Assessing And Improving The Quality Of Aquatic Animal Gametes To Enhance Aquatic Resources - The Need To Harmonize And Standardize Evolving Methodologies, And Improve Transfer From Academia To Industry (AQUAGAMETE)

FA1205
Start date: 29/11/2012
End date: 28/11/2016
Year: 4
Three International Workshops on the Biology of Fish Gametes (IWBFG)

Vodnany (Czech Republic, 2007)

Valencia (Spain, 2009)

Budapest (Hungary, 2011)
Plenary session for COST Action proposal

AQUAGAMETE

Á. Horváth, H. Rosenthal and J.F. Asturiano lead the session, finding the general interest of assistants, and starting to define precise objectives, WGs structure and nominating potential WGs leaders.
Scientific context

• Background / Problem statement:
  - Europe needs aquatic animal species.
  - The most evident... Aquaculture has compensated the reduction of captures, centered in controlled-reproduction species.
Aquaculture

- Rapidly developing technologies
- Increasing and intensifying production

STANDARDIZATION IS INEVITABLE
Until now we need…

Control of reproduction
Broodstock management
Gamete management
Larval quality
Fry survival

THE ACTUAL AREA OF USE IS MUCH BROADER THAN THAT!
Aquaculture companies (hatcheries)

Broodstocks management

Parents selection

Evaluation of sperm/egg quality

Identification of quality markers

Improvement of fertilization protocols

Development/improvement of cryopreservation techniques

Genetic improvement (at its infancy in most of the fish species)
Fish species interesting for aquaculture but having reproductive limitations
Genetically selected fish
Biotechnology companies (biomedicine, mammals/human reproduction)
Improvement of basic knowledge regarding physiological processes
Conservation of mutants, genetically-modified strains & transgenic lines
Developing countries/ countries developing Aquaculture

Extreme potential, many new species, high growth rate, low production costs, omnivorous diet, societal impact

Everything to be done (hormonal treatments to genetic improvement)
Ecology and Fisheries
Management of local fisheries resources (i.e.: for angling)
Management of endangered aquatic species
Cryobanking of local genetic resources
Use of PGCs transplantation technologies to improve artificial propagation
Fish sperm cryopreservation (as example)

Studies of near 300 species

Results vary widely
Even for similar protocols and species

Difficulty in repeating protocols

Controversies in many aspects
Pooled milt vs. separate males
Cryoprotectants and concentrations
Short vs. long equilibration time
“Fast” vs. “slow” cooling
No Standardization

Initial sperm quality
Sperm concentration
Cryopreservation procedures
Packaging, cooling, thawing
Fertilization procedures
Evaluation criteria
Experimental design
Reporting of results

The extreme diversity of fish species, evaluation techniques, cryopreservation protocols, etc. make necessary to standardize protocols and methodologies for reporting results.
Main objectives

Our main objective is to harmonize and standardize evolving analytical methodologies used in assessing the quality of aquatic gametes, improving their different uses, enhancing aquatic resources and transfer from academia to the industry.
Objectives

1) To review the current state of knowledge on aquatic species gametes.
2) To coordinate activities dedicated especially to intercalibration and standardization of techniques of analysis, and to identify gaps in research and technology, to avoid overlapping research and to transfer to industry.
3) To reach a consensus on protocols and guidelines that permit the use of results in relational studies.
4) Maximize the dissemination of results.
Working groups

Chair: Dr. Juan F. Asturiano
ViceChair: Dr. Ákos Horváth

WG1. Techniques for evaluation of gametes quality
Leader: Dr. Julien Bobe (France); Vice-leader: Dr. Christian Fauvel (France)

WG2. Gametes storage and preservation
Leader: Dr. Elsa Cabrita (Portugal); Vice-leader: Dr. Vanesa Robles (Spain)

WG3. Basic and applied research on gametes biochemistry and physiology, including omics.
Leader: Dr. Andrzej Ciereszko (Poland); Vice-leader: Dr. Catherine Labbé (France)

WG4. Organization of training courses, coordination meetings, and two editions of International Workshop on Biology of Fish Gametes
Co-leaders: Dr. Sonia Martínez-Páramo (Portugal) and Dr. Oliana Carnevali (Italy)
Action Parties

- Brazil
- Japan
- Singapore
- South Africa

27 countries

- Parties
- Non-COST Countries
Action participants

- Total no. of indiv. participants
- ESRs
- Female
Ways to accomplish the objectives

- Working group meetings
- Training schools
- Short-term Scientific Missions (STSM)
- Workshops
- Coordination meetings

- Funding: 181,000 € in the first grant period (15 months)
  154,000 € in second grant period (12 months)
  114,247 € in third grant period (11 months)
  84,087 € in fourth grant period (7 months)
  Total: 533,333 €
Results vs. Objectives

The main progress towards reaching the Action scientific objectives were:

- The **state of the art** on several aspects of aquatic species gametes is being reviewed (several review papers published and in redaction).

- **Intercalibration and standardization of techniques** of analysis were addressed in several of the 105 STSMs supported.

- Standardization of CASA systems for sperm quality evaluation (involving PROISER, a software designing company)

- Development of protocols for PGCs transplantation (several spp)

- Development of new sperm cryopreservation protocols (i.e.: sturgeons) and standardization (after evaluation of epigenetic damages) of some others protocols (i.e.: European eel).

- Identification of main proteins in seminal plasma (several spp)

- Exploring the use of different additivies (i.e.: anti-freezing proteins) to sperm freezing media
Significant Highlights in Science or Networking

• 7 Training Schools performed

1st TS: Cádiz (Spain), May 2013: Techniques for fish germline cryobanking

2nd TS: Rennes (France), Jun 2014: Molecular basis of fish gamete quality

3rd TS: Faro (Portugal), Jan 2015: Techniques in Reproductive Biology and Cryobanking

4th TS: Vodnany (Czech Republic), Mar 2015: Optical Microscopy and Image Analysis

5th TS: Valencia (Spain), Mar 2016: Cryopreservation of fish germ cells

6th TS: Rennes (France), Jun 2016: Molecular basis of fish gamete quality: genomic tools

7th TS: Olsztyn (Poland), Sep 2016: Fish proteomics
Significant Highlights in Science or Networking

- 4th and 5th International Workshop on the Biology of Fish Gametes

4th IWBFG, Albufeira (Portugal, 2013)
118 participants from 24 countries; 107 communications.

5th IWBFG, Ancona (Italy, 2015)
140 participants from 28 countries; 130 communications.
Significant Highlights in Science or Networking

- 105 STSM funded
- We have been congratulated by COST Office because this number has beaten the record of STSM per year in COST Actions.
More in:

“AQUAGAMETE COST Action”

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