AQUAEXCEL

Aquaculture Infrastructures for Excellence in European Fish Research

Project number: 262336

Combination of CP & CSA
Seventh Framework Programme
Capacities

Deliverable D4.2a

(Second) Call for Access

Due date of deliverable: M09

Actual submission date: M13

Start date of the project: March 1st, 2011 **Duration**: 48 months

Organisation name of lead contractor: University of Stirling

Revision: V01

Project co-funded by the European Commission within the Seventh Framework Programme (2007-2013)	
Dissemination Level	
PU Public	✓
PP Restricted to other programme participants (including the Commission Services)	
RE Restricted to a group specified by the consortium (including the Commission Services)	
CO Confidential, only for members of the consortium (including the Commission Services)	

Table of contents

Summary 4

1. Call for access 5
1.1 Document development 5
1.2 Document publication 5

2. TNA Guide 5
2.1 Document development 5
2.2 Document publication 5

3. TNA Application Form 5
3.1 Document development 5
3.2 Form publication 6

4. CV Template 6
4.1 Document development 6
4.2 CV template publication 6

5. TNA Application Administration 6
5.1 Application tracking 6
5.2 Procedure on receipt of application 8
5.3 Procedure for selection 8

Conclusion 9

Glossary

AQUAEXCEL:	Aquaculture Infrastructures for Excellence in European Fish Research
AQUA TT	AquaTT UETP Ltd
CSIC	Agencia Estatal Consejo Superior de Investigaciones Cientificas
ExCom	Executive Committee
GC	Governing Council
HAKI	Research Institute for Fisheries, Aquaculture and Irrigation
HCMR	Hellenic Centre for Marine Research
IFREMER	Institut Français de Recherche pour l'Exploitation de la Mer
IMARES	Institute for Marine Resources and Ecosystem Studies
IMR	Havforskningsinstituttet
INRA	Institut National de la Recherche Agronomique
IT	INRA Transfert S.A
NOFIMA	Nofima Marin AS
NTNU	Norges teknisk-naturvitenskapelige universitet
PDF	Portable Document Format (Adobe Acrobat File)
SINTEF	SINTEF Fiskeri og havbruk AS
TNA	TransNational Access
UGENT	Universiteit Gent
ULPGC	Universidad de las Palmas de Gran Canaria
UoS	The University of Stirling
VURH	University of South Bohemia
WU	Wageningen Universiteit

Summary

Objectives
The second call for access continued the aims of the first, to publicise the opportunities for transnational access (TNA) to key aquaculture research infrastructures across Europe, facilitated through the AQUAEXCEL project, and provide the necessary information and tools for interested scientist to apply. The overall objective being to promote the coordinated use and development of these experimental facilities and encourage problem-based research and knowledge transfer to more effectively support the development of a sustainable European production of high quality seafood with reduced environmental impact.

Rationale:
The second call for access was issued after the first call applications had been evaluated and selected. Lessons that were learned from the first call were taken into account when modifying some aspects of the call text and guidance given with the application forms.

The guidance document for TNA was unchanged from the first call as facilities had not sufficiently developed or published new material and no problems were reported with the original approach. The main call document was updated to include stronger guidance on the need to complete the application form in full and to better consider both ethical issues and opportunities for exploiting the results.

The application form guidance was updated, but the content remained the same as the first call. The form was prepared in Adobe Acrobat X which allows applicants to complete the form on their own computer and then send the data via e-mail to the TNA coordinator. Reviewers are able to annotate applications using Adobe Acrobat Reader software. The main advantage of this approach is that it provides flexibility for applicants and reviewers but also allows the data to be extracted and compiled to a spreadsheet or database for management purposes.

The CV template for applicants was also updated slightly to reduce the burden of information required.

A notice about the second call and associated deadline for submissions was published on the AQUAEXCEL website on 21 December 2011. The revised documents were posted on 3rd February 2012 at http://www.aquaexcel.eu/call_for_access/. The call was then publicised via newsletters, announcements on other project web sites, and through social networks. A second round deadline for applications was set for 16th March 2012.

Teams involved: The documents were prepared by the University of Stirling (P3) with comments and suggestions from the Selection Panel meeting held on 15th December 2011. The web page updates were carried out by AquaTT (P16).

Geographical areas covered: All Europe.

1. Call for access

1.1 Document development

The second call for access document was largely based on the first, with minor updates to take account of comments from the Selection Panel. The deadline for the second round of applications was set at 16th March 2011 so as to maintain the planned 6-monthly intervals between rounds.

1.2 Document publication

The call was published as a PDF document (Annex 2) on the project website (www.aquaexcel.eu/call_for_access) on 3rd February 2012, although the deadline was pre-announced from 21 December 2011. A summary of the call text was included on the website TNA page. Publication of the call was announced to partners through the project communication channels and further disseminated through individual partner actions (via internal e-mailing lists, but also public websites such as: http://www.campusdelmar.es/noticias/proyecto-aquaexcel-febrero-de-2012-segunda-convocatoria-de-acceso-abierta-791; http://wwz.ifremer.fr/institut_eng/The-Institute/Actualites-Agendas/European-project-Aquaexce; http://www.haki.hu/index.cgi?nyelv=en; http://www.iats.csic.es/?not=lista&filtro=todas) and other aquaculture-related networks and websites. These included: AquaTT (Aqua-tnet and AquaTT Training News newsletters), the ASEM Aquaculture Platform, social networking services such as LinkedIn, Facebook and Twitter.

2. TNA Guide

2.1 Document development

The guide to Transnational Access from the first call was unchanged for the second. The guide includes an overview and details of each of the participating infrastructures formatted as a PDF handbook for distribution with the call text. The document also includes contact details for each of the infrastructure facility managers.

2.2 Document publication

The guide to TNA has been published as a PDF document (Annex 3) on the project website (www.aquaexcel.eu/call_for_access) since 1st July 2011.

3. TNA Application Form

3.1 Document development

The TNA application form was mostly unchanged from the first call. This was because

relatively few problems were identified, and consistency in coding and other aspects will help with long-term monitoring and evaluation. However, it was considered necessary to alter and augment some of the guidance notes including some hints that appear when the user views the form on-screen.

Adobe Acrobat PDF form technology is used for the following reasons:

- Electronic format which minimises the need for re-typing information
- Cross-platform compatibility using freely available software (Adobe Reader)
- Forms can be shared and circulated between collaborators during preparation
- Reviewers can add tracked comments and annotations to the completed form during the evaluation process
- Data from the forms can be extracted to spreadsheets or databases for subsequent analysis or management

Alternatives considered were forms based on Microsoft Word, the use of online survey tools, or custom web application development. It was felt that the Adobe Acrobat forms offered the most rapid and flexible solution. The form features a “submit” button, to make online submission easier. The main disadvantage of the PDF form approach is that they are difficult to change once in that format.

3.2 Form publication

The TNA application form with revised guidance was published as a PDF document (Annex 4) on the project website (www.aquaexcel.eu/call_for_access) on 3rd February 2012.

4. CV Template

4.1 Document development

As with the main application form, the CV template from the first call was retained. However, some guidance was altered. In particular, the question about citation scores was made optional as the Selection Panel did not consider these to be sufficiently reliable. For applicants with substantial project experience, the guidance now asks for a list of projects over the past 3 years, rather than being unlimited.

The CV template uses the same PDF form technology as the main application form in order to ensure standard data is collected and to enable information to be extracted from the forms for use in administrative or management spreadsheets or databases.

4.2 CV template publication

The revised CV template form was published as a PDF document (Annex 5) on the project website (www.aquaexcel.eu/call_for_access) on 3rd February 2012.

5. TNA Application Administration

5.1 Application tracking

The spreadsheet set up to track applications and the subsequent process of review in the first call is currently being reviewed and may be moved to a database for greater flexibility. The basic coding system for applications developed for the first call will be altered slightly for the second call by moving the unique application number to the start. The reference code is inserted onto the application forms and CVs by the TNA coordinator as follows:

Application Code Format (example): TNA-0001/01/05/15/A

0001 = Unique application number
01 = Call identifier
05 = Partner number
15 = Infrastructure (Workpackage Number)
A = Version

When there is a change of infrastructure, the relevant codes will be changed and the version letter changed. If the same project is resubmitted in subsequent calls, the unique application number may be re-used but the call identifier and version letter changed.

The partner and infrastructure codes are based on those used in the DoW:

Partner	Workpackage	Facility
1	WP10	INRA-PEIMA
1	WP11	INRA-ST- PEE
2	WP12a	IMR Matre (CEL)
2	WP12b	IMR Matre (Cell)
3	WP13	Institute of Aquaculture
4	WP14	CSIC-IATS
5	WP15	HCMR-Aqualabs
5	WP16	HCMR-Souda
6	WP17	HAKI OEPS
6	WP18	HAKI RECIRK
7	WP19	IFREMER- MFL
7	WP20	IFREMER-MES
8	WP21	Nofima-NCBC
8	WP22	Nofima Averøy
8	WP23	Nofima-NCRA
9	WP24a	VURH HEU
9	WP24b	VURH PEU
9	WP24c	VURH REU
10	WP25	NTNU CodTech (automated start-feeding rig)
11	WP26	SINTEF ACE/SSO
12	WP27	ULPGC-WWSSU
12	WP28	ULPGC-MBS
12	WP29	ULPGC-FITU
13	WP30	WU- Metabolic Research Unit
14	WP31	UGent-GART
15	WP32	DLO-IMARES-RECIRC

The CVs are coded in the same way so that they are readily linked with the application.

CV Code Format (example): CV-0001/01/05/15/01/A

0001 = Unique application number
01 = Call identifier
05 = Partner number
15 = Infrastructure (Workpackage Number)
01 = Number of CV within the application
A = Version

5.2 Procedure on receipt of application

On receipt of an application, the TNA Coordinator codes the form and CV and sends a copy of the application form only to the proposed facility contact person to check if the proposed work and timetable is feasible and if there are any issues that would affect the ability of the applicant to complete the work. These responses (form in Annex 6) are then passed to the Selection Panel members with the application forms and CVs. Copies of the proposals are also stored on the project intranet server.

5.3 Procedure for selection

The selection procedures established under the first call are expected to be retained. Each application is reviewed by four members of the Selection Panel (two internal and two external). Guidelines for evaluation were developed based on 5 main criteria. Evaluators are asked to mark each proposal out of 5 for each criterion. A weighting factor for each criterion is then applied so that a final percentage score can be obtained. The guide and scoring scheme is shown in Annex 7 whilst the evaluation form is shown in Annex 8. The scores from the 4 evaluators are averaged and the applications ranked. The scores are considered to be a guide to decisions on funding with a threshold score of 65% as a guideline. However, borderline cases are discussed and a decision agreed on a case by case basis.

Proposals accepted for funding by the Selection Panel are then subject to an external ethical review, which might raise fundamental objections, but mostly is expected to recommend improvements to experimental design. Proposals scoring above the threshold and that are ethically acceptable will be selected depending on the available units of access at each facility and with respect to score rank (highest ranking proposals will be selected first). Evaluators may also recommend that proposals are re-drafted, or asked to consider using a different facility.

The results of the selection process are fed back to the applicant and copied to the relevant Infrastructure Manager by means of a summary evaluation form (Annex 9). This is completed by one of the four evaluators with assistance as required by the WP 4 Coordinator.

Conclusion

The second call for access is largely a refinement of the first call and was published on 3rd February 2011, approximately 2 months later than planned. The reason for this delay was to try to complete the first call evaluation and selection procedure so that lessons learned could be incorporated into the second call.

As with the first call, the second call package consists of 4 PDF files:

- Call text with summary of facilities
- TNA guide with full details of facilities
- TNA application form
- TNA CV Template

News of the call and appropriate web links were disseminated through partners, news channels and social networking services. Additional channels for promotion are being considered to ensure all target groups are reached.

A management and monitoring structure continues to be under development to handle application processing and subsequent evaluation of impact.

The Selection Panel consisting of 8 people (4 internal and 4 external to the project) plus one ethics adviser is in place with appropriate evaluation criteria and forms to complete their work.

Annex 1

Deliverable Check list (to be completed by Deliverable leader)

	Check list		Comments
BEFORE	I have checked the due date and have planned completion in due time	✓	*Completion was delayed*
	The title corresponds to the title in the DOW	✓	
	The dissemination level corresponds to that indicated in the DOW	✓	
	The contributors (authors) correspond to those indicated in the DOW	✓	
	The Table of Contents has been validated with the Activity Leader	✓	
	I am using the AQUAEXCEL deliverable template (title page, styles etc)	✓	
The draft is ready			
AFTER	I have written a good summary at the beginning of the Deliverable	✓	
	The deliverable has been reviewed by all contributors (authors)	✓	
	I have done a spell check and had the English verified	✓	
	I have sent the final version to the Activity Leader and to the 2nd Reviewer for approval	✓	

Annex 2

Call for Access

2nd Call for proposals for Transnational Access

Background and objectives

The AQUAEXCEL project unites major aquaculture experimental facilities with capacity to undertake experimental trials on a selection of commercially important fish aquaculture species and system types. These facilities are made available to the research community for Transnational Access (TNA) with the support of the European Union's 7th Framework Programme for Research and Technological Development (Infrastructures).

The facilities available cover the entire range of aquaculture 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, carp etc.); and fields of expertise (nutrition, physiology, health[1] and welfare, genetics, engineering, monitoring and management technologies).

The overall objective of the project is to promote the coordinated use and development of these experimental facilities and encourage problem-based research and knowledge transfer to more effectively support the development of a sustainable European production of high quality seafood with reduced environmental impact.

Proposal requirements

Expected projects can involve research on any of the available fish species at the selected research infrastructure. The participating facilities are summarised below and full details are available via the project website (www.aquaexcel.eu) or through direct contact with the selected research infrastructure. Proposals can only be approved if feasible and do not exceed a total duration of 3 months.

Proposals may be submitted by a single researcher or by research groups where the group leader and a majority of group members are affiliated to institutions or laboratories (public or private) from European member or Associated States[2], which are different from the State where the selected Research Infrastructure is located. It is required that the facility users communicate the results acquired in an AQUAEXCEL Research Infrastructure to the scientific community at large through classical means, i.e. project reports, congress communications and scientific publications. All group leaders are required to submit their metadata sets and summary report to the Research Infrastructure provider, for further publication via the project dissemination channels (technical leaflets, website pages and newsletters).

[1] Note that for challenge trials on zoonoses, emerging diseases and other aquatic animal infectious diseases requiring bio-containment at level 3 (L3), researchers are directed to the NADIR project which is specialised in providing research infrastructure for such pathogens (http://www.nadir-project.eu/nadir_project/call_for_access)

[2] Associated states: Switzerland, Norway, Iceland and Liechtenstein, Israel, Turkey, Croatia, the Former Yugoslav Republic of Macedonia and Serbia, Albania and Montenegro, Bosnia & Herzegovina

Proposal review

Each submitted proposal that is eligible, and considered to be feasible at the chosen Research Infrastructure, will be appraised by a selection panel involving independent aquaculture experts and project nominated technical experts.

Following an initial screening for practical and financial feasibility, the criteria for selection will be scientific quality, degree of innovation, relevance, exploitation potential and ethical soundness of the study[3]. Secondary selection criteria will be the expertise of the applicants, the cost efficiency of the work, and whether group members are first time users of the facility. In considering the exploitation potential, attention will be given to how the work contributes to meeting the objectives of the European Aquaculture Technology and Innovation Platform, as defined in the thematic Strategic Research and Innovation Agendas (www.eatip.eu).

Projects approved for access will enter a negotiation phase in which the project design and costs will be agreed and the project will be subjected to an ethical review. All work must be completed by 01-02-2015 to fall within the funding period of the AQUAEXCEL project by the European Commission.

Resources

There are 27 different Research Infrastructures available for access within the AQUAEXCEL project, provided by 15 different partner organisations. Access is measured in the most appropriate way for each facility. Applicants must indicate the number of units of access they wish to apply for. The attached table summarises the facilities available and the units of access used by each. The table focuses mainly on fish culture facilities although most also have supporting analytical laboratories.

The AQUAEXCEL project will cover both facility costs and the research group(s) travel and subsistence expenses according to the submitted workplan. Some facilities assume one person per project whilst others assume that up to two will be involved. As costs and reimbursement arrangements may vary between facilities, full details will be provided on request to the specific Research Infrastructure. Where flat rates are used the maximum allowances will be calculated with reference to EC FP7 funding regulations[4].

Application procedure

Information on the facilities offering Transnational access is available at the project website (http://www.aquaexcel.eu/) and in the document "AQUAEXCEL Guide for Transnational Access" which is available on the website alongside the application form and CV template. Applicants are required to contact their preferred partner facility to discuss the project design and costs for the proposed project, before the submission of an application.

Requests must be submitted via e-mail using the PDF form available on the website. Full instructions for submission are included on the form. Submissions must be made before the announced Call deadline – 16th March 2012.

Opportunities for access will be offered as long as transnational funding for the particular facilities is remaining. An updated list of available Research Infrastructures will be published as part of the periodic Call for Proposals.

[3] See guidance at http://cordis.europa.eu/fp7/ethics_en.html
[4] See guidance at ftp://ftp.cordis.europa.eu/pub/fp7/docs/flat-rates-subsistence_en.pdf

Engagement conditions

After the completion of an AQUAEXCEL Transnational Access, each appointed group leader should:

1. Submit a summary report to AQUAEXCEL using the supplied template
2. Fill a questionnaire available on-line at: http://cordis.europa.eu/fp7/capacities/questionnaire_en.html
3. **All group members** are expected to publish the results of their work at the infrastructure in the open literature. All publications resulting from the project should acknowledge the EC-support by mentioning: "The access to [name of selected facility] was funded by the European Union's Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 262336"
4. Proprietary research (research where results are not generally available to the public or only made available under confidentiality arrangements) cannot be supported.
5. Travel and subsistence expenses linked to the access will be reimbursed upon approval of the report. Reimbursements will be done according to administrative rules of each hosting organisation.
6. For more information about transnational access conditions, see the ANNEX III to the Grant Agreement – Infrastructures: ftp://ftp.cordis.europa.eu/pub/fp7/docs/fp7-ga-annex3-infra-v2_en.pdf and for the purpose and legal background of the Research Capacities Programme see http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:400:0299:0367:EN:PDF

Further information: If further guidance on the call and application procedure is required please contact John Bostock <j.c.bostock@stir.ac.uk>

Disclaimer: *This project is part-funded from the European Union's Seventh Framework Programme (FP7/2007-2013) under grant agreement no 262336. This document has been authored by consortium members, and the European Union cannot be held responsible for any use which may be made of the information contained therein.*

Summary of Research Infrastructure Facilities

Category	System	Water	Further details	Country	Organisation	Facility	Units of access	Web link
Cages	Seawater cages	Temperate SW	3 x 3 x 3 m or 1 x 1 x 1.5 m cages	Greece	HCMR	Souda	Week	www.hcmr.gr
		Cold SW	12 x 12 m cages with full monitoring	Norway	IMR Matre	CEL	Cage/Week	www.imr.no
		Cold SW	5 x 5 x 5 m cages with computer feed control and waste collection	Norway	NOFIMA	Averøy	Cage/Week	http://www.nofima.no/marin/en/about-nofima-marin/facilities/averoy-research-station
		Cold SW	2 highly monitored commercial scale sea cage facilities	Norway	SINTEF	ACE/SSO	Week	www.sintef.no/fish & http://www.aceaquaculture.com/english/
Ponds	Freshwater ponds	Temperate FW	20 x 25 ha ponds and 50 x 0.1 -0.2 ha ponds	Czech Republic	VURH	PEU	Pond/Week	http://www.frov.jcu.cz/en/servisni-pracoviste/experimental-fish-culture-facility-2
		Temperate FW	Around 60 ponds of different sizes with individual water supplies and power for aerators	Hungary	HAKI	OEPS	M2/Week	www.haki.hu
Tank systems	Freshwater only systems	Temperate FW	Indoor tanks totalling 43 m3, flow-through or RAS	Czech Republic	VURH	REU	Tank/Week	http://www.frov.jcu.cz/en/servisni-pracoviste/experimental-fish-culture-facility-2
		Temperate FW	Hatchery unit of around 400 m2 with 5 internal and 8 external tanks plus incubator systems	Czech Republic	VURH	HEU	Week	http://www.frov.jcu.cz/en/servisni-pracoviste/genetic-fisheries-center-2
		Temperate-Warm FW	100 m^3 RAS with range of tank sizes , + 80 m^3 flow-through tank system	Hungary	HAKI	RECIRK	M3/Week	www.haki.hu
		Cold FW	Salmonid hatchery for 3 million eggs, wide range of tanks and facilities including RAS for experimental work	France	INRA	INRA-Peima	Tank/Week	http://www.rennes.inra.fr
		Cold FW	Two full scale experimental salmonid farms and a dedicated facility for fish nutrition using RAS	France	INRA	INRA-St-Pée	Tank/Week	http://www.st-pee.inra.fr
	Fresh and/or seawater systems	Cold-temperate, FW-SW	80 tanks which can be configured for a wide range of conditions and types of research	Norway	IMR Matre	Cell	Tank/Week	www.imr.no
		Cold-Warm, FW & SW + hatchery	Several separate aquarium facilities and associated analytical laboratories for nutrition, genetics and disease trials	UK	UoS	IoA	Person/ Week	www.aqua.stir.ac.uk

Category	System	Water	Further details	Country	Organisation	Facility	Units of access	Web link
		Warm, cold, SW or FW -	Specialist facilities for metabolic research using 12 chambers linked to RAS	Netherlands	WU	WU-MRU	Week	www.afi.wur.nl
		Warm, cold, SW or FW	3 RAS systems of different scale with facilities for replicate trials	Netherlands	DLO-IMARES	RECIRC	1 system per week	http://www.imares.nl
		Cold SW or FW	4 separate RAS systems for work on fish requirements, and system management	Norway	NOFIMA	NCRA	Tank/Week	http://www.nofima.no/marin/en/about-nofima-marin/facilities/nofima-centre-for-recirculation-in-aquaculture
	Seawater only systems	SW - Feed Ingredients testing	Wide range of tanks up to 1 m^3 for feed and digestibility trials with on-site feed production	Spain	ULPGC	FITU	Tank/Week	www.grupoinvestigacionacuicultura.org
		Warm SW-Selection Unit	Around 150 tanks configured for family based breeding	Spain	ULPGC	WWSSU	Tank/Week	www.grupoinvestigacionacuicultura.org
		Temperate SW (+ Hatchery)	Range of systems including two rooms for experimental work on marine fish larvae with controlled environments	France	IFREMER	MFL	Tank/Week	www.ifremer.fr
		Temperate SW	Marine eco-tolerance section provides highly controlled environment for experimental work on sea bass	France	IFREMER	MES	Tank/Week	www.ifremer.fr
		Cold SW	18 tanks of 160 l each with controlled environment for work on pelagic fish larvae	Norway	NTNU	CodTech	Week	www.ntnu.edu/marine/sealab
		Cold SW	National Cod Breeding Centre provides family-based selection facilities with around 550 tanks and a cage farm	Norway	NOFIMA	NCBC	Tank/Week	http://www.nofima.no/marin/en/about-nofima-marin/facilities/norwegian-cod-breeding-centre
		Temperate SW	Marine finfish hatchery, broodstock and research facilities	Greece	HCMR	Aqualabs	Week	www.hcmr.gr
		SW, Temperate to warm	4 aquariums with over 250 tanks. 2 aquariums with RAS, suitable for a wide range of studies	Spain	CSIC-IATS	EXP	Person/ Week	www.iats.csic.es
		SW - Biosecure	3 main RAS units with facilities for pathogen challenge experiments	Spain	ULPGC	MBS	Tank/Week	www.grupoinvestigacionacuicultura.org
Other	Gnotobiotic system	SW	System for work on axenically cultured feed for artemia and sea bass larvae	Belgium	UGent	GART	50 axenic recipients/ Wk	http://www.aquaculture.ugent.be
	Analytical laboratories		9 Analytical laboratories with wide range of facilities	Spain	CSIC-IATS	ANA	Person/ Week	www.iats.csic.es

Annex 3

TNA Guide

AQUA EXCEL

Guide for Transnational Access

Version 01, June 2011

www.aquaexcel.eu

Contents

1 Introducing the AQUAEXCEL Consortium of Research Infrastructures 4

2 Arrangements for Transnational Access 7

3 The Partners and Research Infrastructures 8

3.1 Institut National de la Recherche Agronomique (INRA) 8

3.1.1 Introduction 8

3.1.2 INRA-PEIMA 8

3.1.3 INRA St Pée 10

3.2 Institute of Marine Research (IMR) 12

3.2.1 Introduction 12

3.2.2 IMR Matre - Cell 12

3.2.3 IMR Matre CEL 14

3.3 University of Stirling (UoS) 16

3.3.1 Introduction 16

3.3.2 Institute of Aquaculture 16

3.4 Consejo Superior de Investigaciones Científicas- Instituto de Acuicultura de Torre de la sal (CSIC) 20

3.4.1 Introduction 20

3.4.2 CSIC IATS-EXP 21

3.4.3 CSIC IATS-ANA 22

3.5 Hellenic Center for Marine Research (HCMR) 24

3.5.1 Introduction 24

3.5.2 HCMR Aqualabs 24

3.5.3 HCMR Souda 27

3.6 Research Institute for Fisheries, Aquaculture and Irrigation (HAKI) 28

3.6.1 Introduction 28

3.6.2 HAKI OEPS 28

3.6.3 HAKI RECIRK 30

3.7 Institut Francais de Recherche pour l'Exploitation de la Mer (IFREMER) 32

3.7.1 Introduction 32

3.7.2 IFREMER MFL 32

3.7.3 IFREMER MES 34

3.8 The Norwegian Institute of Food, Fisheries and Aquaculture Research (NOFIMA) 36

3.8.1 Introduction 36
3.8.2 NOFIMA NCBC 36
3.8.3 Nofima Averøy 39
3.8.4 Nofima NCRA 40
3.9 University of South Bohemia in Ceske Budejovice, Faculty of Fisheries and Protection of Waters, Research Institute of Fish Culture and Hydrobiology (VURH) 44
3.9.1 Introduction 44
3.9.2 VURH REU, PEU and HEU 44
3.10 Norwegian University of Science and Technology (NTNU) 46
3.10.1 Introduction 46
3.10.2 NTNU CodTech 46
3.11 SINTEF Fiskeri og havbruk AS (SINTEF) 49
3.11.1 Introduction 49
3.11.2 SINTEF ACE/SeaLab 50
3.12 Universidad de Las Palmas de Gran Canaria (ULPGC) 52
3.12.1 Introduction 52
3.12.2 ULPGC WWSSU 52
3.12.3 ULPGC MBS 54
3.12.4 ULPGC FITU 55
3.13 University of Wageningen (WU) 56
3.13.1 Introduction 56
3.13.2 WU-MRU 57
3.14 University of Ghent (UGent) 59
3.14.1 Introduction 59
3.14.2 UGent GART 60
3.15 Institute for Marine Resources and Ecosystem Studies (DLO-IMARES) 62
3.15.1 Introduction 62
3.15.2 DLO-IMARES 62

1 Introducing the AQUAEXCEL Consortium of Research Infrastructures

The AQUAEXCEL project is a key part of the European Commission strategy to support the development of research in the field of aquaculture to address the key priorities of the European Research Area:

- Realising a single labour market for researchers
- Developing world-class research infrastructures
- Strengthening research institutions
- Sharing Knowledge
- Optimising research programmes and priorities
- Opening to the world: international cooperation in Science & Technology

The project promotes collaboration between research groups and research infrastructures in a way that will help to optimise research programmes and priorities and strengthen the institutions. It should lead to higher quality research outputs and better sharing and exploitation of results.

AQUAEXCEL gathers partners who are leaders in the domains they are involved in within the project, and have multidisciplinary interest and expertise. They offer as a whole an unprecedented set of aquaculture research infrastructures covering all important species, rearing systems and environments (see Table 1 below).

AQUAEXCEL makes available 27 Research Infrastructures provided by 15 partners across Europe

Competences combined in AQUAEXCEL range from biological sciences (genetics, nutrition, physiology, pathology) to technology (rearing systems, engineering, information and communication technologies), and integrative expertise such as system modeling and design.

The partners expertise not only covers the range of the necessary academic scientific fields but also the many species that need to be considered to propose integrated aquaculture research infrastructures, as well as the access to specific environments (freshwater and marine, cold and warm water) and scales (small, medium and industrial scale):

- Coldwater marine species (salmon, cod) in Norway and in the UK
- Temperate marine species (turbot, sole) in the Netherlands and France
- Coldwater freshwater species (trout) in France and the UK
- Mediterranean marine species (sea bass, sea bream) in Greece, Spain and France
- Temperate/warm freshwater species (common carp, sturgeon and many others) in Czech republic and Hungary
- Tropical species in recirculated systems (tilapia, catfish) in the Netherlands, UK and Hungary

AQUAEXCEL partners provide a unique set of world-class infrastructures, providing researchers with excellent facilities and support to set up the highest quality experimental protocols:

- The combined facilities of INRA are the largest research infrastructure for freshwater salmonids in the EU, with a collection of trout lines that has no equivalent at the world level (base populations, selected lines, isogenic lines)
- The facilities offered by IMR and Nofima in Norway are the best facilities to study the biology of Atlantic salmon and cod, the major species in Northern Europe, for which they leaders at the world level
- NTNU and SINTEF will give access to world class facilities for research, development and testing of aquaculture technology and engineering
- For recirculated systems, which are essential to develop for environment-friendly aquaculture, DLO-IMARES and Nofima offer facilities specifically designed for the optimisation of such systems at several scales, allowing replication of systems – a very rare feature
- Mediterranean species are covered by a unique set of facilities, offering controlled rearing conditions (Ifremer Palavas, CSIC, ULPGC), cages (HCMR), larval rearing (Ifremer Brest), disease challenge testing (ULPGC), specialized facilities integrated with laboratories (HCMR, CSIC) and broodstock lines of sea bass (Ifremer) and sea bream (ULPGC)
- The two largest research stations for pond-reared temperate species in the EU (HAKI and VURH) will offer an outstanding combination of hatcheries, recirculated systems and ponds, with world level reference collections of common carp broodstock lines and sturgeons
- Multi-disciplinary research, across species and environments is offered by the University of Stirling, the leading international centre in aquaculture research and the largest of its kind in the world.
- Highly specialized units to study key aspects of fish biology, with unique set-ups at the world level, are available at WU (metabolic chambers with total control on water quality and fish behaviour) and Ugent (axenic culture of live prey and larval fish)

Table 1 : Complementarities of AQUAEXCEL partners

Infrastructure	Systems						Environments				Expertise						Main species
	broodstock/lines	Hatchery	Flow-through tanks	RAS tanks	Cages	Ponds	Sea water	Freshwater	Cold water	Warm water	Nutrition	Genetics	Physiology	Behaviour/welfare	Pathology	Technology/systems	
INRA	x		x					x	x		x	x	x				trout, sea bass
IMR	x	x	x		X		x	x	x		x	x	x	X	x		salmon, cod
UoS	x	x	x	x			x	x	x	x	x	x	x		x		salmon, cod, tilapia
CSIC			x	x			x			x	x		x		x		sea bream, sea bass
HCMR	x				X		x			x	x			x		x	sparids, sea bass
HAKI	x			x		x		x		x		x			x	x	common carp, pikeperch
IFREMER	x	x	x	x			x			x	x	x		x		x	sea bass
NOFIMA	x	x	x	x	X		x	x	x		x	x	x			x	salmon, cod
VURH	x	x		x		x		x		x		x	x				common carp, sturgeon
NTNU		x	x				x		x		x		x	x		x	cod, turbot
SINTEF		x	x	x	X		x	x	x	x	x			x		x	salmon, cod
ULPGC	x	x		x						x	x	x			x		sea bream
WU	x	x	x	x			x	x	x	x	x		x	x		x	tilapia, turbot, sole
UGent		x					x		x		x				x	x	artemia, sea bass
DLO-IMARES			x	x			x	x	x	x	x		x	x		x	turbot, sole, eel, pikeperch

2 Arrangements for Transnational Access

Researchers from any EU or Associated State can apply for access to these Research Infrastructures. Applications must be made to use a Research Infrastructure in a different country to that of the lead researcher. Details of the Research Infrastructures available within AQUAEXCEL are contained in this document. Each Research Infrastructure has a budget based on units of access, which are detailed for each facility in the following pages. Access to the facilities is provided free of charge to users and travel and subsistence expenses will also be paid. In general, it is anticipated that access will be in the form of one or in some cases two scientists travelling to work at one of the Research Infrastructures for a period of between one and three months.

Applications for Transnational Access may be made by any organisation (including commercial companies), but the conditions of access require the results of the work to be published and made available to the scientific community via standard channels.

Applications for Transnational Access should be made in accordance with the guidance published in regular "Calls for Proposals" that are made available on the project website (www.aquaexcel.eu). Applicants are also encouraged to directly contact individual facilities to discuss their research plans in advance of submitting an application.

Applications for Transnational Access will be reviewed by an expert selection panel and an independent ethics adviser. Projects selected for Transnational Access will be expected to demonstrate high scientific quality, make efficient use of resources and effectively address issues important for the development of European aquaculture – e.g. as expressed through the Strategic Research Agendas of the European Aquaculture Technology and Innovation Platform (www.eatip.eu).

All Transnational Access projects must be carried out between October 2011 and January 2015. It is anticipated that individual Research Infrastructures will only be included in the six-monthly calls for access as long as there are remaining units of access available.

3 The Partners and Research Infrastructures

3.1 Institut National de la Recherche Agronomique (INRA)

3.1.1 Introduction

Competences: In this project, INRA, the main institute for agronomic research in France puts forward the main two infrastructures of its Aquaculture Experimentation Platform 1) PEIMA is the main salmonid experimental station in France, and one of the largest in Europe, and is dedicated to all kinds of studies on mainly trout genetics and physiology, and interaction between those, 2) INRA St Pée Infrastructure which is a unique set of installations devoted to nutrition research in freshwater salmonids. INRA has internationally-recognized teams in fish physiology, genetics, nutrition and pathology (>400 peer-reviewed papers in the last 5 years) which will be involved in the networking and joint research activities.

3.1.2 INRA-PEIMA

Name of the infrastructure: INRA-PEIMA (Pisciculture Expérimentale INRA des Monts d'Arrée)

Location: Sizun, FRANCE

Web site address:
http://www.rennes.inra.fr/l_inra_en_bretagne_et_basse_normandie/ressources_specifiques/un_dispositif_experimental_unique/une_pisciculture_experimentale_d_eau_douce

Contact: Laurent Labbé (laurent.labbe@rennes.inra.fr)

3.1.2.1 Facilities

PEIMA is a flow-through experimental unit for experiments on salmonids from egg to commercial size. It is equipped with:

- Two separate water supplies:
  - River, with a flow rate of 900m^3/h and a temperature varying from 5 to 18°C.
  - Spring, with a maximum flow of 50m^3/h and a constant temperature 11°C ± 1°C.
- a hatchery with a capacity of 3 million eggs instantaneous hatching
- 156 indoor nursery tanks (250L to 400L) for testing the early stages
- 156 outdoor tanks (2 m^3). 70 tanks have individual oxygen control and 42 have photoperiod control
- A recirculated water platform (10 tanks of 7 m^3) equipped with fecal-trap, with a filtration system (drum filter 30µ, UV) and a biological filter. This platform can operate in total or partial recirculation of water source or river.
- A platform of 26 circular tanks of 28m^3 used for broodstock maintenance
- A wet laboratory for sampling and measurement of live fish
- An experimental processing unit with individual data acquisition on morphometry, yields, physiological & quality traits, and processing of samples for sensory evaluation.

Ten full-time permanent technical staff work on site, highly skilled in fish protocols in genetics, physiology (reproduction, growth), welfare and nutrition.

3.1.2.2 Services currently offered by the infrastructure

PEIMA provides an experimental platform for fresh water studies throughout the whole life cycle of salmonids. All experimental animals are from well characterized genetic lines, including highly variable populations with different spawning dates, isogenic clonal lines and lines selected for specific traits (growth, muscle fat, dominant albinism). Production of triploid and/or monosex fish is available on request. Usual protocols are in all fields of physiology, genetics and nutrition, interactions between those, and their effects on product quality.

INRA-PEIMA is currently used as a research infrastructure by several remote laboratories from INRA (physiology, genetics, nutrition) and other French institutes and universities. It has also hosted many experiments from private companies.

3.1.2.3 Modality of access

INRA-PEIMA will carry out experiments for potential users and provide physical access to its facilities during crucial periods of the running experiments. As the standard procedures and the general maintenance will be carried out by trained and experienced staff, the external user might choose to be on-site only during sampling periods or other relevant procedures.

PEIMA offers access to carry out fish trials with all tank types and water qualities available at the premises. Access will comprise the use of tanks including maintenance, water supply, daily feeding and husbandry of fish; manipulation, and sampling of fish. Access to all dry laboratory facilities and other infrastructural, logistical, technical and scientific support to external users is offered, as well as accommodation and office access with PC and international phone, fax and internet communications.

PEIMA provides standardized experimental protocols, documentation of results, and appropriate sampling and conservation of samples. Provision of experimental fish will exclusively be done using the collection of fish lines (rainbow trout, brown trout) available on site. Provision of specific genetic settings (different lines and crosses, triploids, monosex) should be agreed in advance. Use of rainbow trout isogenic lines is subject to prior agreement on research topics and IP rights.

3.1.2.4 Unit of Access

The unit of access is defined as 1 tank week; equalling the occupation of 1 standard fish holding unit (2 m^3) for 7 days. Occupation of small (250 l) or large (> 2000 l) tanks will be assigned a fraction or a multiple, respectively, of the standard tank unit. One trial is expected to comprise 144 tank-weeks on average (i.e. 12 tanks to test 4 factors in triplicate, during 12 weeks).

Access typically consists of:

- Week n°1-2: Details of trial protocol and work planning, acclimatization, fish tagging and initial measurements/sampling (user on site).
- Week n°5: intermediate measurements (done by PEIMA personnel)
- Week n° 9: intermediate measurements (done by PEIMA personnel)
- Week n° 11-12: final measurements/sampling, completion of documentation, sample processing (user on site)

3.1.3 INRA St Pée

Name of the infrastructure: INRA-STPEE

Location: Saint Pée sur Nivelle ,FRANCE

Web site address: http://www.st-pee.inra.fr

Contact: Françoise Médale (medale@st-pee.inra.fr)

3.1.3.1 Facilities:

INRA-STPEE facilities include three platforms, two full scale experimental fish farms with flow through raceways supplied with water at constant water temperature (8 and 17°C) and one specialised, original dedicated facility for fish nutrition research under controlled re-circulated water systems that allows feeding behaviour studies and digestibility measurements. INRA-STPEE facilities thus enables fish nutrition research work all through the life cycle from larvae to broodstock.

Platform 1: The Experimental fish farm at Donzacq has a complete feed manufacturing plant with a twin-screw extruder. There are also wet lab facilities for in vivo work as well as samplings. The water supply is from natural springs at a constant 17°C with oxygenation and gas desaturation. The farm has large (160 cubic meters) and small scale (5000 and 200L) flow through raceways and individual tanks of different sizes: 20 small tanks of 50L for hatchlings, 48 1m² tanks, 18 2m² tanks, the latter potentially attached to computer controlled eater-feeders.

Platform 2: At the experimental fish farm at Lees Athas, a constant water temperature of 7°C enables nutrition studies on cold water salmonids.. The facility comprises of 11 flow through raceways enabling studies on more than 400 groups of eggs until hatching; a UV-treated thermoregulated system for the production of eggs and fry; 84 self-cleaning tanks for growing juvenile salmonids, of special interest for studies on nutrient-genotype interactions, 16 tanks of 200L, 32 tanks of 500L; 6 concrete out-door circular ponds, 8 raceways of 12 to 20m3 for studies with broodstock nutrition.

Platform 3: Specialised facilities

3.1 Control of Feed intake and feeding rhythms: A set of 2 independent recirculated systems each with 12 tanks, each of which is equipped with an eater-meter device specially developed by the research team (Boujard et al., 1992) allows (i) monitoring activity and feeding rhythms, (ii) control feed distribution over the daily cycle and (iii) evaluation of the amount of feed distributed. Each tank being equipped with fecal collectors, accurate knowledge on feed intake by fish is gathered over long periods. Adapted with more than one feeder, the setup also enables one to discriminate feed choice by fish.

3.2 Digestibility: In a recirculated temperature-controlled system, the system consists of 3 series of 6 cylindro-conical tanks connected with a continuous automatic fecal collector. The set up originally developed by the research unit (Choubert et al. 1982) has been recognised by the EIFAC fish nutrition committee as the most valid method for in vivo studies on digestibility measurements with fish. This makes possible evaluation of apparent digestibility coefficients

(ADC) of both diets and feed ingredients and a Quality-control system has been developed for ensuring the validity of standardised protocols and methods. In the context of nutrition related environmental impacts of aquaculture, this allows the estimation of suspended matter loss of dietary origin.

3.1.3.2 Services currently offered by the infrastructure

INRA-STPEE can undertake all types of nutrition research experiments on freshwater salmonids. It has been actively used in experiments from EU projects from the 5th to the 7th FP (PEPPA, RAFOA, GUTINTEGRITY, FINEFISH, AQUAMAX, PROMICROBE, LIFECYCLE).

An added strength to the experimental infrastructure is the proximity of research laboratories having all the necessary analytical equipment for nutrition related work: proximate and chemical composition analyses, bomb calorimeter, UV-visible spectrophotometers, HPLC, GC, radio-isotope lab and beta counter, ultracentifuge, cell culture facilities, histology and image analysis, molecular biology and genomics (real time PCR, phosphorimager). The laboratory provides a healthy environment for scientific interaction and exchange.

3.1.3.3 Modality of access

INRA-STPEE will carry out nutrition experiments on any life-stage of freshwater salmonids, either in open-flow farms at constant temperature (platforms 1 &2) or in controlled specialized units (3). A combination of platforms 1&2 for different temperatures and 1&3 for feeding behaviour, digestibility measurement and feeding trial can also be used. The usual trial duration is 3 months in order to allow sufficient growth of the fish. The access will comprise the use of tanks including maintenance, water supply, daily feeding and husbandry of fish; manipulation, and sampling of fish. Access to all dry laboratory facilities and other infrastructural, logistical, technical and scientific support to external users is offered, as well as office access with PC and international phone, fax and internet communications. Experienced staff will carry out the standard procedures and the general maintenance; however, the external user will be strongly integrated in all processes, recordings, evaluations, preparation and dissemination of results.

INRA-STPEE will provide advice on experimental design and methodology, documentation of results for all experiments conducted during the project, and appropriate sampling and conservation of samples. Specific feeds can be produced for the experiments using the feed manufacturing plant. Provision of experimental fish can be done using the fish lines available on site, or at INRA-PEIMA. Provision of specific genetic settings (different (isogenic or selected) lines and their crosses) should be agreed in advance.

3.1.3.4 Unit of Access:

Unit of Access: The unit of access is defined as 1 tank.week; equaling the occupation of 1 standard fish holding unit per week. One trial is expected to comprise 16 tanks on average (i.e. to test 3 factors and one control in quadruplicate, during twelve weeks).

3.2 Institute of Marine Research (IMR)

3.2.1 Introduction

The Institute of Marine Research is the largest marine institute in Norway and covers marine living resources, marine environment and aquaculture. The main task is to provide advice to Norwegian authorities on aquaculture and the ecosystems of the Barents Sea, the Norwegian Sea, the North Sea and the Norwegian coastal zone. The aim of research and management advice provided by IMR is to ensure that Norway's marine resources and aquaculture industry are managed and develop within a sustainable frame. IMR are making available both landbased (Cell) and cage-based (CEL) facilities.

IMR Matre has access to cultured and wild stocks of salmonids like Atlantic salmon, rainbow trout (only cultured fish), and Atlantic cod. In all these species experiments can also be designed with full-sib and half-sib groups. The available Atlantic salmon stocks include wild salmon from several Norwegian rivers, and wild cod stocks. The facilities has been used for species varying from salmonids to halibut, cod, herring and horse mackerel, and has also been approved for a variety of other species (e.g. mackerel, capelin, hake, sand eel, saithe, sea bass, sea bream and krill).

AQUAEXCEL visitors will be invited to work in conjunction with one of IMR's eighteen research groups and if appropriate with existing research programs. Our experience is that a close integration of visitors is stimulating and lead to development of mutual ideas and networks. The researchers that work in aquaculture related topics produce more than 100 peer-review papers every year and create a stimulating scientific environment. IMR will designate a contact person and together with the liaison officer and personnel from the technical and biological support groups make sure that the visitors will be given the same support as the local researchers. This support includes full access to e-mail, internet, office facilities, computing library and chemical lab facilities. We can assist visiting scientists with accommodation nearby.

IMR Matre has been a necessary part of the activities in several national projects and EU projects like PUBERTIMING, GUTINTEGRITY, WEALTH, FASTFISH, AKVAMAX, SALMOTRIP and LIFECYCLE and the scientists are involved in collaborative research with colleagues from within the EU and from North America, and we have frequent visits of guest scientists. Each year, trainees spend 1-3 month training periods at our research facilities. The trainees are funded by EU programs such as Erasmus, as well as from development cooperation countries (e.g. South Africa, Cuba, Thailand and Indonesia), or from the industry. Several important scientific achievements have been obtained by the users of the infrastructure. The studies leading to a seasonal independent production of salmon smolts and photoperiod control of growth and sexual maturation in Atlantic salmon and cod must be highlighted.

3.2.2 IMR Matre - Cell

Name of the infrastructure: IMR Matre Cell

Location: Matredal Western Norway, 80 minutes drive north of Bergen

Web site address: www.imr.no

Contact: Øivind Torslett (oivindto@imr.no)

3.2.2.1 Facilities

The land based facilities at IMR Matre (Cell) have tanks with automatic feeding, photoperiod, salinity (0-35 ppt), temperature (1-20°C all year round), O_2 and CO_2 control. This environmental lab installation (cell) is excellent for studies on fish welfare, growth, reproduction, and flesh quality, involving experimental parameters like diet, ration and photoperiod, in salinities ranging from full freshwater to full salinity seawater and fish sizes from first feeding fry up to 2 kg. The tanks have waste feed collectors and some tanks have video cameras. These environmental labs can be followed and controlled over the web (through a vpn client). The facility comprises 80 tanks with 100cm diameter. The experimental parameters are controlled by computers and can be regulated to preset values, or set to follow daily or seasonal cycles.

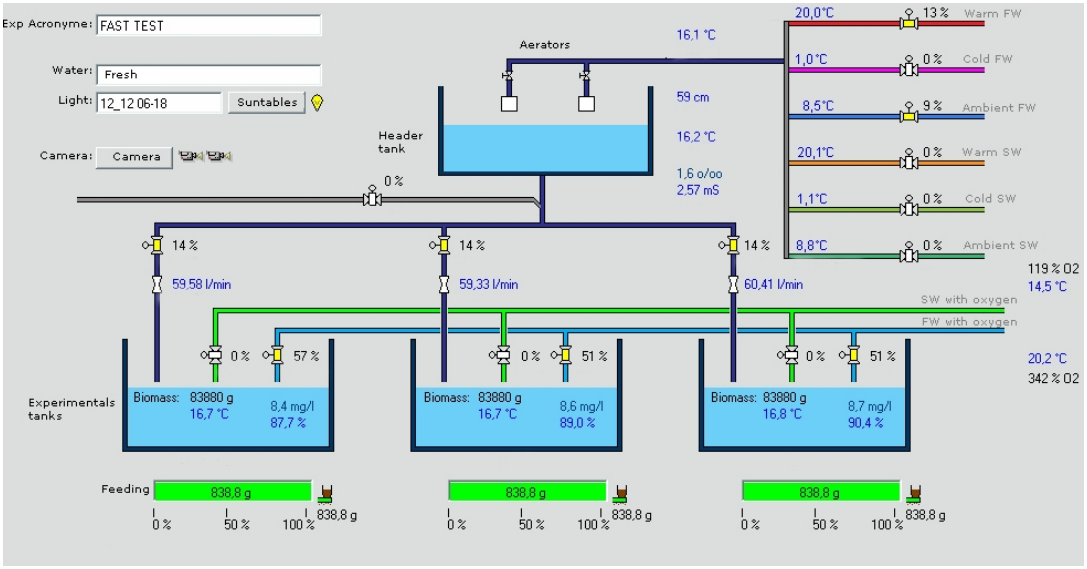


Figure A: *A printout of the screen showing one of the computer controlled environmental laboratories (Cell). From the original six water qualities (up right), the water is mixed to the wanted water quality (in this case 16 C freshwater) in the header tank. From the header tank the water is distributed to the experimental tanks. In this experiment oxygenated water is added to keep the oxygen level at 90%. The fish is reared under a 12:12 photoperiod and have been given 100% of their daily ration. Oxygen level can also be controlled by regulating the water flow and CO2 can be added.*

3.2.2.2 Services currently offered by the infrastructure

Fish behaviour and welfare is highlighted as one of major aquaculture research areas at IMR Matre. The major goals of this research area is to identify environmental standards that secure animal welfare, to create basic knowledge on relationships between the culture environment and the animals coping ability, to identify welfare indicators and methods to assess welfare and to develop and evaluate production strategies and technology that secure animal welfare and efficient production.

Growth and reproductive physiology is a research area where IMR Matre is considered to be in the international front. The main goals of this work are to increase the knowledge about the environmental, physiological and molecular regulation of puberty, broodfish and egg quality, sex differentiation and muscle and skeletal development (including malformations). The facilities at Matre (Cell and CEL) are excellent for holding all stages of fish (including large broodstock), under natural and artificial photoperiod and temperature regimes. Studies of reproductive strategies in

important fisheries species and how these are influences by environmental factors and pollution is also possible.

Feeds, feeding and flesh quality is a research area which has been developed in close cooperation with the industry. To increase the knowledge of how the feed influence the health, welfare and flesh quality are the main goal in this research area. The work has mainly been concentrated against pigmentation in salmonids and to evaluate potential alternative marine feed resources. The facilities at Matre make it possible to do these studies in small scale and also under full industrial scale.

Biological mechanisms: The new research facilities are excellent for aquaculture related studies, but are also designed to support research on biological and environmental studies related to wild stocks and fisheries. The temperature and CO_2 control makes the facilities excellent for studies on climate related studies.

3.2.2.3 Modality of access

Because of the sophisticated design of this facility the research activities are virtually independent of season and are only limited by the fact that some life stages are only available 'in season'.

From 2003 all the available facilities at IMR has been included in the institute's main database. As a consequence the facility description and availability can be accessed through the institute's intranet. Today requests/proposals are registered by the scientists in this web-based system. IMR has also appointed a committee that meet every three months to evaluate the different requests and assign the different resources and experimental facilities to the proposed research activities. In cases where several requests for the same facility overlap in time the committee can give priority or suggest moving research activities in time. IMR will make sure that AQUAEXCEL visitors will be given the same priority as our internal users and if the visitor wants it, a high degree of independence to the normal research activities at the infrastructure.

Visitor planning to perform experiments in the IMR Matre facility will provide an experimental plan for their work which will enable planning of activities in relation to other activities.

3.2.2.4 Unit of Access

Access to one tank during one week. A typical project at the Matre cell installation under AQUAEXCEL will have access to up to 16 tanks which normally are organized in an experiment with four treatments and four replicates. A normal experimental period will be 3 months and the visiting scientist will normally come to Matre for the first and last two weeks to start and finish the activity, respectively. In the period when the visiting scientist is not at the facility the experiment will be followed by the technicians at Matre, in close contact with the visiting scientist. The visiting scientist can follow the experiment on internet.

3.2.3 IMR Matre CEL

Name of the infrastructure: IMR Matre CEL

Location: Matredal Western Norway, 80 minutes drive north of Bergen

Web site address: www.imr.no

Contact: Øivind Torslett (oivindto@imr.no)

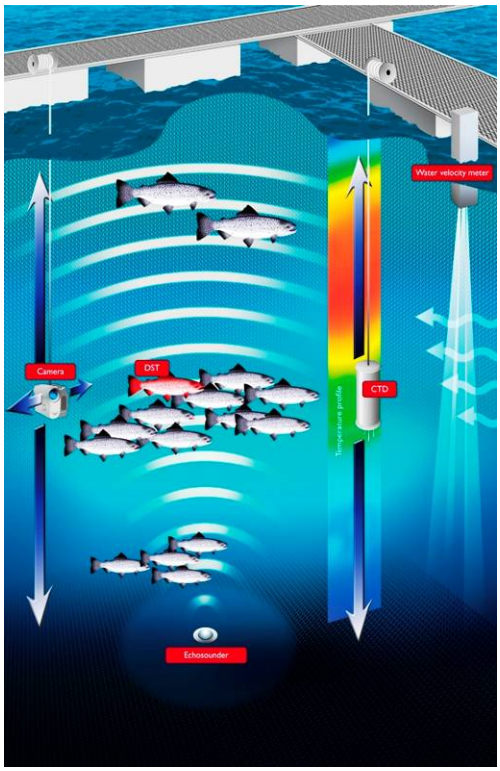
3.2.3.1 Facilities

IMR Matre also includes the Cage Environment Laboratory (CEL) which consists of 12x12m cages fully equipped with automatic computerized feeding. The Cage Environment Laboratory (CEL) is a specialised facility for behaviour and environmental studies. The equipment of this cage lab includes video cameras, echo sounders, continuous logging of T, S, O2 and light intensity in all cages. On-farm studies of behavior is a powerful tool to understand the needs and improve the welfare of caged fish. The Cage Environment Laboratory at Matre Research Station provides a unique international research platform for high-resolution studies of behavioral and physiological responses of free-swimming fish in a dynamic environment. The overall aim is improved management advice and farming protocols.

This cage facility is also excellent for feeding and photoperiod studies and can be used for species like Atlantic salmon, rainbow trout and Atlantic cod.

The CEL has been used to study the environmental preferences of salmon by operating Data Storage Tags into the body cavity of salmon and comparing the temperature and pressure (depth) data with the high resolution environmental data sampling from the monitoring system.

The CEL has also been used to study the feed intake, growth and behaviour of Atlantic salmon in a submerged cagesystem, and the effect of fish density on behaviour and vertical positioning in a highly stratified environment.



The present scientific activity at the facility is divided into four major research areas: Fish behaviour and welfare, growth and reproductive physiology, feeds, feeding and flesh quality and biological mechanisms.

Figure: *Schematic presentation of the Cage Environmental Laboratory. Echo sounders positioned under the cages observe swimming depth and fish density. Remotely operated cameras observe schooling behaviour, social interactions and horizontal distribution. With the use of Data storage tags (DST) the swimming depth and body temperature experience of individual fish can be registered. Winch-mounted CTD's continuously profiles temperature, salinity, oxygen and light within and outside cages, while profiling current meters positioned at surface, measure water velocity with depth.*

3.2.3.2 Services currently offered by the infrastructure

See above description for IMR Matre Cell.

3.2.3.3 Modality of access

From 2003 all the available facilities at IMR has been included in the institute's main database. As a consequence the facility description and availability can be accessed through the institute's intranet. Today requests/proposals are registered by the scientists in this web-based system. IMR has also

appointed a committee that meet every three months to evaluate the different requests and assign the different resources and experimental facilities to the proposed research activities. In cases where several requests for the same facility overlap in time the committee can give priority or suggest moving research activities in time. IMR will make sure that AQUAEXCEL visitors will be given the same priority as our internal users and if the visitor wants it, a high degree of independence to the normal research activities at the infrastructure.

Visitor planning to perform experiments in the IMR Matre facility will provide an experimental plan for their work which will enable planning of activities in relation to other activities.

3.2.3.4 Unit of Access

One cage for one week. Similarly, a project on the CEL installation will have access to 6 cages for three months. The experiments are normally organized two treatments and three replicates. The rest of the organization of the CEL based experiments is similar to the tank based experiments (see Cell above). However, CEL cannot be followed live on internet.

3.3 University of Stirling (UoS)

3.3.1 Introduction

Competences: The Institute of Aquaculture is a department of the University of Stirling and its mission is to carry out research and teaching in sustainable aquaculture. It carries out research in most areas of aquaculture related science, including health and welfare, nutrition, reproduction and genetics, and aquaculture development and environmental management. The Institute has particular research interests in the development of isogenic lines and genetically defined families of fish as experimental tools.

3.3.2 Institute of Aquaculture

Name of the infrastructure: Institute of Aquaculture

Location Institute of Aquaculture and Buckieburn Research Facility (Stirling, Scotland), Machrihanish Marine Environmental Research Laboratory (Machrihanish, Argyll, Scotland).

These sites are very closely integrated and their activities are entirely complementary. Fish are frequently moved between sites for experimental and management purposes and laboratory facilities at the Institute of Aquaculture site are used for all analysis of experimental material.

Web site address: www.aqua.stir.ac.uk & www.fishresearch.co.uk

Contact: David Penman (d.j.penman@stir.ac.uk)

3.3.2.1 Facilities

The Institute of Aquaculture provides extensive laboratory and experimental facilities capable of supporting research in most fields of aquaculture science. Our facilities are closely integrated increasing the potential for interdisciplinary research to support the development of sustainable aquaculture. The Institute's strength lies in the combination of first class laboratory facilities with staff internationally recognised for their research, and all types of fish-keeping facilities, both marine and freshwater, cold and warmwater.

Fish keeping facilities include:

- Machrihanish Marine Environmental Laboratory is a marine facility containing ca 150 tanks providing 375m^2 experimental area. Tanks vary in size from 1-10m^2 and are suitable for research on all sizes of fish from fry to broodstock. There is a marine fish hatchery with live feed production and an isolation unit capable of experimental studies on EU – host 2 pathogens. Species held on site include salmon, cod and sea bass. There is a filtered sea water supply and temperature and photoperiod controlled systems are available. Machrihanish is suitable for research into fish reproduction, genetics, nutrition, physiology, larval rearing and fish health, including studies on vaccines and fish health.
- Within the Stirling campus there is a multiple use warm water facility containing genetically defined tilapia, catfish and Macrobrachium strains, as well as a zebrafish research unit. The facility contains 20 self-contained warm-water recirculation systems with separate environmental controls. Systems can be modified to run with a wide range of different sized tanks. Experimental studies on genetics, reproduction and nutrition are carried out within the facility. Also situated within the Stirling campus is a temperate freshwater aquarium with ca. 150 tanks of 10-1600L volume, with temperature and lighting control, and expressly designed for fish health research an EU list 2 pathogens. Additional facilities within the Stirling campus are a series of constant temperature rooms in which can be installed marine or freshwater recirculation systems for a wide variety of experimental studies.
- Close to the Stirling campus there is the freshwater Buckieburn Experimental Facility containing 216m^2 of tank space suitable for genetics, reproductive and nutritional studies on salmonids.

Experimental studies at these fish keeping facilities are supported by extensive laboratory and analytical facilities. A total of 1254m^2 of laboratory space is available allocated between four main research areas: fish health and welfare, genomics and reproduction, nutrition, and aquaculture development and environmental management. Available equipement includes fluorescent, confocal and electron microscopy, histology, culture facilities for viruses and bacteria, preparation of test vaccines including recombinant monoclonal antibody preparation, serology, in-situ hybridization, image analysis, gene cloning and sequencing, gel electrophoresis (including 2D gel), radioimmunoassay, DNA microassays, large insert gene libraries, bioinformation capability, HPLC, gas and thin-layer chromatography, GC mass spectrometry, amino-acid analysis, high resolution desitometry, feed preparation, CHSNc analysis, AA spectrophotometry, and Coulter counter.

The range of equipment available, together with experienced support staff, allows visitors using fish keeping facilities to gain maximum advantage whilst at the Institute.

3.3.2.2 Services currently offered by the infrastructure

The Institute offers a wide range of services to visiting scientists and its research environment provides visitors with every support necessary to carry out high quality research. All laboratory aquarium and ancillary facilities are made available to visitors, with full technical and administrative support. In addition Institute staffs have wide experience of collaborations with visiting scientists both from Europe and wider afield. The range and quality of research undertaken at the Institute, together with a large cohort of younger, dynamic researchers, provides a very supportive and stimulating environment for visiting researchers. The majority of Institute research is of direct application to the aquaculture or aquaculture-related industry and this provides a valuable focus for many visitors. In collaboration with visiting scientists, Institute staff has a number of notable achievements across a range of research areas. These include:

- Successful development of commercial and trial vaccines against a number of fish pathogens
- Development of diagnostic reagents and genetic probes against fish pathogens
- Development of welfare indications for fish
- Development of chemotherapeutants
- Modelling of the fate of aquaculture effluents
- Genetic control of biotransformation enzyme systems
- Development of selective improvement programmes based on genetic markers
- Development of isogenic lines of fish species
- Evaluation of the mechanisms underlying the control of reproduction and smolting in salmonids and cod and their application in aquaculture
- Improved polyunsaturated fatty acid nutrition of marine fish larval feeds and antioxidant protection
- Fish oil substitutions in salmonid diets
- Application of GIS modelling for aquaculture development

The Institute plays hosts to ca.30 national and international visitors per annum who stay to carry out research for periods ranging from 5-90 days. Community funding of this TNA activity will provide European researchers with new opportunities of access to the infrastructure.

3.3.2.3 Modality of access

Users will identify their own research projects and will be supported in carrying them out independently if they so wish. The senior scientists within each Institute of Aquaculture research group will, in discussion with applicants, determine whether the available facilities are appropriate for the planned research. If appropriate facilities are available the most suitable time for the visit will be determined given the needs of the visiting researcher, other demands on the facilities and staff, and the degree of support required.

Each user will receive access to all necessary live animals, equipment and consumables to complete their research project, as agreed in their project proposal. In addition, users will be provided with any necessary technical assistance, training and advice on methodologies, experimental design and data analysis. Users will have full access to computing and office facilities, and will also be able to

obtain use of all normal university central facilities. Users may be able to combine access to IOA with access to other infrastructures if this increases complementarity. Users may also be able to access remote facilities, including commercial aquaculture sites, research vessels, or other laboratories.

Every effort will be made to accommodate visits at times suitable for applicants and when facilities, experimental animals and staff are available. In most cases we have found that visiting scientists wish to undertake joint research with Institute of Aquaculture staff and that this collaboration will often continue beyond IHP programs, thus further developing networks of European researchers in aquaculture. In our experience the great majority of IHP visitors to the Institute have carried out research which has led to substantial publications in peer-reviewed journals. In addition visits often lead to further more extensive collaborations with Institute staff, thus promoting closer networking within the European research area.

Institute of Aquaculture hosts a large number of visiting researchers and is therefore experienced in providing support and assistance particularly to younger researchers. All visiting scientists are attached to a senior member of staff who assists them in developing their research and dealing with administrative matters. As necessary, other staff will be allocated to help with general scientific matters and laboratory and aquarium work. Specialist technical assistance is available in all areas, including aquaria.

In general visitors will be invited to work in one of the five active groups that cover most aspects of research devoted to developing a sustainable aquaculture sector globally. Depending on the nature of the study we can offer multidisciplinary research collaboration opportunities unavailable in many other Institutions. With many existing programs in place we can attach visiting scientists to work alongside Institute staff with training skills in the required techniques as well as access to a wider network of collaborators. When you combine the academic support and training alongside world class fish holding facilities, well defined and specialist fish strains and well equipped modern laboratories focused on specific research themes the visiting scientist is getting a world-class research experience moulded to their exact requirements.

Visiting researchers have full on-line access and other office facilities, including telephone, fax and photocopier. Visitors also have access to central university computing and library facilities. Visitors are encouraged to present seminars on their research and to participate in the Institute's ongoing program. Most institute and university facilities are available on a 7 day week basis, although some procedures may need to be restricted for safety reasons.

3.3.2.4 Unit of access

Unit of Access is defined as one person per week meaning giving access to the 150 tanks (size from 1-10m^2) at Machrihanish Marine Environmental Research Laboratory and the Institute of Aquaculture to carry out laboratory and aquarium based studies on all sizes of fish from fry to broodstock and/or to the 216m^2 of tank space at freshwater Buckieburn Experimental Facility to carry out genetics, reproductive and nutritional studies on salmonids.

A typical project is 7 weeks for one person. Experience has shown that visits under previous IHP programs last from 1-12 weeks with an average length of 7 weeks. Visits have taken place across the

whole range of Institute of Aquaculture facilities but it is anticipated that a research group will not host more than two visitors at any one time.

3.4 Consejo Superior de Investigaciones Científicas- Instituto de Acuicultura de Torre de la sal (CSIC)

3.4.1 Introduction

Competences: The Instituto de Acuicultura de Torre de la Sal (IATS), research is focused on basic and applied aspects of marine aquaculture, with permanent contact with the aquaculture industry. IATS is the only CSIC centre dedicated exclusively to this topic. It has produced a significant body of knowledge on fish reproduction, nutrition and feeding, fish parasites and exploitation of natural resources for their use in aquaculture.

Material resources: IATS's wet facilities allow the design and execution of ecotoxicology, growth, nutrition, reproduction and pathology studies mainly in Mediterranean fish species. They include two full-equipped wet laboratories four necropsy labs and four halls: a unit of reproduction and environmental manipulation; a pathology unit with quarantine tanks and experimental infection facilities; a feeding, nutrition and growth unit; and a live preys unit. Most units have open and semi-open marine and brackish water circulation systems, and some kind of thermal regulation. The analytical laboratories are equipped with the most advanced analytical tools, which include general biochemistry and chromatography, microscopy, histology, molecular biology, radioisotopes, proteomics and metabolomics.

The infrastructure offered by CSIC is made up of two types of installations (IATS-EXP, IATS-ANA) located in the campus of the Instituto de Acuicultura de Torre de la Sal (IATS).

The service offered by both types of installations includes: the animal husbandry service with technical support for running in vivo experiments, the histology service which provides stained-histological slides from fixed or frozen material sent to the service, the SIEO service which deals with informatics and scientific equipment issues and a library specialized in Aquaculture books and journals. Users will have the opportunity to integrate in any of the main three Aquaculture research lines: a) Biodiversity and sustainability in cultured species, b) Fish Reproduction, and c) Nutrition and Animal Health and to have scientific support from the permanent scientific staff. Thus, users can develop their research projects using highly qualified facilities and having access to a research environment which has proven to be highly productive.

Although this will be the first time that IATS installations will be opened through EU transnational access, IATS has a broad experience in opening the installations to international users under research projects, networks, Marie Curie Grants, South-American and North-African Cooperation Programmes, etc. In the last five years, IATS has increased its degree of internationalisation, with 11 international projects and 107 articles published with foreign authors. Currently, 3 international students are developing their Ph.D. projects with us, and the average annual number of international users using the facilities is ca. 6. IATS receives regularly numerous letters of interest from several countries indicating their interest in using IATS installations in different areas of research.

3.4.2 CSIC IATS-EXP

Name of the infrastructure: Instituto de Acuicultura de Torre de la Sal (IATS-EXP)

Location: Ribera de Cabanes, Castellón, Spain.

Web site address: www.iats.csic.es

Contact: Jose Miguel Cerdá Reverter (aquaexcel.wp4@iats.csic.es)

3.4.2.1 Facilities

IATS-EXP includes research holding tanks located in 4 different buildings in the campus of IATS (Fig. 1). The total surface of these buildings is 2100 m^2, and all of them have been recently renewed and improved. More than 250 of tanks (from 3000 l to 30 l), together with the associated wet labs and sampling rooms are offered. These installations are adequate for conducting experiments in fish pathology, physiology, reproduction, nutrition and growth, live prey and larval rearing. Water quality (salinity, temperature, filtration, etc.) and light quality (photoperiod, intensity, etc.) will vary depending on the type of project and specific tanks in use. The open sea flow provides 90,000 m^3/h and water temperature ranges naturally from 11 to 28ºC. Tanks with recirculation and heat/cooling systems are available in halls A, B and C. Experimental studies can be conducted with a great variety of species: gilthead sea bream, European sea bass, sole, turbot, zebrafish, *Aphanius iberus*, Artemia (with access to one of the largest Artemia Cysts collection available in Europe), rotifers, copepods, and a variety of algae.

Figure 1. *View of the 4 buildings (A-D) which compose installation IATS-EXP within the campus of the Instituto de Acuicultura de Torre de la Sal*

3.4.2.2 Modality of access

A typical user group of IATS-EXP will have to designate a contact person for the set up of the project with the officer liaison of the discipline involved. This previous contact is essential to know the specific and detailed services required for the project, and to integrate it into the scheduling of the research groups and other external users which use the infrastructure. The unit of access is weeks per person and it is defined as the number of weeks each person in a project is using a set of

experimental tanks, which will include the preparatory work of the experiment, the technical support during the experimental time and access to sampling wet labs, autonomous desk, computer, fax, copy machine, etc., information about safety and security rules and procedures. Unit of access: 1 user and an average duration of 3 months. The user will typically stay at the installation during an average time of 2 weeks, one at the beginning of the project and another at the end.

Users will receive access to all necessary live animals, equipment and consumables to complete their research project, as agreed in their project proposal. In addition, users will be provided with any necessary technical assistance, training and advice on methodologies, experimental design and data analysis. Users will be integrated in a research group and expected to collaborate in all the research process including report and article writing and publishing. The visiting scientist will receive a workplace including internet access, and receive support in finding living accommodation.

The access offered will include assessment by technical and scientific personnel, and will depend on the type of project. Users will be welcomed and introduced by the officer liaison and will be integrated in the scientific group related to the subject of the project. The support would vary depending on the actual degree of autonomy of the user in respect to efficiency and security aspects. Users will have the opportunity to consult, have advice and interchange ideas with scientific staff with expertise on most of the disciplines in Aquaculture, with notable excellence in: Morphological and molecular diagnosis of marine fish parasites; Fish immune response and immunomodulation, Methodologies and skills in biochemistry, immunology, cellular and molecular biology to study and control fish reproduction, food intake and growth; Transgenesis using model species as a tool for gene expression and function; Artemia; Fish larviculture and nutritional enrichment of live preys. Thus, users will have the opportunity of learning how to run a project under the best experimental conditions and to apply this knowledge to their own infrastructures back to their countries. This support and scientific environment is currently provided to external users working in collaborative projects and international grants. IATS researchers have expertise in training and outreach to students, as they have supervised 9 Ph.D theses and have completed 671 lecture hours in masters and specialized training courses in the last five years.

During the stage at IATS, users will have access to the full text journals and databases through internet, with the same rights as internal users. This will imply quick and efficient way of acquiring bibliographic information, as IATS is nowadays subscribed to the “web of knowledge” and to most of the relevant scientific editorials. More details can be found at the web page of the IATS library (http://www.iats.csic.es/biblioteca). All this will mean that scientist will have more opportunities to discuss the information available and to produce high quality scientific publications.

3.4.2.3 Unit of access

Unit of access is defined as one person per week giving access CSISC-EXP to use a set of experimental tanks, which includes the preparatory work of the experiment and the technical support during the development of the project.

3.4.3 CSIC IATS-ANA

Name of the infrastructure: Instituto de Acuicultura de Torre de la Sal (IATS-ANA)

Location: Ribera de Cabanes, Castellón, Spain.

Web site address: www.iats.csic.es

Contact: Jose Miguel Cerdá Reverter (aquaexcel.wp4@iats.csic.es)

3.4.3.1 Facilities

IATS-ANA includes 9 analytical laboratories (Fig. 2), equipped with all the scientific appliances and devices to conduct most of the techniques and analyses involved in research in aquaculture: microscopy, histology, immunohistochemistry, ISH, immunoassays, gas and liquid chromatography, PCR and RT-PCR and other molecular techniques, in vitro cell and eukaryotic culture, isotopic assays, micromanipulation, etc.

***Figure 2**. Right: Detailed view of the holding tanks in building C of installation IATS-EXP. Left: Detail of an analytical laboratory in installation IATS-ANA.*

3.4.3.2 Modality of access

A typical user group of IATS-ANA will have to designate a contact person and define precisely which techniques are to be applied in the project. The unit of access will be weeks per person, and it is defined as the number of weeks one person is using the analytical labs to analyse samples. This includes the previous holding space of the samples to be analysed (if necessary), the scientific and technical support and the access to autonomous desk, computer, fax, etc., and information about safety and security rules and procedures. This access could be combined with access to IATS-EXP or to other experimental facilities offered by other partners of AQUAEXCEL. A typical project will have 1 user and an average stage of 4 weeks.

Users will receive access to all necessary equipment and consumables to complete their research project, as agreed in their project proposal. In addition, users will be provided with any necessary technical assistance, training and advice on methodologies, experimental design and data analysis. Users will be integrated in a research group and expected to collaborate in all the research process including report and article writing and publishing. The visiting scientist will receive a workplace including internet access, and receive support in finding living accommodation.

The access offered will include assessment by technical and scientific personnel, and will depend on the type of project. Users will be welcomed and introduced by the officer liaison and will be integrated in the scientific group related to the subject of the project. The support would vary depending on the actual degree of autonomy of the user in respect to efficiency and security

aspects. Users will have the opportunity to consult, have advice and interchange ideas with scientific staff with expertise on most of the disciplines in Aquaculture, with notable excellence in: Morphological and molecular diagnosis of marine fish parasites; Fish immune response and immunomodulation, Methodologies and skills in biochemistry, immunology, cellular and molecular biology to study and control fish reproduction, food intake and growth; Transgenesis using model species as a tool for gene expression and function; Artemia; Fish larviculture and nutritional enrichment of live preys. Thus, users will have the opportunity of learning how to run a project under the best experimental conditions and to apply this knowledge to their own infrastructures back to their countries. This support and scientific environment is currently provided to external users working in collaborative projects and international grants. IATS researchers have expertise in training and outreach to students, as they have supervised 9 Ph.D theses and have completed 671 lecture hours in masters and specialized training courses in the last five years.

During the stage at IATS, users will have access to the full text journals and databases through internet, with the same rights as internal users. This will imply quick and efficient way of acquiring bibliographic information, as IATS is nowadays subscribed to the "web of knowledge" and to most of the relevant scientific editorials. More details can be found at the web page of the IATS library (http://www.iats.csic.es/biblioteca). All this will mean that scientist will have more opportunities to discuss the information available and to produce high quality scientific publications.

3.4.3.3 Unit of access

Unit of access is defined as one person per week giving access to the analytical labs to analyse samples and additional support as specified above.

3.5 Hellenic Center for Marine Research (HCMR)

3.5.1 Introduction

Competences: HCMR is the main research and advisory body for marine environment, fisheries and aquaculture in Greece. It carries out basic and applied research concerning the rearing process of marine fish, their welfare, aquaculture technology as well as the improvement of fish and fish food quality. It has state of the art facilities for both experimental and pilot scale studies, including hatcheries, pre-growing and on-growing land facilities and a pilot scale sea cage farm.

Material resources: Specialized laboratories (nutrition, physiology, pathology, water quality and ethology) support any experimental study. Aqualabs are more specialized on hatchery technology, where systems with automated feeding and monitoring of environmental parameters will be applied. There is under development a metabolic toolbox which will be used for monitoring of metabolic needs in cultured fish species. In Souda cages are devoted to on-growing experiments and monitoring of feeding behavior in larger specimen of new warm-water species.

3.5.2 HCMR Aqualabs

Name of the infrastructures: HCMR-Aqualabs

Location: Iraklio, GREECE

Web site address: www.hcmr.gr

Contact: Stavros Chatzifotis (stavros@her.hcmr.gr)

3.5.2.1 Facilities

The Institute of Aquaculture (Crete) provides access to a modern infrastructure enabling multidisciplinary research on all life stages (genitors, eggs, larvae, juveniles, market size) of sea bass and sea bream and of 16 new promising species of 11 genus (*D. dentex, P. pagrus, D. sargus, P. erythrinus, D. puntazzo, U. scirosa A. regius, S. umbra, S. dumerili P. americanus* and *E. marginatus*). It also provides access to associated food chain technologies (microalgae, rotifers, artemia) and to innovative techniques or tools (self-feeders, mesocosms, photobioreactors, automation). Aqualabs are located at Gournes 17 km from Heraklion.

Plans of Aqualabs

(without offices and labs on 2nd floor)
total surface 3600 m^2

1- Brood stock zone (200 of 500m^2)
2- Behaviour zone (386 m^2)
3- Nursery zone (100 of 500 m^2)
4- Intensive hatchery (477 m^2)
5- Food chain zone (100 of 178 m^2)
6 - Photobioreactors (187 m^2)
7 - Mesocosm zone (200 of 480m^2)

from which **1700** m^2 of experimental zones and labs for Access

In the broodstock zone, specimens of 18 different species have been able to spawn and produce viable eggs. There is a possibility of controlled temperature and photoperiod, as well as induced spawning by use of implants, which is a frontline technique used at our facilities. In the behaviour zone, 100-500 L tanks are used in a flow-through system. In the intensive hatchery, 500-L tanks are used connected to 1m^3 biofilters and these systems are applied for the rearing of marine fish larvae in high stocking densities of larvae (50-200 larvae per L). Temperature and photoperiod are controlled and feeding with microalgae, rotifers, and Artemia can be adjusted through a computerized system, which is in the frontier of this type of technology for automated feeding of fish larvae. In the live food zone, microalgae are produced in 1500-L photobioreactors in high density cultures (200-300 millions cells per mL). These photobioreactors use natural light condition, and thereby take advantage if high light irradiance and favourable light conditions in Crete and are a product of constant development in the area of microalgae production during the last 15 years. Rotifers and Artemia are produced in industrial scale with automated feeding, controlled temperature by experienced personnel. Six mesocosmos unit are housed of 40m^3 where rearing of larvae takes place with high survival rates even of most “difficult” species.

Aqualabs has been a necessary part of national research projects as well as large European research projects in the area of aquaculture such as FINEFISH, FASTFISH, SEACASE and SELVDOTT.

3.5.2.2 Services currently offered by the infrastructure

At Gournes, the two floors infrastructure named Aqualabs (see plan) is organised as a vertical integrated hatchery (19 people staff) with pilot scale and small scale experimental rearing facilities well equipped with specialised wet and dry laboratories and more classic infrastructures (offices, library, 50 places meeting room, etc). The 7 main zones of experimental Access (1700 m^2) integrate the up-to date technology in fish larviculture and computerised management and are managed each by a scientist. The ability to work with early life stages of so many different species (18 different species) is unique worldwide.

The main axes of research are:

- Determinism and control of reproduction (physiology, ethology,)
- Biology and control of fish development (morphology, osteology)
- Improving hatchery technology and larviculture (early life Biology and Ethology)
- Behaviour and applications (schooling, self-feeding, learning, sorting devices, welfare)
- Optimisation of feeding with pellets (Biochemistry, Nutrition)

3.5.2.3 Modality of access

Visitor planning to perform experiments in the Aqualabs facility will provide an experimental plan for their work, in collaboration with Aqualabs researchers in the project. This will enable planning of activities in relation to other Aqualabs activities. The visitors will, once they arrive, have the same access to the facility, equipment and technical support as any of the HCMR researchers already working in the facility.

Aqualabs offered the possibility for researchers, students and trainees from various parts of the world to learn the techniques for rearing of marine fish larvae, live food production, fish behaviour etc. The users of the AQUAEXCEL infrastructure will be provided access to internet, desk, and will be offered the possibility to work with the different groups of activities in the Institute of Aquaculture. The following laboratory facilities will be used of support of researchers using the access areas:

- microscopy (fluorescence, inverted microscope, phase contrast) and stereoscopy equipped for photography, camera and image analysis
- physico-chemical analysis of water with electronic devices or photometer
- microbiology (cooled incubator, laminar flow, deep freezer, cooled centrifuge, colony counter).
- biochemistry and nutrition (kjeldhal unit, Soxhlet extractor, Hydrolysis unit, fibertec, muffle furnace, oven)
- Fish Physiology (ELISA, RIA enzymatic methods), haematology, endocrinology, speed vac
- Histology (rotary tissue processor 12 stations (histokinette), embedding station, microtome, slide warmer plate, portable bench, top fume hood, staining system).
- Fish Behaviour, Ethology, biorythms and welfare with electronic self-feeders linked to computerised data collector, tagging systems of fish (fish eagle) and cameras
- computers for processing, analysis and presentation of data as well as redaction of reports

3.5.2.4 Unit of access

One week represents the access of installation for the duration of one week. In the installation of Aqualabs projects will be run with an average duration of three weeks.

3.5.3 HCMR Souda

Name of the infrastructures: HCMR- Souda

Location: Iraklio, GREECE

Web site address: www.hcmr.gr

Contact: Nikos Papandroulakis (npap@her.hcmr.gr)

3.5.3.1 Facilities

In Souda Bay the concession of floating cages provides access to 100 m^2 of pilot scale 3x3x3 m cages or 1x1x1.5 m cages for experimentations on production. Excellent for simulation of real cage aquaculture, this zone is managed by 2 technicians providing daily maintenance and feeding. The zone for access is located in Souda Bay (130 Km from Aqualabs, close to city of Chania).

3.5.3.2 Services currently offered by the infrastructure

The installation in Souda is unique in the Mediterranean as it offers a variety of high quality experimental facilities for study of early fish life and produces ± 2.000.000/year fry species thus making them always available for experimental purposes.

The main axes of research are:

- Behaviour and applications (schooling, self-feeding, learning, sorting devices, welfare)
- Optimisation of feeding with pellets (Biochemistry, Nutrition)

3.5.3.3 Modality of access

Visitor planning to perform experiments in the Souda facility will provide an experimental plan for their work, in collaboration with Souda researchers in the project. This will enable planning of activities in relation to other Souda activities. The visitors will, once they arrive, have the same

access to the facility, equipment and technical support as any of the HCMR researchers already working in the facility.

Souda offered the possibility for researchers, students and trainees from various parts of the world to learn the techniques for live food production, fish behaviour etc. The users of the AQUAEXCEL infrastructure will be provided access to internet, desk, and will be offered the possibility to work with the different groups of activities in the Institute of Aquaculture. The following laboratory facilities will be used of support of researchers using the access areas:

The following laboratory facilities will be used of support of researchers using the access areas:

- microscopy (fluorescence, inverted microscope, phase contrast) and stereoscopy equipped for photography, camera and image analysis
- physico-chemical analysis of water with electronic devices or photometer
- Fish Behaviour, Ethology, biorythms and welfare with electronic self-feeders linked to computerised data collector, tagging systems of fish (fish eagle) and cameras
- computers for processing, analysis and presentation of data as well as redaction of reports.

3.5.3.4 Unit of access

Unit of access of one week represents the access of installation for the duration of one week. In the installation of Souda projects will be run with an average duration of four weeks.

3.6 Research Institute for Fisheries, Aquaculture and Irrigation (HAKI)

3.6.1 Introduction

HAKI is implementing a multidisciplinary research work, to provide scientific basis for the development of sustainable aquaculture and agriculture systems, and for the responsible use and protection of aquatic resources. The major fields of research are: aquatic ecology; fish genetics and immunology; fish feeding and nutrition, aquaculture systems and irrigation.

HAKI has a RAS unit, one flow-through system and two experimental pond farms. The recirculation system has 100 m^3 useful volume, consisting from plastic tanks of different shape and volume (from 40 L to 4 m^3). The flow-through system of HAKI contains about 800 m^3 volumes (mainly tanks of about 4 m^3). It is supplied mainly by geothermal water (about 25-27 ^oC) but filtered and aerated pond water also available. This unit also includes a hatchery unit with 42 pcs 7 L volume hatching jar and 8 pcs 150 L hatching jar. The experimental pond station of HAKI is 5.8 ha, with pond's surfaces between 150 and 3000 m^2.

3.6.2 HAKI OEPS

Name of the infrastructure: Outdoor experimental pond station (OEPS)

Location: Szarvas, Hungary

Web site address: www.haki.hu

Contact: Istvan Lehoczky (lehoczkyi@haki.hu)

3.6.2.1 Facilities

The facility consists of earthen ponds with the following distribution:

	area (m^2)
18 experimental pond	1,500
3 experimental pond	3,000
8 experimental pond	400
16 experimental pond	200
4 experimental pond	300
4 experimental pond	150
4 wetland pond	2,500
2 wetland pond	1,200
2 wetland pond	650

The ponds can be filled up with water and drained individually. The water is supplied to the ponds from the natural open surface waters (Szarvas-Békésszentandrás oxbow lake). The ponds have electrical supply for the artificial aeration and also equipped with aerators. The ponds are operated by a professional staff (3 persons). The pond system is suitable for experiments in different purposes (i.e. feeding tests, testing different production, management and technological elements; ecosystem modelling, etc.).

Besides the experimental ponds a constructed wetland system is also operating in the part of the experimental station. The open surface wasteland system is equipped with flow metres and electrical system. It is suitable to test wastewater treatment techniques and mechanism. The wetland system is included 8 pond units (among others 3 macrophyta covered ponds with *Typha, Phragmites* and *Salix*).

3.6.2.2 Services currently offered by the infrastructure

The facility is a pilot scale system, built for experimental purposes mainly for feeding and rearing experiments. It enables:

- Research trials on the applicability of different feed additives (immuno-stimulant, vitamins, amino-, and fatty acids, etc) and replacement of fish meal and oil in fish feeding.
- Testing eco-technological elements for water treatment
- Experiments about nutrient dynamics in pond ecosystems
- Development of integrated fish production systems
- Nutrient remediation experiments in wetlands and ponds

It provided research infrastructure for several national and EU funded grant (Eurocarp, Aquamax, SustainAqua etc.). The pond system in the last few years was used approximately 4-5 foreign users per year.

3.6.2.3 Modality of access

The pond system provides facility for the implementation of joint or independent research projects. The ponds operate from March till November, but it could be investigated in winter period on demand. The operation and sampling staff are available, the water and sediment laboratories are able to analyse samples all the year. The user or user group will have a full access to the ponds belonging to the experimental work they plan. The work plan will be prepared before arriving to the institute to make sure that the users will be fully integrated into the scheduling of experiments. The users will be able to use feeding machines, aerators and all other equipment necessary for pond experiments. The fisherman of the institute will help them with the introduction, feeding and harvesting of the experimental fish. The users will work independently based on their workplan.

The operation of the experimental system will be integrated with a professional team for sampling (i.e. water, sediment, plankton, fish, etc.) and in situ measurements (i.e. oxygen, conductivity, pH, turbidity, temperature, etc.) and with professional analytical laboratories (equipped – among others - with water, TOC analyser, atomic absorption and ICP spectrometry) for water, sediment, soil, fish, plant, etc. analysis, as well.

3.6.2.4 Unit of Access

The unit of access is defined as 1 m^2/week; equalling the occupation of 1 m^2 pond surface for 7 days. One trial is expected to comprise 96 000 units of access on average (i.e. 16 pieces of 200 m2 to test 4 factors in quadruplicate, during 30 weeks or 8 pieces of 400 m^2 to test 2 factors in quadruplicate, during 30 weeks or another combination that will suit the external users). The duration of 1 trial in pond installation is estimated for 30 weeks (to utilize full potential of growing season for mass rearing of relatively slower growing freshwater fishes; for common garden experiments etc.) with a stay planned for weeks No. 1, 2, 29 and 30.

3.6.3 HAKI RECIRK

Name of the infrastructure: Indoor fish rearing facility for semi-, and large scale experiments (RECIRK)

Location: HAKI, Szarvas, Hungary

Web site address: www.haki.hu

Contact: Istvan Lehoczky (lehoczkyi@haki.hu)

3.6.3.1 Facilities

The recirculation system has 100 m^3 useful volume, consisting from plastic tanks of different shape and volume (from 40 l to 4 m^3). Water treatment is performed by sedimentation tanks, submerged gravel biofilters, UV-sterilisation and aeration. Water turnover rate for the 100 m^3 is once per hour. System is supplied with underground water (about 16 ^oC, 10 L/min.), but there are possibilities for supply it by tap, or geothermal water (about 25-27 ^oC). Part of the recirculated water can be heated up to 30 ^oC and even more. This variability of the temperature and the flexibility of the system – together with proper water management – give possibilities for year-round propagation and rearing fish species with different temperature requirements (i.e. Percidae, Acipenseridae, Siluridae, Claridae, Cichlidae, etc). The large volume of the system also allows to perform large-scale rearing trials, or to apply multi-variable treatments with the required replicates.

The flow-through system contains about 80 m^3 volumes (mainly tanks of about 4 m^3). It is supplied mainly by geothermal water (about 25-27^oC) but filtered and aerated pond water also is available in it. This unit mainly is suitable for year-round rearing of Claridae and Cichlidae and for large-scale trials with them.

3.6.3.2 Services currently offered by the infrastructure

The facility is mainly used for propagation, feeding and rearing experiments, i-e:

- Development of seasonal and out-of-season propagation and fry rearing technology of economically important species (European and African catfishes, sturgeons sp., pike-perch, etc.).
- Development of growth and production models for the above species.
- Rearing (up to 100) half-, and full-sib families of common carp for further genetic, immunological, feeding and nutriogenomic research.
- Research trials on the applicability of different feed additives (immuno-stimulant, vitamins, amino-, and fatty acids, etc) and replacement of fish mil and oil in fish feeding.

It provided research infrastructure for several national and EU funded grant (Lucioperca, Eurocarp, Aquamax, Sustainaqua, Sustainaq etc.) This infrastructure was used approximately by 3-4 international users per year.

3.6.3.3 Modality of access

The infrastructural background is suitable for carrying out experiments in collaboration with our researchers or alone. In our system experiments can be realised with special needs such as special location or special equipments in the fields of immunology, production, ethology or nutrition etc. The institute ensures the user infrastructural base for the whole period of experiments e.g. laboratories, office with PC etc. for evaluations. As a result of these activities the new scientific results can be published in national or international journals and conferences. The typical user will prepare a working plan in advance to make sure that the planned research work can be adequately integrated into the schedule of this infrastructure. The typical experimental period vary between 4-12 weeks depending on the type of experiment and using experimental tanks for the research activities. During this period the user or user group will have full and access to the experimental tanks they use and work independently with the support of the institute's staff.

HAKI-RECIRK has professional fishermen who will assist in the fish nursing, feeding, harvesting etc. In the recirculation system a permanent worker will look after the continuity of the water recycling and always helps the researchers for their practical work. There are many assistant who can deal with the fish in work time e.g. feeding, cleaning the tanks, measuring etc. The researchers of the institute will share their knowledge (on fish genetics, immunology, nutrition, aquaculture production, waste waters, irrigation and aquatic ecosystems) and practical experiences with the guest and also can help organising the logistics if it necessary.

3.6.3.4 Unit of Access

The unit of access is defined as 1 m^3/week; equaling the occupation of 1 m^3 standard fish holding unit for 7 days. One trial is expected to comprise 48 units of access as a suggested minimum (i.e. 16 pieces of 0.25 m^3 tanks to test 4 factors in 4 replications, during 12 weeks). Stay on site comprises 2 weeks (initial week 1 plus final week 12).

3.7 Institut Francais de Recherche pour l'Exploitation de la Mer (IFREMER)

3.7.1 Introduction

Ifremer is the largest French institution involved in marine research (1500 people) through research centers and stations in mainland and overseas. In Palavas, the research station is devoted to fish domestication, health and welfare. In Brest, the aquaculture department has an international expertise in fish larval physiology, ontogeny and lipid metabolism of the digestive functions in sea bass, turbot and sea bream.

In Palavas, the infrastructure comprises identical tanks (1 cubic meter each) shared in 2 rooms in flow through or in recirculated system with a high control of water quality and associated laboratories. The infrastructure of Brest, located in a larger research center in marine sciences, has two rooms with tanks supplied with thermo-regulated and filtered seawater for fish larvae. These facilities are associated to with highly specialized laboratories.

3.7.2 IFREMER MFL

Name of the infrastructure: Experimental facilities for marine fish larvae (MFL)

Location: Brest, FRANCE

Web site address: www.ifremer.fr

Contact: Jose-Luis Zambonino (Jose.Zambonino@ifremer.fr)

3.7.2.1 Facilities

The total area of the aquaculture research infrastructure is 800 m², totally devoted to experimentations in marine fish physiology and nutrition. The experiments are conducted in separates units, including rooms for larval rearing, nutrition, growth, and physiology experiments for marine finfish, mainly sea bass, turbot, sea bream. Several laboratories are joined very close to the rearing rooms. This facility includes:

Two rooms for larval rearing experiments fitted each with 24 circular tanks (48 in total) with conical bottom (38l), all environmental factors controlled, running UV treated water, specially fitted for studies on early nutrition of marine larvae with inert feed. The Ifremer group is pioneer in the use of inert feed during larval nutrition from mouth opening, and this experimental facility is unique in the world.

3.7.2.2 Services currently offered by the infrastructure

These facilities are devoted to experimentations in marine fish physiology and nutrition, aiming at improving scientific knowledge in the field of determination of nutritional requirements of marine fish larvae. Experiments can be performed with a high degree of control of environment, water quality and feeding management. European seabass and common sole are the target species. Skilled technicians operate these research infrastructures.

The services include an experimental feed manufacture room 220 m^2, equipped with blenders, grinders, driers, sievers, which can produce diets from 60 µm (larval diet) to 8 mm diameter, and a stock of various raw materials. In addition, there are five laboratories with all necessary equipment for biochemical (hormones, protein, lipid, fatty acids, amino acids …) and molecular (gene expression) analyses. spectrophotometers, centrifuges, Liquid and Gas Chromatographs, Thin Layer Chromatograph, RT-PCR apparatus, Quantitative Real Time PCR apparatus, electophoresis, microscopes.

3.7.2.3 Modality of access

The access will comprise the use of the high-quality facilities and include 3H/day technician support for laval experiments. Fish will be available from larval stages, originated from commercial farms. The experiments on larvae generally last 45 days. The external user will be supervised by trained and experienced staff that will carry out the standard procedures and the general maintenance.

The access will comprise the use of tanks including fish supply, maintenance, water supply, daily feeding, handling, sampling and husbandry of fish.

On request, access to all laboratory facilities and other infrastructural, logistical, technical and scientific support to external users is offered.

Scientific support will include advice on experimental design and methodology, documentation of results for all experiments conducted during the project, and appropriate sampling and conservation of samples.

3.7.2.4 Unit of Access

The unit of access is defined as 1 tank, equalling the occupation of 1 standard fish holding unit for 7 days. One larvae trial is expected to comprise 48 tanks during 6 weeks.

3.7.3 IFREMER MES

Name of the infrastructure: Marine Eco-tolerance section (MES)

Location: Palavas les Flots, South FRANCE

Web site address: www.ifremer.fr

Contact: Gilles Lemarié (Gilles.Lemarie@ifremer.fr)

3.7.3.1 Facilities

The infrastructure offered to TNA activities, is located in a 4000m^2 research station. It comprises a room (185 m^2) of 12 same tanks each, running with seawater and working in flow through or in recirculated system. The experimental tanks are 1 cubic meter each, black coated, u-shaped with a central outlet for efficient self cleaning. Each tank is covered with a black plastic sheet to protect fish against external visual stress. Light intensity (from 0 to 500 lux at the water surface) and the photoperiod including an artificial dawn and dusk can be regulate. Sea water is sand-filtered at 15 *m, UV sterilised, heated or cooled and degassed in a packed column. Seawater is provided to tanks by gravity from a header tank with small overflow. This system guarantees a very stable water pressure for long periods at the inlet valve. Water temperature can be maintained in a range from 10 to 25°C. Water flowrate per tank ranges from 10% per hour to 250% per hour. Seawater can be enriched with oxygen or other gas by injecting an adequate flow in a bicone running under pressure. Tanks are fitted with efficient feeders and particle traps allowing a high level of the control of feed intake and uneaten feed, especially when fish are fed at satiation. For dedicated studies, feeders can be use on-demand by the fish in combination with a PIT-tag antenna device in 12 tanks in order to identify individual fish feed-demand

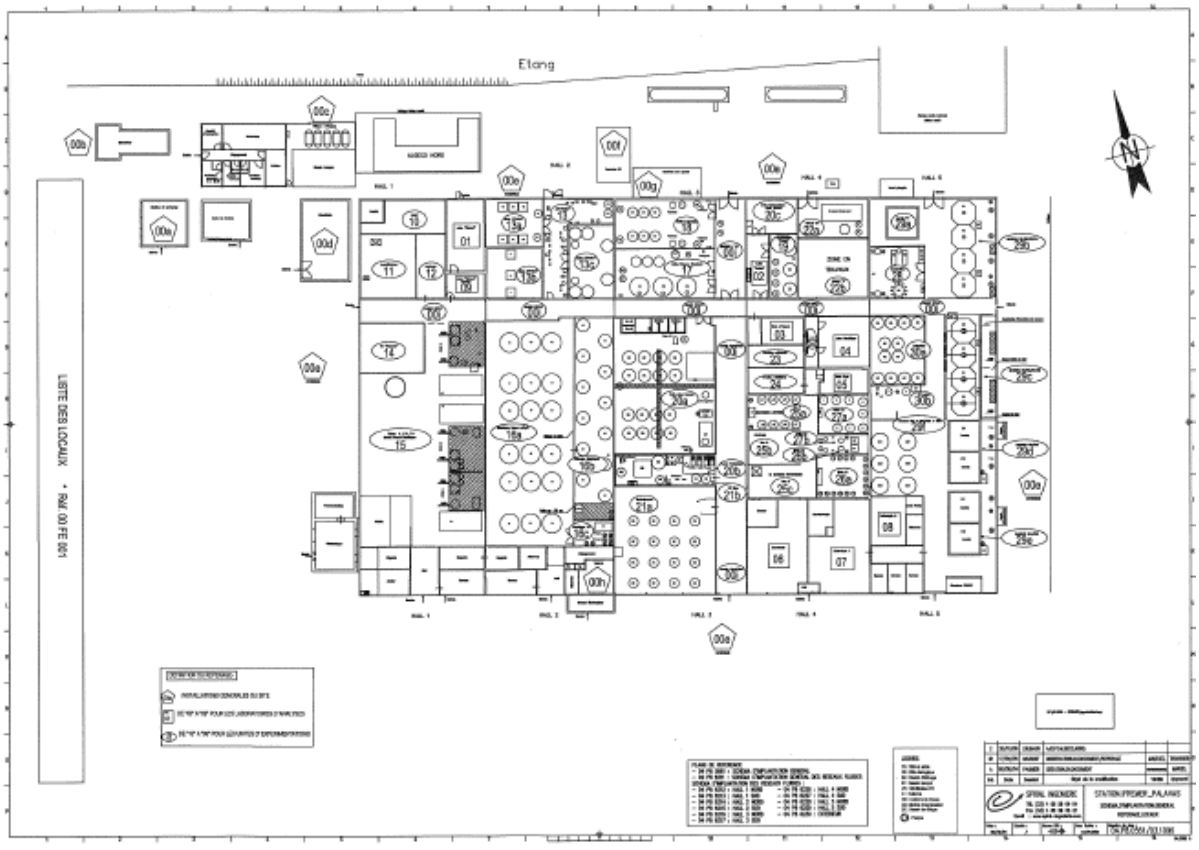
(Covès et al. 2006, Millot et al. 2008). Therefore complex studies can be operated simultaneously at a significant scale, with a great number of replicates in these facilities quite rare and unique. These facilities are reliable as they run from some years.

3.7.3.2 Services currently offered by the infrastructure

Marine Eco-tolerance section (MES) is devoted to experimentations in mainly marine fish physiology, nutrition, feeding behaviour, genetics and genomics aiming at improving scientific knowledge in the field of welfare, domestication and recirculating rearing systems. Experiments can be performed with a high degree of control of environment, water quality and feeding management. Seabass is the target species and fish at different mean weights can be provided for experiments. If needed, genetically identified seabass can also be provided.

On condition that material is available, additional challenges can be conducted to qualify fish swimming activity and coping style using dedicated video analysis (n=2) and maze systems available from another associated Ifremer laboratory based in La Rochelle. Previous scientific experiments performed in that infrastructure on tropical fishes such as red drum (*Sciaenops ocellata*) demonstrate the high capacity of adaptation of these facilities to original experiments.

Three specialized laboratories are also available for measurements in water chemistry, fish pathology and molecular biology. The Ifremer station of Palavas is associated with nearby specialized laboratories in Montpellier (University, Cirad, INRA and IRD) which creates a scientific environment of good quality with numerous researchers involved in aquatic living resources and ecosystems.



Long term experiments on water quality were performed with success in these infrastructure and effects of various levels of ammonia, pH, oxygen, carbon dioxide, total gas pressure have been

assessed individually or in combination. Feeding behaviour and nutrition experiments were also performed there.

3.7.3.3 Modality of access under this proposal

The access will comprise the use of the high-quality facilities and access to the laboratories. Fish will be available at various mean weight (2, 10, 50 or 150g) originated from strains genetically identified and reared in Palavas research station or from commercial farms located not far. The duration of the experiment can last until 2 months (3 months with the preparation time before experimentation and put back in service). Usually, trained and experienced staff will carry out the standard procedures and the general maintenance. Nevertheless, the external user will be strongly integrated in all processes.

The access will comprise the use of tanks including fish supply, maintenance, water supply, daily feeding, handling, sampling and husbandry of fish. On request, access to laboratories facilities on site (water quality measurements and biometry) and other infrastructural, logistical, technical and scientific support to external users is offered.

Scientific support will include advice on experimental design and methodology, documentation of results for all experiments conducted during the project, and appropriate sampling and conservation of samples.

3.7.3.4 Unit of access

The unit of access is defined as 1 tank/week, equalling the occupation of 1 standard fish holding unit ($1m^3$) for 7 days. One trial is expected to comprise 12 tanks during 8 weeks.

3.8 The Norwegian Institute of Food, Fisheries and Aquaculture Research (NOFIMA)

3.8.1 Introduction

Nofima is working in R&D for the aquaculture, fisheries and food industry, and provide research at an international level. Nofima has four research divisions; Nofima Marin (Marine) Nofima Mat (Food) Nofima Ingrediens (Ingredients) and Nofima Marked (Market).

Nofima is located at Ås, Stavanger, Bergen, Sunndalsøra, Averøy and Tromsø. For this project Nofima Marin at Sunndalsøra, Averøy and the Norwegian cod breeding centre (NCBC) in Tromsø will be included. Sunndalsøra has indoor tanks with A. salmon, A. cod, rainbow trout or halibut, in flow-through or RAS. Averøy has sea cages with salmon and cod. NCBC has a land based facility for production of cod families and research.

3.8.2 NOFIMA NCBC

Name of the infrastructure: National Cod Breeding Centre (NCBC)

Location: Tromsø, Norway

Web site address: http://www.nofima.no/marin/en/about-nofima-marin/facilities/norwegian-cod-breeding-centre

Contact: Atle Mortensen (atle.mortensen@nofima.no)

3.8.2.1 Facilities

The National Cod Breeding program in Norway was established in 2003, with the purpose of improving economically important traits in farmed cod by selective breeding. Initially the program was conducted at the Aquaculture Research Station in Tromsø. The program uses traditional methods, a combination of family and individual selection, but efforts are also made to improve the selection efficiency by using molecular genetic methods (marker assisted selection). Since 2005 the production cod families for the breeding program has taken place at the National Cod Breeding Station in Tromsø. This facility is designed for an efficient production of a large number of cod families, and for the production of high quality cod eggs independent of season. To achieve this the facility posses a unique combination of features:

- 24 brood fish tanks (25m^3), including 8 with facilities for photoperiodic manipulation, and 4 of which are provided with cooled sea water for off season egg production.
- 220 small (20 l) incubators for the family production and some larger incubators for incubation of larger volumes of egg.
- 300 tanks (200 l) for start-feeding of cod larvae. Feeding is performed by two programmable feeding robots which can feed both live and formulated feed simultaneously.
- Modern equipments for the production and enrichment of rotifers and Artemia.
- 6 nursery tanks (25m^3) for ongrowing of juveniles.
- A variety of water treatment technology, including different filters for removal of particles, protein skimmer with ozone generator, UV disinfection, 2 heat pumps for heating and cooling of water and vacuum degassers.

The breeding program also has its own cage farm where the breeding nucleus is kept until sexual maturation.

3.8.2.2 Services currently offered by the infrastructure

National Cod Breeding Centre offer its services to produce family groups to be used for selective breeding as well as for doing genetics related studies and for experiments aimed at improving the production protocols of cod larvae and juveniles.

Nofima Marin has a highly competent scientific staff covering all these areas. We are acknowledging the value of scientific exchange, and would appreciate the possibility of participating in a network where we can receive scientists, students and trainees from other institutions, and vice versa.

NCBC has been partners of several NFR applications this year. We offer services of staff who are competent in marine finfish culture including broodstock management, larval and juvenile production and husbandry.

Currently we have been involved in collaborative work with industry and university researchers on formulated feed development and on enhancement of livefeed production. We also accommodate students from the Aquaculture Program at the University of Tromsø and other countries doing their work term projects. The operation of the National Cod Breeding Centre is integrated with the Aquaculture Research Station in Tromsø, so scientists working at one of these locations can easily coordinate activities at both.

3.8.2.3 Modality of access

The main function of the National Cod Breeding Centre is to produce family groups of cod juveniles to be used in the selective breeding. The ordinary production is a seasonal event, starting up in February – March every year, and lasting until November. This is the most convenient period for external users to attend the centre. The users can couple their activity to the ordinary production, for instance by getting access to the material produced, such as sperm, eggs, larvae and fingerlings from 200 family groups and live feed (rotifers and Artemia). They can also be linked to ongoing research projects regarding genetics and production protocol optimization, or they can use the overcapacity of tanks and other facilities to run their own projects.

In addition to the ordinary production of juveniles, the centre also produces eggs three more times per year by the use of light manipulation. Eggs and larvae from these additional spawning is also available for experiments. However, it may be difficult to run projects which involve larval feeding since live feed is normally not produced outside the ordinary season (March – July), and the technical staff is busy conducting routine maintenance work at the facilities. But if the proposed experiment is shorter in duration and the running cost can be absorbed by the applicants then it is possible to extend the live feed production.

As mentioned earlier, NCBC have facilities to conduct successful experiments such as reliable water quality and 24-hr seawater supply, best quality live feed for larval feeding experiments, programmable feeding robots (so that can be done anytime). NCBC can easily accommodate an external research partner/group and provide the required facilities not only for production of cod family groups is the main priority, but also for all life stages, live feed, feeding equipments and experienced staff. The research partner/group can carry out independent or collaborative work depending on their needs.

External users will be supported by a team of experienced scientists and technicians, who are experts in producing cod juveniles and conducting experiments on cod at the early life stages. The users may also get support from the group of geneticists at Nofima Marin, which holds an international high standard in fish genetics and selective breeding. The National Cod Breeding Centre is located 15 km from the city of Tromsø, which is about two hours by plane from Oslo. As a normal service Nofima Marin can assist visiting scientists with accommodation in Tromsø, and arrange local transportation. We have in-house technical staff (electrical, mechanical and electronics) who can provide faster and reliable technical support. The facility is also equipped with walk-in freezers for sample storage and the laboratories at the Nofima Marin has many -75°C freezers where samples can be stored for longer periods. Apart from the scientists working in the breeding program, there are more than 20 scientists in the aquaculture department with variety of expertise and a healthy discussion can be initiated at any time with these scientists.

3.8.2.4 Unit of Access

The unit of access at NCBC is defined as one tank/week; equalling the occupation of one standard tank for seven days. For instance, 288 tank/weeks can imply an experiment using 24 tanks (e.g. a 2x4 factorial experiment in triplicate tanks) for 12 weeks.

3.8.3 Nofima Averøy

Name of the infrastructure: Nofima Averøy Research Station (Averøy)

Location: Averøy, Norway

Web site address: http://www.nofima.no/marin/en/about-nofima-marin/facilities/averoy-research-station

Contact: Michel Guajardo (michel.guajardo@nofima.no)

3.8.3.1 Facilities

The main concept at the Nofima Averøy Research Station is to carry out controlled trials under natural conditions, similar to those at commercial fish farms. The activities vary greatly within the following main areas for Atlantic salmon, rainbow trout and Atlantic Cod:

- Comparative feeding trials
- Controlled infection trials with lice
- Trials to determine digestibility of feed ingredients
- Vaccine testing
- Product quality
- Trace elements, pigmentation etc
- Breeding trials
- Testing of new technologies

Feeding trials: Nofima Averøy Research Station is currently one of the most modern stations for carrying out feeding trials in cages. The station has a total of 84 certified experimental units. The majority of trials are implemented in units measuring 5 x 5 x 5 m (125m³). Nofima has developed an automatic waste feed control by counting pellets. Waste feed can also be collected in a collection system. This unique equipment enables exact measurements of the feed intake, a prerequisite for accurate results on the effects of different feeds and ingredients. The station has individual systems for each cage regarding how the fish should be feed: number of meals per day or appetite controlled feeding. The station also features cage units of 350 m³ and storage cages for the experimental fish measuring 2400 m³.

Analyses and sampling: The station has a laboratory for sampling, fixation of samples and for analyses of simple to moderate complexity, and includes centrifuges and a -80°C sample freezer. An experimental slaughter line with packing room, freezing plant and refrigerated storage room provide the opportunity to test out different processes and methods for slaughter, cooling, packing and freezing from a quality perspective. The station also has x-ray equipment for x-ray pictures up to 6-8 kg fish, installed for studies on fish deformities.

3.8.3.2 Services currently offered by the infrastructure

Nofima Averøy Research Station can offer experimental facilities and technical assistance for projects as outlined in the list above. The research station currently has a staff of 13 with considerable competence in aquaculture and the implementation of trials. The station manager and the project coordinator at Averøy are responsible for the day-to-day follow-up of experiments. Scientists are not permanently located at Averøy, but come from other Nofima locations or

collaborating institutions/companies when required. There is office space and a meeting room (capacity 25 people) equipped with modern audiovisual equipment. The station can provide housing for approximately 8 students or scientists for shorter periods.

The station has been instrumental in advances in aquaculture nutrition and quantitative genetic research, as well as for teaching aquaculture personnel. In particular, the possibilities to do controlled experiments but otherwise under natural conditions as experienced in commercial farms, has been valuable. Many of the institutions and aquaculture companies involved at Nofima Sunndalsøra have also been involved in projects at Nofima Averøy.

3.8.3.3 Modality of access

Averøy can offer access to the available facilities at the station including fish material and technical support. Researchers from Nofima and/or collaborate institutions may stay at the station for the amount of time it is required to perform the trial. The offered equipment and scientifical tools are listed above. It is up to the visiting scientists to decide the tasks and deliverables, who to collaborate with, and for how long. They may work independently and also in collaboration with one or more of the research groups within Nofima. However, the activities should preferably be planned in collaboration with the project management group in Nofima and also the station manager in Averøy. In order to plan activities at the station the trials have to be reported to the station manager within 1-2 months ahead of arrival, depending on the complexity of the research.

Visitors and partners that come to Nofima and want to perform trials in Averøy will meet a scientific environment with highly qualified personnell. The technical support at the research station is of highest quality with long experience in research work. Also the logistics are optimal and will not interfere with the smoothly conductance of the trials. Nofima Averøy is frequently receiving national and international partners that perform trials and exchange scientific ideas. The visitors will be carefully followed up, and will be included in the daily scientific work. Averøy also have access to offices and meeting rooms that may be used for the purpose.

3.8.3.4 Unit of Access

The unit of access at Nofima Averøy is defined as one cage/week; equalling the occupation of one standard cage for seven days. A typical trial is expected to be 72 cage/weeks (using 6 cages for 12 weeks, to test one factor against a control in triplicate) but different settings can be discussed with the visitors.

3.8.4 Nofima NCRA

Name of the infrastructure: Nofima Centre for Recirculation in Aquaculture (NCRA)

Location: Sunndalsøra, Norway

Web site address: http://www.nofima.no/marin/en/about-nofima-marin/facilities/nofima-centre-for-recirculation-in-aquaculture

Contact: Per Brunsvik (per.brunsvik@nofima.no)

3.8.4.1 Facilities

Recirculating Aquaculture Systems (RAS) can provide good control of the water environment, sensible utilisation of water sources, less discharge of nutrients, and better protection against

introduction of external pathogens. However, cold-water RAS for Atlantic salmon and Atlantic cod are little used in Europe, and many questions about water quality thresholds, growth, and fish welfare remains unanswered for this production form.

The Nofima Centre for Recirculation in Aquaculture (NCRA) carries out research on recirculation on a broad basis. Experiments in the areas of fish nutrition, physiology and welfare are central in this facility. Construction of the centre is nearly finished, and experiments have already started. Within April 2010 the facility will be fully operational. This research facility is to the best of our knowledge unique due to:

- NCRA is designed for studies on physiological and nutritional requirements of fish in cold-water RAS
- NCRA is designed for studies across several scales, from small-scale to industrial scale; relevant data for European aquaculture industry can therefore be obtained
- Four research RAS for cold-water species using three-chambered moving bed bioreactors and ozone
- Flexibility of water sources for experiments; seven water qualities, recycled or single-pass, can be assigned to tanks for studies on water quality impact on e.g. fish performance
- Degree of control and monitoring using modern e-infrastructure
- NCRA offers possibilities for studies on innovative energy forms in aquaculture; A sustainable energy source for water and building heating, and possibly cooling, is installed in the form of waste heat water (+80°C) from nearby aluminium production.

The NCRA has a 1750 m² ground area, and a 2nd storey of 550 m^2. The centre features six experimental sections and has a total culture volume of 1100 m³. The facility has access to both freshwater (3 intake pipes, well and surface water) and seawater (intake from 40 m depth, microscreen and UV-filtered). Cooling water is taken from a nearby hydro power station or heat-pumps in other parts of Nofima Sunndalsøra.

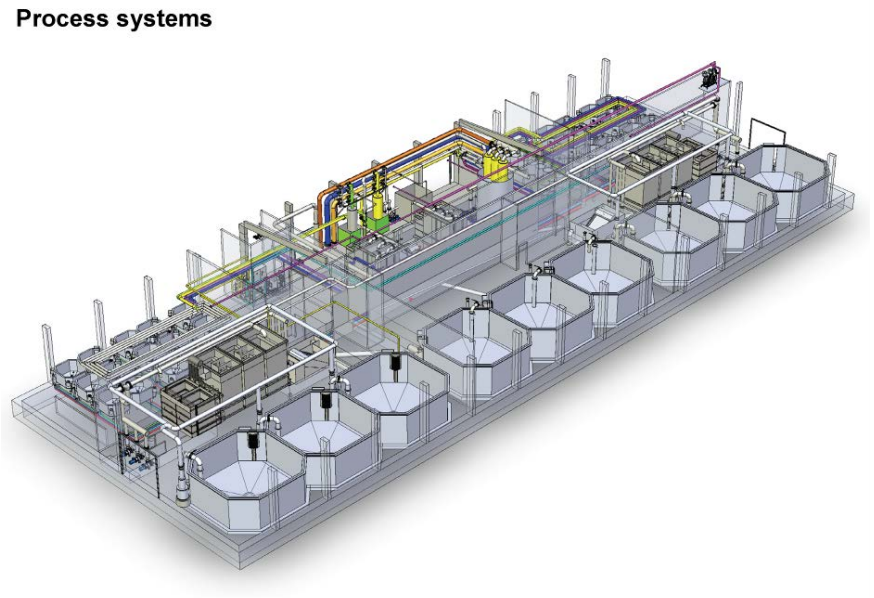


Fig. A. Process research systems at NCRA. Only ground floor (1 750 m^2) is shown.

Two experimental sections contain 15 separate 2 m tanks in each, and a third section has 18 pcs of 1 m diameter tanks. During experiments all these 48 tanks can use water from two separate medium-scale recirculating systems (RAS 1 and RAS 2), or two other water qualities in single-pass mode. These water qualities can be randomly assigned to individual tanks and sections. Further, three sections have each three 100 m³ tanks for experiments on a large, near-commercial scale. Two of these sections have separate RASs, while one section operates as single-pass. Feeding is fully automatic and computer controlled, with tank level feeders in the three experimental sections, while the larger tanks have a pneumatic feeding system with rotor feed distributors. Light regimes in all six sections can be programmed in the case such factors are to be used in experiments.

3.8.4.2 Services currently offered by the infrastructure

The centre thus has four separate RAS, containing tanks with triple outlets (side, centre, and centre particle), which can be varied and thus invites studies on tank water velocity and turnover effects on the fish. Further, the systems contain particle collectors at tank level, ozone treatment, belt micro screens, moving bed bioreactors each with three chambers, counter-current CO_2 degassers with temperature control of the air, and pump sumps. Oxygenation is at tank level, thereby avoiding bias in experiments which can happen if only the main pipes are oxygenated.

The centre is controlled by two programmable logic controllers (PLCs). This enables continuous logging of research data, including pump status, water flow, temperature, oxygen, pH and ORP. The centre also has an autoanalyser for measurement of ammonia, nitrite, nitrate and total inorganic carbon.

The building is purpose-built for the research infrastructure with entrances, and below-ground level areas for easy access to pipe trenches. The centre has a viewing area on the second floor, which enables visitors and students to get an overview without crossing the hygiene barriers. In addition, the second floor has a 200 m² area for moving, sorting and sampling large quantities of experimental fish, and meeting and control room. Each of the six experimental sections and the water treatment room have sluices for contamination control. There are a total of five air ventilation systems, including a separate plant for heating or cooling of the intake air to the CO_2 degassers for all four RAS. In cases where infection is suspected, the ventilation plant may be shut off for individual sections.

This facility is newly constructed, and the numbers of users are therefore limited at the moment, although increases will occur soon. One international user (USA based), and two national users are affiliated with activities occurring in the facility. In addition, two trainees from Chile (PhD level), and a visiting PhD student funded by the Government of Spain, are currently working on Nofima projects in the centre.

This facility is integral to the Nofima Marin Sunndalsøra Research Station, which has a large national and international user base and is well known in the field world-wide. Significant break-troughs have been made in fish nutrition, fish welfare and quantitative genetics. In the last years, 9 national research institutes and 22 national aquaculture industry companies have been involved in projects. Internationally, 11 research institutions and 27 industry companies have been involved.

3.8.4.3 Modality of access

Visitor planning to perform experiments in the NCRA facility will provide an experimental plan for their work, preferably in collaboration with Nofima researchers in the project. This will enable planning of activities in relation to other NCRA activities. The visitors will, once they arrive, have the same access to the facility, equipment and technical support as any of the Nofima researchers already working in the facility.

NCRA will offer equipment, technical assistance, and collaboration with researchers to do experiments in many fields on Atlantic salmon, cod, and rainbow trout. Support will be given for the following type of research, but other types of research questions can also be considered: Fish nutrition related to RAS can be studied by using different feeds across several water qualities, to study if e.g. the fish adapt differently to challenging water quality according to nutritional status. Factors such as light-regime, temperature, water velocity, fish density etc. can be superimposed on the experimental designs. Alternatively, two feeds of differing physical qualities can be used in separate RAS, to study impacts on fish performance and welfare due to high or low fragmentation of pellets and faeces in the rearing water. The centre gives exceptional possibilities to study differences in fish performance when reared in either single-pass, RAS or RAS with different hydraulic retention times. Water quality thresholds, e.g. chronic or acute limits for ammonia or nitrite, can be determined in the section with smaller tanks. Most water quality limits for salmonids today have been established in a flow-through environment, but in this facility thresholds in a RAS environment can be found.

Support will also be offered for RAS courses and workshops for students, other researchers, or industry. The two medium scale RAS will give the students hands-on experience in how to establish and maintain optimal water quality. The building contains rooms that can be used for classes, where real time data from the different RAS may be shown.

Visitors and partners that come to NCRA and want to perform trials in the facility will meet a scientific environment with highly qualified personnel. The visitors will collaborate with leading scientists within physiology, nutrition, water quality and welfare. The technical support at the research station is of highest quality since they are trained and educated to perform trials in a scientific manner. Nofima Sunndalsøra is frequently receiving national and international visiting scientists that perform trials and exchange scientific ideas. The visitors will be carefully followed up, and be included in the daily scientific work. NCRA can also provide offices, meeting rooms, and access to housing.

3.8.4.4 Unit of Access

The unit of access at NCRA is defined as one tank/week; equalling the occupation of one standard tank for seven days. For instance, 108 tank/weeks can imply an experiment using 12 tanks (e.g. a 2x2 factorial experiment in triplicate tanks) for 9 weeks.

3.9 University of South Bohemia in Ceske Budejovice, Faculty of Fisheries and Protection of Waters, Research Institute of Fish Culture and Hydrobiology (VURH)

3.9.1 Introduction

VURH deals with research, education and counselling on fisheries and aquaculture, especially in fish genetics, reproduction and health protection.

VURH will provide: i) hatchery about 400 m^2 for artificial reproduction of fish with indoor/outdoor tanks for broodstock handling, ii) incubation hall equipped for fish reproduction and larval nursing, iii) recirculation system of tanks for freshwater intensive aquaculture, used also for induction of gametogenesis by manipulating with environmental stimuli, iv) 70 ponds for aquaculture of common carp, tench, pike, pikeperch, European catfish, sturgeons up to marketable size fish and broodstock.

3.9.2 VURH REU, PEU and HEU

Name of the infrastructure: Experimental Infrastructure of VURH

Location: Vodnany, Czech Republic

Web site address: http://www.frov.jcu.cz/en/servisni-pracoviste/experimental-fish-culture-facility-2 & http://www.frov.jcu.cz/en/servisni-pracoviste/genetic-fisheries-center-2

Contact: Monika Malkusová (mmalkusova@frov.jcu.cz)

3.9.2.1 Facilities

In faculty organization system the hatchery, recirculation system and ponds together make one infrastructure. Freshwater fish hatchery about 400 m^2, well equipped for artificial reproduction of fish with 5 internal and 8 external tanks for broodstock handling. Incubation hall equipped with devices for experimental artificial reproduction of fish as well as with incubators for growing hatched larvae. A heating system provides researchers with possibilities to reproduce fish by means of controlled temperature. Six round outdoor tanks of 27 000 l total volumes are available to extend the capacities for outdoor juvenile nursing. Indoor recirculation systems of tanks of 43 000 l total volume for freshwater intensive aquaculture equipped with mechanical and 3 biological filters, with possibilities to switch tanks from recirculation to flow-through, and of round tanks of 1 800 l total volume for juvenile nursing. It is used also for induction of fish gametogenesis by manipulating with environmental stimuli as temperature and photoperiod. Both the hatchery and recirculation systems are equipped with computer monitoring and warning system to detect water level, temperature, oxygen saturation and pH in tanks in given intervals. Altogether 70 ponds (20 ponds of 25 ha in total plus 50 ponds 0.1-0.2 ha each) for aquaculture of different species (common carp, tench, pike, pikeperch, European catfish, sturgeons) are used from juveniles to marketable size fish and for broodstock culture. These ponds are in size, which makes their management easy. Experimental complex has been used for different experiments such as testing of performance traits, common garden experiments, ecology and behavior, feeding and nutrition, semi-artificial or natural reproduction, as well as fish disease and toxicology. Own broodstock of altogether 21 strains of common carp and own broodstock of sterlet and carnivorous fish.

3.9.2.2 Services currently offered by the infrastructure

The experimental Infrastructure of VURH has a broad experience with experimental and pilot-scale assays with reproduction of common carp, sterlet, optimization of intensive aquaculture in carnivorous fish, fertilization trials using frozen/thawed spermatozoa after cryopreservation, induction of genome manipulations, breeding and testing of performance traits of common carp. Standardized protocols are available for controlled artificial reproduction and performance trait testing.

3.9.2.3 Modality of access

Experimental Infrastructure of VURH offers to give access to experimental and pilot-scale assays with reproduction of common carp and other species, increase the efficiency and utilization of this infrastructure, testing of aquaculture e-Infrastructure prototype, fertilization trials using frozen/thawed spermatozoa after cryopreservation, induction of genome manipulations and sex reversal, and testing of performance traits of common carp. Experimental fish to be used originate from the broodstock of VURH, free of diseases.

All three installations within the infrastructure are necessary and technologically linked together. Duration of 1 trial in hatchery (reproduction, incubation, hatching and endogenous feeding) is estimated to two weeks with a stay for weeks No. 1 and 2. Duration of 1 trial in recirculating system (start of exogenous feeding, ongrowing of juveniles, gonad differentiation and maturation of freshwater fish) is estimated to12 weeks with a stay for weeks No. 1 and 12. Duration of 1 trial in pond installation is estimated for 30 weeks (to utilize full potential of growing season for mass rearing of relatively slower growing freshwater fishes; for common garden experiments etc.) with a stay planned for weeks No. 1, 2, 29 and 30. For the above technological reasons, access exceeds 3 months for ponds.

The access will comprise the use of the facilities with regard to experiments and access to the laboratory equipment. Usually, trained and experienced engineer- and technical staff will carry out the standard procedures and the general maintenance. The external user will be strongly integrated in all processes, sampling, data recording, due analyses and assessment, and preparation and dissemination of results.

Experimental Infrastructure of VURH offers to the Infrastructure programme access to carry out trials with fish reproduction, genome manipulations, intensive aquaculture and performance testing at mutually convenient times. The access will comprise the use of hatchery facilities, tanks, including maintenance, water supply, daily feeding and husbandry of fish, handling and sampling the fish. On request, access to laboratory facilities and other infrastructural, logistical, technical and scientific support to external users is offered.

Scientific support will include advice on experimental design and methodology, documentation of results for all experiments conducted in the project and appropriate sampling and storage of samples.

3.9.2.4 Unit of Access

VURH-REU: The unit of access is defined as 1 tank/week; equaling the occupation of 1 tank for 7 days. One trial is expected to comprise 108 units on average (i.e. 9 tanks to test 3 factors in triplicate, during 12 weeks).

VURH-HEU: The unit of access is defined as 1 week; equaling the occupation of the reproductive and hatching unit for 7 days. One trial is expected to comprise 2 weeks (hormonal stimulation, artificial reproduction, fertilization, incubation, hatching and swimming-up).

VURH-PEU: The unit of access is defined as 1 pond per week; equaling the occupation of 1 standard fish pond (0.15ha) for 7 days. Occupation of smaller (0.1 ha) or larger (0.2 hal) ponds will be assigned a fraction or a multiplum, respectively, of the standard fish pond. One trial is expected to comprise 360 units on average (i.e. 12 ponds to test 4 factors in triplicate, during 30 weeks).

3.10 Norwegian University of Science and Technology (NTNU)

3.10.1 Introduction

NTNU has been given the national responsibility for graduate engineering education. Through prioritizing 'Marine science and technology' as one of six focus areas for research, the university is encouraging the integration of knowledge from a wide range of engineering and bioscience disciplines. NTNUs special competence is related to open ocean cage systems, land based recycling systems, and hatchery technology and logistics.

The Centre for Aquaculture and Fisheries at Sealab was established in 2006 with hatchery and recycling aquaculture systems. Its laboratories are equipped with a wide variety of instruments, such as a spectrophotometer and a spectrofluorometer (both including temperature control and a microplate reader), a Gas Chromatographer, a HPLC, a coulter counter and an algae incubator. At the morphology lab one fluorescence microscope and one light microscope with a computer-assisted stereological toolbox for making 3D-calculations from histological sections, are available.

3.10.2 NTNU CodTech

Name of the infrastructure: NTNU CodTech

Location: Trondheim, Norway

Web site address: www.ntnu.no/marine/sealab

Contact: Jan Ove Evjemo (jan.ove.evjemo@bio.ntnu.no)

3.10.2.1 Facilities

The new facilities of Centre of Fisheries and Aquaculture at NTNU were established in 2007 in order to stimulate interdisciplinary research and education in the fields of aquaculture and fisheries. The Centre houses laboratories for the cultivation of both marine and freshwater organisms under controlled conditions.

The automated start-feeding CodTech rig consists of 18 tanks of 160 l each. It is suitable for experiments on a wide range of freshwater and marine species, and the rig is especially designed for controlled experiments with pelagic fish larvae. Continuous in-house cultures of live prey organisms (rotifers, Artemia, copepods) and microalgae provide a good basis for nutritional and developmental studies of marine fish during larval and fingerling life stages. Environmental variables, such as temperature, light, dissolved oxygen, carbon dioxide, and nutrient concentration are monitored and controlled electronically. The installations thus provide a unique degree of flexibility and automation, which can guarantee optimal cultivation conditions on a continuous basis. Incoming water undergoes a microbial maturation process whereas effluents are submitted to an advanced disinfection procedure. The latter makes the facilities particularly attractive for experiments with different bacterial communities and possible contaminants. In 2008, the laboratories were upgraded to an experimental facility with automatically controlled feeding, water exchange and light, and online measurements of live feed density. All tanks are equipped with underwater cameras for remote observation. This combination makes the facility one of the most advanced cultivation hatchery units in Europe.

3.10.2.2 Services currently offered by the infrastructure

NTNUs automated start-feeding rig provides a stimulating and integrated environment for applied research in the field of marine aquaculture technology, fish biology and environmentally related issues. It serves as a principal facility for the development of intensive methods for the production of marine fish larvae. There are well established laboratories for experimental studies of fish cultivation, developmental biology, larval rearing and live prey production, and well equipped laboratories for molecular analyses, histology, microbiology, and biochemistry.

The aquaculture research group has been pioneers in developing biological knowledge and technology for intensive larval rearing of coldwater species, with numerous national and international research projects, and major international involvement in R&D. The group has a long experience in innovating and improving start feeding techniques related to the cultivation of marine fish species, in particular cod, halibut and cod, but also for more tropical species such as cobia and Asian sea bass. The group has published more than 400 scientific, refereed publications directly related to larval rearing, and more than 20 PhD- and 100 MSc-students have graduated in the field. A major expertise has been built up on the establishment of a stable tank environment, through the use of microalgae, reduction of opportunistic bacteria, and the stimulation of a balanced microflora, both in the fish gut and in the live prey organisms. Specific attention has been given to the function of probiotic bacteria in intensive aquaculture. During recent years, the facility has also contributed significantly to the development of methods for cultivation of continous lines of copepods (*Calanus finmarchicus* and *Acartia tonsa*). These organisms are considered to be important alternative larval

feed sources in mariculture, as well as being increasingly used as model species for environmental and toxicological studies.

Marine fish require different types of live prey during the first stages of their life. NTNU has the capacity and experience to produce different types of live feed, depending on the species cultivated and the specific needs of the experiments: microalgae, rotifers, artemia and copepods. These prey organisms can also be enriched in various ways, in order to provide fish larvae with requested nutritional contents according to experimental design.

Since establishment of the laboratory in 2007, a unique cooperation between the aquaculture group from the Department of Biology, Department of Biotechnology, and the Department of Engineering Cybernetics has resulted in significant contributions in the application of control engineering on the marine larviculture process (especially through the recent large strategic research programme CODTECH, funded by the Norwegian Research Council, 2003-2007). These include automatic live feed monitoring equipment, full appetite controlled feeding, and a model based system for estimating larval density from live feed dynamics. The automated start-feeding rig serves as a showcase for these technologies, and offers an experimental environment where more advanced research both on biological and technological aspects of the rearing process can be performed.

An upgrading of the CodTech facilities, including testing and calibration of its monitoring instruments and control equipment has only recently been finalised. Hence, there is no track record yet of its annual use by external users. Still, the start feeding rig is planned to be used for training of students within engineering, biology and microbiology at PhD and MSc levels. The NTNU “International Master Programme in Marine Coastal Development” offers aquaculture studies, where several students already have used the CodTech facility in their MSc thesis projects. Since the first publications and conference presentations about the CodTech system, several external research groups have expressed interest in collaborating through use of the new technological systems.

3.10.2.3 Modality of access

As soon as a proposal for access is approved by the evaluation panel, the group leader will be contacted and be appointed a contact person at the infrastructure. This person will be responsible for the preparation of the planned experiments. Typically, the group leader will be invited to Trondheim to have a first discussion on experimental set-up combined with a visit to the premises, in advance of the start of the project. Details to be clarified with the facility provider are the number of tanks, species, quantity of eggs or larvae, instruments and analytical labs needed. In addition to the contact person, researchers and/or students working in similar field of research may join the group. This will stimulate the interaction between external and internal users of the facilities, resulting in an expansion of the existing collaborative network and eventually in joint publications. All group members will be offered a work space, from where they will have access to all necessary office amenities, such as telephone, internet, copy and printing services. In addition, they will be given the possibility to access laboratory space where the results can be analysed. A project will typically last about 7 weeks, including preparations and performance of the experiments. Upon request, guest researchers and students can join different educational elements that are part of the International Master of Marine Coastal Development.

We anticipate having 3 projects, with duration of 7 weeks each, adding up to 21 weeks in total. 40 days for the experiment and 1 extra week for preparation/analysis.

The Codtech facilities are organised under the NTNU focus area “Marine Coastal Development”. Monitoring and controlling equipment is designed in-house, and therefore, state-of-the-art expertise will also available to external users. During the transnational access project, support will be offered on a scientific, technical and logistic level:

Scientific support: With marine larval technology and engineering at the centre of research, a wide range of disciplines is represented. The scientific staff involved in the ongoing interdisciplinary research and education activities consists of professors, post-doctoral and senior researchers from several departments and faculties. The presence of experts and broad knowledge in first feeding experiments and cultivation of planktonic organisms, fish physiology, larval development and nutrition, microbiology, functional genomics, biotechnology, marine cybernetics, robotics, control systems and ICT tools in intensive aquaculture systems, provides a stimulating research area for external researchers and students visiting the facilities at Sealab.

Technical support: Dedicated technical staff for operation of 18 tanks, instruments, monitoring and sampling gear, adjustment of systems, temperature, water quality, water exchange rate according to experimental design. Supply of live prey organisms (enriched), microalgae necessary for optimal larval conditions and laboratory assistance to perform standard analyses of samples.

Logistic support: All users will be offered an office space, and will be connected to the wireless communication area of NTNU. They will also have the opportunity to use technical workshops, digital meeting rooms and library services. The university’s Office of International Relations offers professional services to all guest researchers. Accommodation is offered within the city of Trondheim by NTNU, which has 40 furnished and fully equipped apartments and guesthouses allocated for guest researchers.

3.10.2.4 Unit of Access

The unit of access is one week meaning the occupation of the automated start-feeding CodTech rig - which consists of 18 tanks of 160 l each- during five days.

3.11 SINTEF Fiskeri og havbruk AS (SINTEF)

3.11.1 Introduction

SINTEF is Scandinavia's largest independent research organisation. The research institute is strongly involved in the development of European aquaculture. Bridge-building between biological and engineering sciences is important for the institute to serve a more complex, advanced, future aquaculture industry with knowledge. It develops, organise and operate the large scale infrastructure specialised for serving RTDI on technology used in sea based aquaculture (within a licence of production of 2340 t salmon).

SINTEF offers two unique installations: 1) SeaLab SSO – Facility for Surveillance, Simulation and Operation (e-infrastructure for R&D within marine disciplines that enables connection of different infrastructures); and 2) ACE Facility for large scale testing of solutions for seabased aquaculture: 2

sites with industrial scaled salmon farms having up to 900.000 salmon kept in 4–6 circle cages (120m/157m in circumference and 12m/15m deep) at each farm, and in addition one environmental buoy and one welfare meter logging environmental conditions at each salmon site.

3.11.2 SINTEF ACE/SeaLab

Name of the infrastructure: ACE/SeaLab SSO (Aquaculture Engineering/SINTEF Facilities for Surveillance, Simulation and Operation)

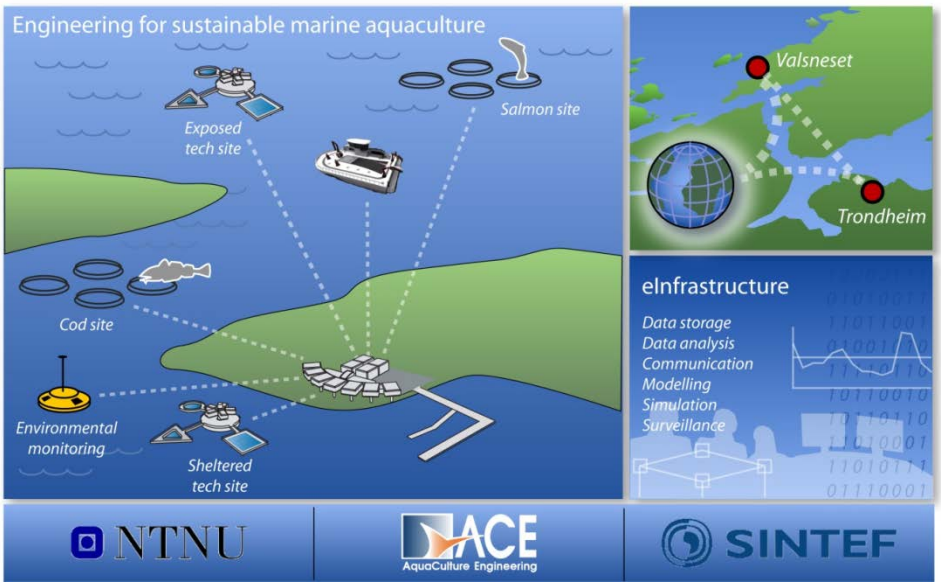
Location: ACE: Valsneset, Norway & SeaLab SSO: Trondheim, Norway

Web site address: www.sintef.no/fish & http://www.aceaquaculture.com/english/

Contact: Finn Victor Willumsen (fvw@aceaquaculture.com)

3.11.2.1 Facilities

ACE is a new large infrastructure developed for testing and verification of improved and new technical and operational solutions in sea-based aquaculture. Through offering a combination of full scale facilities for different species, flexible technology test sites at different exposure levels, and state-of-the-art monitoring and communication equipment, the infrastructure will promote engineering developments for a more sustainable marine aquaculture production. ACE will focus on on-growing stages of fish species in exposed sea sites. The facilities and their relative location are shown in the figure below.



ACE is integrated with the SeaLab SSO e-infrastructure laboratory in Trondheim, providing equipment and software for simulation, operations and surveillance as well as for design of technical equipment. This includes support for data capture, storage and analysis of environmental and operational data. Computing clusters and database servers as well as graphical processing equipment and displays are installed. The SeaLab SSO communications infrastructure provides a secure and controlled access to ACE. This includes live video and on-line access to sensors and actuators, thus enabling remote configuration, monitoring and operation of equipment. SeaLab SSO was officially opened by the Norwegian Minister of Fisheries and Coastal Affairs during the AquaNor

exhibition in August 2009, and attracted substantial attention from national and international delegations from research and industry.

3.11.2.2 Services currently offered by the infrastructure

In order to meet industrial requirements, and to facilitate the implementation of scientific results, full-scale test facilities are needed. This will bridge the gap in the development circle between laboratory scale experiments and the application of new scientific knowledge in an industrial production.

ACE will merge knowledge and technology from a wide range of disciplines into a single large-scale environment, adding the necessary operation, management and engineering aspects in order to put the results into a realistic context that is relevant for its application. The current services are focused on industry scale salmon farming and on facilities for testing sea-based aquaculture technology. All operational and project specific data from ACE are stored in SeaLab SSO, and are made available through the SeaLab SSO e-Infrastructure. On-line remote access to ACE through SeaLab SSO will contribute to more efficient use of resources during design, setup and monitoring of experiments, and also for analysis and dissemination of results.

Although both facilities (ACE and SeaLab SSO) can be used independently, we consider it most convenient in the context of the work to be carried out in this project, to view them as a joint facility. This, is because we see the potential benefit to other organisations as being clearly at its greatest when the two facilities are used together - with ICT facilities provided by SeaLab SSO providing the means to use ACE facilities with optimum effectiveness.

3.11.2.3 Modality of access

One main offering consists of two sites with industrial scale salmon farming (cages, feed barge). During the four year access period, three production cycles will be completed. The smolt used in each cycle will have a documented genetic background, and low variance in treatment and handling. The sites/cages are equipped with sensors for continuous measurements for documentation of environmental conditions (oxygen, temperature, salinity, currents etc). Operational data (type of feed, feeding rates, sea lice treatments, biomass growth estimates etc) are also available. Infrastructure for efficient installation of project related equipment is available on every cage, including communications interfaces for remote monitoring and data transfer via SeaLab SSO. Reference measurements are supplied by an environmental monitoring buoy, also accessible through SeaLab SSO.

Another main offering consists of one exposed and one sheltered test site for the development and testing of new technology, materials and solutions. Infrastructure (mooring, power, data communications etc) for installing project related equipment will be available. Remote monitoring and data transfer is available via SeaLab SSO.

Through the close integration between ACE and SeaLab SSO, the modality of access is flexible, ranging from on-site visits on the farming sites, to remote access to data from other consortium infrastructures (via logon to SeaLab SSO). The experimental set-up has to be clarified in advance with the facility provider, e.g. number of cages, quantity of fish and quantity of fish samples. The SeaLab SSO communications network is divided into several VLAN's (Virtual Local Area Networks). Access to the relevant VLAN and the resources on that VLAN is given on a per user basis (password

protected). All connections to external data acquisition equipment (e.g. sensors, video cameras) are routed to a VLAN dedicated to this purpose, thus limiting the risk for unauthorized access to other resources. Office space is available both on the ACE land base (Valsneset) and adjacent to SeaLab SSO (Trondheim).

Scientific and technical support will be available both for visits to ACE and for remote access through SeaLab SSO. This includes boat transport between shore and farming sites, necessary safety equipment and clothing for operations at sea. On-site installation of project related equipment will be done by the technical support staff to minimize the risk for personnel and operations. Documented time series of environmental and operational data will be available through SeaLab SSO on a site/cage basis, along with environmental reference data for the coastal area. A limited number of fish samples will be analyzed on a monthly basis, these samples can also be used for project related special analysis. Scientific and technical support includes appropriate sampling and conservation of samples. In addition to live video feeds from ACE, meeting rooms with video conferencing will be available, enabling visiting scientists to communicate with colleagues and other research groups during experiments.

3.11.2.4 Unit of Access

The unit of access is defined as one week, equalling the occupation of ACE/SSO facility during 5 days each of 7.5 hours for up to 2 persons.

3.12 Universidad de Las Palmas de Gran Canaria (ULPGC)

3.12.1 Introduction

GIA (Grupo de Investigación en Acuicultura) is a Joint Research Unit of the University of Las Palmas de Gran Canaria (ULPGC) and the Canary Institute of Marine Sciences (ICCM), with a 30 years experience in fish aquaculture RTD, mainly nutrition, pathology, new species and genetics. One of its main achievements has been the clarification of the biological mechanisms involved in the regulation of the functioning of several tissues by means of dietary nutrients, using histological and immune-histological studies. Besides, GIA has developed physical tagging systems and selection schemes in sparid species and microarrays, and molecular markers for genealogies and health studies (microsatellites, TNF, IL11, GR, HSP70, HSP90, Δ5 and Δ6 desaturases).

ULPGC facilities include the facilities WWSSU, MBS and FITU: a Warm Water Species Selection Unit (WWSSU) with a completely equipped laboratory of Molecular Biology and Quantitative Genetics techniques, a Marine Biosecurity Station (MBS) with three RAS and a Fish Pathology, an Anatomo-pathology and a Microbiology Lab, a Feed Ingredients-additives Testing Unit (FITU) with labs for nutrition (GLCs, HPLCs and GLCs/HPLC-MS), analysis, feed production, , digestibility and wet labs with computer controlled photoperiod and feeding for either larvae (including automated start feeding), juveniles or broodstock of marine fish species, both commercial or new species for aquaculture.

3.12.2 ULPGC WWSSU

Name of the infrastructure: Warm Water Species Selection Unit (WWSSU)

Location: Las Palmas, Spain

Web site address: www.grupoinvestigacionacuicultura.org

Contact: Juan Afonso Lopéz (jafonso@dpat.ulpgc.es)

3.12.2.1 Facilities

The facility includes a breeding and a selected family rearing station. It comprises 45 circular tanks of 1 000 litres and 12 circular tanks of 30 000 litres of capacity prepared to obtain spawnings from tagged pairs or groups of marine warm water fish broodstocks, by controlled photoperiod and temperature or hormone induction, respectively. Besides, 90 tanks of 500 litres allow larval and juvenile rearing until they are ready to be tagged. These tanks have a capacity to culture of fish from up to 45 different families. It also includes a completely equipped laboratory for Molecular Biology and Quantitative Genetics techniques (manual and automatic sequencers, gel documentation systems, 5 color gene expression equipment, quality quantifier of nucleic acids, design and planning of breeding schemes, development of individual identification systems for physical and molecular reconstruction of genealogy, estimation of genetic parameters and evaluation of players, etc..), where we have reported, for the most important species in Mediterranean aquaculture (gilthead seabream), physical and genetic tagging systems for estimates of genetic parameters under industrial conditions. Furthermore, it benefits other research lines in animal breeding of other species with similar biological characteristics (sparids), which are important for the diversification of Mediterranean aquaculture. The facility is included in the Marine Scientific and Technological Park of the ULPGC and has access to other large aquaculture infrastructures and laboratories

3.12.2.2 Services currently offered by the infrastructure

This infrastructure provides the possibility to establish a breeding program with its subsequent genetic progress and increased profits, both for commercially well-established species and for new species for aquaculture. Services include genetic advice, construction of genealogies, estimation of genetic parameters and selection of breeders. It also has a self-selection scheme in which users can provide elite breeders or measure the genotype-environment interaction, which is interesting in species such as sea bream produced in very diverse environments.

Several successful EU and national projects have been conducted of the facility, whereas a new hall will be ready for April 2010. At present, the Unit is the coordinator and National Reference Center for Development of a genetic improvement program in gilthead seabream (PROGENSA from JACUMAR-2008), giving also service to commercial hatcheries

3.12.2.3 Modality of access

Users can also have access to individuals from the different lines in order to conduct trials in their own laboratories. Fish are shipped by airplane in cube-containers by GIA researchers which have a wide experience and success in this process. The number of trials per year will depend on the numbers of families demanded and the requests by the different partners.

The access will comprise the use of tanks including maintenance, water supply, daily feeding and husbandry of fish; manipulation, and sampling of fish. Also access to all dry laboratory facilities and other infrastructure, logistical, technical and scientific support to external users is offered on request. Scientific support will include advice on experimental design and methodology,

documentation of results for all experiments conducted during the project, and appropriate methods for sampling and conservation of samples.

3.12.2.4 Unit of Access

The unit of access is defined as 1 tank/week, equaling the occupation of 1 tank of $1m^3$ for 7 days. Occupation of small (500 L) tanks will be assigned a fraction or a multiplum, respectively, of the standard tank unit. One project is expected to comprise 45 tanks on average during twelve weeks.

3.12.3 ULPGC MBS

Name of the infrastructure: Marine Biosecurity Station (MBS)

Location: Las Palmas, Spain

Web site address: www.grupoinvestigacionacuicultura.org

Contact: Fernando Real Valcárcel (vidi@ulpgc.es)

3.12.3.1 Facilities

The MBS is located in the Marine Scientific and Technological Park of the ULPGC and the ULPGC itself and comprises three main RAS units completely equipped to separately challenge with up to three different pathogens at the same time in all phases of fish life cycle including broodstock, larvae and juveniles of marine fish species. Each of them is provided with automatic and programmable control of flow, oxygen concentration, temperature, salinity and feeders and is designed to content up to 18 circular tanks of different volume (100, 200, 500 and 1 000 litres). Therefore, 6 treatments in triplicates can be run at the same time in each unit, but up to 90 tanks can be used if all units are included in the same experiment. The design of the recirculatory units is versatile, which allows a great amount of testing conditions and assays in vivo with any pathogen. It also has a support laboratory in situ, as well as access to the Fish Pathology Laboratory of the Institute of Animal Health and Food Safety (IUSA) and the Microbiology Laboratory, both at the ULPGC, with microbiology and anatomo-pathology techniques ready for all fish and mollusc tissues (including anterior kidney, brain, muscle and bone, among others). These characteristics make the MBS the most versatile and controlled research station in Europe to challenge marine fish with virus, bacteria or parasites. These kind of studies have been conducted by GIA and the Fish Pathology Lab for the last 10 years, fish health and welfare being a main research line of this group. The MBS is a reference center for disease prevention in the Canary Islands and adjacent African countries.

3.12.3.2 Services currently offered by the infrastructure

In marine fish, facilities to provide pathogen-free animals with which to develop large-scale experiments are scarce. In this sense, the MBS supplies pathogen-free animals, which are highly demanded by experimental and industrial laboratories, offering services on pathogen challenge for researchers, feed producers and pharmaceutical companies, developing vaccines, immunestimulants and therapeutical products. The service includes standardised models for several pathogens and infection by intramuscular or intraperitoneal injection, cohabitation, immersion and rectum canulation as well as the development of combined experiments in nutrition and disease. All experiments are supported by biochemical, enzymatic histological, and microbiological analysis.

3.12.3.3 Modality of access

One project is expected to comprise 18 tanks on average during eight weeks. Users are given access to this infrastructure for an average of 8 weeks for in vivo infection experiments. The number of trials per year will depend on the numbers of treatments demanded and the requests by the different partners.

The access will comprise the use of marine fish of both, commercially important and new species for Aquaculture, different types of pathogens, tank maintenance, water supply, daily feeding and husbandry of fish; manipulation, and sampling of fish. Also access to all dry laboratory facilities and other infrastructure, logistical, technical and scientific support to external users is offered on request. Scientific support will include advice on experimental design and methodology, documentation of results for all experiments conducted during the project, and appropriate methods for sampling and conservation of samples.

3.12.3.4 Unit of Access

The unit of access is defined as 1 tank/week equalling the occupation of one standard tank for seven days.

3.12.4 ULPGC FITU

Name of the infrastructure: Feed Ingredients-additives Testing Unit (FITU)

Location: Las Palmas, Spain

Web site address: www.grupoinvestigacionacuicultura.org

Contact: Marisol Izquierdo López (mizquierdo@dbio.ulpgc.es)

3.12.4.1 Facilities

The infrastructure includes an ingredient processing laboratory, a feed production hall, two series of 15 digestibility tanks (200 and 500 litres) and three wet labs with 170 tanks of 100, 200, 500 and 1 000 litres, as well as two lines for commercial scale testing, provided with computer controlled automatic, auto-demand or manual feeding and waste feed collectors (feed intake control), to test diets and ingredients for either larvae (including automated start feeding), juveniles or broodstock of marine fish species, both commercial or new species for aquaculture. Photoperiod control is also available in 100, 200 and 500 litres tanks. It also has access to a complete nutrition laboratory equipped with 3 GLCs, GC-MS, 3 HPLCs, Densitometer, Iatroscan, Khjeldahl, ovens, muffles, etc., where all lipid, protein, aminoacids, fatty acids, lipid classes, vitamins, pigments, toxines, dioxines, PCBs and certain minerals from ingredients, feeds, live preys, seaweeds, moluscs, fish, turtles and marine mammals are daily analysed. Several successful EU and national projects have been conducted in this facility which has been completely renewed one year ago allowing complete automatisation and control for research on larval, juvenile and broodstock nutrition including nutritional requirements determination, alternative nutrient sources search, development of feeding tables and feeding methods, etc. The facility is included in the Marine Scientific and Technological Park of the ULPGC and has access to other large aquaculture infrastructures and laboratories, such as in vitro cell studies.

3.12.4.2 Services currently offered by the infrastructure

The facility allows determination of ingredient and feed quality, as well as nutritional studies, in relation to growth, nutritional status, health, welfare and juvenile and flesh quality of fish and mollusc. Up to now the facility has been used in cooperation with researchers from more than 20 countries that came for student, post-doc or sabbatical stages. Besides, it has given service to more than a dozen of local, national and multi-national companies, working at present for 4 of them. There is a very high demand for the use of these facilities that cannot completely being covered by the present facilities and hence a new plant is being build that will be ready for the end of 2010. Two patents, commercial feed formulas for aquaculture species, several new ingredients for two farmacological companies, more than 20 PhD thesis and 25 Master thesis, 7 EU projects and about 300 scientific papers have been produced in this facility.

3.12.4.3 Modality of access

One project is expected to comprise 15 tanks on average during twelve weeks. The duration will depend on the life cycle stage (from first feeding larvae to broodstock).

The access will comprise the use of tanks including maintenance, water supply, daily feeding and husbandry of fish; manipulation, and sampling of fish. Also access to all dry laboratory facilities and other infrastructure, logistical, technical and scientific support to external users is offered on request. Scientific support will include advice on experimental design and methodology, documentation of results for all experiments conducted during the project, and appropriate methods for sampling and conservation of samples.

3.12.4.4 Unit of Access

The unit of access is defined as 1 tank/week equalling the occupation of one standard tank for seven days.

3.13 University of Wageningen (WU)

3.13.1 Introduction

WU-AFI (Aquaculture and Fisheries) belongs the Department of Animal Sciences of WU. It lectures in the MSc Aquaculture and Fisheries and organizes intensive courses/workshops on recirculation aquaculture system (RAS) technology. WU-AFI has a 30 years record of research on the interaction and modulation of fish and rearing environment in intensive farming systems, such as RAS. It developed expertise in: (1) growth, nutrient and energy metabolism using metabolic chambers and (2) the engineering and operation of RAS systems (since the 80's) and is now worldwide recognized as one of the leading experts in that area.

Aquaculture scientists visiting this facility can benefit from Wageningen Aquaculture Research Facility, a 1800m^2 aquatic indoor recirculation systems based research facility (approximately 65 RAS and 560 holding tanks). The facility contains: (a) the Metabolic Research Unit (for more info see detailed description in the TNA paragraph). The unit offers a research environment for studies on nutrient and energy balances and metabolism in fish (both over a production cycle and for within-day variations, (b) the Recirculation Facility consisting of sets of identical lab scale and pilot scale RAS

to replicate treatments on system level. Marine and freshwater pilot scale RAS can be extended with several water treatment units (e.g. a single sludge denitrification reactor or a Geotube®system).

3.13.2 WU-MRU

Name of the infrastructure: The Metabolic Research Unit (WU-MRU)

Location: Wageningen, The Netherlands

Web site address: www.afi.wur.nl

Contact: Menno Ter Veld (Menno.terVeld@wur.nl)

3.13.2.1 Facilities

The metabolic research unit is unique for: (1) its water degassing possibility and capacity. All supply water to the metabolic chambers can degassed (< 1 mg O_2/L) where after 4 new, oxygen influent concentrations can be chosen and controlled which supply each 3 metabolic chambers, (2) measurement of O_2 consumption and CO_2 production in water and air (unique), (3) high accuracy and stability of the online water flow measurement across the metabolism chambers, in combination with mobile webcams per chamber for behavioural studies and on line water quality measurements , (4) it can be operated in fresh and salt water, cold and warm water (flexibility, rare), (5) measurement of within days variation by concomitant determination of O2 consumption (from water and air), CO_2 production (in water and air), TAN, Urea, Orthophosphate, temperature and pH.

The Metabolic Research Unit consists of twelve metabolic chambers (200L each) linked to a recirculation system with a total water volume of ± 7m^3. The recirculation system is equipped with an independent water quality (pH, salinity, temperature) measurement and control system. The metabolic unit is placed in a room with adjustable photoperiod. It has on-line measurement of actual and cumulative water flow per metabolic chamber; oxygen, temperature, pH, Conductivity (µS), salinity, CO_2 production/consumption, TAN, Urea, NO_2-N, NO_3-N, dissolved protein, and PO_4-P in the rearing water, using an auto-analyzer (Type San autoanalyzer adapted with flow through cuvettes, Skalar, Breda, The Netherlands). The metabolic research unit allows the measurement of cumulative airflow across each metabolic chamber and on line measurement of O_2 and CO_2 concentration in and out going air of each metabolic chamber for air breathing fish species. It is designed to enable measurements for both freshwater and marine organisms (salinity can be varied from 0 to 35ppt), and for cool- and warm water fish (water temperature can be controlled between 15 and 30 °C). The unit allows controlling changes in influent oxygen or carbon dioxide concentration through a combination of degassing and controlled oxygen or carbon dioxide supply enabling studies on the response of fish to various O_2/CO_2 ratios in the environment. The twelve metabolic chambers can be equipped with a mobile feeding registration system. Mobile faecal collection units (one can choose 12 Choubert faeces collectors or 12 sedimentation funnels or a combination) can be used to study the digestibility of feed nutrients. Mobile webcams (N=16) and imaging analysis software are available to record and analyse behavioural data. The metabolic research unit is equipped with a data acquisition system in which all data can be stored and made available in excel spreadsheets for later analysis. The unit can be connected to two identical RAS differing in water quality (pH, salinity, water exchange rate, nitrate level) to study the effects of these factors on the response of fish

The metabolic research unit is commonly used for studies on nutrient and energy balance studies in fish (both over a production cycle and for within-day variations) and for studies on the adaptive physiology of fish.

3.13.2.2 Services currently offered by the infrastructure

The metabolic research unit offers a research environment for studies on nutrient and energy balances and metabolism in fish (both over a production cycle and for within-day variations). The research questions in the metabolic research unit relate to how animal factors (genetics, phenotypic differences, and health status), nutritional factors and environmental factors (temperature, oxygen concentration, carbon dioxide concentration, stocking density, sex ratio and housing conditions) affect responses of animals.

However, over the past 5 years, research has focused on adaptive physiological responses of fish to various husbandry conditions, such as the changes in feed intake behaviour and nutrient utilisation when ambient oxygen conditions are pre-set at different levels (tilapia) or carbon dioxide levels are pre-set at different levels (seabass). Studies were combined with changes in feed composition (substitution of animal by plant proteins, and different levels of non-starch polysaccharides, affecting the viscosity of the chyme and other intestinal ecological parameters), chronic (density; light conditions) and acute (netting) stress conditions, etcetera. Measured responses in the metabolic research unit strongly depend on the research questions involved, but generally, feed efficiency, feeding behavior (latency and feeding time), digestibility, heat production and behavior are among the measurements performed.

In addition, these measurements may be combined with blood parameters and anything you can measure at slaughter. Studies were partly conducted through EU funded research (for example, the WEALTH project (SSP8-CT-2003-501984) investigating the metabolic effects of rearing European Seabass in extreme high densities, and at high CO2, low O2 levels in RAS). Visiting scientists and PhD's did research in the metabolic research unit. Currently the unit is in use in PhD studies and national projects (turbot and sole).

3.13.2.3 Modality of access

A project will last typically 3 months, whereby the users spends part of the 3 months time for preparation of the final work protocol, discussion with the local WU scientists and supporting staff, and discussion of the results. The effective use of infrastructure for experimentation during each a project will be 8 weeks. Within AQUAEXCEL, the WU infrastructure will receive three projects of 3 months each during the project duration, thus 3*8=24 weeks of infrastructure use. When a proposal is selected, a host-supervisor will be identified and allocated from the senior staff of WU. The visiting user group is expected to discuss details of the proposed research with this senior staff member who acts as immediate local partner for the proposed research. The study will be further executed as a joint collaborative research project between AFI and the project user group. This guarantees that the study is administratively registered as a Wageningen University Task, which facilitates the further administrative implementation. The host unit (WU) will start all logistic and administrative procedures and supports the execution of the work by providing supporting staff (lab technicians, administrative support, fish care taking staff etc) and scientific embedding and backing. The visiting scientists are expected to stay 6 weeks at WU and execute part of the experiment themselves: three weeks at the start of the experiment and three weeks at the end of the experiment (to be discussed

with the host supervisor). In the meantime the practical work will be done by the infrastructure personnel.

The Aquaculture and Fisheries Group of WU will assist in the outline of the work protocol, submit the application for approval of the Ethical committee, and provide scientific backup on methods and results interpretation and act as co-author for eventual publication of the results.

WU technicians will support the proper execution of the experiments, keep track of the (mandatory) Welfare logbook, purchase of fingerlings and feeds required, and act as liaison to the staff of the Experimental Facility "De Haar Vissen". Staff of the research facility" De Haar Vissen" will provide support in feeding the animals and preparing the infrastructure before/after its use in the project.

The visiting scientist will receive a workplace, including a WUR internet account for the duration of their stay, receive support in finding living accommodation and be registered as visiting scientists. The latter enables the formal support of all WU administration, e.g., finances, book-keeping, secretarial support etcetera.

The support offered is a standard support given to visiting scientists and PhD's by WU.

3.13.2.4 Unit of Access

The unit of access is defined as a week meaning an access to the whole metabolic research unit (12 metabolic chambers (200L each) linked to a recirculation system) during 7 days.

3.14 University of Ghent (UGent)

3.14.1 Introduction

The "Ugent Aquaculture R&D Consortium" groups the interdisciplinary research performed at Ghent. Two labs of the UGent consortium will participate in this project.

The Laboratory of Aquaculture & Artemia Reference Center (ARC) has been involved in larviculture research since the late 70's. Since the mid 80's research activities extended to fish & shellfish larviculture-related fields a.o. lipid and vitamin requirements, microbial management in larviculture systems, microorganism (bacteria, yeast, micro-algae)-fish larvae interactions, egg and larvae quality, use of enriched Brachionus and Artemia, effects of immunostimulants and other compounds on disease and stress resistance.

The Laboratory for Microbial Ecology and Technology (LabMET) focuses on the cultivation independent analysis of microbial communities. The lab studies in particular processes that are steered by mixed microbial communities. LabMET has a large spectrum of equipment including PCR-cyclers, een Real-Time PCR cycler, Denaturing Gradient Gel Electrophoresis units, a 3-laser flow cytometer and a fluorescent microscope

The set up consists of sterile vials (15 mL) mounted on rotors placed in a temperature and light controlled room.

3.14.2 UGent GART

Name of the infrastructure: Gnotobiotic culture system for Artemia and sea bass (GART)

Location: Gent, Belgium

Website address: http://www.aquaculture.ugent.be/index.htm

Contact: Kristof Dierckens (kristof.dierckens@UGent.be)

3.14.2.1 Facilities

The gnotobiotic set-up is placed in a temperature controlled room. The set up consists of sterile recipients mounted on a rotor (4 rpm). In the GART system, axenic Artemia are fed axenically cultured feed, such as bacteria, yeasts (*Saccharomyces cerevisiae* wild type and strains with different cell wall composition) or axenically cultured microalgae (*Dunaliella tertiolecta*, *Tetraselmis suecica*). The axenic sea bass larvae are fed axenic Artemia nauplii or a γ-irradiated compound diet.

Gnotobiotic systems are especially interesting in studying the effect of specific micro-organisms on higher organisms because bias caused by the microbiota that is naturally present in cultures of these organisms is eliminated. There are standardised challenge tests for both gnotobiotic systems with *Vibrio anguillarum* O_2a (for seabass), *Vibrio campbellii* and *V. harveyi* (for GART). There are also different quorum sensing (i.e. bacterial cell-to-cell communication) mutants available of both *V. anguillarum* and *V. harveyi*.

The set-up can be used to study host-microbial interactions, quorum sensing-regulated mechanisms, testing probiotic bacteria, testing the effect of microorganisms (bacteria, yeasts, algae) or feed components (glucan, heat shock proteins, poly-β-hydroxybutyrate) on resistance to challenge, gastro-intestinal morphology and development of larvae (gastro-intestinal, cranial,...) deformities, gene transcription, immunological essays. It can also be used to verify phenotypic differences in larvae of seabass lines towards a *Vibrio anguillarum* challenge

The set-up can be used to run the experiments and gather samples. Analysis of these samples might need the input of visitor's laboratories, depending on the specific interest.

3.14.2.2 Services currently offered by the infrastructure

The GART set up is currently used to study quorum sensing regulation of virulence of Vibrio spp., the effect of microorganisms on the development of the intestinal tract, the application of anti-infective feed components (heat shock proteins, poly-β-hydroxybutyrate and poly-β-hydroxybutyrate-containing bacteria). The system has been used in collaborative studies with groups from Belgium (Tom Coenye, Ghent University), the USA (Thomas Wood, Texas A&M University), Canada (Edward Meighen, McGill University and Thomas MacRae, Dalhousie University) and has been used by a group from India (Indrani Karunasagar, UNESCO MIRCEN for Marine Biotechnology).

This set up has been used in four PhD studies (A. Marques: A gnotobiotic Artemia test system to study host-microbial interactions, 2001-2005 ; S. Siyavash: Immunostimulating characteristics of isogenic yeast strains in Artemia 2004-2007 and T. Defoirdt: Interference with quorum sensing for the prevention and curing of infections in aquaculture 2003-2007, Yeong, Y.S: The role of heat shock proteins as immunostimulants in Artemia 2004-2007) and has lead to 20 publications.

The gnotobiotic sea bass system is currently used to study the effect axenity on the development of the intestinal tract (Rekecki et al., 2009), the pathogenicity of different serovars of *V. anguillarum* (Dierckens et al., 2008) and the effect of feed components on the resistance to Vibrio-challenge.

Scientists can work in bacteria free conditions to study interactions between sea bass larvae or Artemia and defined (self-assembled) microorganism communities, study the impact of microorganism communities on fish fed compound diets, …

Since the first publication, research groups from Italy (Giuseppe Scapigliatti, University of Tuscia), from Spain (Jorge Galindo, Laboratory of Cellular Biology and Histology, Faculty of Biology, Murcia University), have shown interest to work with this system. This facility is used in 1 international project (Promicrobe) and by 5 PhD students.

3.14.2.3 Modality of access

UGent can give access to these gnotobiotic set-ups under different conditions. For Artemia, access is easy and can be arranged for on a short term basis. The visitor will be assisted to a very high degree in setting up the experiment by the trained technicians. The goal and the specific experiment will be discussed with the UGent scientist. The visitor will participate in the experiment which will be mainly executed by local staff. A visitor will need about 5 to 6 weeks continuous at UGent for such an experiment (preparation and rounding off).

For a sea bass test, 7 sea bass experiments are planned with 18 access units per experiment. As a sea bass test is time consuming, it is foreseen that a user is going to run 1 test. For the artemia tests, 18 tests are planned with 2 access units per experiment. Artemia tests are smaller and shorter. So, one user can easily run 2 tests.

For gnotobiotic Artemia experiments, local staff will teach the methodology. Experiments will subsequently be performed by the visitor with the supervision and help of UGent staff. For gnotobiotic seabass experiment, a research plan will be described by the visitor and discussed with local scientific staff. The experiment will be executed by local staff in which the visitor will participate.

The visitors will be guided by highly trained technical personnel with a long experience in conducting scientific experiments. There is a very international atmosphere in the lab, as there are continuously more than 10 foreign PhD students/post-doc researchers bringing in their own experience and knowledge. Prof. P. Bossier has a long-standing experience in microbial ecology and genetics and is focussing his research on host microbial interactions (65 international publications). Prof. P. Sorgeloos has been pioneering in aquaculture research making a great contribution to the nutritional and microbial aspects of aquaculture food chain (237 international publications). K. Dierckens is specialised in live feed for aquaculture and focussing his research on microbial aspects (28 international publications). Prof. N. Boon is specialised in microbial ecology, focussing on MC composition and functioning (80 international publications).

3.14.2.4 Unit of Access

Experiments with bacteria-free Artemia are conducted in sterile vials mounted on a rotating device. For each experiment, we use an access unit of 50 vials for the control and the treatment. Hence the unit of access of 50 axenic recipients.week.

3.15 Institute for Marine Resources and Ecosystem Studies (DLO-IMARES)

3.15.1 Introduction

DLO-IMARES (Institute for Marine Resources and Ecosystem Studies, about 200 FTE) is the Netherlands research institute established to provide the scientific support that is essential for developing policies and innovation in respect of the marine environment, fishery activities, aquaculture and the maritime sector. Within the aquaculture department DLO-IMARES holds in its species portfolio a wide range of fresh water and marine species and culture technologies

Within the project independent units for research on RAS system engineering and RAS system operation are provided. DLO-IMARES has at its deposition three sets of research infrastructure: 14 lab scale RAS, for warm water research configured for warm, fresh or salt water research with about 80-100l tank volume), 21 pilot scale RAS either for cold, warm, fresh or marine studies, ranging from several hundreds of litres to up to 5m³, 2 semi industrial scale RAS either for cold, warm, fresh or salt water with about 10-30m3. All systems are equipped with mechanical and biofiltration units. In addition filter modules can be exchanged to meet the specific needs of the end-user, such as UV disinfection, ozone treatment, upflow filtration, denitrification etc.

3.15.2 DLO-IMARES

Name of the infrastructure: Recirculation facilities of DLO-IMARES

Location: Yerseke and Wageningen, The Netherlands

Web site address: http://www.imares.nl

Contact: Andries Kamstra (andries.kamstra@wur.nl)

3.15.2.1 Facilities

The Recirculation facilities of DLO-IMARES enable research on RAS system engineering and RAS system operation. The unit for RAS Research offers three sets of research infrastructure:

(1) lab scale RAS, for warm water research configured for warm, fresh or salt water research

- 14 identical RAS to replicate treatments on system level

(2) pilot scale RAS either for cold, warm, fresh or marine studies

- 6 identical RAS; 0.5 m^3 ; to replicate treatments on system level
- 6 identical RAS; up to 3m³ & 1.5kg feed/d ; to replicate treatments on system level
- 2 identical RAS; 3.0 m^3; 4 fish tanks/RAS
- 2 identical RAS; 5kg feed load/d ;
- 1 pilot scale RAS; 5.5 m^3; 4 tanks./RAS
- 1 pilot scale RAS; 2.5kg feed/day;
- 3 single tank RAS units;

(3) semi industrial scale RAS either for cold, warm, fresh or salt water

- 1 semi industrial RAS (10 kg feed load /d)
- 1 semi industrial RAS (20-30 kg feed load /d)

3.15.2.2 Services currently offered by the infrastructure

The recirculation facility service aquaculture researcher uniquely as they offer the:

- Ability to test in identical and truly independent RAS at system level (system as experimental unit) effects of nutritional factors (nutrient composition, feed technology), environmental factors (pH, O_2, alkalinity, temperature, salinity etcetera), management factors (stocking density, sex ratio, genotype etc.) on water quality, waste production etc.
- Choice out of different RAS configurations and tank composition (volumes, flows, tank replicates) based on the experimental objectives (e.g. drum filter filtration or sedimentation; comparison real flow through versus RAS) allowing for the most economical set-up.
- Possibility to study or compare the effect innovative system components, such as different mechanical or biofilter types (submerged, trickling, USB-denitrification, peryphyton and duckweed reactors).
- Potential integration of single cell protein reactors, with pH and oxygen control, and adjustable sludge supply unit
- Presence of a transportable auto analyzer with sampling unit which measures online at 14 sample locations (sampling interval ± 5min.) TAN, Urea, NO_2-N, NO_3-N, dissolved protein, and PO_4-P in the rearing water, using an auto-analyzer (Type San autoanalyzer adapted with flow through curettes, Skalar, Breda, The Netherlands). Next to this analyser, standardized water quality testing equipment is available allowing for analysis of about 200 different parameters
- Option to use bioassay studies to determine effects of management on individual or group housed fish.
- Comparison of flow through with recirculation on pilot scale at different temperatures
- System research can be combined with behavioural studies using three independent sets of video camera systems (4, 16 and 18 channels) with digital output and internet stream. This technology allows as well or remote supervision of systems
- Web Cam based supervision (4 camera systems) for the parts of the facilities, monitoring system function and tanks

3.15.2.3 Modality of access

Users will be given access to the facilities based on the common procedures of DLO-IMARES. The necessary local arrangements will be taken by the technical staff, e.g. system set-up, adaptation of biofilms and water quality, adaptation of the required experimental animals etcetera. In case the proposed experiment falls under the code of conduct and regulation for usage of experimental animals, the approval of related experimental commissions had to be granted a priori the experiment can be started. In this case the experiment needs to be supervised by a certified researcher of DLO-IMARES and been executed by certified technicians. Users will have access either locally by directly staying at the facilities and being integrated in the scientific atmosphere at DLO-IMARES or are granted remote access under the development of the e-infrastructure within WP6. In that case the scientist gain access through web interfaces using web cam visual and technical access using a stand-of-the-art interface to manipulate flows, influence water quality and access acquired data. In this case fish will be taken care of by a local technician who will be supervised by a local

researcher to avoid discomfort for fish during the experiment. Local staff and remote accessing researchers are therefore jointly safeguarding the success of the present experiment.

The remotely accessing scientist or locally present experimentator will be supported by local staff, such as the directly involved technical staff dealing with the direction of the scientist to conduct the experiment. A local responsible scientist will collaborate with the experimentator to ensure that the regulation of DLO-IMARES and national animal protection laws are followed. Locally present experimentators will be granted with internet access to the scientific literature and databases of DLO-IMARES and other e-infrastructure and labs. The in RAS experiments experienced research staff will safeguard the success of the experiments by support during the design phase, the generation of a work protocol and the related animal experimental code of conduct, execution of the experiment and data acquisition.

3.15.2.4 Unit of Access

The unit of access is defined as 1 system-week; equalling the occupation of 1 RAS for 7 days. One trial is expected to comprise 72 system-weeks on average (i.e. 6 RAS to test 2 factors in triplicate, during 12 weeks).

Annex 4

TNA Application Form

Application Reference Code *(Leave Blank - will be filled by secretariat)*:

APPLICATION FORM FOR RESEARCH ACCESS

(Please read guidelines before completing this form)

1. Name and code of the Research Infrastructure for which you are applying for access:

Select Facility

2. Research project short name (max 30 characters):

3. Lead Researcher applying to access the Research Infrastructure (Also attach separate CV)

Name: Title: Select

Position:

Citizenship: Birth Year: Gender: Select

Highest qualification: Select

Research category: Select

(PGR = PostGRaduate, PDOC = PostDOC, EXP = EXPert, TEC = TEChnician, OTH = OTHer)

Organisation Name:

Organisation Acronym: Organisation Country: Select

Organisation Type: Select

(UNI=University, RES=research institution, SME=small or medium size enterprise, PRV=private)

Organisation Web Address:

Organisation Address:

Phone: Fax: Email:

4. Additional member of research group involved in visit (if applicable) (attach separate CV)

Name: Title: Select

Position:

Citizenship: Birth Year: Gender: Select

Highest qualification: Select

Research category: Select

(PGR = PostGRaduate, PDOC = PostDOC, EXP = EXPert, TEC = TEChnician, OTH = OTHer)

Organisation Name:

Organisation Acronym: Organisation Country: Select

Organisation Type: Select

(UNI=University, RES=research institution, SME=small or medium size enterprise, PRV=private)

Organisation Web Address:

Organisation Address:

Phone: Fax: Email:

For *any additional co-researchers not involved in the visit, please provide the following information:*

Name Organisation: Role* Select

Name Organisation: Role* Select

Name Organisation: Role* Select

Name Organisation: Role* Select

(*Role – select from EXP - Expert/Adviser; AC-COL – Academic Collaborator; CO-COL – Commercial Collaborator; RES-ST – Research Student; TECH – Technician)

5a. Have you or your research group previously carried out collaborative research with staff of the proposed Research Infrastructure? If so, when and how?

5b. Have any members of your research group previously accessed this Research Infrastructure? or are you a new user of this Research Infrastructure? Please give details of previous access or write "new user":

5c. Please give details of any previous applications made by your Research Group under the AquaExcel project whether supported or not (*Note, not applicable for first call***):**

Application	Project title	Year submitted	Leader Name	Aqua Excel Ref. No.
1		Select		
2		Select		
3		Select		
4		Select		

6. Proposed study title:

7. Number of units of access requested:

a) **Number of people visiting the Research Infrastructure** Select

b) **Number of weeks you will be at the Research Infrastructure**

c) **Number of tanks, ponds, cages, etc* you will use (if appropriate)**

d) **Number of "Units of Access"* Requested**

*Please see call details for guidance on calculating the units of access for each Research Infrastructure, for instance it may be number of weeks x number of tanks, or number of weeks x number of people etc.)

8. Introduction (max 0.5 page – include background and why you wish to use the specific Research Infrastructure).

9. Study objectives (max 0.5 pages)

10. Research plans (max. 2 pages; include proposed plan of work, include timings/number of days):

Continue text on next page when this form field is full

11. Specific requirements (max 1 page, include details of equipment, materials and supplies required; use of specific fish lines, sizes and quantities; technical assistance and training etc)

12. Ethics screening

a) Does your research involve any procedures likely to cause harm or suffering to the fish, or procedures that fall under welfare regulations of either your own country or that of the Research Infrastructure? If so, please give further details and describe any procedures to be carried out on the fish

b) Please give details of any procedures you plan to put in place to ensure adequate welfare of experimental animals

c) Will the study involve any work with the public or people below the age of 18? If so, please give further details.

e) What checks have you made to ensure that the proposed research complies with the ethical regulations of the selected Research Infrastructure?

13. Was this application developed discussed with staff of the Research Infrastructure prior to submitting the application? If so who?

14. Suggested start date for the study visit and overall duration

Requested start date	**Duration (weeks)**

15a. Thematic classification (please check the boxes for the areas that best describe the focus of your study)

- ☐ **Nutrition**
- ☐ **Genetics**
- ☐ **Physiology**
- ☐ **Welfare**
- ☐ **Other** **(please specify)**
- ☐ **Health and pathology**
- ☐ **Environmental interactions & impacts**
- ☐ **Aquaculture systems engineering**
- ☐ **Processing**

15b. Species classification (please check the boxes for the species groups used in your study)

- ☐ **marine fish - cold** (salmon, sea trout, cod, halibut, others)
- ☐ **marine fish – temperate** (sea bream, sea bass, others)
- ☐ **freshwater fish** (trout, carp, tilapia, others)
- ☐ **model fish** (zebrafish, guppy, others)
- ☐ **other aquaculture species** (algae, crustaceans, molluscs, other invertebrates, others)

16. EATIP Strategic Research & Innovation Agenda (Please indicate which areas of the European Aquaculture Technology and Innovation Platform Strategic Research & Innovation Agenda (http://www.eatip.eu/default.asp?SHORTCUT=295) will be addressed by the study and how):

- ☐ **Technology and Systems**
- ☐ **Product Quality, Consumer Safety and Health**
- ☐ **Sustainable Feed Production**
- ☐ **Managing the Biological Lifecycle**
- ☐ **Knowledge Management**
- ☐ **Integration with the Environment**
- ☐ **Socio-economics & Management**
- ☐ **Aquatic Animal Health & Welfare**

Provide further explanation here:

17. Anticipated outputs (dissemination and exploitation)

18. Estimated cost for travel to this Research Infrastructure.

19. I confirm that this proposal fulfil the eligibility criteria for access to this Research Infrastructure. **Name:** **Position:** **E-mail Address:** **Date:**

SUBMIT

GUIDELINES FOR COMPLETION OF APPLICATION FORM

(NOTE: All questions on the form should be answered and developed as fully as possible)

1. **Research Infrastructure**
   This should be one of the facilities listed in the Call for Access at http://www.aquaexcel.eu/. You should contact the Research Infrastructure prior to completing the form to ensure your proposals are feasible.

2. **Research project short name**
   Please provide a short name for your project which can be used to refer to the project and in any promotion and publicity.

3. **Research Group Leader.**
   This is the lead researcher involved in accessing the Research Infrastructure and who is participating in the visit and work at the Research Infrastructure facilities. In addition to the details requested please provide a short *curriculum vitae* using the template provided. If the lead researcher is a student, please also provide details of supervision arrangements both at the Research Infrastructure and home base.

4. **Co-researchers**
   Please provide full details of the second researcher involved in the access visit (if applicable) on the form and attach a CV. Also list the names, organisation and roles of any additional co-researchers not directly involved in the access visit.

5. **Questions about previous collaborations, use of the Research Infrastructure and participation in AQUA EXCEL.**
   This three-part question is to enable the Selection Panel to determine the priority that should be accorded to the application under the EC contract guidance on promoting new collaborations and ensuring widest possible access.

6. **Proposed study title**
   This should be concise, but sufficient to describe the key aims of the project

7. **Number of units of access requested**
   These questions help to calculate the amount of resource that you wish to use and duration of the visit to the Research Infrastructure. Further information is available for each facility in the AQUAEXCEL TNA Guide document.

8. **Introduction.**
   Provide a summary of the scientific context of the proposal study, including the current state of knowledge. Include any commercial context for the work. Please identify the key reasons why you are applying to this particular infrastructure, e.g. with respect to facilities, species or particular expertise available or potential future collaboration plans. You should also clarify why the proposed research cannot be carried out in your own country.

9. **Study objectives.**
   Describe the objectives of the study and especially any potential commercial or quality of life benefits. Make reference to official documents and other literature to show how this specific study meets the aims and objectives of broader EU research programmes.

10. **Research plans.**
Provide details of the research to be carried out at the Research Infrastructure (give a minimum of 1 page and maximum 2 pages). Indicate if your research can only be carried out at a particular time for operational reasons, e.g. availability of material. Include experimental schedules.

11. **Specific requirements**
Please provide as much detail as possible here about specific equipment, consumables, technical assistance and training that will be required. In particular consider any materials the pose a hazard and require special procedures or disposal facilities.

12. **Ethics screening**
It is AQUAEXCEL policy that all research linked to the project will be conducted according to the 3Rs (reduce, refine replace) methodology (Further explanation is given at the end of this document, and via web sites such as http://www.nc3rs.org.uk/category.asp?catID=31). Please these principles in relation to your proposed work, showing how you will comply with this best practice. You should also provide details of any other fish welfare or ethics guidelines or procedures that will be followed in accordance with either the policies of your own organisation or that of the Research Infrastructure.

13. **Prior discussion with Research Infrastructure Manager**
It is recommended that research plans are discussed in detail with the appropriate Research Structure Manager prior to completing the proposal form in order to ensure the proposed work is feasible and fits in with existing work schedules etc.

14. **Suggested dates and duration of visit.**
Please give your preferred timing to visit the Research Infrastructure and the length of the visit. Please refer to the guidance provided by the specific facility concerning expected minimum or average length of visits. Visits for longer than 3 months must obtain prior permission from the European Commission.

15. **Thematic and species classification**
To help with evaluation and reporting of the project, please indicate which thematic area(s) and species groups are the subject of your study.

16. **Addressing EATIP Strategic Research and Innovation Agenda**
Describe clearly how your research is expected to contribute to the European Aquaculture Technology and Innovation Platform Strategic Research and Innovation Agenda (See. http://www.eatip.eu/default.asp?SHORTCUT=295).

17. **Anticipated outputs**
Describe what scientific and other outputs you expect to produce as a result of your work at the Research Infrastructure and how they might subsequently be transferred to industry or otherwise used and exploited.

18. **Estimated cost for travel to the Research Infrastructure**
Travel expenses will be paid from the user's home institution to the Research Infrastructure and return. Economy class air fares will be reimbursed on production of tickets. Any additional travel costs incurred in travelling to and from the Research Infrastructure (e.g. train, taxi) will also be reimbursed at economy rates. Any travel expenses involved in carrying out the research whilst at the Research Infrastructure will also be provided. Accommodation will be provided in accommodation owned by the Research Infrastructure or in nearby guest houses (bed and breakfast) or hotels. Full details of accommodation provisions and expense allowances are available from the individual

Research Infrastructures. Users of the Research Infrastructures will need to make their own insurance arrangements.

19. Declaration

Please complete the declaration having read the terms and conditions for Transnational Access as detailed within the Call for Access and in ANNEX III to the Grant Agreement – Infrastructures: ftp://ftp.cordis.europa.eu/pub/fp7/docs/fp7-ga-annex3-infra-v2_en.pdf

NOTE: Explanation of the 3Rs in relation to ethics:

Reduction refers to methods for obtaining comparable levels of information from the use of fewer animals in scientific procedures or for obtaining more information from a given number of animals so that, in the long run, fewer animals are needed to complete a given research project or test. Reduction will be achieved through experimental planning and design, in order to avoid unconclusive experiments due to inadequate statistical power of experiments, as well as by by standardisation of the animal population (genetics, health), the environment and experimental techniques.

Refinement encompass those methods that alleviate or minimize potential pain and distress and enhance animal well-being. Potential pain and distress can be avoided or alleviated with the proper use of anesthetics, analgesics, and sedatives. The use of such methods is integral to the implementation of Directive 86-609-EEC which will be the baseline of the animal experimentation procedures used in Aquaexcel.

Replacement alternatives encompass those methods that permit a given purpose to be achieved without conducting experiments or other scientific procedures on animals. Whenever possible, ex vivo methods will be preferred to experimentation on animals.

Annex 5

TNA CV Form

Curriculum Vitae

PERSONAL DETAILS

Title: Select AQUAEXCEL CV Reference Number (inserted by secretariat):

Family Name: First Name(s):

Date of birth:

Nationality:

Gender: Select

Organization name:

Organization address:

Tel:

Email:

Web page:

SCIENTIFIC PROFILE

Summary of your scientific interests and expertise: (MAX 50 words)

EDUCATION AND DEGREES AT UNIVERSITY LEVEL

Degree	Year of Graduation*	Subject
Select		
Select		
Select		

*Start the list from the most recent graduation

PRIZE AND AWARDS

Other academic and professional awards and recognition (start with the most recent):

Award	Year	Further details

CITATION STATISTICS

See: http://interaction.lille.inria.fr/~roussel/projects/scholarindex/

h-index

g-index

Number of references

Citations per reference

PRESENT AND RECENT SCIENTIFIC EMPLOYMENT

Start year	End year	Descriptive job title

*Start the list from the most recent position

PROJECT FUNDING AND CO-ORDINATION

Project name	Start year	End Year	Funder	Your budget*	Your role
					Select
					Select
					Select
					Select
					Select
					Select
					Select
					Select
					Select
					Select

* Amount of funding to your organisation

MOST RELEVANT PUBLICATIONS*

* highlight your name in BOLD, Start the list from the most recent publication

Submit

GUIDANCE NOTES

Personal Details

Please complete in full as this information is required for proper monitoring of access and in case secondary means of contact is required

Scientific Profile

Briefly state your main areas of expertise and professional activity

Education and Degrees at University Level

If you have more than 3 degree, please use the Prizes and Awards section to add others

Prizes and Awards

Brief details of any other awards or recognition of your work and expertise

Citation Statistics

This section is now optional – Only complete if you have the information and consider it useful in representing your work

Present and Recent Scientific Employment

If you are currently a (research student) please enter this in the first row

Project Funding and Co-ordination

If you have an extensive list of product funding, you may enter only those within the last 3 years

Most Relevant Publications

Only those relevant to the application are required, although additional publications can be cited if you consider they would help the selection panel to assess your prior experience

Annex 6

Facility Feedback Form

Facility Comments

Application Ref:

Facility comments

Annex 7

TNA Evaluation Guide

Evaluator Guide

Guidance on score criteria:

1) Scientific Excellence

Is the proposed work of high scientific quality?

- *Include original ideas?*
- *Develops new techniques?*
- *Contributes new knowledge?*

2) Expected output

What outputs are envisaged from the work and what might be their impact? What steps are planned for exploitation and dissemination?

- *Publications – type and quality,*
- *Contribution to future research proposal,*
- *Transfer to commercial sector,*
- *Contribute to policy development*

Potential impacts:

- *On future research*
- *Commercially (economic benefits)*
- *On future policy/strategy*

What evidence is provided concerning the need for the research from industry (or expected user group)? What plans are there for further technology transfer?

3) Compliance with EATIP Strategic Research and Innovation Agenda

Does the applicant show familiarity with the EATIP SRIA and explain how their work will contribute? http://www.eatip.eu/default.asp?SHORTCUT=278 *(still under development). Does the work clearly address issues from the SRIA?*

4) Compliance with EC Agenda for broadening access

- *is this a new partnership and a first working visit to the infrastructure for the applicant?*
- *Is this making use of facilities that are not available in the home country of the applicant?*
- *Does this provide access opportunities to scientists that might not otherwise be able to access such facilities?*

5) Applicant/team (CVs)

CVs are mainly provided for background to help evaluate various aspects of the proposal including scientific quality and how the project might fit into the wider programmes and collaborations of the applicant. However, it may also be appropriate to comment on whether the proposed work fits in with the wider research of the applicant, motivations for the project and likelihood of success

6) Overall

Additional comments or questions to the applicant. Score entered here is weighted total score from the above criteria (leave blank if in doubt) Please also make a specific recommendation:

- *Very good, top priority*
- *Medium priority*
- *Return to applicant for improvements.*

Evaluator Score System

Criteria	Score marks	Weighting multiplier	Total score
Scientific excellence	5	10	50
Expected outputs & impact	5	4	20
Compliance with EATIP SRIA	5	3	15
Broadens collaboration and access to facilities	5	2	10
Applicant/team	5	1	5
TOTAL			100

Use of the score: A threshold score of 65% (To be confirmed) is suggested. Only applications exceeding the threshold will be eligible for funding. Following this, applications will be ranked and funding decisions then taken on the basis of reconciling rank with available resource.

Annex

Selection criteria cited in Description of Work:

1. Scientific excellence of the proposed project
2. No previous use of the infrastructure
3. Non existence of such infrastructure in the country of the candidate
4. Their geographical location
5. The nature of their research project (an outline of their project, expected results and publications will be requested)
6. Their motivation for accessing the AQUAExcel services and collections
7. Their potential for disseminating/publishing their results (i.e. must be free to publish and acknowledge)
8. A good gender, age and nationality balance will be taken into consideration

Note from Annex III (Specific Provisions for Transnational Access Activities

The selection panel shall base its selection on scientific merit, taking into account that priority should be given to *user groups* composed of *users* who:

- have not previously used the *infrastructure*, and
- are working in countries where no such research *infrastructures* exist.

Annex 8

TNA Proposal Evaluation Form

Evaluation Form

Application Ref: **Evaluator Ref:**

1) Scientific Excellence

Comments:	
Score	

2) Expected output

Comments:	
Score	

3) Compliance with EATIP Strategic Research and Innovation Agenda

Comments:	
Score	

4) Compliance with EC Agenda for broadening access

Comments:	
Score	

5) Applicant/team (CVs)

Comments:	
Score	

6) Overall

Comments & recommendations:	
TOTAL WEIGHTED SCORE	

Name of Evaluator

Signature of Evaluator

Date

Annex 9

Summary Feedback Form for Applicants

Evaluation Summary

Application Ref: **Date:**

1) Comments from Selection Panel

2) Comments from Ethics Adviser

3) Recommendation of Selection Panel