while plant proteins in the diets have negative effects. The cause of chronic ulcerative dermatopathy has also been studied. In this reporting period analysis of samples obtained from rearing trials in borehole water and natural sea water were finished and indicate the disease can be induced with borehole water. Histology and SEM analysis confirmed that the lesions were limited to the lateral line organ mainly in the head while qPCR analysis showed overexpression of genes connected with specific osteolytic enzymes. Two alternative infestation models were trialed to develop a challenge method for *Scianocotyle pancerii* while another experiment was set up to test the efficiency of cinnamon as an antiparasitic agent against *S. panceri*. The results are currently under analysis. Attempts to identify and isolate *Nocardia* sp. from SG-affected meagre were also undertaken but only a single case of nocardiosis in cultured meagre was found, suggesting it is not the cause of SG. This impacted on our vaccine studies where we have switched to studying a commercially available *Vibrio anguillarum* vaccine rather than try to develop an autogenous vaccine based on *Nocardia* isolates. These trials are scheduled for later this year. Analysis of immune responses have shown that meagre can respond robustly to pathogen derived molecules (PAMPs), and reagents to detect antibody production in meagre have been developed. During the reporting period, two disease outbreaks were recorded, several bacterial strains have been isolated and a challenge test was trialed with *Nocardia*. Such information will contribute to a diagnostic manual for fish health specialists and producers at the end of the programme.



In WP 25 attempts to identify the causative agent of epitheliocystis have been undertaken. Mesocosm studies gave no clear results but samples collected from fish farms in Greece revealed that, in contrast to the prevalent belief that Epitheliocystis is caused by Chlamydia, at least in Greece the main pathogens causing Epitheliocystis disease are intracellular bacteria that belong in the β - or γ -proteobacteria. Studies to promote resistance to parasitic incidence on greater amberjack trialed two different prebiotics, MOS and cMOS. Positive effects were found for cMOS and prebiotic combination (MOS + cMOS) following challenge with the monogenean *Neobenedeniagirellae*. Immune gene expression analysis of skin and gills also showed positive effects with cMOS. Whether cMOS could impact on bacterial load was also studied. After feeding for 90 days the fish were stressed by crowding and prevalence of opportunistic bacteria detected in tissues. Crowding resulted in 100% prevalence for opportunistic bacteria in liver and spleen, with more bacterial species (*Vibrio*'s) present in control diet fed fish vs cMOS fed fish. Studies of an antimicrobial peptide (piscidin) from greater amberjack showed good bacterial growth inhibition against two fish pathogens. The effect of stocking density on parasite (*Neobenedenia melleni*) egg production was also studied and revealed that egg number tended to decrease with stocking density. Several anti-attachment factors were trialed and two treatments (cumin and mannose) showed a reduction in egg number. Mannose in particular looked promising and further optimization of treatment dose and frequency may lead to potential application in the control of monogenean parasites. These practical applications will be incorporated into a diagnostic manual, to be published at the end of the programme as for WP24/meagre.

No partner from IMR participated in this ACM. Nevertheless, the partner in charge of WP 26 has reported that attempts to vaccinate Atlantic halibut against nodavirus (VNN) were made. The VNN capsid protein expressed in different expression systems was delivered to halibut larvae by injection or in feed (via *Artemia*). The juveniles were challenged with VNN 10 weeks after vaccination, and samples collected post challenge to assess for effect of vaccination on protection and immunity (analysis on-going).



GWP Socioeconomics

In total, a number of at minimum 15 articles per GWP is acceptable. A count indicates that we will easily reach the 15 papers as estimated, given the high number of papers in preparation.

Species workshops

The species leaders have asked us to participate in the species workshops, mainly with feasibility work, but if needed also other issues regarding market chances for the specific species. 5 workshops are planned: meagre (May, Barcelona Spain), grey mullet (14 May, Bari) pikeperch (June, Nancy), greater amberjack (September, Athens), halibut (September, Stavanger Norway).

Dissemination meetings GWP7

Rocio has organised already 2 dissemination meetings for GWP7 in Bremen and Cadiz. There are 2 meetings planned in Verona (22 February 2018) and Athens (June 2018). The presentations at these meetings will be done by Rocio, Marija, Gemma, Maren, Javier, Luis and a local representative.

WORK TO BE DONE THIS YEAR

WP28

Sub-task 28.3.1 (Deliverables 28.5 and 28.6)

- Description of Deliverable 28.5 is not correct in the DoW (same text as text of D28.6). **Action:** Luis and Kriton write a new description of Deliverable 28.5 and provide it as an amendment to Dinos.

Sub-task 28.3.3 (Deliverable 28.8)

- Scope of the deliverable is not very clear. We conclude that this task is kind of wrap-up of the work that has been done in WP28, although some new aspects are mentioned (e.g., packaging), but that can be relatively easily fit in.

WP29

All work is done, except that there are still some publications to write. Proposed is to write 3 papers.

WP30

Virtual market test (Task 30.2.2, Deliverables 30.5 and 30.6)

Virtual market test is delayed, due to continuous discussion about the methodology and implementation. Ed doesn't think that delay will lead to delay but Gemma thinks this is very optimistic. One-month delay is needed at minimum, given the planning that in April the fieldwork will start. 2 publications are intended on the outcomes of the experiment and the system dynamics model based on the virtual market test.

Feasibility study (Task 30.3.1, Deliverable 30.7)

Robert is very optimistic that all relevant analyses can be done before the species workshop start. All species leaders are willing to participate and in some cases even the companies are involved.

Final report (Task 30.3.2, Deliverable 30.8)

This task is basically a wrap up/ conclusion of our work in GWP7. **Action:** WUR (Gemma and Machiel) make a first suggestion for Task 30.2.2





Deviations:

The only deviation of this ACM according to the DOW, was that instead of an ACM being held in Norway (hosted by IMR), it was decided at the end of the previous ACM to hold it in Tenerife (hosted jointly by ULL and IEO). A similar change in the original plan was the organization of the ACM 2014 (Y2) in Bari, Italy (hosted by UNIBA), instead of in Las Palmas de Gran Canaria (hosted by FCPCT).



A group photo of some of the participants of DIVERSIFY ACM 2018 on the stairs of the Sciences Faculty building, University of La Laguna, Tenerife, Spain.



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