Project no.: **044224**

Project acronym: **REPROFISH**

Project title:

INTEGRATING BASIC AND APPLIED KNOWLEDGE ON FINFISH REPRODUCTION

Instrument: **SPECIFIC SUPPORT ACTION**

Title of report:

Publishable Final Activity Report

Period covered: from **01/02/2007 to 31/01/2009**

Date of preparation: **15/04/2009**

Start date of project: 01/02/2007

Duration: 24 months

Project coordinator name: Dr Olivier KAH
Project coordinator organisation name: Université de Rennes1
Project coordinator e-mail: olivier.kah@univ-rennes1.fr

Revision: [FINAL]

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A - Publishable executive summary

A.1 Description of the project objectives

The REPROFISH project aimed at maximising dissemination, accessibility, and applicability of the outcomes of FP5 and 6 projects dedicated to improve our knowledge and control on finfish reproduction. To meet these objectives, 4 major tasks were developed. First, a working group including many European scientists engaged in past EU projects was formed with the goal of preparing a special issue of a well-renown international journal (General and Comparative Endocrinology, to be released in spring 2009) gathering 11 review papers on current hot topics in terms of reproductive physiology of Fish. A second major objective was to develop a website dedicated to Fish reproduction with information on basic knowledge on the reproduction of the most important farmed fish. For scientists, students and fish farmers, the website (www.reprofish.eu <http://www.reprofish.eu/>) also provides a list of research laboratories and reproduction protocols. In addition, information on the interest and benefits of European fish biology research in providing a safe and environmentally friendly product for the European consumer. The website offers a large selection of scientific PDF presentations dealing with matters of interest for the students, scientists or farmers. A third major objective was to organize workshops with the aquaculture industry. The REPROFISH project put together a special session on the occasion of the European Aquaculture Society (EAS) meeting in Krakow Poland in summer 2008. A series of presentations was given by internationally-recognized experts in different relevant topics of interest for the farmers. A second workshop was organized in Paris in October 2008 in association with another European project AQUABREEDING. This 3-days meeting gathered about 100 participants from across Europe and was the occasion of in depth discussion between scientists, European commission officials and industry representatives on the future of sustainable aquaculture in Europe, the respective roles of international breeding programmes and the European Aquaculture Technology Platform project. Finally, a recommendation report identifying research gaps and technical bottlenecks was presented to the European commission. A 50 pages brochure, targeting a large audience, was also produced to inform on the usefulness and current status of European research in the field of Fish Reproduction.

A.2 Consortium

Role	N°	Participant organisation name	short name	Status	Country
CO*	CR1*	UNIVERSITE DE RENNES 1	UR1	GOV	FRANCE
CR**	CR2	INSTITUTE OF MARINE RESEARCH	IMR	GOV	NORWAY
CR	CR3	SPANISH COUNCIL FOR SCIENTIFIC RESEARCH	CSIC	GOV	SPAIN
CR	CR4	UNIVERSITY OF UTRECHT	UU	GOV	THE NETHERLANDS
CR	CR5	INSTITUT NATIONAL DE LA RECHERCHE AGRONOMIQUE	INRA	GOV	FRANCE

*CO = Coordinator ;
**CR = Contractor ;

A.3 Coordinator Contact Details

Contact of the coordinator:

- Project coordinator name: Dr Olivier KAH
- Project coordinator organisation name: Université de Rennes1
- Project coordinator e-mail: olivier.kah@univ-rennes1.fr

All available on the website :

Website : http://www.reprofish.eu/reprofish_eng/

B - SECTION 1: Project Objectives and major achievements during the reporting period

B.1 General project objectives and relation of the project to the state-of-the-Art, work performed, contractors involved, main achievements

The REPROFISH project aimed at maximising dissemination, accessibility, and applicability of the outcomes of FP5 and 6 projects dedicated to improve our knowledge and control on finfish reproduction. To meet these objectives, 4 major tasks (as exposed in the DOW).

- To organise two workshops to gather relevant expertise, expose results, exchange information, identify synergisms that emerge from the conclusions of the different programmes, and classify and distribute responsibilities
- Identify, analyse and synthesise main results in reviews/books targeting the scientific community, and the aquaculture industry
- To build up a website (to be hosted by INRA Rennes) containing simplified digested information on general and species-specific aspects of finfish reproduction and its control by external and internal factors. Target groups are – next to the scientific community and aquaculture industry – in particular the consumer and their associations.
- Based on these analyses, to submit to the European Commission an integrative document identifying knowledge caveats and problems requiring further or new research efforts regarding reproductive issues and their interconnection with other major life processes, such as growth and immunity.

All these objectives were fulfilled as described below:

- A first two-days workshop gathered 33 scientists to define and organize the content of a special issue of the international journal General and Comparative Endocrinology
- A special issue of General and Comparative Endocrinology, entirely dedicated to reviews dealing with some important aspects of Fish Reproduction is being finalized.
- A website was developed with information on basic knowledge on the reproduction of the most important farmed fish, information on fish reproduction research projects, useful contacts in the fish reproduction field, the interest and benefits of European fish biology

research in providing a safe and environmentally friendly product for the European consumer, summarised information on fish reproduction, accessible to the general public and detailed information on fish reproduction and reproduction protocols, for scientists, students and fish farmers

- A special session of the European Aquaculture Society meeting was held in Krakow where a number of state-of-the-art lectures were given with Reprofish partners and other leading scientists
- The fish reproduction research scientists of the Aquabreeding and Reprofish projects held a highly successful and stimulating joint meeting, entitled "the future prospects for aquaculture breeding in Europe", with representatives of the European fish and shellfish hatchery industry, from 1-3 October 2008, in Paris, France.
- A brochure was produced providing to a wide audience an instant picture on the interest of research on Fish reproduction, some topics actively studies and some of the actors.
- A recommendation report has been produced identifying bottlenecks in aquaculture, knowledge gaps related to reproduction in finfish in aquaculture, potential new solutions for the aquaculture industry related to reproduction in finfish and prospective research topics

B.2 Problems and corrective actions during the project

B.2.1. On the scientific viewpoint:

No corrections

B.2.2. On the organisational viewpoint:

No problems

C-SECTION 2:"Workpackage progress of the period"

C.1 - WP1 Working group and workshop

WP Leader: CR1 – O. Kah

C.1.1 Objectives in WP1

The objectives of WP1 were to form a working group of about 25 scientists involved in FP5 and FP6 projects and to organize a workshop to discuss and organize the content of a book or a special issue of a journal dedicated to the Reproductive Physiology of Fish.

C.1.2 Progress towards objectives,

All partners were involved as planned. It must be mentioned that Miranda Maybank played a key role in the technical aspect of the organization.

Work methodology:

- Initial meeting to identify the participating scientists
- Development of the programme
- Organisation of a venue (on site preliminary visit, discussion of technical details, room reservation,..)
- Organisation of an evening event (diner to a restaurant)
- Other administrative tasks (invitations, directions, hotel bookings, choice of menues etc.)

- *Kick-off meeting in Amsterdam (28th of January 2009)*

A kick–off meeting was held in Amsterdam before the beginning of the project (January 28th 2007). The reason was that all REPROFISH partners were present at this time in Amsterdam for another purpose. During this meeting, a number of key decisions were taken regarding the composition of the working group, the location of the first Workshop, the strategy of the publication and the main sections of the website (see Minutes of the Amsterdam kick-off meeting in Annex).

- *The working group*

Shortly after the beginning of the project, a number of European scientists were invited to participate in the collective work defined in the proposal. These scientists were selected either because they were implicated in European or ambitious national projects in Europe or because they have a well-identified field of excellence pertinent to REPROFISH.

It was decided to take advantage of the organization in St Malo (65 kms from Rennes) of the 8th International Symposium on Reproductive Physiology of Fish to set the workshop in Rennes just after the international meeting. Given the presence in France of many scientists, it was decided to invite a few selected non-European colleagues from United States, Australia and Taiwan). This strategy allowed to invite more people and at the same time to save a very significant amount of money originally forecasted to pay for travelling.

- *Workshop in Rennes (9-10th of June 2007) :*

The first workshop of the project took place at the Mercure hotel, in Rennes, on the 9th and 10th of June 2007. A total of 33 scientists (instead of 25 originally planned) attended, from 10 different countries and 4 different continents. The main objective of this workshop

was to prepare a special issue for General and Comparative Endocrinology, dedicated to the recent advances concerning the mechanisms controlling finfish reproduction. During this meeting the outline of the special issue was presented and the organisation of the chapters was discussed and agreed upon. The participants were divided into relevant chapter groups, according to their expertise, and discussions were held on the layout and content of each of the chapters. Each chapter group submitted a work plan at the close of the meeting.

During the meeting in Rennes Miranda Maybank (hired on the 1st of April 2007) as REPROFISH scientific and technical communication officer presented the objectives of her role and the main communication actions. An overview of the website was provided, its layout (organisation of sections, functionality of the site, graphics...), function and target audience.

A full description of this meeting and a selection of related documents are available on the Reprofish website and in the Annex: (http://www.inra.fr/reprofish_eng/ateliers/reprofish_reunion_du_groupe_de_travail)

This Rennes REPROFISH workshop was essential for the subsequent development of the project. It permitted creating sort of a "REPROFISH Community" and to have a number of key scientists committed to participate in the different tasks. In that respect, it was successful and considered a real progress towards our different objectives.

C.1.3 Deviation from the project work programme / corrective actions

In terms of work programme, there has been no deviation in the completion of WP1. The main change was with respect to the budget modifications entrained by the fact that REPROFISH did not have to pay for the travel costs of the meeting participants. This change proved essential for the rest of the project as it allowed, with the permission of the Commission, paying Miranda Maybank, the Scientific and Communication Officer of REPROFISH for the whole duration of the project (at 50% from October 2007 until July 2008). This decision has been instrumental for the proper development of the whole project.

C.1.4 Deliverables WP1

- **Table 1: Deliverables List**

List all deliverables, giving date of submission and any proposed revision to plans.

Del. no.	Deliverable name	Workpackage no.	Date due (month)	Actual delivery date	Estimated indicative person-months *	Used indicative person-months *	Lead contractor
D1	Invitation of projects	WP1	2	1			UR1
D2	Working group Meeting	WP1	3	5			UR1
D3	Report on scientific and technical content of participating projects	WP1	3	5			UR1

***if available**

- **Table 2: Milestones List**

List all milestones, giving date of achievement and any proposed revision to plans.

Milestone no.	Milestone name	Work package no.	Date due (month)	Actual/Forecast delivery date	Estimated indicative person-months *)	Used indicative person-months *)	Lead contractor
M1.1	Milestone 1.1 : Selection of manuscript titles and authors; identification of publisher and choice of the publication format (book, review, journal issue)	WP1	8	5			UR1

C.2 - WP2 Publication state of the art book / Special Journal Issue

WP Leader: CR4– R. Schulz and O. Kah

C.2.1 Objectives in WP2

The main objective was to disseminate state of the art knowledge on fish reproduction (including their applications in aquaculture) gained from the different FP5 and FP6 European projects to the scientific community and industries. The aim was thus to publish a book or a special issue of a journal containing a number of reviews on key topics not necessarily restricted to the output of FP5 and FP6 projects, but as exhaustive as possible regarding recent findings in the field of Fish Reproductive Physiology.

C.2.2 Progress towards objectives

All partners were involved in this task from the very beginning: All partners were involved in the preparation of the outline and the writing of part of the chapters.

Work methodology:

- August 2006: Discussion in Manchester with Robert Dores and I. Henderson, Chief Editors of General and Comparative Endocrinology (GCE)
- End of 2006-Early 2007: Discussion with other editors
- January 28th 2007: Amsterdam meeting held to agree on the structure and development of the special issue.
- January 28th 2007: Selection of as the support for the special issue
- June 2007: Workshop in Rennes: Discussion on contents, designation of chapter leaders
- June 2007: Submission of an outline to Bob Dores, Chief editor of GCE
- 2007-2008:Writing of reviews
- Winter 2008: Evaluation of reviews
- January-March 2009: Delivery of reviews

On the occasion of a meeting in Manchester the coordinator met the editors of GCE and proposed the possibility of a special issue on Fish Reproduction. This offer was well received and further discussed during fall 2006. At the kick-off meeting in Amsterdam, the option was presented and discussed with respect to the book option. It was unanimously decided that a special issue of GCE would be a better choice in terms of visibility, half life of the articles, motivation of scientists to collaborate, cost and edition process.

Because the issue of publication has been largely anticipated, things were well advanced when the Rennes workshop was held. On this occasion, the project of the special issue was presented, including its aims, the audience targeted, the number of pages and diagrams permitted. The organisation of the chapters, the importance of their order and their content was discussed in great details. An agreement was reached on the individual chapters and which experts would lead on each chapter. Deadlines for submission of manuscripts were set and agreed to. The manuscripts were to be submitted for review before the 31st December 2007. This provided time for review before the final manuscripts are submitted for publication in April 2008.

The overall structure proposed and the coordinators of the chapters are found below.

1. Sex determination and sex differentiation (Y Guiguen, France) 40 pages
2. Oogenesis (E Lubzens, Israël) 50 pages
3. Spermatogenesis (RW Schulz, The Netherlands) 45 pages
4. Endocrine functions of the gonads (A Fostier, France) 50 pages
5. Pituitary gonadotrophin (B Levavi, Israël) 45 pages
6. Brain, neuroendocrine regulation (O Kah, France) 45 pages
7. Light, Pineal, melatonin, brain (J Falcón, France) 40 pages
8. Puberty Growth Nutrition (GL Taranger, Norway) 70 pages
9. Broodstock (C Mylonas, Greece) 70 pages
10. Gamete quality (J Bobe, France) (40 pages)
11. Hormonal control of behaviour (M Kobayashi, Japan) 30 pages
12. Stress and reproduction (C Schreck, USA) 40 pages
13. Biotechnologies

Further discussions in Calgary (June 2008) led to the decision that the material to be included in chapter 4 would be incorporated in other chapters at the relevant places, this decision was taken to avoid repeating sections. It was also decided that chapter 13 would not be inserted as it was not Physiology of Reproduction *per se*.

C.2.3 Deviation from the project work programme / corrective actions

There was no deviation from the work programme, except that the difficulty in gathering the manuscripts was largely overlooked. Although, it was expected, as it is always the case for collective work, the coordinator had a very hard time gathering the manuscripts. At the present stage (March 8rd 2009), all manuscripts have been submitted, 6 are ready for publication, 2 are waiting for comments and 3 are been revised. This results in a delay in the publication that will be ready in spring 2009. However, despite this long and painful process, one expects the special Fish Reproduction issue to be very successful and highly cited in the next ten years, as there is no equivalent in the literature.

C.2.4 Deliverables WP2

- **Table 1: Deliverables List**

List all deliverables, giving date of submission and any proposed revision to plans.

Del. no.	Deliverable name	Work package no.	Date due (month)	Actual/Forecast delivery date	Estimated indicative person-months *	Used indicative person-months *	Lead contractor
D4	Publication strategy	WP2	6	5			All partners
D5	Provisional contract for the book with selected publishers	WP2	6	5			UR1
D6	Title and outline of content of each book chapter	WP2	6	5			All partners
D7	Book editing and publication	WP2	18	24			UR1

- **Table 2: Milestones List**

List all milestones, giving date of achievement and any proposed revision to plans.

Milestone no.	Milestone name	Work package no.	Date due (month)	Actual/Forecast delivery date	Estimated indicative person-months *)	Used indicative person-months *)	Lead contractor
M2.1	Identification of publisher and conditions agreement	WP2	6	5			UR1
M2.2	Selection of Manuscript titles and authors	WP2	9	5			All partners
M2.3	Collation of the manuscripts and edition of the different book chapters completed (month 12)	WP2	12	20-22			UR1
M2.4	Publication of the book dealing with fish reproductive physiology, reproductive associated biotechnologies and applications in aquaculture context	WP2	18	April 2009			All partners

C.3 - WP3 Development of a website (http://www.reprofish.eu)

WP Leader: CR5 – J-J. Lareyre

C.3.1 Objectives in WP3

The main aim of developing the website was to provide easy access to the following information:

- Basic knowledge on the reproduction of the most important farmed fish
- Information on fish reproduction research projects
- Useful contacts in the fish reproduction field
- The interest and benefits of European fish biology research in providing a safe and environmentally friendly product for the European consumer
- Summarised information on fish reproduction, accessible to the general public
- Detailed information on fish reproduction and reproduction protocols, for scientists, students and fish farmers

The information provided on the website targets the following groups:

- fish farming industry
- scientists
- students
- general public & consumer groups

C.3.2 Progress towards objectives

All partners were involved in this WP and contributed substantially to the content of the website. Technical aspects were covered by partner 5 (INRA) and 1 (UR1)

Work methodology:

- January 28th 2007: Management Team meetings to agree website on general structure and content (
- April 1st: Miranda Maybank hired on the project
- April/May 2007: Development of project logo with the INRA Communications Team
- May 2007: Development of website banner with the INRA Communications Team
- 9th-10th June 2007: Rennes Workshop to present and discuss website content with the wider partners
- Work plan generated by the Scientific & Technical Communications Officer
- Development of content by the Scientific & Technical Communications Officer, with input, review and validation by the Reprofish partners and network

Overall management of the site was under the responsibility of Jean-Jacques Lareyre, as work package leader (INRA, France). The principal editor of the site during the duration of the project was the Scientific and Technical Communications Officer (Miranda Maybank, University of Rennes 1 / INRA, France). In order to edit the website, the Scientific and Technical Communications Officer underwent website publishing training at the INRA institute, France. The interface used to edit the website is eZ Publish.

The development of the website was a team effort, drawing on the competencies of a wide range of people:

- *Conception of website template & quality assurance:* Isabelle Blanc (INRA)
- *Site Publishers:* Jean-Jacques Lareyre (INRA), Olivier Kah (University Rennes 1 / CNRS)
- *Site Editor:* Miranda Maybank (University Rennes 1 / INRA) *Content Advice:* Jean-Jacques Lareyre, Olivier Kah
- *Graphics (banner, logo):* Emilie Bonnet (INRA)
- *Technical advice & training:* Christine Soster; Bernard Kenklé (INRA)
- *Validation of scientific information & contribution of materials:* Reprofish members and the wider scientific community (not listed by order of importance of contribution):

Contributing author	**Institution**
Benoît Auperin	INRA, France
Igor Babiak	Bode University College, Norway
Julien Bobe	INRA, France
Oliano Carnevali	Universita Politecnica delle Marche
Manuel Carrillo	CSIC, Spain
Sylvie Dufour	MNHN / CNRS, France
Abigail Elizur	University of the Sunshine Coast, Australia
Jack Falcon	CNRS, France
Alicia Felip	CSIC, Spain
Pascal Fontaine	University of Nancy / INRA, France
Alexis Fostier	INRA, France
Ana Gomez	CSIC, Spain
Yann Guiguen	INRA, France
Pierrick Haffray	INRA, France
Olivier Kah	University Rennes 1 / CNRS, France
Catherine Labbé	INRA, France
Laurent Labbé	PEIMA, France
Jean-Jacques Lareyre	INRA, France
Hervé Migaud	Institute of Aquaculture, Stirling, UK
Gilles Monod	INRA, France
Christian Michel	INRA, France
Constantinos Mylonas	HCMR, Greece
Birgitta Norberg	IMR, Norway
Francesc Piferrer	CSIC, Spain
Patrick Prunet	INRA, France
Carl Schreck	Oregon State University, USA
Rüdiger Schulz	University of Utrecht, The Netherlands
Penny Swanson	NOAA, USA
Geir-Lasse Taranger	IMR, Norway
Patrick Williot	Cemagref, France
Silvia Zanuy	CSIC, Spain

Images

These were provided mainly by:

- INRA photo library
- Contributing scientists listed above
- Internet (fishbase, specialist websites etc.)

Permission from the author was sought for all the photos on the website before their publication.

The main sections of the Reprofish website:

- **What is Reprofish?**

This section provides information on the European management committee and the international working group. Related research projects on a European and worldwide scale are also listed.

- **Scientific Area**

This section provides a **listing of research laboratories**, classed by country, scientific interest and research application. **"Knowledge" factsheets**, validated by scientific experts, have been especially produced for the website; these concern broodstock management, the production and quality of gametes, regulation by the brain of the reproductive cycle, stress, reproductive health, and biotechnology. Additionally, a listing is provided for scientists seeking **PhD opportunities, internships and jobs**.

- **Fish Farmers Forum**

The benefits of research for aquaculture are outlined here. Fish farmers can access **protocol factsheets** providing information concerning the major problems facing the finfish farming industry, such as precocious puberty, sex ratios and spawning control; as well as **legal aspects** related to production. An overview of the benefits and applications of biotechnology to aquaculture is also available. **Listings** of **scientific advisors**, **associations and federations and fish farming events** can also be consulted.

- **General Public Corner**

This section concerns largely the **consumer**, in terms of the quality and production of farmed fish products, as well as the sustainability of fish production and reduction of its environmental impact.

- **ABC of Fish Reproduction**

An overview of the **history of fish domestication** and **factsheets concerning the reproductive cycle** of key aquaculture species can be accessed here. A brief description of **fish farming systems** is also provided, as well as a list of responses to "**frequently asked questions**" and orientation towards relevant sources of further information.

- **Workshops**

This section provides access to an overview of the **three Reprofish workshops** held during the lifetime of the project. **Power-point presentations** are available for download, as well as workshop **programmes**, **summary reports and photos**.

- **Information Corner**

This area of the website provides a listing of **fish farming publications**, **international events** (meetings, symposia…), **frequently asked questions**, project **press articles and documents**, as well as an **aquaculture-related website directory**.

Website use analysis:

A website statistics analyser (www.xiti.com) was used to provide a global view of website traffic and to access useful information, such as the origin of users, the number of visitors and the access source. This analysing software enabled the strengths and weaknesses of the site to be identified, allowing the possibility for its visibility to be improved. About 8000 visitors have logged on since its launch in autumn 2007, with more than 30,000 pages viewed. An overall increase of 70% in visitors to the site was observed immediately after the Reprofish special session at Aquaculture Europe 2008 (September 2008) and the Aquabreeding-Reprofish workshop (October 2008).

The website provides the possibility to receive information alerts, by subscribing on-line to receive notification when new material is published. A special email address (reprofish.contact@rennes.inra.fr) allows readers to contact the project for information; a log is kept of all information requests and their follow-up.

The major outputs of the website:

- Planning of the website structure, agreement on sections and content to be developed
- Development of the website banner
- Fish reproduction research laboratory listing
- EU research project listing
- Scientific factsheets
- Reproduction protocols
- Legislation factsheet
- Fish species reproduction factsheets
- Useful websites listing
- Contacts listing
- Events listing

The website was officially launched in November 2007 (press releases in specialist and general, national and international press). A presentation on the website was also given by the scientific and technical communications officer during the Reprofish session at the Aquaculture Europe 2008 conference (September 2008, Krakow, Poland).

The website will be maintained by the INRA institute beyond the end of the project and will continue to be a useful source of information on fish reproductive biology. A Number of scientists committed to continue contributing the websites on a regular basis.

C.3.3 Deviation from the project work programme / corrective actions

None, except that for administrative reasons, Miranda Maybank was hired on the budget of UR1 which implied some changes in the budget (see below), with the agreement of the Commission.

C.3.4 Deliverables WP3

- **Table 1: Deliverables List**

List all deliverables, giving date of submission and any proposed revision to plans.

Del. no.	Deliverable name	Workpackage no.	Date due (month)	Actual/Forecast delivery date	Estimated indicative person-months *)	Used indicative person-months *)	Lead contractor
D8	Website opening with summary of the FP5 and FP6 projects and links	WP3	6	6			INRA
D9	Website with available information on reproductive biology of fish	WP3	12	10			INRA
D10	Website with information for the general public	WP3	18	10			INRA

- **Table 2: Milestones List**

List all milestones, giving date of achievement and any proposed revision to plans.

Milestone no.	Milestone name	Work package no.	Date due (month)	Actual/Forecast delivery date	Estimated indicative person-months *)	Used indicative person-months *)	Lead contractor
M3.1	M3.1 Web site construction	WP3	3	3			INRA
M3.2	Web pages content validated (month 8)	WP3	8	8			INRA
M3.2	Web site opening with public access (month 9)	WP3	9	9			INRA

C.4 - WP4 Transfer activities

WP Leader: CR3 – S. Zanuy

C.4.1 Objectives in WP4

The main objective was to transfer knowledge and protocols on controlled reproduction in farmed fish to the industry, based on the scientific results summarized in WP2.

C.4.2 Progress towards objectives

All partners contributed to this task

This WP entailed the following tasks:

Project communication documents and materials:

- Project leaflet (in English and Spanish)
- Detailed project poster in French
- General project poster in English
- Newsletters (2)
- Press releases
- A 50 pages Brochure
- Website
- Special session to Aquaculture meeting (Krakow, Poland)
- Reprofish-Aquabreeding workshop with industry (Paris, France)

Project leaflet

A colour leaflet in English describing the aims and objectives of the project was developed by the Reprofish scientific and technical communications officer in liaison with the INRA Communications Team (Emilie Bonnet), with input and validation on the content from the Reprofish management committee. Images were sourced from the INRA photolibrary, Reprofish project members and the Internet (permission for use of all photos was sought before publication).

The leaflet was translated into Spanish by Silvia Zanuy (CSIC) and re-printed. Copies were distributed amongst the network of Reprofish members, for dissemination all over the world. They were also distributed during conferences and workshops organised or attended by Reprofish members. A number were also sent directly to contacts in the fish farming field (federations, associations, publications, research institutes etc.).

Detailed project poster in French

This poster was developed by Jean-Jacques Lareyre for the occasion of the « Premières journées recherche filière piscicole » on the 6th February 2008 in Paris. Aimed at a scientific and professional audience, it describes the project, its objectives, actions and target groups.

Summary poster in English

A very visually-based support, this poster was developed by the Reprofish scientific and technical communications officer, in liaison with the INRA Scientific Diffusion Unit

(Sylvaine Bitteur). It was displayed at the Consensus (sustainable aquaculture in Europe) final stakeholder meeting in Oostende, Belgium, in April 2008. This poster is aimed at the general public and is timeless, remaining relevant well beyond the close of the project. Two copies of the poster were printed professionally and remain at the disposition of Reprofish project members, should they wish to borrow the poster for display at a specific event.

Newsletters

Two newsletters were produced during the duration of the project, one in April 2008 and the other in November 2008. They described the past, current and upcoming activities for the project. The first newsletter was distributed at the Consensus final stakeholder meeting (April 2008), and posted on the Reprofish website. The second newsletter was emailed to all contacts and posted on the Reprofish website.

Press releases

These were produced in relation to specific events concerning the project:

- Reprofish Rennes workshop, 9th-10th June 2007, Rennes, France
- Reprofish website launch, November 2007
- Reprofish session at Aquaculture Europe 2008, 18th of September 2008, Krakow, Poland
- Reprofish / Aquabreeding workshop, 1st-3rd October 2008, Paris, France

The press releases appeared in a variety of French and International press, of both a general and specialist nature. Articles were also posted on Internet-based publications and research institution websites. The material is available on the website at: (http://www.inra.fr/reprofish_eng/ateliers/reprofish_reunion_du_groupe_de_travail)

REPROFISH Brochure

A 50 pages brochure was produced at the end of the project, aimed at the general public. This brochure aims at providing an instant picture of the needs to make research on reproduction. It also presents some key fields of research and some of the actors in differenet countries throughout Europe. It takes the scientific facts concerning fish reproduction and fish farming and places them in their everyday context, in the form of an illustrated story.

The brochure means at targeting a large audience and thus has been written in a way that will make it accessible to students, administrations, general public, farmers…. The aim of this brochure is to implicate and educate the average person in this subject area, by explaining how it affects their environment, their health and their everyday lives. The public has a responsibility, as a part of society, to comprehend the need and usefulness of fish reproduction biology research in finding solutions to the current knowledge gaps and problems. With a better understanding, consumers can make informed choices. It includes conclusions from the Aquaculture sector (European Aquaculture Society and a member of the European Commission. This brochure will be made available to Research Institutes, Universities, Administrations, General public, European commission, Fish farming associations. One thousand copies on recycled paper will be released. If necessary, it will be possible to print more for a very reasonable price. A PDF version will be also available on the website.

Workshop and special session organisation:

- Reprofish session at Aquaculture Europe 2008, 18th September 2008, Krakow, Poland
- Reprofish / Aquabreeding workshop, 1st-3rd October 2008, Paris, France

The aim of the workshop and the special session was to communicate the latest advances in the fish reproduction biology field to a wide audience, to encourage information exchange and to identify knowledge bottlenecks.

Participation at related events:

- « Premières journées recherche filière piscicole » 6th February 2008, Paris
- « Consensus » final stakeholder meeting, 23rd-25th April 2008, Oostende, Belgium

The objective of the participation of the Reprofish project at these two events was to communicate and network for the project, via poster displays, distribution of leaflets and newsletters.

Workshops organised

- Reprofish session at Aquaculture Europe 2008 (Krakow, Poland):

The Reprofish project held a special day-long session at the international aquaculture event "Aquaculture Europe 2008", in Krakow, Poland (18th September). This event attracted over 800 participants from 55 different countries, the focus being on the optimal use of natural, human and material resources for the sustainable development of aquaculture. The aim of the Reprofish contribution was to highlight the latest technical advances in fish reproduction control and identify the current knowledge gaps.

An audience of approximately 100 people attended the session, consisting mainly of scientists (researchers and students), but also some fish farming professionals. One can regret that the technical conditions were far from being what one would expect for a meeting this size.

The topic of fish reproduction and sustainable aquaculture was covered via a rich array of presentations, outlining the latest scientific advances in the field. Subjects presented by the Reprofish project members ranged from the neuroendocrine control of reproduction to the project website and sustainable aquaculture. A special Polish guest speaker presented the control of fish reproduction within the Polish aquaculture industry. A round-table discussion wrapped up the day, allowing for an interesting exchange to take place between the participants.

The conclusion reached was that there exists a real difficulty in adapting scientific knowledge to the needs of the industry. A concerted effort is required on an international (European) scale in terms of maintaining genetic resources and coordinating research activities to improve our understanding of the integrative biology of a diversity of fish species. Science and industry must work together to find solutions for an aquaculture production that is sustainable and environmentally friendly.

The presenting members of the Reprofish project were: Olivier Kah (Rennes 1 University / CNRS, France), Silvia Zanuy (CSIC, Spain), Yann Guiguen (INRA, France), Miranda Maybank (University Rennes 1, France), Alexis Fostier (INRA, France), Igor Babiak (Bodo University College, Norway), Hervé Migaud (Stirling University, Scotland), Rüdiger Schulz (Utrecht University, The Netherlands), Jean-Jacques Lareyre (INRA, France) and Constantinos Mylonas (HCMR, Greece). Mirka Sokolowska (University of Agriculture,

Poland) was an invited guest speaker, providing a Polish perspective on aquaculture production.

The presentations from all the speakers, as well as a summary report on the session, are available on the project website (www.reprofish.eu).

The session was organised as follows:
Introduction to the Reprofish project

Part 1: News from the labs - recent advances in fish reproductive physiology
- Recent developments in neuroendocrine control of reproduction
- Light perception, entrainment of biological rhythms and reproduction
- Sex differentiation and sex control in farmed fish
- Endocrine mechanisms of male puberty in aquaculture species
- Presentation of the Reprofish website

Part 2: From the lab to the farm - sustainable aquaculture
- Sustainable aquaculture: the issues in terms of reproduction
- Advances in the control of puberty and the reproductive cycle in European sea bass
- Puberty control in farming of salmon, cod and halibut
- Broodstock management and spawning induction
- Reproduction control in Polish aquaculture
- Reproductive biotechnologies in fish aquaculture

- Reprofish-Aquabreeding workshop (Hôtel Campanile, Paris)
"The future prospects for aquaculture breeding in Europe":

The fish reproduction research scientists of the Aquabreeding and Reprofish projects held a highly successful and stimulating joint meeting, entitled "the future prospects for aquaculture breeding in Europe", with representatives of the European fish and shellfish hatchery industry, from 1-3 October 2008, in Paris, France.

Approximately 100 people, from 17 different countries, attended over the three days, including members of the European scientific community (fish and shellfish reproduction and genetic research), European fish and shellfish breeders and hatchery managers, genotyping and fish genetics companies, professsional aquaculture breeding and selection organisations, European Technology Platforms (FABRE-TP and EA-TP) and European Commission representatives. Discussions covered a wide range of fish species.

The aim of this meeting was to present the major objectives and outcomes of these two fish reproduction and breeding projects to the industry, thus providing them with the opportunity to voice their currrent concerns and problems to the scientific community. The idea was to succeed in pinpointing needs in terms of future fish reproduction and breeding research**.** Open discussion was engaged with fish breeders and hatchery managers to identify research priorities for the industry for important fish species farmed in European waters (salmon, rainbow trout, common carp, sea bass, sea bream, turbot, sole, cod, halibut, tuna).

Members of the Reprofish and Aquabreeding projects, as well as the DG Mare department of the European Union presented diverse topics, including: improving

reproduction using light and temperature control; sterilising fish to protect biodiversity and improve quality; experience of individual-based trout and marine fish breedig programmes in France; knowledge gaps and propositions for aquaculture breeding research; and an overview of EU supported actions for breeding in aquaculture. The Aquabreeding project also presented the results of their breeding survey (14 selected species, 30 breeding organisations and 34 selective breeding programmes in Europe) and examples of current European breeding programmes, whilst their consortium proposed a vision for the development of aquaculture breeding in Europe, including future research needs. Finally, two propositions were made: firstly that aquaculture breeding companies adhere to EFFAB, joining other European livestock breeders (cattle, pigs, poultry...), thereby creating synergies on animal breeding within the FABRE-TP; secondly that all aquaculture hatcheries manifest their interest to be a part of the Aquabreeding network of researchers and companies, and subsequently participate in the activities of this network within the EA-TP**.**

Workshop organisation methodology:
- June- September 2007: Discussions with the Aquabreeding project
- October 2007: Decision to have a join meeting with Aquabreeding
- Winter 2007: Identification of a venue for the event (seminar and hotel facilities), preparation of the final budget
- Spring 2008: Development of the objectives and programme for the 3-day workshop (Reprofish and Aquabreeding team meetings)
- Spring-Summer 2008:Identification of delegates to be invited: key European fish hatcheries, research organisations, genotyping companies, consultants, professional body representatives, European Commission representatives
- Summer 2008: Identification and invitation of speakers for each fish reproduction topic
- Summer 2008: Invitations launched by email
- September 2008:Organisation of an evening event for participants
- September 2008: Identification of documentation to be provided to participants
- September 2008: Production of participant badges
- October 1-3: Workshop

- Other Workshops attended

« Premières journées recherche filière piscicole » 6th February 2008, Paris

The research institutes INRA, CIRAD and Ifremer joined forces with professional organisations CIPA, ITAVI and SYSSAF, as well as the Ministry of Agriculture and Fisheries, to organise the first event of « research days for the fish farming industry ». The objective of this event was to improve the exchange of information between all the stakeholders in this sector (France only), in order to stimulate a partnership and encourage the emergence of innovations necessary to ensure the competitivity of the sector.

Several members of the Reprofish network were present (French partners only). The French Reprofish poster was displayed and leaflets were distributed.

« Consensus » final stakeholder meeting, 23rd-25th April 2008, Oostende, Belgium

Consensus is a coordination action under the FP6-FOOD research programme of the European Commission. The strategic objective of Consensus is to provide consumers with, and demonstrate the benefits of, high quality, safe and nutritious farmed fish and shellfish products, grown under sustainable conditions. The objective of this workshop was to bring

together stakeholders to address key questions on the future development of sustainable aquaculture in Europe.

A project market was created, where representatives of EU-funded projects showed how their research is contributing to sustainable aquaculture. The project coordinator and scientific and technical communications officer attended this event on behalf of the Reprofish project and displayed a poster at the project market, as well as providing copies of leaflets and the latest newsletter.

C.4.3 Deviation from the project work programme / corrective actions

There was no major deviation as compared to the initial work programme and one can say that all objectives have been reached. The main change was the joint organization of the Paris Workshop together with another SSA Aquabreeding. This initiative was extremely pertinent as proved by the success of this event. This was discussed in due time with the Commission. These changes again permitted inviting much more people (almost a hundred instead of 20 originally envisioned by Reprofish and 30 by Aquabreeding) by joining the two budgets. The choice of a very central location such as Paris, (reachable in one flight for most location in Europe) also allowed saving money on air fare. The Campanile Hotel at Porte de Bagnolet, well connected by metro, offered also a very reasonable package and proved very efficient. However, an unsuspected problem appeared during the workshop as the Hotel would not accept to make separate bills for the individual people and the two projects. Given that the reservation was done and guaranteed by Partner 1 (UR1), the Hotel expected UR1 to cover the whole bill. This was done after discussion and permission with UR1 and EU authorities. As a result, Aquabreeding and INRA had to send money to UR1 to cover these changes. This resulted in a complicated situation with the different financial services.

Another deviation was the decision to make a REPROFISH brochure of about 50 pages in order to present an instant picture of the Research carried out in Europe in the field of Fish Reproduction. This was also done after obtaining permission from the Commission.

C.4.4 Deliverables WP4

- **Table 1: Deliverables List**

List all deliverables, giving date of submission and any proposed revision to plans.

Del. no.	Deliverable name	Work package no.	Date due (month)	Actual/Forecast delivery date	Estimated indicative person-months *)	Used indicative person-months *)	Lead contractor
D11	Guide to the research laboratories with contacts persons for specific topics	WP4	8	9			CSIC
D12	Protocols for control of finfish reproduction	WP4	15	17			CSIC
D13	Workshop with fish farmers and EU officials	WP4	18	21			CSIC

- **Table 2: Milestones List**

List all milestones, giving date of achievement and any proposed revision to plans.

Milestone no.	Milestone name	Work package no.	Date due (month)	Actual/Forecast delivery date	Estimated indicative person-months *)	Used indicative person-months *)	Lead contractor
M4.1	M4.1: Protocols for control of fish reproduction and FAQ list on the web site	WP4	24	17			CSIC

C.5 - WP5 Prospective

WP Leader: CR2 – G.L. Taranger

C.5.1 Objectives in WP5

This WP aimed at analysing the current status of fish reproduction research, and to subsequently provide recommendations for future research orientations (during the 7th EU FP), an essential factor in the development of a sustainable aquaculture industry.

C.5.2 Progress towards objectives

Description of work

Task 1. Organize a workshop with invited scientists and industry representative to present and discuss state-of-the-art as identified in Wp2, and to discuss bottlenecks, knowledge gaps and potential new solutions for the industry. This was covered by the Krakow and Paris work-shops.

Task 2. Based on task 1, identify important research themes in the sustainable aquaculture context. This was covered by the Krakow and Paris work-shops.

Task 3. Organize working group and write a short synthesis of the recommendations to the EU Commission about prospective research.

Based on the presentations and discussion at the Krakow and Paris work-shops a range of; 1) bottlenecks in finfish aquaculture, 2) gaps in knowledge, and 3) possible new solutions for the aquaculture industry, were identified related to reproduction in finfish. Based on these discussions the REPROFISH consortium has also developed some prioritized ideas for important and innovative/original research in the reproductive field that needs to be reinforced or supported during the 7th FP (see below).

Task 3.1: Bottlenecks in aquaculture (related to reproduction in finfish)

The most important bottlenecks were identified as:

1) High quality gametes (to obtain optimum juvenile quality and avoid malformations caused by broodstock problems).
2) Avoiding early maturation (in most species such as salmon, trout, sea bass, sea bream, turbot, cod, halibut...).
3) Inducing maturation in species that do not mature (e.g. European eel).
4) Obtain season-independent (out of season) gamete production for more flexible juvenile and on-growing production.
5) Cryopreservation of gametes to allow crosses between different strains and year classes, and for bio-banking (e.g. to preserve biodiversity).
6) Avoid spawning in cages (to minimize risk of genetic impact on wild stock or release of pathogens with gametes to the environment).

7) Avoiding negative impact of escaped fish (such as genetic impact on wild stocks of escapees).
8) Maintain high welfare in broodstock or in early maturing fish in on-growing facilities.
9) Prevent health problems (e.g. outbreaks of contagious diseases) as a consequence of sexual maturation.
10) Reproductive rhythmic dysfunctions caused by improper environmental, social conditions, or by improper hormonal manipulation of reproduction.

Task 3.2: Knowledge gaps related to reproduction in finfish in aquaculture

The most important knowledge gaps were identified as:

1) Understanding the basis of gamete quality including understanding the importance of maternal transcripts and effects of broodstock environment and broodstock handling on gamete quality in finfish
2) Understanding the genetic and physiological basis of puberty, including the effects of environment, husbandry practices and genetic background on onset of puberty in finfish, in order to both delay and promote puberty
3) Understanding the impact of genetic and environmental factors on seasonal timing of spawning to facilitate out of season gametes with high quality
4) Understanding the genetic and physiological basis of sex determination and sex differentiation in different species of finfish as well as the basis for sex change, as basis for mono sex production and sex control in fish farming.
5) Understanding the biological basis for cryopreservation of germ cells for bio-banking and crosses across strains and year-classes.
6) Provide the knowledge base for new sterility models and clarify welfare and production performance in existing sterility models such as trilploidy
7) Understanding the impact of sexual maturation on the welfare of farmed fish, including understanding requirements for maturing fish in terms of environment and husbandry practices
8) Understanding the impact of sexual maturation of the innate and acquired immune system, and potential risk of disease outbreaks as a consequence of maturation.
9) Understanding how the daily and seasonal information is transduced and transmitted to neuro- and hormonal centres that control reproductive function.

Task 3.3: Potential new solutions for the aquaculture industry related to reproduction in finfish

Some new solutions for the industry has also been identified and discussed:

1) Improved methods for sex control (including alternative methods for sex reversal and mono sex production).
2) Improved methods for puberty control (including more efficient photoperiod regimes, more efficient selective breeding strategies and methods to induce puberty in species that do not mature in culture).
3) Improved or new sterility models including transgenic models that mitigate production problems with early puberty and avoid the potential genetic impact of released gametes or escapees.

4) Methods for natural spawning in species that do not produce gametes or do not show normal reproductive behaviour under farming conditions.
5) Improved methods for hormone induced spawning with high gamete quality.
6) Improved methods for environmental control of seasonal timing of spawning for out of season gametes with high quality.
7) Improved cryopreservation methods for bio-banking and crosses between strains/year classes.
8) Improved broodstock environments and handling (including optimal diets and feeding. regimes) to ensure health and welfare in brood animals, and to avoid transmission and spreading of contagious diseases.

Task 3.4: Recommendations to the EU Commission about prospective research topics

Important or innovative/original research in the reproductive field that need to be reinforced or supported during the 7th FP:

- One of the key issues will be basic research on sex differentiation as a knowledge platform for new sterility models, e.g. approaches that target primordial germ cells in order to create "germ cells less" individuals. This can involve knock-down approaches, as well as transgenic models. The basis for such sterility can be studied in models species such as zebra fish and medaka, and transferred and tested in farmed fish. Such approaches would also benefit greatly on the genomic approaches that have been applied on model species (e.g. zebra fish) and more recently also in farmed fish such as Atlantic salmon, rainbow trout, sea bass, sea bream and Atlantic cod.
- New and existing sterility models should also be evaluated on their impact on fish welfare and fish health, in part by exploring the possibilities to study underlying mechanisms of welfare and health using genomic approaches as well as novel behavior and coping studies.
- It is also suggested to apply genomic approaches in combination with highly controlled experimental set-ups to study key processes such as sex differentiation, puberty onset and spawning, as well as the molecular basis of gamete quality and its impact on offspring performance.
- Application of new genomic tools (such as high throughput SNP typing in combination with global transcriptome analyses) can also be a way to provide the knowledge base and tools for new approaches for selective breeding on desired reproductive traits (e.g. late puberty, high broodstock and gamete performance).
- With the high focus on fish welfare and fish health it is also suggested to establish knowledge on optimal farming conditions for broodstock or fish that become sexually mature in on-growing farms (due to early puberty), and study in detail the relations between farming conditions and welfare parameters including immune functions and disease resistance.

C.5.3 Deviation from the project work programme / corrective actions

None

C.5.4 Deliverables WP5

- **Table 1: Deliverables List**

List all deliverables, giving date of submission and any proposed revision to plans.

Del. no.	Deliverable name	Workpackage no.	Date due (month)	Actual/ Forecast delivery date	Estimated indicative person-months *)	Used indicative person-months *)	Lead contractor
D14	Arrange workshop with invited scientists and industry representatives (month 18)	WP5	18	21			IMR
D15	Identified research themes on control of reproduction in farmed fish (month 18)	WP5	18	21			IMR
D16	Arrange writing group to produce recommendations to the EU Commission (month 22)	WP5	22	22			IMR
D17	Produce report containing recommendations to the to the EU Commission (month 24)	WP5	24	27			IMR

- **Table 2: Milestones List**

List all milestones, giving date of achievement and any proposed revision to plans.

Milestone no.	Milestone name	Work package no.	Date due (month)	Actual/ Forecast delivery date	Estimated indicative person-months *)	Used indicative person-months *)	Lead contractor
M5.1	Workshop with invited scientists and industry representatives	WP5	18	21			IMR
M5.2	Identified research themes on control of reproduction in farmed fish	WP5	24	21			IMR
M5.3	Arrange writing group to produce recommendations to the EU Commission	WP5	22	22			IMR
M5.4	Send report containing recommendations to the to the EU Commission	WP5	24	27			IMR

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C.6 - WP6 Management

WP Leader: CR1 – O.Kah

C.6.1 Objectives in WP6

- To ensure the overall coordination of the project, distribute responsibilities and budget, implement the work plan, identify potential problems and take action.
- To act as the link between REPROFISH and the European Commission.

C.6.2 Progress towards objectives

In general the coordinator tried to strictly follow the workflow that was planed during the preparation of the proposal. However, in order to be more efficient and to make the best use of the communautary funds, some adjustments were made according to the evolution of the project and new ideas.

C.6.3 Deviation from the project work programme / corrective actions

None, except those mentioned previously

C.6.4 Deliverables WP6

- **Table 1: Deliverables List**

List all deliverables, giving date of submission and any proposed revision to plans.

Del. no.	Deliverable name	WP no.	Date due (month)	Actual/ Forecast delivery date	Estimated indicative person-months *	Used indicative person-months *)	Lead contractor
D18	Project presentation on Flyer	WP6	6	4			UR1
D19	Final plan for disseminating knowledge	WP6	6	5			UR1
D20	Intermediate report	WP6	12	12			UR1
D21	Final report	WP6	24	26			UR1
D22	Brochure	WP6	24	26			UR1

- **Table 2: Milestones List**

List all milestones, giving date of achievement and any proposed revision to plans.

Milestone no.	**Milestone name**	**Work package no.**	**Date due (month)**	**Actual/ Forecast delivery date**	**Estimated indicative person-months *)**	**Used indicative person-months *)**	**Lead contractor**
M6.1	Continuous assessment of the progress of the project to be able to perform necessary adjustments in order to fulfil the deliverables	WP6	0-25	0-25			UR1

C.7 Overview of deliverables and milestones

- **Table 1: Deliverables List**

List all deliverables, giving date of submission and any proposed revision to plans.

Del. No.	Deliverable name	Workpackage no.	Date due (month)	Actual/Forecast delivery date	Estimated indicative person-months *)	Used indicative person-months *)	Lead contractor
D1	Invitation of projects	WP1	2	1			UR1
D2	Working group Meeting	WP1	3	5			UR1
D3	Report on scientific and technical content of participating projects	WP1	3	5			UR1
D4	Publication strategy	WP2	6	5			All partners
D5	Provisional contract for the book with selected publishers	WP2	6	5			UR1
D6	Title and outline of content of each book chapter	WP2	6	5			All partners
D7	Book editing and publication	WP2	18	24			UR1
D8	Website opening with summary of the FP5 and FP6 projects and links	WP3	6	6			INRA
D9	Website with available information on reproductive biology of fish	WP3	12	10			INRA
D10	Website with information for the general public	WP3	18	10			INRA
D11	Guide to the research laboratories with contacts persons for specific topics	WP4	8	8			CSIC
D12	Protocols for control of finfish reproduction	WP4	15	15			CSIC
D13	Workshop with fish farmers and EU officials	WP4	18	18			CSIC
D14	Arrange workshop with invited scientists and industry representatives (month 18)	WP5	18	21			IMR
D15	Identified research themes on control of reproduction in farmed fish (month 18)	WP5	18	21			IMR
D16	Arrange writing group to produce recommendations to the EU Commission (month 22)	WP5	22	22			IMR
D17	Produce report containing recommendations to the to the EU Commission (month 24)	WP5	24	27			IMR
D18	Project presentation on Flyer	WP6	6	4			UR1
D19	Final plan for disseminating knowledge	WP6	6	5			UR1

D20	Intermediate report	WP6	12	12			UR1
D21	Final report	WP6	24	26			UR1
D22	Brochure	WP6	24	26			UR1

- **Table 2: Milestones List**

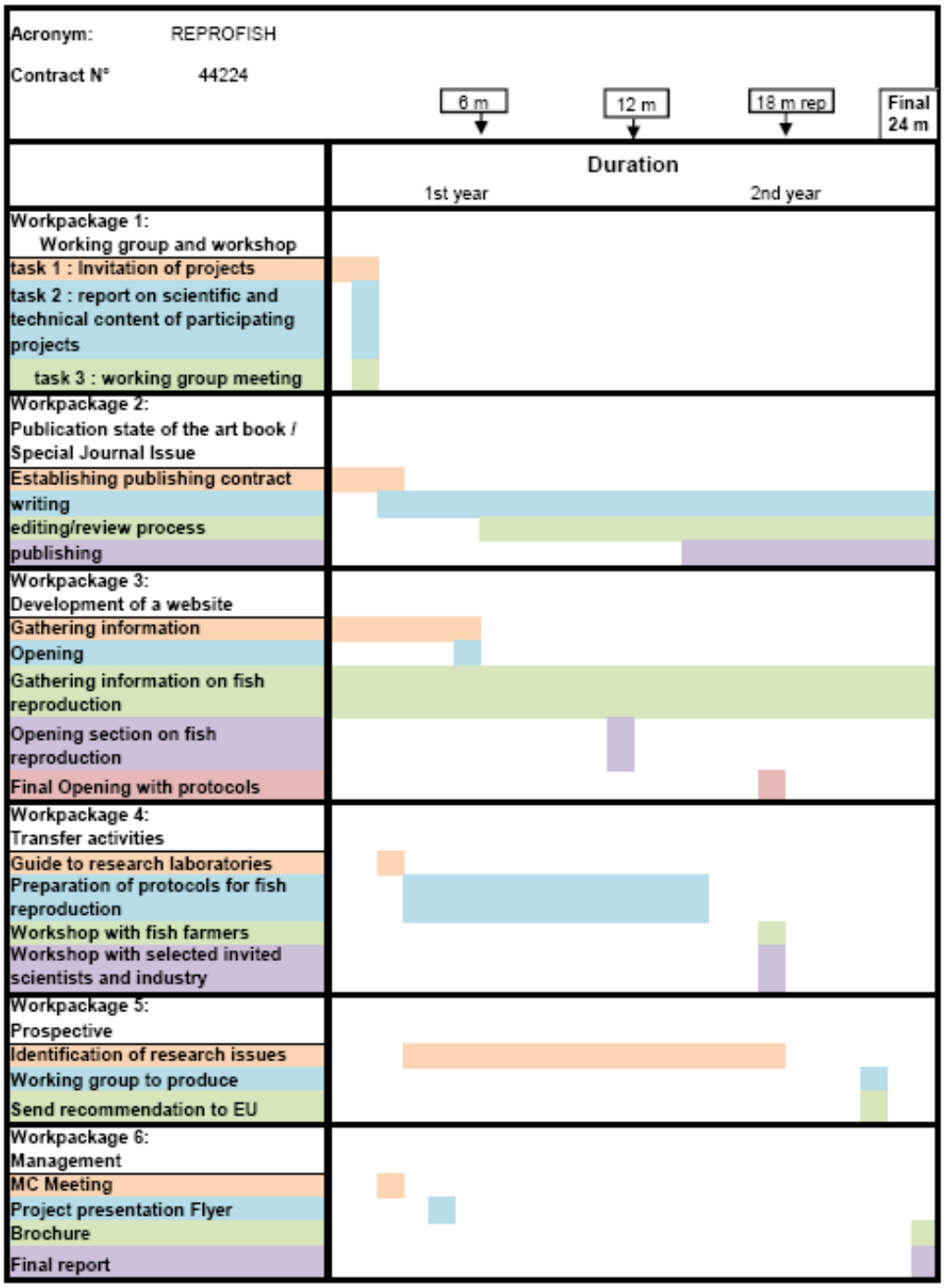
List all milestones, giving date of achievement and any proposed revision to plans.

Milestone no.	Milestone name	Work package no.	Date due (month)	Actual/Forecast delivery date	Estimated indicative person-months *)	Used indicative person-months *)	Lead contractor
M1.1	Milestone 1.1 : Selection of manuscript titles and authors; identification of publisher and choice of the publication format (book, review, journal issue)	WP1	8	5			UR1
M2.1	Identification of publisher and conditions agreement	WP2	6	5			UR1
M2.2	Selection of Manuscript titles and authors	WP2	9	5			All partners
M2.3	Collation of the manuscripts and edition of the different book chapters completed (month 12)	WP2	12	20-22			UR1
M2.4	Publication of the book dealing with fish reproductive physiology, reproductive associated biotechnologies and applications in aquaculture context	WP2	18	April 2009			All partners
M3.1	M3.1 Web site construction	WP3	3	3			INRA
M3.2	Web pages content validated (month 8)	WP3	8	8			INRA
M3.2	Web site opening with public access (month 9)	WP3	9	9			INRA
M4.1	M4.1: Protocols for control of fish reproduction and FAQ list on the web site	WP4	24	17			CSIC
M5.1	Workshop with invited scientists and industry representatives	WP5	18	21			IMR
M5.2	Identified research themes on control of reproduction in farmed fish	WP5	24	21			IMR
M5.3	Arrange writing group to produce recommendations to the EU Commission	WP5	22	22			IMR
M5.4	Send report containing recommendations to the to the EU Commission	WP5	24	27			IMR
M6.1	Continuous assessment of the progress of the project to be able to perform necessary adjustments in order to fulfil the deliverables	WP6	0-25	0-25			UR1

D - SECTION 3: “Consortium Management”

As Reprofish has a specific workpackage (WP6) devoted to Management, please refer to this aforementioned activity.

D. 4 Project timetable and status



E - SECTION 4 “Other issues”

No deviation compared to the Annex1

SECTION 5: "PLAN FOR USING AND DISSEMINATING THE KNOWLEDGE" (PUDK)

B - Dissemination of knowledge

B1.Overview Table

Planned / actual Dates	Type	Type of audience [general public / higher education / research / industry (sector x)]	Countries addressed	Size of audience	Partner responsible /involved
	Publications / Original articles*				
2008	M. Maybank, O. Kah, J.-J. Lareyre, R. Schulz, S. Zanuy, M. Carrillo, G.-L. Taranger, 2008. The project website www.reprofish.eu: improving accessibility to finfish reproduction knowledge, for the benefit of the aquaculture industry, scientists and the general public. In: AQUACULTURE EUROPE 2008. Compiled by E. Kamler and K. Dabrowski. Pp: 419-420. European Aquaculture Society Special Publication Nº 37.	Research and aquaculture industry	International		All Partners
2008	C.C. Mylonas, A. Fostier, S. Zanuy, G.L. Taranger, B. Norberg, P. Fontaine and Y. Zohar, 2008. Broodstock management and spawning induction. In: AQUACULTURE EUROPE 2008. Compiled by E. Kamler and K. Dabrowski. Pp: 458-4590. European Aquaculture Society Special Publication Nº 37.	Research and aquaculture industry	International		CR2, CR3
2008	S. Zanuy, M. Carrillo, A. Felip, B. Crespo, A. Gómez and M.J. Mazón, 2008. Advances in the control of puberty and reproductive cycle In european sea bass, Dicentrarchus labrax. In: AQUACULTURE EUROPE 2008. Compiled by E. Kamler and K. Dabrowski. Pp: 706-707. European Aquaculture Society Special Publication Nº 37.	Research and aquaculture industry	International		CR3
	Publications / Reviews*				
2009	Zohar Y, Munoz-Cueto JA, Elizur A, Kah O. Neuroendocrine control of repoduction in teleost fish. (in press)	higher education / research and aquaculture industry	international	1000-3000	CR1
2008	Geir Lasse Taranger, Manuel Carrillo, Rüdiger W Schulz, Pascal Fontaine, Silvia Zanuy, Alica Felip, Finn-Arne Weltzien, Sylvie Dufour, Ørjan Karlsen, Birgitta Norberg, Eva Andersson, Tom Hansen. Control of puberty in farmed fish. General and Comparative Endocrinology (Under revision).	research	international		CR2, CR3, CR4

2008	J. Falcon, H. Migaud; J. A. Muñoz-Cueto and M. Carrillo. Current knowledge on the melatonin system in teleost fish. Gen. Comp. Endocrinoel. (Under revision).	higher education / research and aquaculture industry	International		CR1, CR3, CR4
2008	C.C. Mylonas, A. Fostier, and S. Zanuy. Broodstock management and hormonal manipulations of fish reproduction. Gen. Comp. Endocrinol. (In press, doi:10.1016/j.ygcen.2009.03.007)	higher education / research and aquaculture industry	International		CR1, CR3, CR4, CR5
2008/2009	B. Levavi-Sivan, J. Bogerd, E. Mañanós, A. Gómez and J.J.Lareyre. Perspectives on Fish gonadotropins. Gen. Comp. Endocrinol. (Under Revision)	higher education / research and aquaculture industry	International		CR1, CR3, CR4, CR5
	Invited Conference*				
2007	M. Carrillo. In: Primeras Jornadas Científico_Técnicas del Observatorio Español de Acuicultura (First Technical-Scientific Workshop of the Spanish Observatory for Aquaculture. New insights on the use of the photoperiod in the management of fish reproductive process: Special attention on the control of the reproductive cycle and early puberty in marine fish species (25-27 April 2007; Mariñan, La Coruña, Spain)	research and aquaculture industry	Spain	75	CR3
2008	S. Zanuy; In: AQUACULTURE EUROPE 2008 (September 15-18, Krakow, Poland). Advances in the control of puberty and reproductive cycle In European sea bass, Dicentrarchus labrax.	research and aquaculture industry	International	75	CR1, CR3
2008	Kah O (2008) Recent advance in fish neuroendocrinology. Special Symposium on Fish Reproduction, Aquaculture Europe 2008, Krakow 15-18 September 2008, Pologne	research and aquaculture industry	International	100	CR1
2008	Puberty control in salmon, cod and halibut. G.L. Taranger, Ø. Karlsen, M., Pall, C. Kristoffersen, E. Andersson, R.W. Schulz, B. Norberg and T. Hansen. Reprofish session. EAS meeting, Krakow September 18 20	Research and aquaculture industry	International	100	CR2, CR4
2008	Endocrine Mechanisms of Male Puberty in Aquaculture Species. Rüdiger W. Schulz, Fernanda F.L. Almeida, Angel Garcia-Lopez, Marcelo de Castro-Leal, Paul P. de Waal, Jan Bogerd, Eva Andersson, Birgitta Norberg, Cathrine Kristoffersen, Geir Lasse Taranger	Research and aquaculture industry	International	100	CR2, CR4
2008	G.L. Taranger and M. Carrillo; In Reprofish/Aquabreeding Workshop; The future prospects for aquaculture breeding in Europe (1-3 October 2008; Paris; France). Improving reproduction using light and temperature control.	Research and aquaculture industry	International	120	CR1, CR2, CR3
2008	A. Felip; In: Reprofish/Aquabreeding Workshop; The future prospects for aquaculture breeding in Europe (1-3	Research and aquaculture industry	International	120	CR1, CR3

	October 2008; Paris; France). Sterilizing fish to protect biodiversity and improve quality				
	Oral presentation in Meetings				
2008	Kah O (2008) Expression and functions of estrogen receptors and aromatase in the brain. 6th International Symposium on Fish Endocirnology. June 23-26 2008, Calgary, Canada	research	international	300	CR1
2008	Improving reproduction using light and temperature control; examples from salmon, cod and sea bass. Geir Lasse Taranger and Manuel Carrillo. The future prospects for aquaculture breeding in Europe. REPROFISH-AQUABREEDING WORKSHOP, PARIS, OCT 1-3, 2008.	Research and aquaculture industry	Europe	100	CR2, CR3
	Media briefing				
	Rennes Workshop	General public	France	?	CR1
	Paris workshop	General public	international	?	
	Press release(press/radio/TV)				
	EAS - "Reprofish: leading experts on reproductive physiology of fish meet to discuss a review of ground breaking research"	Aquaculture industry	international	Several hundred	CR1
2007	Aquafilia - April / May 2007			?	CR1
2007	Ouest France - June 2007	General public	France	?	CR1
2007	Fish Farming International July 2007	industry	international	Several thousand	CR1
2007	Fish Farming International - December 2007	industry	international	Several thousand	CR1
2007	Aquaculture Europe - September 2007	industry	international	Several thousand	CR1
2008	INRA "En direct des labos" N°20 - January 2008	research	France	Several hundreds	CR4
	Project web-site				
2007-2009	http://www.reprofish.eu	Research and aquaculture industry, higher education, general public	International		All partners
2008	Puberty control in salmon cod and halibut. G.L. Taranger et al. http://www.reprofish.eu/reprofish_eng/ateliers/reprofish_session_aquaculture_europe_2008/documentation_presentations	Research and aquaculture industry, higher education, general public	International		CR2, CR4
2008	Improving reproduction using light and temperature control; examples from salmon and cod. G.L. Taranger. http://www.reprofish.eu/reprofish_eng/ateliers/reprofish_aquabreeding_atelier/documentation_et_presentations	Research and aquaculture industry, higher education, general public	International		CR2
2008	Spermatogenesis in fish. Rüdiger W. Schulz et al.	Research and aquaculture	International		CR2, CR4

	http://www.reprofish.eu/reprofish_eng/ateliers/reprofish_aquabreeding_atelier/documentation_et_presentations	industry, higher education, general public			
2008	Website with biological knowledge on fish reproduction (European sea bass, sea bass puberty)	Research and aquaculture industry, higher education, general public	International		CR3
2008	Website; Scientific and student area: Educational material; Aquaculture Biotechnology	Research and aquaculture industry, higher education, general public	International		CR3
2008	Website Fish Farmers Forum: Reproduction protocols; Puberty control; Sex control; sterilization	Research and aquaculture industry, higher education, general public	International		CR3
	Posters				
	Reprofish poster in english	higher education / research / industry/general public	international	Several hundred	CR1
	Reprofish poster in english	research	France		CR4
2008	Plasma steroids and pituitary gonadotropins (mRNA of FSHβ and LHβ) in male Atlantic cod at different photoperiods. C. Kristoffersen & F. Almeida, E. Andersson, B. Norberg, Ø. Karlsen, C. Mittelholzer, R. W. Schulz and G.L. Taranger. Aquaculture Europe 2008. European Aquaculture Society meeting, Krakow September 15-18 2008. Poster.	Research and aquaculture industry	International	500	CR2, CR4
	Flyers				
	One flyer in english	higher education / research / industry/general public	international	700-800	CR1
	One flyer in spanish	higher education / research / industry/general public	Spain Latin America	300-500	CR1, CR3