Recommendation - Good husbandry practices in shellfish farming

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1. Introduction

Background and explanatory notes

This recommendation has its origin in the European Commission's request to establish guidelines for aquaculture following the publication of the "Strategic guidelines for a more sustainable and competitive EU aquaculture for the period 2021 to 2030". In its Communication, the Commission[1] underlines the lack of "*good husbandry practices*" in aquaculture at the European level.

Also, in compliance with this request from DG MARE, the AAC analyses that shellfish farming "*good practices*" are divided into several categories, including "*good shellfish husbandry practices*", which we will limit to a single area of the action plan for more sustainable and competitive aquaculture in the European Union, namely, Area 3 "animal and public health". While this scope may initially appear incomplete in regard to ***good husbandry practices*** – given the diversity of the issues involved - **we will limit this work to animal health and health aspects**, as animal welfare issues are not appropriate for this form of aquaculture, according to the scientific literature to date.

This document is not intended to set additional regulatory objectives and constraints but aims to provide technical expertise to DG MARE, so that it can appropriately define what "good shellfish husbandry practices" can be in a changing open environment. This recommendation is also a reminder of the know-how already in force in our European shellfish production methods, which are now subject to well-defined European health and animal health standards. In addition, it is important to point out that other categories of good practices need to be recalled and integrated for a complete process of rational definition of shellfish farming "*good practices*".

In this respect, it was agreed that any process, system, measure, technology, document, or other element deemed relevant to the promotion of good animal health and the health of shellfish and shellfish waters could be considered *"good husbandry practice"*. This recommendation will therefore be based essentially on existing practices accepted by shellfish farming professionals, sometimes going beyond the limits of European regulations and their correct application.

Nurseries, hatcheries, and shellfish farmers from the main European producer countries, as well as any expert deemed relevant by the members of the Focus Group, have been asked to list existing practices in their Member States.

Following a summary of the animal health and health challenges facing European shellfish farming, examples of these "*good husbandry practices*" will be presented. We will then discuss available categories of good practices identified in previous AAC work.

Health and animal health issues in European shellfish farming

European shellfish products shine on the international scene thanks to the many skills and good practices of shellfish farmers[2], in place for decades, facilitating the good health and animal health of shellfish and the environments in which they have harvested.

Working in an open and shared environment, shellfish farmers depend upon the quality of the coastal waters. Aware of the socio-economic impact that successive health and animal health crises have had on the shellfish industry and considering the risk of pathogen emergence and climate change[3], European shellfish farmers have adopted a culture of prevention and safety in their production to deal with these risks. Over and above current regulations, protection measures are tailored to the specific features of each member state and its production methods.

In terms of health, we note the increased frequency and duration of blooms of toxic microalgae on the coast, and the emergence of new species of microalgae, both toxic and non-toxic, directly linked to climate change. We are also seeing an increase in population density on the coasts and the undersizing of health systems which, in periods of gastroenteritis and/or heavy rainfall, leads to microbiological (*E. coli*) or viral (norovirus) contamination of coastal waters and shellfish. Each of these crises has a direct economic impact on the industry (area closures, batch withdrawals and recalls), and undermines consumer safety and the image of European shellfish products.

In addition to these health issues, European shellfish farmers have suffered and continue to suffer from major animal health crises. In the 1970s, farming of the flat oyster, *Ostrea edulis*, virtually disappeared due to the parasites *Marteilia refringens* and *Bonamia ostreae* (Grizel, 1985), as did the production of the Portuguese oyster, *Crassostrea angulata* (1960-1970), when iridovirus-type viruses were detected. From 1992 on, other mortality episodes were regularly reported in larval and juvenile Portuguese oysters with the identification of *Ostreid herpesvirus* type 1 (OsHV-1) throughout Europe (Garcia et al., 2011; Morrissey et al., 2015; Renault, 2018). Moreover, since 2008, the emergence of a particular genotype of this virus has been responsible for a massive increase in the deaths of young Portuguese oysters in the various EU Member States (Soletchnik, 2009). Adult oysters have also been affected since 2012 by high mortality during which the bacterium *Vibrio aesturianus* has systematically been detected (Garnier et al., 2007). Other species of molluscs have not been spared. For example, cockle populations in Galicia have been notably declining since 2008 due to the presence of *Marteilia.* These examples illustrate the high vulnerability of shellfish farming to epizootics and the need to adapt farming practices to animal health restrictions, particularly as the weakening of shellfish can facilitate predation and, by extension, the resulting production losses[4].

2. Good health and animal health practices on shellfish farms

Thus, in order to anticipate these health and animal health risks on their stocks and farms, shellfish farming professionals have developed, in addition to their regulatory obligations, good health and animal health practices that improve the resilience and sustainability of their business. Shellfish growers are supported in the development and application of these best practices by their professional organisations.

Good health and animal health practices in shellfish farming are implemented at all stages of production, from shellfish production areas to shellfish marketing, and also concern communication and training within the industry.

Health monitoring of shellfish production areas

In addition to the health surveillance networks run by the competent authority, shellfish industry workers (professionals and professional organisations), with the help of specialised companies, are developing **predictive alert systems** targeting the health risks that have the greatest impact on shellfish farms, such as **microbiological, viral and phycotoxin contaminations.**

Thanks **to targeted data collection and modelling**[5], **professionals can better anticipate the risk of contamination of their shellfish and adapt their farming practices according to contaminants:** sheltering batches or long-term purification systems among other practices**.**

However, it should be emphasised that these practices result in significant additional costs for companies and that storage infrastructures are often not designed for prolonged shelter (water renewal required, large storage volume). Another option is to use alternative, uncontaminated shellfish production areas whenever possible**.**

In addition to predictive tools, it is essential to **establish constant and transparent communication between shellfish farming professionals and the various players in the catchment area about water quality**, particularly in the case of norovirus pollution of shellfish production areas. As mentioned in the EFSA report (European Food Safety Authority (EFSA), 2019), noroviruses are associated with human faecal pollution resulting, among other things, from wastewater discharges from sewage systems following malfunctions, bypasses or uncontrolled discharges. By way of illustration, in several regions of France, as soon as a problem linked to wastewater treatment is noted, the information is passed on by managers to professional organisations (email or SMS), who then inform their shellfish farmers. This rapid communication makes it possible to **anticipate the risks of shellfish contamination and the adaptation of farming practices mentioned above.**

At the same time, to gain a better understanding of shellfish contaminants in the environment and to develop management measures adapted to each territory, several professional organisations, in partnership with government departments and/or local authorities, are **monitoring the environment for noroviruses, pesticides or micropollutants.** This monitoring involves sampling and analyses of shellfish at strategic points during targeted periods.

In France, for example, professional organisations also play an important role in passing on health warnings from government surveillance networks to the industry.

Animal health monitoring of shellfish production areas

The quality of coastal waters is vital to guaranteeing the safety of shellfish consumers and the health of livestock.

In France, for early detection of infections due to regulated and emerging pathogenic organisms affecting wild and farmed marine molluscs, professionals, at the heart of animal health surveillance, are the **first to sound the alarm as soon as abnormal shellfish mortality is observed on their farms**. These samples and analyses are taken via an **online form** and processed directly by designated animal health representatives in each professional organisation.

This event-based animal health surveillance is complemented by **numerous oyster and mussel farming observatories run by French scientific institutes, located in the various production basins, or even directly by professional organisations**. Throughout the year, these networks monitor the zootechnical performance of the different life stages of shellfish, from spat to adult, by measuring parameters such as recruitment, growth, mortality, temperature, salinity, etc.

Some networks also monitor the presence of pathogens of interest to the shellfish industry, pathogens which have a major impact on shellfish health, such as the herpes virus, Vibrio *aestuarianus*, the *Francisella halioticida* bacterium, and so on. **These networks have multiple objectives** for professionals, always with a view to improving and adapting breeding practices:

a. Obtain an early estimate of the catch before the oyster peeling period,

b. Monitor shellfish recruitment as an indicator of ecosystem health,

c. Evaluate the zootechnical performance (growth, mortality and quality) of shellfish about the environment and farming methods,

d. Establish standardised breeding norms under production conditions that are representative of local activity by characterising seasons and production sites,

e. Be reactive in the event of exceptional events (mortality, pollution, etc.).

Similarly in Ireland, Shellfish farmers operate with a similar system of animal health surveillance objective aimed at avoiding disease introduction and to minimise the impact of disease outbreaks should they arise. This is outlined in the Good Practice Guidelines for the Pacific oyster industry6

which provides guidance for producers in relation to strengthening on-farm biosecurity measures and on potential measures to assist in minimising stock losses associated with disease (Marine Institute, 2023).

Finally, some professional shellfish farmers guarantee the **continuity of their production by operating their stocks on several concessions spread over several territories**. In this way, they can protect their shellfish in the event of a suspected health or animal health problem and guarantee the healthy quality of their products.

Shellfish farms

In response to **recurring problems of water quality degradation in shellfish production areas** (microbiology, chemistry, etc.), shellfish farmers have equipped their onshore **operations with above-ground purification and storage tanks on their land-based farms**. This equipment, which can operate in a closed and recirculated circuit, gives shellfish farmers the capacity to store their shellfish in clean water in the event of health alerts. However, not all shellfish can be stored in tanks for more than 2 days. While the process works well for oysters, it is complicated to set up for mussels, cockles and clams.

The use of above-ground basins requires **rigorous management of the quality of the pumped water** supplying shellfish farm equipment. Sea water is usually pumped in close proximity to the operating sites. In this respect, professionals, either individually or collectively and in agreement with government departments, can equip themselves upstream with **unsinkable basins, with controlled water inflows, that guarantee a reserve of water** for purification and storage basins. These water reserves enable initial water treatment by **decantation and UV action**.

Then, the water may pass through a filtration system (sand filter, bag filter, etc.) and, in some cases, UV lamps, before being fed into the basins. In order to achieve optimum water quality, professionals also invest in **innovative filtration systems (micro-bubbling), the performance of which is monitored and validated by government authorities.**

Hatcheries and nurseries, by virtue of their production, are particularly sensitive to this issue and must also provide their customers with animal health guarantees. For **pumping water treatment**, these structures are **systematically equipped with settling basins, filters (sand, bags, cartridges, lamellae, etc.) and a UV steriliser**, preferably oversized by manufacturer standards, as seawater can retain residual turbidity despite filtration. Finally, **bacteriological and virological checks** are carried out at every stage of the larval cycle, from broodstock management to micro-nursery, to control mortality and guarantee the absence of pathogens.

Equipped in this way, shellfish farmers can continue to purify, store and market their shellfish even in the event of health alerts and closures of production areas. In fact, some professionals **only work in closed circuits, without water renewal, and put their products under cover as soon as the health-risk periods begin**, for example, in winter for the norovirus risk.

In addition to above-ground basins, depending on the region, **oyster beds, converted former salt marshes, are also used by professionals to shelter their shellfish in the event of health alerts or during periods of** norovirus or toxic microalgae **risk**. Water quality in these environments is monitored by professional organisations or government services, and water inflows can be controlled by professionals. Storage for 15 to 20 days in oyster beds provides an additional health guarantee for the products, protecting them from contamination affecting shellfish production areas located on the foreshore.

To control the risk of norovirus, following research carried out under the OXYVIR 2 project (FEAMP, 2021-2023[7]), some professionals are using **infectious F-specific RNA bacteriophages to estimate the presence of infectious norovirus in their oysters**. Purification experiments conducted show an

extinction of the infectious signal in phages after 15 to 20 days (Hartard et al., 2017; Leduc et al., 2020). So, in the event of health alerts or during the norovirus risk period (November to April), in addition to the good practices in shellfish production areas related to norovirus described above, professionals apply **long-term closed-circuit purification to their products until the disappearance of infectious phages in their shellfish has been confirmed by analyses**. Professionals using this practice have not received any customer feedback concerning norovirus collective food poisoning on their shellfish during the gastroenteritis period (November to April).

Although these practices and equipment ensure continuity of business for professionals, we would like to point out that these investments involve non-negligible operating and analysis costs (around 250 euros for a norovirus analysis) for the companies that primarily work on the coast. Shellfish are farmed in **shellfish production areas classified in compliance with European regulations by the competent authority, which must guarantee water quality for shellfish farmers who, despite being victims of these pollutions, find themselves in contradiction with the polluter pays principle**.

Lastly, **in recent years, trade organisations have been developing new skills to support shellfish farmers in health and animal health matters**. They have **"health centres", which may or may not be recognised by the government,** with clearly identified health and animal health advisors. They can plan and supervise self-monitoring plans in shellfish farms in their area, in conjunction with approved departmental laboratories, and help professionals manage their non-conformities.

Communication and training in the shellfish industry

Developing and transferring these best practices requires **regular communication between those involved in the shellfish industry**, as well as the creation of specific training materials for professionals.

Professional organisations play an important role in providing a **forum for exchange and sharing** throughout the year, through **organised meetings and working groups bringing together professionals, inter-professional organisations and government bodies**. For example, in France, the Shellfish Farming Committee regularly organises health commissions bringing together their professional representatives and government departments. Among other things, these meetings deal with regulatory news, present the progress of research projects linked to the quality of health and the health of the shellfish, and orientate work according to the needs of professionals. The regional or national professional bodies are key points referent for helping professionals and providing advice to businesses throughout the year.

This information and advice is also transmitted via the **newsletters of professional organisations, primarily aimed at shellfish farmers**.

Exchanges with those involved in fundamental and applied research are just as important and necessary. Numerous events bring together professionals, the world of research and government agencies – to achieve these sharing and consultation objectives. Popularising projects and studies are essential for shellfish farmers to correctly take onboard the results and conclusions. Similarly, the experience of professionals and their knowledge of the environment and the animals is essential for good research.

Finally, to help shellfish farmers understand and meet their health and animal health obligations, professional organisations working with the training sector offer their members HACCP training courses and guides to good hygiene practices, as well as guides to good animal health practices. Some documents, such as those for hatcheries and nurseries, are specific to a particular category of company. These materials, drawn up by the professionals themselves and interprofessional parties, may be validated by government departments. While they meet the requirements of European

regulations, they can also go beyond this framework by proposing best practices directly derived from and shared by the field, depending on the problems encountered in shellfish businesses.

3. Other existing best practices to be clearly defined

As mentioned in the introduction, other types of "*good practices*" in shellfish farming exist that go beyond the "*health/animal health*" framework and deserve to be fully considered by the European Commission in its definitions of "*good shellfish farming practices*". The section aims to provide a **non-exhaustive** reminder of practices previously presented by the AAC, which can be carried out by professionals and/or European professional organisations, and which deserve to be taken into consideration in the Commission's reflections on the main categories of "good practices" in shellfish farming, and by extension, in aquaculture.

In line with the values of sustainable European aquaculture integrated into its marine ecosystems, as stated in the AAC Recommendation on Aquaculture Values (December 2021), shellfish farming contributes to **European food security with low environmental impact** and provides **multiple ecosystem services (water purification and clarification, nitrogen sinks, carbon sequestration** (Alimpex)[8], **biodiversity sinks**, etc.) [9]. These ecosystem services, which are still difficult to quantify, are provided on a daily basis thanks to the work of professionals. Also, research into quantifying and disseminating these services, as well as raising public awareness of these issues, are actions and practices carried out by professionals (or groups of professionals) who need to be supported, even more so today.

On the other hand, "*good practices*" that help to reduce the carbon footprint[10], however small it might be in shellfish farming, of the production chain and downstream, must be encouraged and supported. With regard to the **decarbonisation of the sector and aquaculture vessels**, regional and national initiatives, made possible in part by European subsidies, are being set up[11]. The transition from traditional shellfish barges to electric or hydrogen-powered barges also contributes to the attenuation of the carbon impact and can be considered as a practice of mitigation and adaptation in the face of global warming[12]. (Scyphers et al., 2011; Steven G Hall et al., 2011). On a different theme, there are numerous commitments by the industry in the EU to **recycle plastic waste** [13] **and its by-products**. These **virtuous practices**, mostly implemented as part of a regionalised circular economy, are still costly and need to be fully recognised and supported.

In terms of adapting to global warming, other livestock farming practices, in line with European Directives, are being developed in member states. The issue of **crop diversification, integrated multi-trophic aquacultures and the multiple uses of sea areas** are, for example, particularly pressing for shellfish farmers, who have to contend with ocean acidification and the weakening of associated biological processes. Genetic selection strategies are also followed with interest.

Finally, it is essential to point out the existence of **good practices** led by professional organisations to **encourage new shellfish farmers to take over concessions**, as the **attractiveness of these professions** and **access to concessions** are being undermined, notably by land pressure, the arduous nature of the work and the deteriorating quality and scarcity of shellfish waters.[14][15] Several initiatives are already underway to alleviate some of these problems (grouping of professionals with local players, facilitating access to exoskeletons to reduce drudgery, etc.).

4. Recommendation

To the European Commission:

- The AAC insists on the need to identify and distinguish "good husbandry practices" specific to shellfish farmers from those of fish farmers, as the latter do not share the same requirements in terms of animal welfare, health and animal health constraints.
- The AAC strongly encourages a better definition of "good shellfish farming practices", by establishing precise categories of "good practices" (environmental, social, economic, zootechnical, scientific, for safety at work, etc.) during the next review of the Common Fisheries Policy or, preferably, in the next Common Aquaculture Policy, as mentioned in the AAC letter of 17 April 2023[16].
- The AAC recommends being consulted to the definitions of these "good practices" categories, by drafting new recommendations and taking into account its previous recommendations.
- The AAC suggests recognising the pathogens *herpes virus (OsHV-1); Vibrio aestuarianus*; *Francisella halioticida*, etc., as "pathogens of interest" in European regulations, and including them in Member States' animal health surveillance systems.
- The AAC recommends facilitating the sharing of best practices between Member States.

To the EU Member States:

- The AAC suggests improving their health monitoring of shellfish production areas to better prevent and manage the risks associated with marine biotoxins and norovirus in particular.
- The AAC recalls the obligations in terms of water quality, in particular those relating to compliance with good ecological status and the protection of shellfish areas defined as areas designated for protecting aquatic species of economic importance in the Water Framework Directive.
- The AAC encourages Member States:
  - in addition to regulatory health surveillance, to encourage the introduction of predictive warning systems linked to pollution from catchment areas (viral, chemical, pesticide pollution, etc.),
  - to support producers in making the investments needed to shelter livestock and purify shellfish and water,

to monitor regulated pathogens as well as unregulated pathogens of interest to shellfish farming, and to support professionals in implementing appropriate management measures. to support producers in setting up suitable systems to protect and purify shellfish production areas, to set up predictive warning systems (in particular to prevent overflows) with upstream watersheds, and to support producers in monitoring regulated and non-regulated pathogens of interest to professionals.

- The AAC recalls the importance of promoting:
  - dialogue between watershed stakeholders on water quality issues.

- meetings between shellfish industry operators (professional organisations, etc.) and national and European scientific bodies to identify best practices in shellfish farming and to draw up guides explaining these best practices,

- The AAC reminds the necessity to involve professional bodies and professionals in the implementation of these best practices, taking into account the specific characteristics of each territory.
- To this end, the AAC recommends strengthening the role of professional organisations, which provide real support for shellfish businesses in terms of passing on information, advice, sharing and exchanging ideas and driving the acquisition of knowledge and best practices in shellfish farming.

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