

Advanced Course

DIAGNOSTICS AND PREVENTION FOR FISH PARASITE CONTROL IN AQUACULTURE

Zaragoza (Spain), 21-25 October 2019

1. Objective of the course

Marine and freshwater finfish aquaculture in the Mediterranean region is nowadays a fast expanding sector in animal production. Gilthead sea bream, European sea bass, rainbow trout, common carp and other species are the most farmed fish in Mediterranean countries and provide high quality animal protein from aquatic origin. These farming activities also contribute significantly to wealth and job creation in coastal and rural areas. However, diseases are still a limiting factor for the development of a sustainable production.

Amongst other diseases, parasites and related infections can cause significant damages to farmed fish species resulting in poor growth performance, impaired welfare and high mortality rates, with significant consequences in terms of production and economic performance. The high impact of these parasitic diseases and the low availability of control tools have called the attention of European authorities for further research that is addressed through several EU H2020 projects.

Early and accurate diagnosis, efficient preventive and palliative measures and precise epidemiological surveys should be the key to reduce the impact of these pathogens in this sector.

The general objective of the course is to provide integrated information on fish parasites affecting marine and freshwater fish farming in the Mediterranean region, focusing on the most recent knowledge of the main parasitic diseases, diagnostic methods, disease assessment and preventive and control measures.

Upon completion of the course, the participants will have gained:

- Better knowledge of the main parasites of economic relevance affecting farmed fish in the Mediterranean area.
- Diagnostic skills based on holistic evaluation and laboratory techniques.
- Increased abilities and expertise in health management and food safety related to parasitic fish diseases.

This course is also a good opportunity to meet first-line international experts in this field and share professional experiences and concerns with them and other participants.

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 EU H2020 RIA project ParaFishControl (Advanced Tools and

Research Strategies for Parasite Control in European farmed fish), with the collaboration of the EU H2020 RIA projects PerformFISH (Integrating Innovative Approaches for Competitive and Sustainable Performance across the Mediterranean Aquaculture Value Chain) and MedAID (Mediterranean Aquaculture Integrated Development), and of the University of Zaragoza, through the Faculty of Veterinary Science.

The course will take place in Zaragoza, at IAMZ and the laboratories of the Faculty of Veterinary Science, and will be taught by well qualified experts participating in the three EU projects. All these experts belong to international institutions and to universities, research centres and private companies in different countries.

The course will be held over a period of 1 week, from 21 to 25 October 2019, in morning and afternoon sessions.

3. Admission

The course is designed for 25 participants with a university degree. It is intended for professionals within the aquaculture industry and public institutions involved in aquatic animal health management and inspection. The course is also open to technical consultants and researchers involved in fish parasite diagnosis and control in aquaculture production.

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 8 July 2019. The deadline may be extended for candidates not requiring a visa and not applying for a grant if there are free places available.

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 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 the participants and with the lecturers. The international characteristics of the course favour the exchange of experiences and points of view.

The programme has an applied approach, combining lecture based teaching, presentation of case studies, discussions and hands-on laboratory practicals on parasite diagnosis procedures and identification of parasites using biological materials.

Furthermore, during the course participants will work in tutored groups applying and integrating the concepts taught during the course to design and implement health management strategies under different scenarios based on data from case studies.

8. Programme

1. Introduction (1 hour)

- 1.1. Marine and freshwater finfish aquaculture production in the Mediterranean region: species, production systems and development constraints
- 1.2. Importance of parasitic diseases in aquaculture health and their relationships with the production systems
- 1.3. Flash on the main parasites/parasitic diseases per fish species and affected organs

2. General concepts about sampling and available diagnostic techniques (3 hours)

- 2.1. Concepts on sampling
 - 2.1.1. Anamnesis and data recording
 - 2.1.2. Sample selection and sample size calculation
 - 2.1.3. Sample collection, preservation and transport
- 2.2. Diagnostic methods for parasitic diseases
 - 2.2.1. Macro-, micro- and ultra-morphological techniques: gross morphology, fast techniques, microscope techniques, histopathology, hematology, electron microscopy, confocal microscopy, micro-CT
 - 2.2.2. Specific techniques for particular parasites and cases: immunohistochemistry, ELISA, specific stains, parasite culture and isolation
 - 2.2.3. Molecular diagnostic techniques: ISH, PCR, qPCR
 - 2.2.4. Tools for the future

3. Main parasite groups and relevant species present in Mediterranean aquaculture: morphology, life cycle, pathology and disease diagnosis (6 hours)

- 3.1. Ectoparasites
 - 3.1.1. Copepods and isopods: *Ceratothoa oestroides*, *Laernanthropus kroyeri* and *Lernaea cyprinacea*
 - 3.1.2. Monogeneans: *Sparicotyle chrysofryi*, *Furnestinia ecbeneis*, *Diplectanum aequans*, *Gyrodactylus* spp., *Dactylogyrus* spp. and *Sciaenocotyle panzerii*
 - 3.1.3. Ciliates: *Ichthyophthirius multifiliis*, *Cryptocaryon irritans* and Trichodinids
 - 3.1.4. Flagellates and dinoflagellates: *Amyloodinium ocellatum* and *Cryptobia* spp.
 - 3.1.5. Amoebae: *Paramoeba perurans* and Nodular Gill Disease (NGD)
 - 3.1.6. Others: *Saprolegnia* spp.
- 3.2. Endoparasites
 - 3.2.1. Digeneans: Diplostomids, Aporocotylids
 - 3.2.2. Myxozoans: *Sphaerospora* spp., *Enteromyxum* spp., *Tetracapsuloides bryosalmonae*, *Myxobolus cerebralis*, *Kudoa* spp., *Thelobanellus kitauei* and *Ceratomyxa* spp.
 - 3.2.3. Microsporidians: *Enterospora nucleophila*, *Tetramicra brevifilum*, *Glugea* spp. and *Loma* spp.
 - 3.2.4. Apicomplexa: *Eimeria* spp., *Goussia* spp. and *Cryptosporidium* spp.
 - 3.2.5. Ciliates: *Philasterides dicentrarchi*
 - 3.2.6. Amoebae: *Endolimax* spp.
 - 3.2.7. Others: *Ichthyophonus* spp.
4. Wild fish parasites and foodborne zoonotic parasites (2 hours)
 - 4.1. Relationships between parasites in wild and farmed species
 - 4.2. Foodborne zoonotic helminths
 - 4.2.1. Nematodes: *Anisakis* spp. and *Contracaecum* spp.
 - 4.2.2. Cestodes: *Diphyllobothrium latum*
 - 4.2.3. Trematodes: *Opisthorchis felineus*
5. Practical work on parasitological examination and diagnostics (8 hours)
 - 5.1. Laboratory hands-on diagnostic procedures
 - 5.2. Identification of parasites based on biological materials
6. Parasitic disease management. Examples based on different fish species and rearing systems (7 hours)
 - 6.1. Prevention
 - 6.1.1. General and specific husbandry measures
 - 6.1.2. Remediation and health booster nutritional strategies
 - 6.1.3. Parasitic cycle firewalls
 - 6.2. Treatments
 - 6.2.1. Available medicines and chemicals
 - 6.2.2. Delivery systems, dosages and recommendations
 - 6.2.3. Safety and potential risks (for humans, environment, fish)
 - 6.3. Tools for the future: vaccines, cleaner fish, natural predators/pathogens, new drugs and delivery systems
 - 6.4. Integrated biosecurity and risk assessment
 - 6.5. Discussion
7. Disease impact assessment under different farming conditions (2 hours)
 - 7.1. Measurements of disease: prevalence, incidence, mortality and case fatality rate
 - 7.2. Assessment of risk factors related with farming condition (fish age/weight, seasonality, location, health status): design and analysis of field trials and observational studies, interpretation of risk estimators.
8. Practical group work based on case studies to integrate and apply the concepts to design and implement health management strategies under different scenarios (5 hours)
 - 8.1. Presentation of the cases
 - 8.2. Tutored work sessions
 - 8.3. Presentation of results and discussion

GUEST LECTURERS

B. BASURCO, CIHEAM-IAMZ, Zaragoza (Spain)
P. BERALDO, Univ. Udine (Italy)
M. CAFFARA, Univ. Bologna (Italy)
M. CONSTENLA, Univ. Aut3noma Barcelona (Spain)
I. DE BLAS, Univ. Zaragoza (Spain)
M.L. FIORAVANTI, Univ. Bologna (Italy)
I. MLADINEO, Institute of Oceanography and Fisheries, Split (Croatia)

F. PADROS, Univ. Aut3noma Barcelona (Spain)
O. PALENZUELA, CSIC-IATS, Castell3n (Spain)
M.A. PERIBAN3EZ, Univ. Zaragoza (Spain)
G. RIGOS, HCMR, Institute of Aquaculture, Hellinikon (Greece)
A. SITJ3 BOBADILLA, CSIC-IATS, Castell3n (Spain)
C. ZARZA, Skretting ARC, Stavanger (Norway)



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