CIHEAM

Mediterranean Agronomic Institute of Zaragoza

Advanced Course

MONITORING ENVIRONMENTAL EFFECTS OF AQUACULTURE

Zaragoza (Spain), 18-22 September 2017

1. Objective of the course

Aquaculture in the Mediterranean has grown substantially over the past 30 years and is expected to continue to do so. This has been accompanied by increasing sensitivity of the aquaculture sector and society towards potential undesirable interactions with the environment. On the other hand the expansion of aquaculture in the coastal zone and the increasing conflicts with other uses for coastal space has made it necessary to plan correct management in such a way as to minimize negative effects and ensure sustainability.

The Mediterranean is a unique example of a water body which is shared by 22 countries with different economic and technological capabilities, legal frameworks and cultural traditions. However, the increasing pressure on marine resources and environmental assets necessitates a common understanding of the environmental risks and the harmonization of the regulatory schemes used across the Mediterranean. Existing regulations for the EU countries (e.g. Water Framework Directive) have imposed a certain degree of common practice in assessing environmental quality. However, it is important to take into account the problems and peculiarities of aquaculture over the entire Mediterranean Basin with an aim to establish a more robust and efficient way of ensuring the future of the industry in this area.

Environmental monitoring techniques are important tools in understanding and managing the impacts of aquaculture. Environmental monitoring describes the processes and activities that need to take place to characterize current status and trends, and assess the quality of the environment. Methodologies and regulations for this are set in many European countries but in many others it has not received the necessary attention. Recording environmental change over time is essential to conform to statutory environmental regulations and for the appropriate environmental management of aquaculture systems. However, there are many methods of monitoring such changes and these can vary between geographical regions or in approaches to effective environmental management of aquaculture.

From the knowledge of the aquaculture environment interactions and progress at different scales, this course intends to provide participants with solid arguments for the establishment of robust monitoring programmes allowing for rational decision making. By the end of the course the participants will:

- Be aware of the environmental impacts associated with marine and freshwater aquaculture systems in relation to present and future legislation in Mediterranean countries, and their adherence to the Ecosystem Approach to Aquaculture (EAA) concept.
- Be familiar with the concepts of why monitoring is important for statutory environmental regulation, for on-farm environmental management, and for environmental research for future aquaculture development, and to understand the cost-benefits of different monitoring approaches.
- Be able to apply standard and new methods for monitoring aquatic environments for aquaculture management.
- Gain experience in taking the environmental samples and subsequent lab analysis of data necessary for effective monitoring and accurate interpretation of the results.
- Understand the application of monitoring to real situations across different aquaculture production systems.
- Be able to debate the pros and cons of different environmental monitoring approaches with aquaculture managers and environmental regulators and policy makers alike.

2. Organization

The course will take place at the **Mediterranean Agronomic Institute of Zaragoza (IAMZ)** of the **International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM)**, and will be given by well qualified lecturers from international institutions and from universities and research centres in different countries.

The course will be held over a period of 1 week, from 18 to 22 September 2017, in morning and afternoon sessions.

3. Admission

The course is designed for a maximum of 25 professionals with a university degree, and is addressed to policy makers and competent authorities, planners, technical advisors, aquaculture managers and other specialists involved in the environmental monitoring and surveillance of aquaculture.

Given the diverse nationalities of the lecturers, knowledge of English, French or Spanish will be valued in the selection of candidates, since they will be the working languages of the course. IAMZ will provide simultaneous interpretation of the lectures in these three languages.

4. Registration

Candidates must 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 **3 July 2017.**

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

Please display on a notice board if possible

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CIHEAM

See updated information at

www.iamz.ciheam.org

INFORMATION CONTINUES OVERLEAF

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 in the Hall of Residence on the Aula Dei Campus.

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

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 IAMZ, 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.

The course will be taught with a combination of lectures, applied examples, case studies and practical sessions that will provide the participant with hands-on experience on field sampling and data processing relevant to environmental monitoring of aquaculture.

Participants will be asked to prepare before the beginning of the course a brief report on the current environmental impact assessment and monitoring practices and priorities related to this activity in their countries/regions.

8. Programme

1. **Background of environmental interactions (1 hour)**
2. **Environmental regulation of aquaculture (5 hours)**
   - 2.1. The ecosystem approach to aquaculture
   - 2.2. Planning for aquaculture development: Environmental Impact Assessment, site selection, assimilative capacity, maximum production, aquaculture zones
   - 2.3. Management of aquaculture development: environmental quality standards and objectives (EQSs/EQOs), allowable zone of effect (AZE), monitoring strategies
   - 2.4. Regulatory framework on environmental monitoring programmes and EIA for aquaculture in the Mediterranean
   - 2.5. Debate on the state of the art and variability of monitoring regulation in the Mediterranean region; examples of best practice?
3. **Monitoring methodology (13 hours)**
   - 3.1. Types of monitoring: for statutory monitoring, for on farm environmental management, for research. Required information base
   - 3.2. Review on the recommendations on the use of indicators and indexes for monitoring programmes
   - 3.3. Efficient design of monitoring programmes
     - 3.3.1. Statistical base
     - 3.3.2. Scales
     - 3.3.3. Strategies
     - 3.3.4. Data analysis and interpretation
   - 3.4. Technical protocols
     - 3.4.1. Sediment structure and characterization: nutrients, granulometry, redox potential, organic matter, etc.
     - 3.4.2. Trace chemicals: chemotherapeutants, metals, antioxidants, etc.
     - 3.4.3. Benthic fauna
     - 3.4.4. Water column: nutrient, plankton and microbial
     - 3.4.5. Seagrasses and maërl
     - 3.4.6. Wild fish and fisheries
     - 3.4.7. Visual methods: ROV, SPI, video mosaic and image analysis
     - 3.4.8. Automated/in situ monitoring methods
     - 3.4.9. New research-based methods for monitoring
       - 3.4.9.1. Stable isotopes
       - 3.4.9.2. Fatty acids
       - 3.4.9.3. Bioassays
   - 3.5. Cost-benefit analysis of monitoring techniques
4. **Decision making for aquaculture development (2 hours)**
   - 4.1. GIS and spatial analysis
   - 4.2. Remote sensing and early warning systems
   - 4.3. Other management models or tools
5. **Technical visit and practicals (8 hours)**
   - 5.1. Visit to the bivalve and fish-cage production area of Ebro delta
   - 5.2. On-board practical sessions
     - 5.2.1. Water column
     - 5.2.2. First sight observation of sediment samples
     - 5.2.3. Sediment geochemistry
     - 5.2.4. Macrobenthos
   - 5.3. Data management and processing (laboratory and computer practicals)
     - 5.3.1. Water column data
     - 5.3.2. Geochemical data
     - 5.3.3. Sorting macrobenthos
     - 5.3.4. Macrobenthic data
6. **Case studies (4 hours)**
   - 6.1. Environmental monitoring of old and new fish farms in Scotland
   - 6.2. Seabream and seabass farming in Greece: adaptation of carrying capacity to the environmental conditions of the zone
   - 6.3. Site selection and environmental monitoring of aquaculture in Turkey
   - 6.4. Life Cycle Assessment of gilthead seabream (*Sparus aurata*) production in offshore fish farms in Spain
7. **Final discussion (1 hour)**

GUEST LECTURERS

F. AGUADO, IMIDA, Murcia (Spain)
N. CAIOLA, IRTA Sant Carles de la Ràpita (Spain)
L. FALCONER, Univ. Stirling (United Kingdom)
B. GARCÍA, IMIDA, Murcia (Spain)
I. KARAKASSIS, Univ. Crete, Heraklion (Greece)
M. LEAVER, Univ. Stirling (United Kingdom)
F. MASSA, GFCM, Rome (Italy)
J.M. RUIZ, IEO Murcia (Spain)
P. SÁNCHEZ JEREZ, Univ. Alicante (Spain)
T. TELFER, Univ. Stirling (United Kingdom)
P. TETT, Scottish Association for Marine Science, Argyll (United Kingdom)
G. YÜCEL-GIER, Univ. Dokuz Eylul, Izmir (Turkey)

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