

project news

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AQUAEXCEL (Aquaculture Infrastructures for Excellence in European Fish Research) is an EU FP7 project that aims to integrate key aquaculture research infrastructures across Europe in order to promote their coordinated use and development.

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As part of its Call for Access programme, the AQUAEXCEL project invites proposals from European research groups for scientific research that utilises the facilities of any of the participating aquaculture research infrastructures. AQUAEXCEL unites major aquaculture experimental infrastructure facilities with capacity to undertake experimental trials on a selection of commercially important fish aquaculture species and system types. These 23 aquaculture research infrastructures (27 facilities provided by 15 partners) are made available to the research community for Transnational Access (TNA) with the support of the EU 7th Framework Capacities Programme.



Access to these research infrastructures is administered through a series of seven calls, each issued at six-monthly intervals. John Bostock of the University of Stirling is the Work Package Leader overseeing this process. Here he discusses the progress of the Call for Access programme.

Q. A recent evaluation of the Call for Access programme has taken place. Can you tell us about some of the findings?

This evaluation has been carried out at the mid-point of the project (after two years), during which time there have been three calls for access and corresponding rounds of project review and selection. The purpose of the evaluation is to identify any problems that have arisen and consider ways in which the management and execution of TNA can be improved for the remainder of the project. During the lifetime of AQUAEXCEL it is expected that up to 135 projects will be carried out, involving around 161 users. A total of 56 applications were received in the three calls evaluated, of which 34 were approved but of which two were subsequently withdrawn leaving 32. Six applications were initially rejected but were resubmitted at the next call and subsequently five were approved. The total number of unique project applications was therefore 50. Since the evaluation, a fourth call closed with a total of 18 applications.

Q. How many project visits to the infrastructures have been completed at this stage?

Only 11 project visits were completed prior to the evaluation. The response of both users and hosts was positive or very

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positive, with the majority of projects leading to further plans for cooperation. Few outputs have yet been produced, but most projects anticipate some form of scientific publication and some expect commercial exploitation.

Q. In terms of the applications, are there any areas that generate more interest from the research community than others?

The greatest number of applications and approvals has been in the area of nutrition, followed by physiology, welfare and health. No applications were received in the area of fish processing during the first three calls. Categorisation by EATIP Thematic Areas showed welfare to be most popular, followed by lifecycle, feed and then technology. The classification of projects by species group revealed the largest number of applications for marine temperate species (e.g. Mediterranean), followed by marine coldwater and freshwater in more or less equal proportions.

Q. The users of the TNA have been surveyed. What was the feedback?

Survey respondents were asked for their opinion on the information provided about how to use the installation. A total of 20 responses were received to this question with an average score of 3.75 out of 5, suggesting some room for improvement. Once visits had started, most users were positive about the quality and suitability of the facilities at the host infrastructures. A total of 12 responses were received to this question with an average score of 4.42/5. There was also a positive response to the question on the quality of scientific support to set up experiments and interpret the results. Eleven responses were received with an average score of 4.45/5.

In general, several respondents commented on how much they valued the collaboration with the host scientists as well as the access to facilities. However, it is clear that collaborations are generally not possible without specific funding. Respondents were asked whether

their AQUAEXCEL TNA project would be viable without AQUAEXCEL funding. The majority (80%) replied that they would not have been able to conduct the work without the support of the project, whilst 13% indicated that they could probably have found the funding from other sources and 7% gave no reply.

Q. In terms of capacity, are the research infrastructures oversubscribed?

No, that is not the case. There is substantial variation between infrastructures, with one already fully utilised and several others close to full utilisation. However, six of the facilities had no applications during the first three calls and nine facilities have yet to have any projects approved. Clearly a more focused promotional effort will be required during the second phase of the project to ensure all of the facilities reach their target utilisation by the end of the period of funding.

Q. What's the main selling point of the Call for Access?

The main selling point is certainly the range of facilities and the support expertise that it provides to researchers. The facilities available cover the entire range of production systems (recirculation, flow-through, cage, hatchery and pond systems); environments (freshwater and marine, cold, temperate and warm water); scales (small, medium and industrial scale); fish species (salmon, trout, sea bass, sea bream, cod, common carp etc.); and fields of expertise (nutrition, physiology, health and welfare, genetics, engineering, monitoring and management technologies).

Interested researchers can propose projects that are compliant with the EATIP Strategic Research & Innovation Agenda, and that involve visits of one or two people to a research infrastructure that provides facilities not available in their own country, for periods of up to three months. Access to the research facilities and associated travel and subsistence expenses will be paid for under the project.

The fifth Call for Access will open on 15 July with a deadline of 13 September 2013.

Applicants are advised to read the guidelines carefully and to properly address all the questions on the application form. Detailed discussion with the manager of the host infrastructure and/or collaborating scientists whilst preparing the proposal is strongly recommended. The ethical implications of the work must also be considered thoroughly for any experiments involving animals (fish). It is not sufficient to report that the experimental work has been approved by one or both of the organisations involved. Applicants are also advised to allow at least three months between the deadline for applications and the planned start date for the project.

Further details and the application form can be found at

http://www.aquaexcel.eu/call_for_access

AQUAEXCEL Training Courses Series

A training course on Recirculating Aquaculture System (RAS) Technology was held by Wageningen University, the Netherlands, from 22-25 April 2013 as part of the activities of the AQUAEXCEL project. AQUAEXCEL will hold further courses on different topics later in 2013 and early 2014. Here, three researchers who attended the course give their feedback.



Name: Eva Kovacs
Position: Junior Technical Officer
for Aquaculture
Institute: The Food and Agriculture
Organisation of the United Nations (FAO)
Regional Office for Europe and Central Asia

I have been working in the Budapest Office of FAO as a Junior Technical Officer for Aquaculture since 2010. Previously I studied and worked in the Department of Aquaculture of Szent István University, Hungary, where my main areas of research were fish larval rearing and sperm cryopreservation.

What were your reasons for applying for this course?

FAO is working towards the eradication of hunger and alleviation of poverty by improving agricultural productivity. Fish production is an important and promising part of this process, as production rates have still been growing even in years of recession. However, the fishery sector is unable to meet the increasing demands for fish products and there is an increased load on aquaculture production as a result. RAS technology seems to be a solution for meeting these new demands.

What was your overall impression of the course?

It was a well developed course that included practical information about the design and operation of RAS along with theoretical information. Although there were many people participating, all with different backgrounds and aims, I think each participant found something that will be useful for their future work.

What part of the course did you enjoy the most?

I enjoyed the farm visits, as they provided an opportunity to see the systems in operation and to learn about the functioning and production of different species in different conditions directly from producers. Personal experiences of farmers and producers are very important for my work.

What do you feel is the most useful thing you have learned on the course and why?

For me the most important message of the course was that, despite all the information that is available about recirculation aquaculture systems, there is no standard method to create one. Each system is unique and needs special care and attention to plan and operate it properly.



Name: Türker Bodur
Position: Lecturer and Researcher,
Department of Aquaculture
Institute: Akdeniz University, Turkey
I have been a researcher and lecturer in the
Aquaculture Department at Akdeniz University,
Turkey, since 1999.

What were your reasons for applying for this course?

In my department we have three wet lab units and two of them have a partly recirculation system. I applied for this course because I wished to learn how to improve these systems in the most efficient way and to be able to create new projects about

fish nutrition. I aim to share the knowledge I have gained from this course with my colleagues and students.

What was your overall impression of the course?

All the lecturers were very experienced in RAS technology and excited about teaching us as much as they could in such a short time. They were all very friendly, patient and happy to answer all our questions during the course, field trip or in the breaks. I greatly appreciated the hospitality of the WUR students and teachers. The other participants themselves were very friendly and wished to learn everything they could from the lecturers. Overall I felt that the atmosphere made the whole course a very successful and valuable experience.

What part of the course did you enjoy the most?

The field trip was interesting, especially seeing aquaculture systems that we don't have in Turkey, such as the eel farm and the turbot farm. The lunches and dinners were great times to network and socialise.

What do you feel is the most useful thing you have learned on the course and why?

The most useful part of the course for me was seeing how European researchers build and use their facilities. I believe that, using the knowledge I have gained from this course, we can build a useful infrastructure in my department back in Turkey.



Name: Maddi Badiola-Amillategui
Position: PhD Student
Institute: AZTI-Tecnalia, Spain

I am currently doing my PhD at the Marine Research Division of AZTI-Tecnalia, Spain, studying the technological feasibility of RAS for the production of marine species (cod

and salmon) in the Basque Country.

What were your reasons for applying for this course?

I look after the management and daily routines of the pilot-scale RAS modules I am using for my PhD research, and I saw this course as an opportunity to learn more about the correct design and management of RAS. The backgrounds and expertise of the lecturers were an attractive factor of the course, and I also saw it as a good opportunity to meet people. AZTI-Tecnalia is quite new to aquaculture research, and I aim to share the knowledge I have gained with my colleagues.

What was your overall impression of the course?

I really enjoyed the course and learnt a lot from it. I would like to highlight the willingness of the teachers to share their knowledge. They were helpful and approachable, encouraged us to participate and answered all the questions we asked. Overall, the course was well structured, although I would have liked more practical sessions.

What part of the course did you enjoy the most?

I enjoyed the field trip and meal times the most. These were good opportunities to share ideas and come up with possible projects for the future. I also had the opportunity to meet the person who will be my tutor during my stay in California later this year, which was an added bonus for me!

What do you feel is the most useful thing you have learned on the course and why?

I learnt which steps to take and which criteria to consider while designing RAS. I hope to build on this knowledge with further experience and training.

TNA Researcher Profiles

In advance of the fifth **AQUAEXCEL** Call for Access opening on 15 July 2013, researchers who have accessed the programme describe their work and experiences of using Transnational Access (TNA) to further their research.



Name: Yiannis Petropoulos
Institute: Andromeda S.A., Greece
Project: NE150 effects in sea bream
Position: Agriculturist (B.Sc), Fish Pathologist (M.Sc) Aquaculture
Infrastructure Accessed: Consejo Superior de Investigaciones Científicas, Instituto de

Acuicultura Torre de la Sal (CSIC-IATS-EXP), Spain

Yiannis completed his visit to CSIC-IATS-EXP at the end of September 2012. The TNA lasted three months. As a result of this TNA, Andromeda, Novus International and CSIC are collaborating on a research agreement to further investigate the anti-parasitic effects of the additive NEXT ENHANCE® 150 on gilthead sea bream in large scale experimental cages at Andromeda farms in Greece.

responses to marine versus vegetable-based diets. This has allowed Mohamed to study the effects of diet composition on the regulation of food in-take by rainbow trout, and how this might be influenced by genotype, particularly in relation to sustainable diets with high levels of fish meal and fish oil replacement. Finally, the two lead researchers in the applicant and host research groups (Sofia Morais and Inge Geurden, respectively) share similar research interests and are keen to establish a long-lasting collaboration within this line of research, the first step of which was made possible by **AQUAEXCEL**. Sofia Morais was particularly instrumental in the experiment's design and kick-off.



Names: Mohamed Emam and Dr. Sofia Morais
Institute: Institut De Recerca I Tecnologia Agroalimentaries (IRTA), Spain
Project: Ingestion of VO diets
Positions: PhD Student (M.

Emam), Researcher (S. Morais)

Aquaculture Infrastructure Accessed: INRA, St. Pée, France

The **AQUAEXCEL** TNA to INRA-St. Pée has been extremely important for Mohamed's PhD project as it made it possible for him to utilise specialised facilities with a completely automated demand-feeding system, ideal for food intake studies. In addition, it allowed him to work with genetic resources (trout isoclonal lines) which are unique, and which have been seen to show different



Name: Dr Wilson Pinto
Institute: SPAROS Lda, Portugal
Project: Protein hydrolysates from waste valorisation of sardine-canning and cheese-manufacturing industries as alternative ingredient sources in microdiets for *Sparus aurata* larvae (Hydrofeed)

Project: Post Doctoral Researcher

Aquaculture Infrastructure Accessed: University of Las Palmas de Gran Canaria Warm Water Species Selection Unit (ULPGC-WWSSU)

The **AQUAEXCEL** call was beneficial for Wilson's project because it allowed him to access the highly automated infrastructures of ULPGC. His project aimed to assess the effect of different feeding regimes on gilthead seabream performance, and it would probably not have been completed in Portugal, since modern infrastructures like those from ULPGC do not currently exist there. ULPGC's infrastructures include numerous tanks and a highly equipped nutrition laboratory, allowing larval studies to be conducted and guaranteeing that all necessary experimental and analytical work was successfully accomplished. Furthermore, the high expertise of the ULPGC scientific team allowed the analysis of results to be as profitable as possible.



Facilities at CSIC



One of ULPGC's research labs

TNA Researcher Profiles



Name: Dr Lloyd Vaughan, Lead Researcher, Veterinary Pathology Institute: University of Zurich, Switzerland

Name: Alexander Fehr, PhD student, Veterinary Pathology Institute: University of Zurich, Switzerland

Name: Dr Pantelis Katharios, Coordinator Institute: HCMR Aqualabs, Gournes, Crete

Project: Epitheliocystis in Larvae (EPITHELIOLARVAE)
Aquaculture Infrastructure Accessed: HCMR Aqualabs, Gournes, Crete

Q. Has AQUAEXCEL's call to access been beneficial for your project? If so, please outline why.

Lloyd Vaughan: Epitheliocystis is a disease affecting both wild and cultured fish, and is found throughout the world in many different fish species as well as molluscs. There is great diversity in the bacteria which cause the formation of the intracellular cysts, although the majority appear to be obligate intracellular bacteria of the phylum Chlamydiae. The target organ in older fish is mainly the gills, while larvae exhibit skin lesions. It is in the larvae that the greatest mortalities occur, with complete cohort losses not uncommon. In the eastern Mediterranean, transfer of young *Sparus aurata* (Gilthead sea bream) to sea cages commonly leads to losses of 20-30% due to epitheliocystis during the months of May through to October.



Indoor 40m³ mesocosm tanks fed with either pathogen-free sea water from a 200m deep bore hole or supplied directly from the open sea. Each tank was stocked with 200,000 sharp snout sea bream (*Diplodus puntazzo*) larvae

A great hindrance to progress in combating the disease is the lack of an experimental setup to follow infections, exacerbated by our inability to cultivate the epitheliocystis agents. The AQUAEXCEL call has been invaluable as through this we could access larval mesocosm culture facilities at the HCMR Aqualabs, Gournes, Crete and at the same time draw on the expertise of Dr Pantelis Katharios and his colleagues to run exactly these experiments.



Pantelis Katharios and Lloyd Vaughan with the large 360m³ outdoor mesocosm tank supplied directly from the open sea, stocked with 200,000 sharp snout sea bream (*Diplodus puntazzo*) larvae.



Lloyd Vaughan and Alexander Fehr sampling the water column, including plankton fractionation.

Q. What type of research were you carrying out?

Lloyd Vaughan: The experimental setup consisted of three mesocosm systems, two 40m³ indoor and one large 360m³ outdoor larval rearing tanks. One of the indoor 40m³ tanks was fed pathogen-free sea water from a 200m deep bore hole. The second 40m³ indoor and the large 360m³ outdoor tanks were supplied with water directly from the open sea, which may offer additional food items for the early stage larvae, but which may also pose a pathogen risk. Each tank was stocked with 200,000 sharp snout sea bream (*Diplodus puntazzo*) larvae in mid October 2012. Larvae were monitored on a daily basis and water samples were taken.

Chlamydiae could be detected in the water columns of the open sea water fed tanks at 15 dph but the larvae were still healthy and Chlamydiae free. However, by 21dph, epitheliocystis lesions were present in the larvae and the severity of the infection increased up to 28dph. Surprisingly, from 35dph, the larvae began to recover. No Chlamydiae were detected in the bore hole fed mesocosm tank, nor did these larvae develop epitheliocystis.

Molecular and morphological analysis has subsequently shown we are dealing with novel members of the phylum Chlamydiae and these analyses are continuing. To our knowledge, this is the first such example of experimental infections, and given these encouraging findings, we will continue with our plans to test further fish species at HCMR Aqualabs to refine this novel approach and our analytical procedures.

TNA Researcher Profiles



Name: Prof William V. Holt
Position: Visiting Professor, Academic
 Department of Reproductive and
 Developmental Medicine, Department of
 Human Metabolism
Institute: University of Sheffield, UK
Project: Seahorses as a new model for

studying epigenetics and development

Position with the project: Lead researcher

Aquaculture Infrastructure Accessed: University
 of Las Palmas de Gran Canaria (ULPGC), Spain

More than 10 years ago I was introduced to the world of seahorse conservation by Dr Amanda Vincent (University of British Columbia, Canada) and Dr Heather Koldewey (Zoological Society of London, UK), who were, and still are, very involved in trying to counter the burgeoning global trade in wild seahorses. I was, however, especially impressed when Amanda and Heather told me that the over-exploitation of seahorses was leading to changes in the size of seahorse eggs. As someone who had until then only studied mammalian systems, where egg size is not really changeable, this conversation implied to me that seahorses have a reproductive repertoire that includes some very unusual and interesting phenomena. Of course, this was in addition to the more widely known seahorse habit of gender role reversal, where the male becomes pregnant after receiving eggs from the female, but also manages to support spermatogenesis in between times. This started me on a new adventure into fish biology.



Prof Holt and colleagues at Las Palmas

However, on looking further into the reproductive biology of the seahorse, I realised that there are interesting, and possibly unsuspected, parallels with mammalian reproduction, especially where pregnancy is concerned. The seahorse embryo undergoes an interaction with the male's pouch that resembles mammalian implantation, and the individual embryos develop a kind of placenta. If this placenta truly provides sustenance and functional support to the developing embryos, the situation becomes very interesting in the light of relatively recent findings in mammals, where the quality of the maternal environment (especially in terms of nutrition) around the time of conception is now known to have major influences on the later life of the adult. Essentially, poor nutrition around the time of conception and early development increases the risk of high blood pressure, cardiovascular disease, diabetes, etc., long after the embryos have reached adulthood. This topic is now a major focus for medical researchers around the world, who use mammalian models such as mice, rats, humans and even farm animals.

Given the apparent similarity between seahorse male pregnancy and mammalian female pregnancy I began to wonder whether the negative impacts of seahorse exploitation, coupled with climate change, could be affecting the development and survival of seahorses later in life. If this was so, the seahorse would then also represent a non-mammalian model for studies of the whole topic. The advantages of developing a seahorse model include the fact that they reproduce very quickly, with broods being produced every two to three weeks, and also the fact that the number of offspring in a brood can exceed several hundred.



Sea horses (*Hippocampus reidi*)

This train of thought was turned into reality, when my colleague Dr Alireza Fazeli from Sheffield and I, heard a lecture about fish nutrition given by Professor Marisol Izquierdo (University of Las Palmas Gran Canaria), when we all attended a COST Action meeting in November 2011, set up by the EU COST Office in Brussels. After a short conversation with Marisol, it became apparent that she was already interested in seahorse biology, and that she had the required facilities to establish a major investigation into the impact of nutrition and feed quality on the fertility and fecundity of seahorses (*Hippocampus reidi*), and the subsequent growth and survival of the offspring. This provided the basis for an AQUAEXCEL project application. The project commenced in January 2013 and is still on-going. The basic experimental design involved using either wild mysids or commercial seahorse diet in order to influence the peri- and post-conception environment. However, because we were able to manipulate the male's and female's diets separately prior to mating, we have been able to establish matings and obtain offspring from animals from all combinations of dietary treatments (i.e. male x female x wild diet x commercial diet).

At the time of writing it is clear that the best fertility, growth and offspring survival is obtained when both males and females are fed with wild mysids. Interestingly, however, it is also looking likely that if either male or female is fed with commercial diet, but mated with a partner fed with wild mysids, the result is lowered fecundity and poorer growth. The formal data analysis cannot be completed yet because the experiment has a few more weeks to run, but it is clear that the project has been a great success and we will have masses of data to analyse very shortly. I am optimistic that this project will provide important data for aquarists interested in seahorse nutrition, but will also provide the data we are seeking in order to justify the belief that seahorses could be an invaluable biological model for research into the developmental origins of adult diseases. The person mainly responsible for the smooth and efficient running of the experiment has been Dr Fran Otero, and he deserves special mention here. Dr Otero not only dived regularly off the coast of Las Palmas to obtain the wild mysids, he was responsible for the feeding treatments (which are very demanding in terms of effort and time) and the physical measurement of over 10,000 juvenile seahorses.

FFPW USB to Open New Experimental Facilities

The Faculty of Fisheries and Protection of Waters, the University of South Bohemia in Ceske Budejovice (FFPW USB) will organise a workshop Diversification in Inland Finfish Aquaculture II, which will be held in Vodnany (Czech Republic) from 24 – 26 September 2013 to mark the occasion of the opening of the Faculty's newly reconstructed premises. Two of these facilities (hatchery and recirculation units with ponds) are part of the infrastructures which have been offered for Transnational Access in **AQUAEXCEL**. More detailed information about the workshop and the celebratory opening can be found on the website <http://www.frov.jcu.cz/difa2013/>. You are all cordially invited to attend.



Genetic Fisheries Centre – Hatchery

Is Your Research Infrastructure on the Map Yet?

The **AQUAEXCEL** Aquaculture Research Infrastructure Map is an integrated online infobase listing all aquaculture research infrastructures in Europe and associated countries, including non-**AQUAEXCEL** partners. The infobase will grow to be a viable European aquaculture research infrastructure directory and a powerful tool to identify European facilities, genetic and human resources, and to promote mutual collaboration. If your research infrastructure does not appear on the map, you are encouraged to register and upload information about the facilities and expertise at www.aquaexcel.eu/rimap.

This will increase the visibility of your infrastructure and include it in planned studies of infrastructure needs and strategies in the aquaculture RDI sector.

For more details about the **AQUAEXCEL** Aquaculture Research Infrastructure Map, please contact:

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e-mail: marieke@aquatt.ie

To add your Research Infrastructure to the **AQUAEXCEL** online infobase, go to:

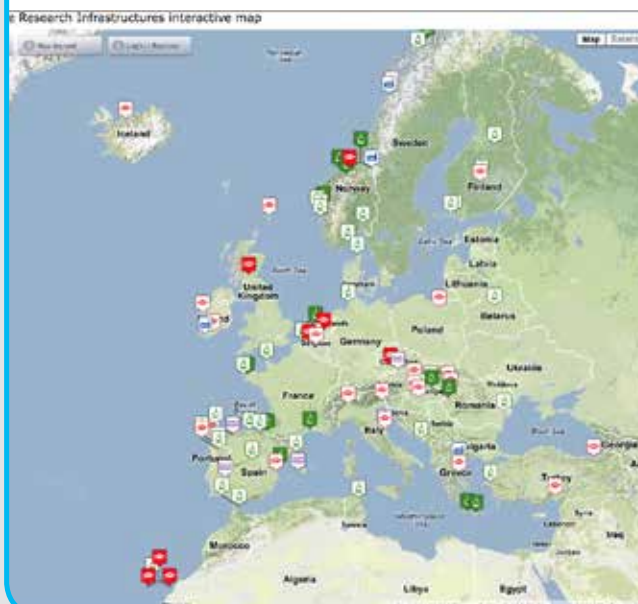
<http://www.aquaexcel.eu/rimap> or go to www.aquaexcel.eu and select the interactive map from the menu (please note that the system is best viewed in Mozilla Firefox or Google Chrome)

1. Click on "Register to map"
2. Complete your details and submit
3. You will be sent a confirmation e-mail with your login details
4. Complete the fields
5. **AQUAEXCEL** will check the information and publish your entry when approved

For more information please check out www.aquaexcel.eu

AQUAEXCEL KEY ACHIEVEMENTS BOOKLET

AQUAEXCEL Key Achievements 2011 – 2013 is the first in a series of four booklets that will introduce the project, its core functions and its progress to date. The booklet focuses on **AQUAEXCEL**'s key achievements and provides detailed summaries of each. The aim of this booklet is to communicate to a general public how **AQUAEXCEL**'s work is benefitting the research community and industry as well as helping to achieve significant value creation. The booklet can be downloaded from the **AQUAEXCEL** website and hard copies can be obtained by sending a request to marieke@aquatt.ie



AQUAEXCEL Partner Develops a Transcriptomic Database of Gilthead Seabream

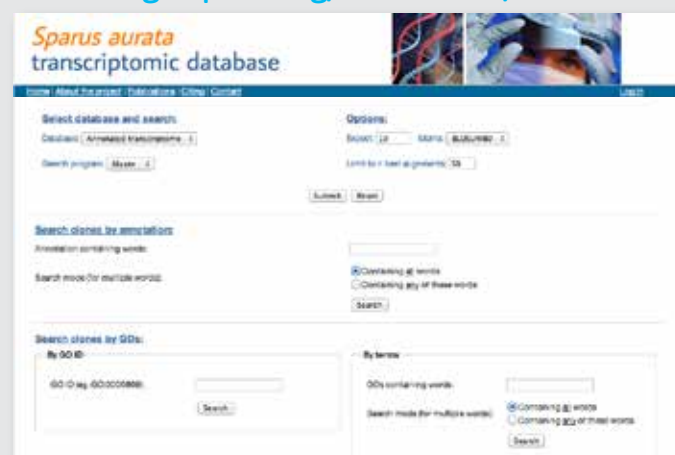
AQUAEXCEL partners, Agencia Estatal Consejo Superior de Investigaciones Científicas (CSIC), headed by Prof. Jaume Pérez-Sánchez, have contributed to the development of a transcriptomic database of gilthead seabream (*Sparus aurata*). This database has been funded by AQUAEXCEL and several other projects: **ARRAINA**, **AQUAGENOMICS**, **AQUAFAT**, **ENTEROMYXCONTROL**, and **NISAAM**. The database is a very useful tool for searching by sequences in FASTA format, annotated gene names and gene ontology terms.

The gilthead sea bream (*Sparus aurata*) is the main teleost species cultured in the Mediterranean area, and a major goal of the Instituto de Acuicultura Torre de la Sal (IATS)/CSIC research group is to integrate new genomic data to assist fish phenotyping and the development of biomarker panels of prognostic and diagnostic value. The present database collects assembled data derived from public repositories of mRNA, collections of expressed sequence tags (suppressive subtractive hybridisation (SSH) libraries of fish challenged with environmental, pathogenic and nutritional stressors) together

with new high-quality reads from five cDNA 454 normalised libraries of metabolically and immunologically relevant tissues (skeletal muscle, intestine, head kidney, and blood).

For more information, please visit:

www.nutrigroup-iats.org/seabreamdb/



AQUAEXCEL Second Annual Meeting

AQUAEXCEL's second annual meeting took place in Brussels from 9-11 April. According to Marc Vandeputte, AQUAEXCEL coordinator, the meeting presented the participants with a platform to discuss and analyse the work achieved so far. "It's important that we take this opportunity to assess the level of progress we have made. It also affords us the opportunity to identify how we can improve as we continue to deliver on our targets for the remainder of the project," he said.



Marc also reiterated the important role that AQUAEXCEL will continue to play in European aquaculture: "As consumers become more concerned about where their food comes from, the European aquaculture sector faces complex challenges. AQUAEXCEL is actively working to address these challenges through our transnational access activities, which enable scientists and researchers to freely access aquaculture research not available in their own countries; through our networking



activities, which foster a culture of cooperation between AQUAEXCEL and other scientific communities; and through our joint research activities, which aim to improve the quality and quantity of services provided by aquaculture research infrastructures."

