



CIHEAM

International Centre for Advanced
Mediterranean Agronomic Studies
Mediterranean Agronomic Institute of Zaragoza



Spanish National Research Council
Institute of Aquaculture Torre de la Sal

Advanced Course

ADVANCES IN FISH REPRODUCTION AND THEIR APPLICATION TO BROODSTOCK MANAGEMENT

Torre de la Sal-Castellón (Spain), 19-24 February 2018

1. Objective of the course

As in many other parts of the world, fish farming is expanding rapidly in the Mediterranean, where for certain species, particularly trout, sea bream, sea bass, tilapia, carp and mullet, aquaculture already makes up most of the production. The development of intensive culture is conditioned by the control of reproduction and broodstock management, thus facilitating permanent supply of constant and optimum quality fry, so as to permit large-scale culture up to market size.

The objective of the course is to provide professionals with an updated vision of the scientific bases and of the progress made in fish reproduction and to demonstrate its practical application to broodstock management.

The programme revises the most recent advances in the study of regulation and control of reproductive fish processes and in the internal and external factors controlling and modulating reproduction. The environmental, hormonal, molecular, behavioural and stress factors, and genetic instruments currently available for an effective control of all these reproductive processes will be presented, including cryoconservation of gametes.

The applied part of the programme will comprise broodstock handling, including anaesthetics, biometry, ovarian biopsies, markers, blood sampling, slaughter and organ extraction. In vivo techniques will be applied to diagnose the state of maturation of broodstock. The quality of eggs and sperm produced will be evaluated as well as the incubation systems used. Trials will be conducted for the hormonal induction of spawning and of artificial fertilization as well as induction of triploidy and gynogenesis. Sperm freezing and thawing techniques will also be applied.

Upon completion of the course, participants will have gained:

- Knowledge of the scientific bases of the reproduction processes of fish kept in captivity for culture purposes.
- Practice in the appropriate application of available technology in the evaluation and handling of broodstock in intensive aquaculture management.
- Experience in the organization, management and control of broodstock, with special emphasis on how these activities influence the physiological processes and life cycle requirements.

2. Organization

The course is jointly organized by the International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM), through the Mediterranean Agronomic Institute of Zaragoza (IAMZ), and the Spanish National Research Council (CSIC), through the Institute of Aquaculture Torre de la Sal (IATS).

The course will take place at the IATS, Castellón, with well qualified lecturers from research centres and universities in different countries. The course will be held over a period of 1 week, from 19 to 24 February 2018, in morning and afternoon sessions.

3. Admission

The course is designed for a maximum of 25 professionals with a university degree who are already directly involved in the subject matter of the course.

The course will be given in English.

4. Registration

Candidates can apply online at the following address:
<http://www.admission.iamz.ciheam.org/en/>

Applications must include the *curriculum vitae* and copy of the supporting documents most related to the subject of the course.

The deadline for the submission of applications is **30 November 2017**.

Applications from those candidates requiring authorization to attend the course, may be accepted provisionally.

Registration fees for the course amount to 500 euro. This sum covers tuition fees only.

5. Scholarships

Candidates from CIHEAM member countries (Albania, Algeria, Egypt, France, Greece, Italy, Lebanon, Malta, Morocco, Portugal, Spain, Tunisia and Turkey) may apply for scholarships covering registration fees, and for scholarships covering the cost of travel and full board accommodation during the course.

Candidates from other countries who require financial support should apply directly to other national or international institutions.

Please display on a notice board if possible



CIHEAM

Instituto Agronómico Mediterráneo de Zaragoza
Avenida de Montañana 1005, 50059 Zaragoza, Spain
Tel.: +34 976 716000, Fax: +34 976 716001
E-mail: iamz@iamz.ciheam.org

See updated information at

www.iamz.ciheam.org

INFORMATION
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6. Insurance

It is compulsory for participants to have medical insurance valid for Spain. Proof of insurance cover must be given at the beginning of the course. Those who so wish may participate in a collective insurance policy taken out by the Organization, upon payment of the stipulated sum.

7. Teaching organization

The course requires personal work and interaction among participants and with lecturers. The international characteristics of the course favour the exchange of experiences and points of view. Formal lectures are complemented by a wide programme of practicals on the various topics addressed during the course and two technical visits to IATS facilities and a fish hatchery.

8. Programme

1. Regulation and control of reproductive processes (8 hours)

- 1.1. Neuroendocrine mechanisms in fish reproduction
 - 1.1.1 Organization of the hypothalamus-hypophysis complex in teleosts
 - 1.1.2. Main factors influencing hypophysis gonadotropic activity: GnRH, dopamine, kisspeptins, GnIH
- 1.2. The hormonal control of gonadal development
 - 1.2.1 Fish gonadotropins: structure and function
 - 1.2.2. Gametogenesis and its hormonal control
 - 1.2.3. Biotechnological approaches to study reproduction in teleost fish
- 1.3. Reproductive dysfunctions and hormonal induction of ovulation, spermiation and spawning
 - 1.3.1. Aquaculture diversification and reproduction constraints
 - 1.3.2. Gonad maturation
 - 1.3.3. Dysfunctions in captivity
 - 1.3.4. Hormonal induction of spawning
- 1.4. Sex control in fish
 - 1.4.1. Sexual determination and differentiation in fish
 - 1.4.2. Genetic and endocrine sex control and its applications in aquaculture
 - 1.4.3. Epigenetics of sex determination and differentiation

2. Internal and external factors controlling and modulating reproduction (9 hours)

- 2.1. Broodstock genetics and breeding programmes
- 2.2. Behavioural factors affecting reproduction

2.3. Environmental control of fish reproduction

- 2.3.1. Photothermic control of the reproductive cycles in teleosts
- 2.3.2. Environmental control of puberty and sexual maturation in sea bass

2.4. Influence of stress and of the immune system on fish reproduction

- 2.4.1. The physiology of stress in fish
- 2.4.2. Effects of stress on fish reproduction

2.5. Broodstock nutrition and spawning quality

- 2.5.1. Broodstock nutrition regarding egg and larva quality
- 2.5.2. Determinant factors and markers for egg quality

3. Cryobanking genetic resources in aquaculture: issues and applications (2 hours)

- 3.1. Cryoconservation methods for gametes, embryos and cells
- 3.2. Use of cryopreserved genetic resources in aquaculture

4. Seminar on broodstock management (1 hour)

5. Practical (18 hours)

- 5.1. Introduction and presentation of practicals
 - 5.2. Broodstock management
 - 5.2.1. Induction of spawning and artificial fertilization
 - 5.2.2. Determination of egg quality and spawning performance
 - 5.3. Sampling procedures
 - 5.4. Evaluation of sperm quality
 - 5.5. Cryoconservation of sperm
 - 5.6. Hormonal treatments for sex reversal
 - 5.7. Chromosome set manipulations
 - 5.7.1. Induction of triploidy
 - 5.7.2. Inactivation of DNA sperm by UV-light
 - 5.7.3. Induction of gynogenesis using UV-light and by cold shock
 - 5.8. Methods of verification of the ploidy
 - 5.8.1. Preparation of metaphasic chromosomes
 - 5.8.2. Silver stain of NOR regions
 - 5.8.3. Erythrocyte measurements
 - 5.8.4. Use of molecular markers for identification of fish with uniparental inheritance
 - 5.9. Discussion of results
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- 6.1. IATS facilities
 - 6.2. Visit to a marine fish hatchery

GUEST LECTURERS

M. BLÁZQUEZ, CSIC-ICM, Barcelona (Spain)
N. DUNCAN, IRTA, San Carles de la Ràpita (Spain)
A. FELIP, CSIC-IATS, Castellón (Spain)
A. GARCIA-AYALA, Univ. Murcia (Spain)
A. GÓMEZ, CSIC-IATS, Castellón (Spain)
M.P. HERRÁEZ, Univ. León (Spain)

M. IZQUIERDO, Univ. Las Palmas de Gran Canaria (Spain)
B. LEVAVI, Hebrew Univ. of Jerusalem (Israel)
H. MIGAUD, Univ. Stirling (UK)
C. MYLONAS, HCMR, Heraklion (Greece)
F. PIFERRER, CSIC-ICM, Barcelona (Spain)
M. VANDEPUTTE, INRA-Ifremer, Palavas (France)

