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Introduction

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A number of examples in recent history have shown how “diseases shape aquaculture”. Relevant examples to be mentioned are the outbreak of infectious salmon anemia in Chile in 2007 and the Faroe Islands in 2000; viral haemorrhagic septicaemia in Denmark in the 1980s and its eradication campaign which followed in 2009 and the occurrence of white spot syndrome virus in Southeast Asia in 1994.

The MedAID project aims to improve key performance indicators of Mediterranean mariculture and envisage the concept of healthy fish for sustainable production, considering health and welfare as prerequisites for sustainable and profitable aquaculture in the Mediterranean area. Recent reports of the different regional events discussing Mediterranean marine aquaculture, such as the European Aquaculture Society (EAS) in 2014 and the European Association of Fish Pathologists (EAFP) in 2015, showed that the industry needs healthier fish throughout the whole production cycle. Therefore diseases are an overall priority for the development and improvement of the Mediterranean aquaculture sector (European Aquaculture Technology Innovative Platform, EATiP 2014; Vendramin *et al.*, 2016).

The current European legislative framework for control of aquatic animal diseases refers primarily to Council Directive 2006/88. This directive covers the whole aquaculture production giving general guidelines on disease control and providing some specific provisions for certain diseases.

European seabass and gilthead seabream are not currently listed as susceptible species to any listed disease and thereby are not targeted by specific provisions for the listed diseases. Nevertheless, the Directive on at least 3 occasions describes the opportunity for Member States to design and implement *ad hoc* measures for specific diseases considered relevant for national aquaculture.

Starting from pre-requisition 30, CD 2006/88 envisages the implementation of the national programme and additional guarantees for disease not subject to Community measures.

“For diseases not subject to Community measures, but which are of local importance, the aquaculture industry should, with the assistance of the competent authorities of the Member States, take more responsibility for preventing the introduction of or controlling such diseases through self-regulation and the development of ‘codes of practice’. However, it may be necessary for the Member States to implement certain national measures. Such national measures should be justified, necessary and proportionate to the goals to be achieved. Furthermore, they should not affect the trade between the Member States unless this is necessary in order to prevent the introduction of or to control the disease, and should be approved and regularly reviewed at the Community level. Pending the establishment of such measures under this Directive, the additional guarantees granted in Commission Decision 2004/453/EC of 29 April 2004 implementing Council Directive 91/67/EEC as regards measures against certain diseases in aquaculture animals (3) should remain in force”.

Article 10 of this Directive broadly includes all aquaculture production and delegates the establishment of a risk-based animal health surveillance scheme to each Member State.

“Animal health surveillance scheme

1. *The Member States shall ensure that a risk-based animal health surveillance scheme is applied in all farms and mollusc farming areas, as appropriate for the type of production.*
2. *The risk-based animal health surveillance scheme referred to in paragraph 1 shall aim at the detection of: (a) any increased mortality in all farms and mollusc farming areas as appropriate for the type of production; (b) the diseases listed in Part II of Annex IV, in farms and mollusc farming areas where species susceptible to those diseases are present”. Finally, article 43 specifically address*

“Provisions for limiting the impact of diseases not listed in Part II of Annex IV

1. *Where a disease not listed in Part II of Annex IV constitutes a significant risk for the animal health situation of aquaculture or wild aquatic animals in a Member State, the Member State concerned may take measures to prevent the introduction of or to control that disease. Member States shall ensure that these measures do not exceed the limits of what is appropriate and necessary to prevent the introduction of or to control the disease.*
2. *Member States shall notify to the Commission any measures referred to in paragraph 1 that may affect trade between Member States. Those measures shall be subject to approval in accordance with the procedure referred to in Article 62(2).*
3. *Approval referred to in paragraph 2 shall only be granted where the establishment of intra-Community trade restrictions is necessary to prevent the introduction of or to control the disease, and shall take into account the provisions laid down in Chapters II, III, IV and V”.*

The possibility to apply specific national regulations to prevent the introduction, or to control the spread of diseases that, despite not being included in the EU legislation as such, constitute a significant risk for the health of aquatic animals in a Member State, is a criteria which is also included in the new Animal Health Law, which will be implemented starting from December 2019. (Article 171 Regulation (EU) 2016/429)

To the best of the authors' knowledge, no national surveillance programmes have been implemented to date for these fish species (Vendramin *et al.*, 2016).

Many relevant players are involved in the health management of seabass and seabream in the Mediterranean, including research and diagnostic laboratories, private testing laboratories, consultants and practitioners involved in diagnostic activities, national reference laboratories and official veterinary officers.

In the current circumstances, each player usually has a narrow focus either for the area of interest or for a specialty in terms of diagnostics (either bacteriology or virology or parasitology). There is a need for a centre to receive, collect, compile and analyse all information in order to have clear figures of production trends, the impact of diseases and so forth. This gap is an obstacle for further development of the industry and for designing and coordinating harmonized strategies in the different regions of the basin.

MedAID (WP4, health management and diseases and fish welfare) is endeavouring to provide tools and common strategies for the prevention and diagnosis of major diseases by creating an operative and collaborative platform at Mediterranean level. This platform will produce codes of good practice and harmonized standards for integrated health management through the establishment of a network of laboratories capable of obtaining a proper diagnosis in case of known pathogens and support in case of emerging or aetiologically unsolved diseases.

Currently, technical and economic constraints have driven the aquaculture industry to prioritize production rather than disease control and efforts from stakeholders in health management are striving to minimize the incidence of disease. One of the key elements of the health

management strategy is fast, reliable, validated and efficient diagnostic techniques capable of a timely detection of the health threat.

The “Diagnostic manual for the main pathogens in European seabass and gilthead seabream aquaculture” is conceived as an instrument to provide up-to-date guidelines and standardized methods enabling the harmonized approach to the health challenges due to viral and bacterial pathogens in seabass and seabream farming.

Parasitic diseases are currently addressed by ParaFishControl, another H2020 project, to take advantage of the synergies between the two projects.

The list of relevant diseases was agreed during the meeting of the WP4 partners held in Zagreb, on 8th and 9th November 2018. The selection was based on the result of the survey questionnaires conducted among experts during the past few years by the EU Reference Laboratory (EURL) for fish diseases, the report of the MedAID questionnaire output on the prevalence of diseases and their impact on production as well as the national presentations during the FAO-GFCM workshop on animal health and risk analysis in finfish aquaculture, Larnaca, Cyprus, 3rd and 4th October 2018. The approach adopted is to describe in detail the existing diagnostic and standardized procedures, suggest improvements or enable the introduction of new methods for diagnosing the specific disease. A specific focus of MedAID has been the viral nervous necrosis for which the diagnostic capacity of European laboratories has been further evaluated through Inter laboratory proficiency testing (Toffan *et al.*, 2018)

The Manual is designed as follows:

- Part I “Sampling procedures” provides guidelines and instructions for: a) on-farm sampling for targeted surveillance in order to certify freedom from a specific disease; b) diagnosis in case of mortalities; c) analysis of mortalities caused by unknown aetiology; d) packing and shipping of samples; e) laboratory receiving the samples.
- Part II “General requirements for the laboratory methods” provides detailed information about the organization, equipment needed and management of a diagnostic laboratory with a focus on specific techniques (bacteriology, virology, molecular methods) which will enable the establishment of a reliable and competent diagnostic unit.
- Part III “Viral diseases with impact to the Mediterranean fish farming” deals with general principles of viral disease management and acquaints the reader in detail with all steps in setting up the diagnostics for VNN.
- Part IV “Bacterial diseases with impact on sea bass and sea bream farming” informs about several most important bacterial diseases affecting seabass and seabream farming describes the aetiological agents and available validated methods of screening, isolation, identification and confirmation of these pathogens.
- Part V “Mortality caused by unknown aetiology” describes the diagnostic procedure in the case of disease outbreaks which may not be attributed to any known causative agents.
- Part VI “Interpretation and reporting of results” gives instructions on how to communicate to the stakeholders the results of diagnostic procedures applied.
- Part VII “Annexes” which includes summary sheets of main diseases, list of contacts and a template for submission form.

The Manual will provide useful contact information to the OIE and EU reference laboratories as well as contacts of MedAID partners dealing with European seabass and gilthead seabream health.

It is hoped that this Manual will assist the public and private diagnostic laboratories, consultants and on-farm health managers in setting up a harmonized approach to the diagnostics of fish

diseases throughout the Mediterranean basin. It is opted to be a basis for collaboration, harmonization and transparency to prevent infectious diseases. Such an achievement will mirror the concepts in the Scandinavian countries where collaborative health management programmes between industry-authorities-research have been necessary for the control and eradication of infectious diseases.

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