FP7-KBBE-2013-07, DIVERSIFY 603121



New species for EU aquaculture

Deliverable Report

Deliverable No:	D31.11		Delivery Month	60
Deliverable Title	Scientific publications in relevant journals.			
WP No:	31	WP Lead beneficiary:P18. CTAQUA		
WP Title:	Dissemination			
Task No:	31.4	Ta	isk Lead beneficiary	P1. HCMR
Task Title:	Scientific presentations and submission of manuscripts			
Other beneficiaries:	P2. FCPCT	P3. IRTA	P4. IOLR	P5. UNIABDN
P6. SWR/DLO	P7. IMR	P8. IEO	P9. UL	P10. TU/e
P11. AU	P12. APROMAR	P13. UNIBA	P14. IFREMER	P15. ULL
P16. FUNDP	P19. CMRM	P20. SARC	P21. DTU	P22. SWH
P23. ARGO	P25. DOR	P26. GEI	P27. FORKYS	P28. CANEXMAR
P31. IRIDA	P32. MC2	P39. F2B	P40. GMF	
Status:	Delivered		Expected month	60

Lead Scientist preparing the Deliverable: Mylonas, C.C. (HCMR),

Other Scientists participating: Robles, R. (CTAQUA)

Objective: The objective of this Deliverable was to present the work carried out during DIVERSIFY in relevant international ISI-indexed scientific journals, and when possible to "open access journals". It was expected to have an output of a minimum of 2 articles per species per year (a total of 60 articles for the whole program).

Description: Publication of the work carried out in DIVERSIFY begun in February 2016, with the publication of an article by P3. IRTA and P1. HCMR entitled "Andree, K.B., Roque, A., Duncan, N., Gisbert, E., Estevez, A., Tsertou, M.I., Katharios, P., 2015. Diplectanum sciaenae (Van Beneden & Hesse, 1863) (Monogenea) infecting meagre, Argyrosomus regius (Asso, 1801) broodstock in Catalonia, Spain. A case report. Veterinary Parasitology: Regional Studies and Reports 1–2, 75-79" (Fig. 1).





Figure 1. Print-screen from the ECAS site, showing the first articles entered into the list of articles in the database of DIVERSIFY.

The publication of the first article took place only 14 months after the start of the project (December 2013), and it was considered to be very rapid completion, analysis and publication of the produced task. Unfortunately, the production of scientific articles progressed rather slow afterwards, with only 5 more articles being published in 2016 (3rd year of the project). Contrary to most FP7 projects, DIVERSIFY was planned for a period of 5 years, therefore many of the tasks included in the DOW had a rather long-term planning. In addition, working with new species with limited experience, meant that some experiments failed, and had to be repeated when high mortalities occurred. In addition, in the case of larval rearing experiments, these had to await the availability of large numbers of high-quality eggs to proceed with the planned trials, which happened after the middle of the project. Nevertheless, the Dissemination leader continued to encourage partners to prepare their results as soon as possible for publication, and a dedicated discussion always took place during the Annual Coordination Meetings (**Fig. 2**).



Figure 2. Slides from the presentations of the Dissemination leader Dr Rocio Robles during the Annual Coordination Meetings (Jan 2017 and Jan 2018), encouraging partners to submit their work for publication promptly.



To facilitate rapid production of scientific articles, all researchers were encouraged by the Project Coordinator to prepare their Deliverables in a manuscript format, with full description of the Materials and Methods, and Results, but also a proper Introduction and Discussion with the associated literature. We believe this was helpful not only for the evaluation of the work carried out and presented in the deliverable, by the EU Scientific Officer and the outside reviewer evaluating the project. In addition, for some Deliverables that were very focused and included a limited number of experiments, the Deliverables could quickly be produced in journal format and submitted for evaluation and publication.

In 2018, the last year of the project, a total of 18 articles have been published. By the end of Mo 60 of the project when this deliverable has been submitted (November 2018), DIVERSIFY had **42 published articles and another 6 under review** (see the list later). Although we have not achieved our projected 60 articles for the project, we feel confident that this number will be reached and exceeded greatly within the next year. A large number of articles are under preparation by a number of partners (**Fig. 2**) in all scientific disciplines and will be submitted for evaluation to scientific journals in the next few weeks/months, eventually bringing the number of articles from DIVERSIFY much higher than proposed in the DOW.



Figure 2. Slides from the presentations of the Dissemination leader Dr Rocio Robles during the final ACM in November 2018, summarizing the published articles. Question marks (?) indicate that the information provided for articles "in preparation" (Right-top) for the specific partner is not complete (not all researchers responded), and it is expected to be actually higher.

As expected, the partners with the largest involvement (and budget) in the project had the largest number of published articles (*i.e.* HCMR, IRTA and FCPCT). But also, some partners with much smaller budgets, such as UNIBA, UL, FUNDP, AU and DTU have done a great job in publishing their results promptly.

In terms of published/submitted articles per scientific discipline, Reproduction and Genetics, and Nutrition have the lead, with Socioeconomics and Fish health following. The areas of Larval and Grow out Husbandry are somewhat behind, probably because their work had to wait for the success of the



Reproduction WPs and information obtained from the Nutrition WPs, and the acquisition of large numbers of high-quality eggs to have juveniles of all the studied species, for their implementation. We expect that the researchers involved will begin the preparation of the relevant articles now that the work has been completed.

The full list of published articles so far (30 November 2018) follows in alphabetical order:

- Alexi, N., Byrne, D.V., Nanou, E., Grigorakis, K., 2018a. Investigation of sensory profiles and hedonic drivers of emerging aquaculture fish species. Journal of the Science of Food and Agriculture 98, 10.1002/jsfa.8571.
- Alexi, N., Nanou, E., Lazo, O., Guerrero, L., Grigorakis, K., Byrne, D.V., 2018b. Check-All-That-Apply (CATA) with semi-trained assessors: Sensory profiles closer to descriptive analysis or consumer elicited data? Food Quality and Preference 64, 11-20.
- Andree, K.B., Roque, A., Duncan, N., Gisbert, E., Estevez, A., Tsertou, M.I., Katharios, P., 2015. Diplectanum sciaenae (Van Beneden & Hesse, 1863) (Monogenea) infecting meagre, Argyrosomus regius (Asso, 1801) broodstock in Catalonia, Spain. A case report. Veterinary Parasitology: Regional Studies and Reports 1–2, 75-79.
- Baekelandt, S., Redivo, B., Mandiki, S.N.M., Bournonville, T., Houndji, A., Bernard, B., El Kertaoui, N., Schmitz, M., Fontaine, P., Gardeur, J.N., Ledore, Y., Kestemont, P., 2018. Multifactorial analyses revealed optimal aquaculture modalities improving husbandry fitness without clear effect on stress and immune status of pikeperch *Sander lucioperca*. Gen Comp Endocrinol 258, 194-204.
- Baekelandt, S., Mandiki, S.N.M., Schmitz, M., Kestemont, P., 2019. Influence of the light spectrum on the daily rhythms of stress and humoral innate immune markers in pikeperch Sander lucioperca. Aquaculture 499, 358-363.
- Banović, M., Krystallis, A., Guerrero, L., Reinders, M.J., 2016. Consumers as co-creators of new product ideas: An application of projective and creative research techniques. Food Research International 87, 211-223.
- Campoverde, C., Estevez, A., 2017. The effect of live food enrichment with docosahexaenoic acid (22:6n-3) rich emulsions on growth, survival and fatty acid composition of meagre (*Argyrosomus regius*) larvae. Aquaculture 478, 16-24.
- Campoverde, C., Milne, D.J., Estévez, A., Duncan, N., Secombes, C.J., Andree, K.B., 2017a. Ontogeny and modulation after PAMPs stimulation of β-defensin, hepcidin, and piscidin antimicrobial peptides in meagre (*Argyrosomus regius*). Fish & Shellfish Immunology 69, 200-210.
- Campoverde, C., Rodriguez, C., Perez, J., Gisbert, E., Estevez, A., 2017b. Early weaning in meagre Argyrosomus regius: Effects on growth, survival, digestion and skeletal deformities. Aquaculture Research 48, 5289-5299.
- Campoverde, C., Andree, K.B., Milne, D.J., Estevez, A., Gisbert, E., Carella, F., 2018. Ontogeny of lymphoid organs and mucosal associated lymphoid tissues in meagre (Argyrosomus regius). Fish Shellfish Immunol.
- Carvalho, M., Peres, H., Saleh, R., Fontanillas, R., Rosenlund, G., Oliva-Teles, A., Izquierdo, M., 2018. Dietary requirement for n-3 long-chain polyunsaturated fatty acids for fast growth of meagre (*Argyrosomus regius*, Asso 1801) fingerlings. Aquaculture 488, 105-113.
- Colchen, T., Faux, E., Teletchea, F., Pasquet, A., 2017. Is personality of young fish consistent through different behavioural tests? Applied Animal Behaviour Science 194, 127-134.
- Duncan, N.J., Mylonas, C.C., Milton Sullon, E., Karamanlidis, D., França Nogueira, M.C., Ibarra-Zatarain, Z., Chiumento, M., Aviles Carrillo, R.O., 2018. Paired spawning with male rotation of meagre Argyrosomus regius using GnRHa injections, as a method for producing multiple families for breeding selection programs. Aquaculture 495, 506-512.



- El Kertaoui, N., Hernández-Cruz, C.M., Montero, D., Caballero, M.J., Saleh, R., Afonso, J.M., Izquierdo, M., 2017. The importance of dietary HUFA for meagre larvae (Argyrosomus regius; Asso, 1801) and its relation with antioxidant vitamins E and C. Aquaculture Research 48, 419-433.
- Fernández-Montero, A., Caballero, M.J., Torrecillas, S., Tuset, V.M., Lombarte, A., Ginés, R.R., Izquierdo, M., Robaina, L., Montero, D., 2017. Effect of temperature on growth performance of greater amberjack (SERIOLA DUMERILI Risso 1810) Juveniles. Aquaculture Research, n/a-n/a.
- Fernández-Montero, Á., Torrecillas, S., Izquierdo, M., Caballero, M.J., Milne, D.J., Secombes, C.J., Sweetman, J., Da Silva, P., Acosta, F., Montero, D., 2018. Increased parasite resistance of greater amberjack (*Seriola dumerili* Risso 1810) juveniles fed a cMOS supplemented diet is associated with upregulation of a discrete set of immune genes in mucosal tissues. Fish & Shellfish Immunology.
- Gisbert, E., Mozanzadeh, M.T., Kotzamanis, Y., Estévez, A., 2016. Weaning wild flathead grey mullet (Mugil cephalus) fry with diets with different levels of fish meal substitution. Aquaculture 462, 92-100.
- Grigorakis, K., 2017. Fillet proximate composition, lipid quality, yields, and organoleptic quality of Mediterranean-farmed marine fish: A review with emphasis on new species. Crit Rev Food Sci Nutr 57, 2956-2969.
- Jerez, S., Fakriadis, I., Papadaki, M., Martín, M., Cejas, J., Mylonas, C.C., 2018. Spawning induction of first-generation (F1) greater amberjack *Seriola dumerili* in the Canary Islands, Spain using GnRHa delivery systems. Fishes 3, 1-22.
- Kotzamanis, Y., Kouroupakis, E., Ilia, V., Haralabous, J., Papaioannou, N., Papanna, K., Richards, R., Gisbert, E., 2018. Effects of high-level fishmeal replacement by plant proteins supplemented with different levels of lysine on growth performance and incidence of systemic noninfectious granulomatosis in meagre (*Argyrosomus regius*). Aquaculture Nutrition.
- Koven, W., Gisbert, E., Nixon, O., Solovyev, M.M., Gaon, A., Allon, G., Meiri-Ashkenazi, I., Tandler, A., Rosenfeld, H., 2019. The effect of algal turbidity on larval performance and the ontogeny of digestive enzymes in the grey mullet (*Mugil cephalus*). Comparative Biochemistry and Physiology Part A: Molecular & Integrative Physiology 228, 71-80.
- Lazo, O., Claret, A., Guerrero, L., 2016. A comparison of two methods for generating descripting attributes with trained assessors: check-all-that-apply (CATA) vs. free choice. Journal of Sensory Studies 31, 163-176.
- Lazo, O., Guerrero, L., Alexi, N., Grigorakis, K., Claret, A., Perez, J.A., Bou, R., 2017. Sensory characterization, physico-chemical properties and somatic yields of five emerging fish species. Food Res Int 100, 396-406.
- Lund, I., El Kertaoui, N., Izquierdo, M.S., Dominguez, D., Hansen, B.W., Kestemont, P., 2018. The importance of phospholipids combined with long-chain PUFA in formulated diets for pikeperch (Sander lucioperca) larvae. British Journal of Nutrition 120, 628-644.
- Lund, I., Rodríguez, C., Izquierdo, M.S., El Kertaoui, N., Kestemont, P., Reis, D.B., Dominguez, D., Pérez, J.A., 2019. Influence of salinity and linoleic or α-linolenic acid based diets on ontogenetic development and metabolism of unsaturated fatty acids in pike perch larvae (*Sander lucioperca*). Aquaculture 500, 550-561.
- Manousaki, T., Tsakogiannis, A., Lagnel, J., Kyriakis, D., Duncan, N., Estevez, A., Tsigenopoulos, C.S., 2018. Muscle and liver transcriptome characterization and genetic marker discovery in the farmed meagre, *Argyrosomus regius*. Mar Genomics 39, 39-44.
- Milne, D.J., Campoverde, C., Andree, K.B., Zou, J., Secombes, C.J., 2017. Two types of TNFalpha in meagre (*Argyrosomus regius*): Discovery, distribution and expression modulation. Mol Immunol 92, 136-145.
- Milne, D.J., Campoverde, C., Andree, K.B., Chen, X., Zou, J., Secombes, C.J., 2018. The discovery and comparative expression analysis of three distinct type I interferons in the perciform fish, meagre (*Argyrosomus regius*). Dev Comp Immunol 84, 123-132.



- Mylonas, C.C., Salone, S., Biglino, T., de Mello, P.H., Fakriadis, I., Sigelaki, I., Duncan, N., 2016. Enhancement of oogenesis/spermatogenesis in meagre *Argyrosomus regius* using a combination of temperature control and GnRHa treatments. Aquaculture 464, 323-330.
- Mylonas, C.C., Duncan, N.J., Asturiano, J.F., 2017. Hormonal manipulations for the enhancement of sperm production in cultured fish and evaluation of sperm quality. Aquaculture 472, 21-44.
- Papadaki, M., Peleteiro, J.B., Alvarez-Blázquez, B., Villanueva, J.L.R., Linares, F., Vilar, A., Rial, E.P., Lluch, N., Fakriadis, I., Sigelaki, I., Mylonas, C.C., 2018. Description of the Annual Reproductive Cycle of Wreckfish Polyprion americanus in Captivity. Fishes 3, 1-20.
- Pousis, C., Mylonas, C.C., De Virgilio, C., Gadaleta, G., Santamaria, N., Passantino, L., Zupa, R., Papadaki, M., Fakriadis, I., Ferreri, R., Corriero, A., 2018. The observed oogenesis impairment in greater amberjack *Seriola dumerili* (Risso, 1810) reared in captivity is not related to an insufficient liver transcription or oocyte uptake of vitellogenin. Aquaculture Research 49, 243-252.
- Reinders, M.J., Banović, M., Guerrero, L., Krystallis, A., 2016. Consumer perceptions of farmed fish: A cross-national segmentation in five European countries. British Food Journal 118, 2581-2597.
- Roo, J., Hernández-Cruz, C.M., Mesa-Rodriguez, A., Fernández-Palacios, H., Izquierdo, M.S., 2019. Effect of increasing n-3 HUFA content in enriched Artemia on growth, survival and skeleton anomalies occurrence of greater amberjack *Seriola dumerili* larvae. Aquaculture 500, 651-659.
- Ruiz García, M.Á., Hernández-Cruz, C.M., Caballero, M.J., Fernández-Palacios, H., Saleh, R., Izquierdo, M., Betancor Quintana, M.B., 2018. Incidence of systemic granulomatosis is modulated by the feeding sequence and type of enrichment in meagre (*Argyrosomus regius*) larvae. Aquaculture Research 0.
- Ruiz, M.A., Betancor, M.B., Robaina, L., Montero, D., Hernández-Cruz, C.M., Izquierdo, M.S., Rosenlund, G., Fontanillas, R., Caballero, M.J., 2019. Dietary combination of vitamin E, C and K affects growth, antioxidant activity, and the incidence of systemic granulomatosis in meagre (*Argyrosomus regius*). Aquaculture 498, 606-620.
- Sarih, S., Djellata, A., La Barbera, A., Fernández-Palacios Vallejo, H., Roo, J., Izquierdo, M., Fernández-Palacios, H., 2018. High-quality spontaneous spawning in greater amberjack (*Seriola dumerili*, Risso 1810) and its comparison with GnRHa implants or injections. Aquaculture Research.
- Sarih, S., Djellata, A., Roo, J., Hernández-Cruz, C.M., Fontanillas, R., Rosenlund, G., Izquierdo, M., Fernández-Palacios, H., 2019. Effects of increased protein, histidine and taurine dietary levels on egg quality of greater amberjack (*Seriola dumerili*, Risso, 1810). Aquaculture 499, 72-79.
- Soares, F., Roque, A., Gavaia, P.J., 2018. Review of the principal diseases affecting cultured meagre (*Argyrosomus regius*). Aquaculture Research, 1-10.
- Tsertou, M.I., Smyrli, M., Kokkari, C., Antonopoulou, E., Katharios, P., 2018. The aetiology of systemic granulomatosis in meagre (*Argyrosomus regius*): The "Nocardia" hypothesis. Aquaculture Reports 12, 5-11.
- Zupa, P., Fauvel, C., Mylonas, C.C., Pousis, C., Santamaría, C.A., Papadaki, M., Fakriadis, I., V., C., 2017a. Rearing in captivity affects spermatogenesis and sperm quality in greater amberjack, *Seriola dumerili* (Risso, 1810). Journal of Animal Science 95, 4085-4100.
- Zupa, R., Rodríguez, C., Mylonas, C.C., Rosenfeld, H., Fakriadis, I., Papadaki, M., Pérez, J.A., Pousis, C., Basilone, G., Corriero, A., 2017b. Comparative study of reproductive development in wild and captive-reared greater amberjack *Seriola dumerili* (Risso, 1810). PLoS ONE 12, e0169645.

The list of manuscripts currently under review (30 November 2018) follows in alphabetical order:

Banovic, M. Reinders, M.J. Claret, A. Guerrero, L. and Krystallis, A. One Fish, Two Fish, Red Fish, Blue
Fish or How Ethical Beliefs Impact "Blue" Products' Purchase Intention?", Journal of Business Ethics
UNDER REVIEW.



- Banovic, M. Reinders, M.J. Claret, A. Guerrero, L. and Krystallis, A. Take it or leave it: Impact of eco-label, health and nutrition claims, and country-of-origin on consumer choice of aquaculture products, Food Policy UNDER REVIEW.
- Colchen, T., Fontaine, P., Ledoré, F., Teletchea, F., Pasquet, A., 2019. Intra-cohort cannibalism in early life stages of pikeperch (*Sander lucioperca*), Aquaculture Research UNDER REVIEW, 2nd version with corrections submitted
- El Kertaoui1, I. Lund2, H. Assogba, D. Montero, D. Domínguez, S. Baekelandt, M.S. Izquierdo, V. Cornet, M. Schmitz, S.N.M. Mandiki and P. Kestemont. Key nutritional factors and interactions during larval development of pikeperch (*Sander lucioperca*), Aquaculture Research - UNDER REVIEW.
- Fakriadis, I. Francesca Lisi, Irini Sigelaki, Maria Papadaki, Constantinos Mylonas. Spawning kinetics and egg/larval quality of greater amberjack (*Seriola dumerili*) in response to multiple GnRHa injections or implants. General and Comparative Endocrinology, UNDER REVIEW, 2nd version with corrections submitted.
- Fontaine, P., Colchen, T., Ledoré, F., Gisbert, E., Krauss, D., Hmila, A., Pasquet, A., Optimization of pikeperch Sander lucioperca larval rearing in RAS conditions, Aquaculture Research UNDER REVIEW.

Deviations: There were no deviations in the implementation of the deliverable.





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Deliverable Report – D31.11 Scientific publications in relevant journals