Guidance document

on Environmental Performance

Introductory Comments

The length and format of the document is challenging for member organisations and is not easily accessible for farmers. Moreover, the pages in the document aimed at farmers to assess their environmental performance are only 14, while those aimed at public administrations are 46. This quantitative imbalance indirectly proves a bias in the content of the Guidance Document.

The document identifies that, 'Given the continuous development of the sector (e.g. emerging circular-economy approaches, new product environmental footprint category rules for aquatic food), this document will need to be regularly updated'. The AAC highlights and recommends that for indicators to be relevant and implementable for operators across Europe, close consultation with all stakeholders is necessary. The Commission should allow sufficient time in this consultation process for operators and experts from a range of production systems to study the proposals and develop joint recommendations. Before approving the Guidance Document, test trials should be run in real farming situations (for all farming types) to check the validity of the selected indicators.

Separate documents are anticipated on the environmental benefits of aquaculture, and on the impacts of feed in aquaculture. The document title, 'Guidance Document on Environmental Performance', suggests a broad scope including all impact categories and beneficial impacts. The title should be adapted to reflect the scope of the document.

The AAC also notes that the decision outlined in the initial part of the document to produce separate sections for negative and positive impacts is inconsistently applied in the subsequent chapters.
The AAC stress the lack of clear definitions of the concepts of impacts and "performance evaluation" which should consider both positive and negative impact on the same plan.

The AAC considers that if some improvements have been made to include the last recommendations, the fragmentation and the unbalanced consideration of these impacts, the facts that important information are still missing, and others are misleading (especially for bivalve molluscs and algae) is making the document difficultly usable for Member States, operators, and other potential stakeholders.

Aquaculture farmers interested in implementing this Guidance Document should be able to directly identify and measure for themselves the environmental performance indicators. However, as presented in the draft document the indicators to be measured are vague. Instead of indicators the proposals are categories of indicators. For example, "Actual measurement of freshwater use" is meaningless unless compared to kg of fish produced and during a certain timeframe. It is the same for most of the rest of indicators.

For all these reasons, the AAC identifies a risk of missing the initial objective of "performance evaluation" at both European and national levels.

Input received from the AAC members

The Aquaculture Advisory Council (AAC)'s members wish to bring inputs from individual members to the current Commission's work to draft a **guidance document on Environmental Performance.** This addition of contributions does not constitute an AAC position.

These comments are based on the draft presented in November 2024. The AAC would welcome the opportunity to contribute to any other preliminary draft of the guidance documents that the European Commission could be sharing with us.

Contributions listed below:

- ✓ **Fédération Européenne des Fabricants d'Aliments Composés (FEFAC)**
- ✓ **COGECA**
- ✓ **Federation of European Aquaculture Producers (FEAP)**
- ✓ **Comité national des Pêches Maritimes et des Elevages Marins (CNPMEM)**
- ✓ **European Fishmeal and Fish Oil Producers (EFFOP)**
- ✓ **Compassion in World Farming Europe**
- ✓ **Eurogroup for Animals**
- ✓ **ROMFISH**
- ✓ **European Mollusc Producers Association (EMPA)**
- ✓ **Comité National de la Conchyliculture (CNC)**

- **FEFAC**

- Page 8 section 2.1.2: What is said about FCR is not correct - the factors cannot be compared and do not lead to a low FCR. Uneaten feed leads to a high FCR and faeces and excretion does not have any impact on the FCR. Actually, the FCR is the quantity of feed needed to produce a kg of product of animal origin. A high FCR means a higher quantity of feed needed and is therefore a sign of low performance. The term is therefore used in the wrong way across the document.
- Page 8 section 2.1.2: Diseases will not lead to a lower FCR as stated here – disease will lead to the opposite.
- Page 10 section 2.2.2: A low FCR will not indicate a higher fish mortality
- Page 10 section 2.2.2: Normally there is no discharge of medicines and pollutants from raceways and tanks as there is a kind of cleaning system and the use of medicine is limited.
- page 12: "Regarding treatment use, … can enter the environment from feed (Zn) 28 ". Feed is not a treatment and Zn present in feed is a nutrient. The release of Zn in the environment is

already captured by the paragraph on nutrient emissions above. Regarding Pb in feed, it is already covered by the reference to heavy metals under "benthic impact.

- *Page 12, footnote 28: "In the case of this substances in feeds, there is the Undesirable substances in animal feed Directive, the EU pesticide regulation, amended in Regulation (EC) No 1107/2009 and repealing Council Directives 79/117/EEC and 91/414/EEC, and the EU feed additives regulation No 1831/2003. Regulation - 1107/2009 - EN - EUR-Lex (europa.eu)*". Feed is not a treatment. Pesticides are not administered via feed. Only veterinary medicines are. If the purpose of linking pesticides and feed is to refer to the presence of pesticide residues in feed, the right legal framework is Regulation 396/2005 on pesticides MRLs and not R1107/2009 which is about authorisation of pesticides.
- Page 14: " *Off-bottom bivalve molluscs grow-out relies on natural feed (e.g. phytoplankton) without the need for* ***artificial*** *feed or fertilisers."* The notion of "artificial is used in a misleading and derogatory way here. A proper terminology would be "manufactured" feed.
- Page 49/50: It should be checked whether the good practices that is mentioned here as an example is compliant with the EU legislation. It is currently prohibited to feed farm animals with waste. So it should be checked whether, in the presented case, the insSo it should be checked whether, in the presented case, the insects are fed with ".. consisting in insects, which in turn have eaten by-products" or waste. In the first case, then the wording should be changed to from the food industry" ".. consisting in insects, which in turn have eaten by-**products** Alfiko et al. (2020). Insects as a feed ingredient for fish culture: Status and trends. Aquaculture and Fisheries, Volume 7, 2, March 2022, 166-178. from the food industry" https://www.sciencedirect.com/science/article/pii/S2468550X21001465 the feeding of insects with waste is prohibited. Otherwise, another illustration of the use of insects in fish feed should be taken (e.g. Alfiko et al. (2020). Insects as a feed ingredient for fish culture: Status and trends. Aquaculture and Fisheries, Volume 7, 2, March 2022, 166-178. https://www.sciencedirect.com/science/article/pii/S2468550X21001465
- Page 51: the footnotes 6 and 7 are inverted.
- Page 52: the term "waste" is inappropriate. Waste are prohibited for use as feed. Only by-products are.
- Page 52: "Benefit / Impacts": although the whole of this good practice is about especially formulated feed to reduce waste and eutrophication, the example taken is presented as a aiming to stimulate fish to utilise natural food sources more effectively. This sounds not consistent since "natural food sources are not part of the formulated feed. If the objective is to point to the presence in the formulated feed of feed additives such as enzymes that improve the digestibility of the "natural" food, this should be specified.
- Page 52: it sounds quite strange that the only example given of a feed especially formulated to reduce waste and eutrophication is this one. There are plenty of other relevant examples in farming of other fish species under intensive production systems.
- Page 54: among the examples quoted, we would suggest mentioning also the AAC recommendations on the circularity of fish feed (AAC 2022. https://aac-europe.org/wp-content/uploads/2023/07/7.-AAC-Recommendation-Circularity-of-Fish-feed_2023_7-2.pdf) .

- Page 55 footnote 12: we suggest using rather this weblink that points to both the brochure on sustainable feeding strategies and the case studies per species: https://fefac.eu/pages/sustainable-animal-feeding-strategies/
- Page 71: It is understood that the environment footprint of feed production is not covered by the document. It should however be specified that feed digestion is obviously covered.
- Page 73: external data: a code of practice regarding communication of the environmental footprint of feed has been recently approved by the EU Commission, which will stimulate the communication by aquafeed manufacturers of primary data to fish farmers including on feed digestion, not only secondary data.
- Page 86: could be added to the list of relevant EU legislation the Feed Additives Legislation (Regulation (EC) 1831/2003), that requires an environmental risk assessment before authorising a feed additive.

- **COGECA – Comments on the draft from June 2024**

- A remarkable contradiction can be found in the document, investigating the environmental indicators of different segment of aquaculture. It is declared in the chapter 2 which sectors of aquaculture are included into the examination (all of them). In the following (chapter 3) section also can be found statements both on marine and inland aquaculture, although marine ones considerably more highlighted.
- However, in Chapter 5, which deals with environmental indicators, inland aquaculture, in particular pond aquaculture, which has a complex relationship with its environment, is not mentioned at all. For this reason, I think it is important to stress that this issue lagged behind painfully and it is urgent to define the proper special environmental indicators for inland aquaculture, including pond farming. Without it is not possible to understand the environmental performace of inland aquaculture.
- In Section 2.1.2. on Land-based production systems, COGECA mentioned that extensive pond systems are manufactured mostly in constructed wetlands and which provide several benefits and services to the natural ecosystem.

- In Section 3 on Environmental impacts on page 11, the aim of this chapter should be to describe the impact that aquaculture activities may have on the biotic and abiotic elements of the ecosystem. It must be stated that the impact can be both negative, neutral (in some aquaculture technology for some environmental elements) and positive on the ecosystem.
- In Section 3.1. "Physical impacts, including impact on seabed and water flow", water bottom and water regime should be added to the title. On page 11, when the installation of land-based facilities is mentioned, ponds should be added next to flow-through systems and recirculating aquaculture facilities (RAS). Furthermore, when talking about the impact of water abstraction due to these installations, it mentions "an impact on the course of the river (e.g. water flow) and the landscape", when it should mention "an impact on the surrounding surface and ground water regime as well as landscape". But, they agree with the fact that ground water is affected by RAS and should be included in this paragraph.
- On page 11, when talking about ensuring that an aquaculture activity does not cause any significant harm to the biodiversity or protected species or habitats, the effects on abiotic and biotic environmental elements should be divided.

- About the title of 3.2 "Benthic impacts and nutrients, including water quality and effluent management (excess feed, faeces), nutrients/eutrophication", they believe that it is quite a marine cage focused title. They suggest the following title: "Impact on nutrient cycling and natural food wed, including water quality and effluent management (excess feed, faeces), nutrients/euthrophication".
- Concerning Section 3.2, these are all valid findings, but above these, the effluents may cause alteration in the nutrient cycling of receiving surface water bodies, both for their abiotic and their abiotic elements. So the indicator should focus on this alteration. The impact, especially determine the impact of ponds is a complex issue, because these operates as an integrated part of natural ecological processes, so their nutrient balance also can be negative with nutrient retention.
- In Section 3.3, it should also be mentioned with regard to inland waters that the effect of fish stocking to natural waters as well as transport of live fish among different river basins or sub-basins can cause spreading of alien and invasive species (unwanted fishes and other organisms). The invasion that can be connected to fish farming can seriously modify the natural aquatic ecosystems, which is amplified by climate change.

- Section 4 is a coherent part, but they would mention here at least in one sentence that for complex biotic environmental issues (e.g ecological status of receiving waters, or fish ponds) other scientific approach can be adopted, especially, which were used in WFD, such as integrated biological indices. These indices would be urgent to develop for better understanding the environmental performance of pond aquaculture in the EU.
- Finally, in Section 4.3 concerning PEFCRs, it must be mentioned that it was developed only for marine aquaculture. Inland aquaculture, especially pond aquaculture, due to its complexity needs special PEFCR to determine its impacts on the natural ecosystem.

- **FEAP – Comments on the draft from June 2024 except the last paragraph**

- Concerning Section 2.2. on "Non-fed aquaculture: filter feeder and algae", there is a need to be careful with the use of the term shellfish, as crustaceans are also shellfish and are "fed-aquaculture". It would be better to use molluscs in this paragraph.
- On page 11, FEAP believes that RAS should not be included in the following paragraph: "The installation of land-based facilities such as flow-through systems and recirculating aquaculture facilities (RAS) imply water abstraction, which could have an impact on the course of the river (e.g. water flow) and the landscape".
- FEAP would add the two words in bold in the following paragraph in page 11: "For this reason, to ensure that an aquaculture activity does not cause any **significant** harm to the biodiversity or protected species or habitats, according to the EU regulation (Birds and Habitats Directives), the authorities perform a habitat screening/assessment for all activities, and aquaculture can only get permission if the activity does not **significantly** adversely affect any protected area, and species."

- Concerning the following paragraph in Section 3.2., "Uneaten feed, faeces and excretion, mostly due to poor quality feed (e.g. high solubility, less digestibility) and or inappropriate

feed management systems (e.g. improper feeding ration and feeding frequency) as well as diseases cause low Feed Conversion Ratio (FCR).", even the best-performing feeds require the fish to expel faeces. This should be rewritten to express that better feeds produce less faeces and excretion. In the following paragraph in Section 3.2., the words "low FCR" should be changed to "high FCR".

- The word "entering" should be added to the following paragraph in Section 3.2 in page 11: "Organic matter and nutrient pollution may lead to hypoxia (low levels of dissolved oxygen) and eutrophication due to the excessive growth of phytoplankton, which also reduces the transparency of the effluents **entering** receiving water bodies."
- Concerning the following paragraph in Section 3.2. in page 13, "Under the net pens or in their surroundings, organic and nutrient enrichment could be also harmful to the life on the seabed. They could affect the physicochemical compositions of the sediment and affect the **benthic communities** (Martinez et al., 2012).", this can also happen beneath intensive shellfish production rafts. Pseudofaeces accumulate below them and cause similar sediment nutrient enrichment problems.
- The words "not measurable" should be replaced by "imperceptible" in the following paragraph in Section 3.2. in page 12: "It is worth mentioning that, in well-managed marine aquaculture net pens, sited in well-flushed waters, the impacts on water quality as well as the benthic effects are usually not measurable at thirty and one hundred meters beyond the cages, respectively (Price et al., 2013)". The mention of "thirty and one hundred meters beyond the cages" is a too prescriptive remark.
- In page 12, the words "managed by" should be replaced by "decantated and passed through" in the following paragraph: "Similarly, in land-based aquaculture facilities where the effluents are managed by drum filters (e.g. recirculating aquaculture systems, RAS) and settlement tanks (e.g. ponds and flow-through systems) the environmental performance of the farms is improved."
- In Section 3.3, the following paragraph is difficult to interpret: "Locally absent species can be introduced from aquaculture facilities when fragments from the aquaculture structures are accidentally lost in the wild water body and reach a new area spreading the fouling fauna from the original site."
- Concerning the following paragraph in Section 3.3, "Thus, locally absent species can be seen in the surroundings of the facilities, and their presence has two main impacts: i) breeding with the native species producing hybrids, and ii) competing over the natural resources (space and food) and replacing the native species.", there is some confusion here. "Locally absent species" are "native species". They just happen to be there anymore for whatever reason. But they are not exotic.
- In the following paragraph in pages 12 and 13, FEAP would add the two words in bold as well replace "released" by "escaped": "Marine fish farmers are obliged to report escaped fish in some countries (e.g. Norway), while in the Mediterranean countries, this is in general not mandatory. However, farms in possession of certain certifications register and report voluntarily and regularly the number of fish released from the facilities."
- In Section 3.5 on page 14, the words in bold should be added to the following sentence: "According to the EU, up to 85% of marine litter is made up of plastics, being 27% of this formed by fishing-related items **mainly from capture fisheries".**

- In Section 4, when mentioning the Environmental Impact Assessment, reference to the legislation is missing. Concerning Section 4.1 on the Life-Cycle Assessment (LCA), LCA is not used today in aquaculture. The PEFCR rules are still in development.
- Concerning Section 4.2 on page 16, the Product Environmental Footprint is the EU recommended Life Cycle Assessment (LCA) based methods to quantify the environmental impacts of products, so there is a question around the need to separate this from the previous point.

- All the selected environmental performance indicators are not such indicators but categories of indicators. For example, "Fresh water" is not an indicator (it's a category), were "Consumption of fresh water" could be one. Nonetheless, a criteria should be defined, as "Actual measurement" is meaningless. This criteria could be "Cubic metres of freshwater consumed per kg of fish produced". And this has to be caried out for all indicators in the document.

- **CNPMEM – Comments on the draft from June 2024**

- In Section 3.1 "Physical impacts, including impact on seabed, and water flow", concerning the installation of land-based facilities and the example of RAS, RAS systems do require water withdrawal, but like all land-based fish farms. The aim of RAS is to optimise the use of water through recirculation. This may not be the best example here.
- In Section 3.2. on page 12, concerning drum filters, most RAS systems also use bacterial filters and UV filters.
- In Section 3.3, it would be useful to include a paragraph on pathogens, which can also have an impact on biodiversity in the vicinity of fish cages. Sea lice are a real problem. Its spread is due to the high densities of salmon in the cages. It attacks farmed salmon but also has an impact on wild populations, whose numbers have been falling sharply for several years.

- Concerning Section 6 and the indicators, it would be relevant to add an indicator on pathogens: number of pathogens and density of pathogens per m3.

- **EFFOP – Comments on the draft from June 2024 on §1 and §2**

- In Section 4.2. on page 16, the segregation is confusing between Section 4.1. on Life Cycle Assessment and Section 4.2. on the Product Environmental Footprint.
- In Section 5.3. on page 19, it is suggested the update the section on the call for volunteers of DG ENVI and DG GROW to present projects to develop PEFCR for specific products groups of 2019 since the second stakeholder consultation just ended in 2024.

- **Page 25, Table 5, Section 4.2.4:** The term "alternative ingredients" could be clarified. For example, the European fishmeal industry valorizes 41% of its raw materials from by-products to produce circularly produced fishmeal and fish oil. Is the objective of the table only to focus

on alternative ingredients or overall circularity? We suggest replacing "alternative ingredients" with "ingredients" to ensure consistency and align with the objectives of the new Circular Economy Action Plan. This also supports the broader shift from a linear to a circular economy, as later discussed on page 49.

- **Page 25, Table 5:** Similar to Section 4.3.1, the term "sustainable alternative ingredients" could be simplified to "sustainable ingredients." Traditional ingredients like fishmeal and fish oil play a critical role in nutrition strategies and environmental performance. The focus should remain on sustainability rather than promoting alternatives for their own sake in this section.
- **Page 49:** The example of Greece's *Insects4Aqua* project highlights innovative research but is misleading. Current EU legislation prohibits using organic waste in insect farming. The document should ensure that examples align with existing regulations to avoid misinterpretation
- **Page 49, Sweden:** The example of Sweden also requires critical evaluation of compliance with EU legislation. Additionally, the feed in the project had an inclusion of 29% insect meal and 28% marine ingredients in the formulation which is a bit misleading for what is being suggested as a good example.
- **Page 50:** The statement, "Processing plants generate twice as many fish by-products as are currently being collected for marine ingredient production," needs a reference. If accurate, it suggests that 2,600,000 tonnes of fishery by-products are not utilized if I have understood it correctly, given that 41% of European marine ingredient production in 2024 came from by-products (1,363,480 tonnes).
- **Page 52:** The statement, "A sustainable feed system includes sourcing feed ingredients by respecting ecosystems and biodiversity, but also reducing reliance on fish meal and oil from wild stock," is problematic. Marine ingredients, when responsibly sourced and certified by MSC, MarinTrust, or ASC, are sustainable, especially when derived from stocks with no value for human consumption. We suggest rephrasing to "reduce reliance on fishmeal and fish oil as limited ingredients" to reflect the greater need to have more feed security to meet the growing demand of aquaculture. Also waste is illegal to use in feeds and should be removed as it is currently written.
- **Page 52:** The assertion that "alternative proteins such as poultry by-products and insect meals have shown good environmental performance" is subjective and potentially misleading. While these alternative proteins can contribute to sustainability in specific contexts, their environmental performance must be critically evaluated. For instance, when assessed using the EU Product Environmental Footprint Category Rules (PEFCR) methodology, insect-based proteins may not exhibit superior environmental performance due to the additional trophic level introduced in their production. This factor often results in higher resource inputs and energy demands compared to other protein sources. Rather than championing alternative proteins like insect meal as a standalone solution, it is more accurate to position them as part of a collective strategy for sustainable feed development.
- **Page 52:** Instead of "holistic," consider referencing Glencross et al. (2007), which outlines a framework for feed performance including digestibility, palatability, functionality, and nutrient utilization. Building around these principles ensures a balanced and sustainable feed.

- **Page 52:** "Utilizing natural food sources more effectively" should be clarified. Feed is manufactured, so the focus should be on optimizing nutrient utilization for digestibility, and palatability among other things and how this promotes growth, and welfare.
- **Page 54:** The statement, "The use of alternative ingredients in aquafeed decreases the pressure on marine wild species," is misleading and oversimplifies the reality of sustainable resource management. European fish stocks are carefully managed under ICES recommendations, which utilize ecosystem-based models to calculate maximum sustainable yield (MSY). This ensures that marine resources are harvested responsibly and within ecological limits. The current wording suggests that using alternative ingredients inherently reduces our need to source from wild stocks but this is not the case. For example, responsibly sourced marine ingredients often come from stocks that are non-competitive with direct human consumption and are harvested under strict regulatory frameworks and will be harvested based on the agreed TAC from ICES advice.
- We suggest rephrasing the statement to, "The use of alternative ingredients in aquafeed promotes feed security by diversifying resources and reducing reliance on limited ingredients." This wording acknowledges the importance of resource diversification to meet growing global demand without undermining the responsible use of marine ingredients. It also avoids unintentionally devaluing well-managed marine stocks, which are a critical component of sustainable aquaculture systems. Such an approach ensures that both traditional and alternative ingredients are viewed as complementary rather than mutually exclusive, aligning with the broader environmental goals and circular frameworks

- **Suggestion for Incorporation:** To enhance the understanding and context of world stock references repeatedly made in this section, I recommend incorporating insights from the article available at https://www.tandfonline.com/doi/full/10.1080/23308249.2024.2337426. For a discussion on sustainability metrics and why the concept of forage fish is not considering the whole hollistic impacts needed in sustainability assessments.

- **Page 54, Implementation Challenges:** Expand the discussion to include single-cell proteins, algae-based meals and oils, and circular products. Highlight the challenges of aligning food production systems to maximize resource utilization, ensuring a comprehensive approach.

- **Page 55, Belgium:** which polyunsaturated fatty acids? And then why they are important

- **Page 67:** The statement regarding the efficient management of fish trimmings aligns with EU Regulation 142/2011. However, caution is needed to avoid suggesting that same-species feeding is permissible, as it is illegal currently.

- **Page 67:** Sludge is also a valuable source of phosphorus with potential for feeds by use in single-cell protein culture, provided the legal definition of sludge evolves within EU legislation. This challenge needs highlighting in the document.

- **Page 67:** Consider referencing BioCeval in France, Germany, and Spain, which processes only by-products, as well as Pelagia in Norway, the UK, and Ireland, for small-scale sidestream utilization in fishmeal and fish oil production and ANFACO-CECOPESCA in spain.

- **Page 71:** "Various impacts" should be revised to "impact categories," aligning with the terminology used in environmental impact modeling and EU PEFCR guidelines for feed.

- Concerning the Life Cycle Assessment, it is also worth mentioning the different forms of allocation and burdens that are used to monitor PEF in LCAs, mass balance, economic balance, energy balance etc and the confusion it can generate.
- EFFOP agrees with the following sentence "Challenges by applying the LCA-methodology is the complexity and lack of standardisation of the models used in the calculations". That is why for feeds at least, they should follow the EU PEFCR rules to level the playing field. There are similar standards for marine ingredients that can be added to this section: https://www.marinefishpefcr.eu/. The second updated version is due to be released soon.

- **Compassion in World Farming Europe – Comments on the draft from June 2024**

- Concerning Section 3.2. on Benthic impacts and nutrients, FCR is an inaccurate measure of environmental performance and efficiency since it misses the impact of nutrient concentration eg protein, nitrogen or phosphorus concentration in the feed. Ideally we should have a measure of nutrient efficiency, eg protein conversion ration etc. If an additional indicator is the concentration of key nutrients in the feed, this can be worked out automatically from the FCR. Ideally the yield of fish from the carcass is also factored in so you get a measure of nutrient efficiency in relation to actual human food. Again, the calculation can be automatic if the right data is fed in.

- Concerning Section 6, this list of indicators is most appropriate for caged systems and perhaps raceways and very much less so for pond and molluscan shellfish systems. RAS systems may also need a different list. If the intention is to produce one common list, then those other systems need looking at separately and gaps filled. Then a piece of work is needed to work out the indicators needed for each system and perhaps for each species in each system. Earlier sections would then need to be edited as appropriate.
- Concerning the indicators, impacts of feed production are a really important aspect of environmental performance, though they understand this may be covered separately.

- **Eurogroup for Animals – Comments on the draft from June 2024 on §1 to §4**

- In Section 5.3. in the Table 4, the kilograms of dead fish to quantify mortalities is a key indicator as part of protein conversion efficiency and the impacts of wasted feed.
- In Section 5.4.1. in the table on the Physical Impacts, one of the most practical and important indicators to be regularly monitoring is the following "Monitoring the physical footprint of aquaculture activities on the seabed, including the extent of sediment disturbance, can be done through underwater photography, video transects, and side-scan sonar".
- In Section 5.4.5. in the table on Waste Management, the following indicator "the volume of mortality should be recorded and all stored and transported dead fish should be clearly registered (including information on the date when the dead fish are put into storage, the

destination, date of collection and relevant details of the receiving entity) and the number of dead fish (tonnes) generated yearly" is critically important at the core of protein conversion efficiency and the large impacts from feed.

- In Section 6, indicator 28 on the mortalities produced is critically important relevant to protein conversion efficiency and the largest environmental impact category of feed.

- Feed Conservation Ratio, or feed quantity, are poor indicators. FCR is not an indicator of environmental impacts due to not taking account of the content or sourcing or manufacturing of the feed, which varies significantly between feeds. Related to feed impacts, there should be a resource indicator that measures biological resources and/or biodiversity impacts. Protein retention is a relevant indicator. Trophic level of the species in the wild is also a relevant indicator, as a proxy for reliance on fishmeal, oil and other organic resources, as suggested by the JRC (https://op.europa.eu/en/publication-detail/-/publication/e4cc8c00-a11c-11ed-b508-01aa75ed71a1/language-en).
- A correction is needed to the sentence: 'Alternative proteins such as poultry by-products and insect meals have shown good environmental performance and could partially replace fishmeal in aquaculture diets(2).' N.B. in the referenced study, the substrate used to rear the insects is not know.
- While substituting part of fish diets with insect meals may mitigate some of the overfishing risks, research has found that the insect meal would have a higher environmental impact than fishmeal, notably on energy, land and water use, and on GHG emissions. Any benefit would also be limited due to nutritional constraints (fish cannot be fed more than 25-30% insects), and the sheer cost of insect meal, which is unlikely to compete with fishmeal in the future.

- **ROMFISH**

- **In paragraph 3.1.1**. it is considered that key aspects of the WFD are the following: "Environmental objectives, non-deterioration**, and aquaculture growth**". There is not a single reference to aquaculture, even less to aquaculture growth, in WFD and moreover the access to water and space bureaucracy simplification for aquaculture is, in some MS, hampered by national authorities applying WFD.
- **In paragraph 3.1.4.** there is the following statement which does not apply to all aquaculture: "Aquaculture activities are carried out in many Natura 2000 sites", because in the case of pond aquaculture, the way aquaculture was performed by generations created the possibility of increasing the value of a habitat by transforming it in man-made wetland, which increased the biodiversity in the area. So pond aquaculture created the premises for N2000 designation, not the other way around.
- **In Table 7,** regarding the indicator called **"Freshwater"** for "land-based aquaculture" and calculated as "Water consumption" we have to remind the Commission that in the Commission staff working document called "on the application of the Water Framework Directive (WFD) and the Marine Strategy Framework Directive (MSFD) in relation to aquaculture" it is stated that "Finally, it should be taken into account that aquaculture does not consume significant quantities of water, as most of the water is returned to the rivers" which is in a obviously confusing.

- **European Mollusc Producers Association (EMPA)**

We fully agree with the introductory comments and we believe it is appropriate to completely review the structure of the document.
However, if this is not possible, we propose the following changes (blue):

Title
Add text in blue:
"Environmental Performance - Part A: Negative impact"

Section 1.3 - First paragraphs page 3
Modified text in blue:
"Addressing the environmental performance of the aquaculture sector is a complex task, given that this sector covers multiple species, production systems, and different environmental parameters are relevant. This is why section 2 provides an overview of the most common production systems in the EU aquaculture sector, including a description of main impacts on the environment per production system. Environmental performance is the impact any activity may have on the environment. It includes negative and positive impacts which will be evaluated by mean of environmental indicators. These impacts are intrinsically linked. Nevertheless, it has been decided to split the document into two parts: "Part. 1 - Negative impacts" and "Part 2 - Positive impacts".
A second and separate document will address positive impacts of aquaculture and how to promote related ecosystem services."

Section 2 - Table 1 page 5-6
Added text in blue:
• Off-bottom systems (Shellfish and seaweed)
• On-bottom systems (Shellfish and seaweed)

Section 2 - Third paragraph page 6
Modified text in blue:
For the purpose of this document, potential impacts are organised under six main categories: i) physical impacts (e.g. water abstraction, infrastructures, hydrographic changes, light penetration, ~~visual impact~~), ii) emission of nutrients, (e.g. water quality, eutrophication; iii) benthic impacts (e.g. changes in properties of the sediment, effects on benthic communities), iv) biodiversity impacts (e.g. impacts of escapees, predators/wild fauna interaction in farm/stock, v) treatment use/discharge (e.g. use of medicine, use of antifoulants), and vi) waste management (e.g. use of plastics, mortalities, sludge).
(N.B.: The visual impact falls into the category of social impacts)

Section 2 - Table 3 page 7
Last row of table 3 should be split in three rows as follow:

	PHYSICAL IMPACTS	EMISSION OF NUTRIENTS	BENTHIC IMPACTS
On-bottom systems	Yes, positive Increased light penetration	Yes, positive Eutrophication mitigation	Yes, positive and negative Dredging Bottom oxygenation

		Waters nitrogen and phosphorus reduction	Deposits
Off-bottom systems	Yes, positive and negative Hydrographic change Reduced or increased light penetration		Yes, positive and negative Deposits
Long-lines systems			

	BIOBIVERSITY IMPACTS	TREATMENT USE / DISCHARGE	WASTE MANAGEMENT
On-bottom systems	Yes, positive and negative Dredging Artificial reefs	No	No
Off-bottom systems	Yes, positive OECMs		Yes, negative Structure materials Plastic nets - net bags
Long-lines systems			

Section 2.6 page 14-15

Modified text in blue:

2.6.1. General features

This sub-section includes aquaculture systems for i) shellfish, mostly bivalve molluscs, which are filter feeders (e.g. mussels, oysters, and clams), ii) other detritivorous benthic animals (e.g. sea cucumbers), and iii) seaweed production (macroalgae and aquatic plants), which rely directly or indirectly on the use of the nutrients present in the water column. They can be produced suspended (mussels, oysters and seaweeds) or directly on the seabed (mussels, oysters, clams, sea cucumbers).

Off-bottom systems refer to various structures used in aquaculture, including trestles, wooden supports and bouchots which are inserted into the seabed and mainly installed in the intertidal and shallow subtidal zone (foreshore and lagoons), while long-lines and floating raft (bateas), which are equipped with floats and anchored on the seabed, are typically installed offshore, in more or less sheltered coastal areas.

On-bottom systems refer instead to the farming of organisms directly seeded on muddy or sandy areas in the inter-tidal zone or shallow subtidal zone.

2.6.2. Impacts on the ecosystem of off-bottom and on-bottom systems, including benefit

Physical impacts could be related to the installation of off-bottom systems that can modify the hydrographic regime and reduce light penetration (shading). The structures used for cultivation may impact on hydrographic conditions in many ways, they can influence sedimentation patterns and modify water currents, they can reduce waves impact on the foreshore and limit coastal line erosion. Therefore, the impact can be negative or positive.

Bivalve molluscs grow-out relies on natural feed (e.g. phytoplankton) without the need for artificial feed or fertilisers. They contribute to **remove nutrients from water** with positive impact on the environment

• bivalves filter phytoplankton from the water and store nitrogen and phosphorus in their tissues. These processes effectively remove nutrients from the marine environment mitigating ocean eutrophication.
• filter feeders remove particulate matter from seawater, reducing water turbidity which increases light penetration with beneficial impact on the whole ecosystem.

Similarly, seaweed production increases water quality by removing nutrients from the water column. Additionally, this type of aquaculture helps mitigate climate change by capturing carbon in their biomass (carbon fixation).
Filter-feeding shellfish reduce plankton concentrations in the water and contribute in reducing the risk of algal blooms. Nevertheless, it is important to consider that in some cases of mussels' production, there could be some negative impact on the phytoplankton community due to their filter-feeding activities. It is worth mentioning that, as part of the ecosystem approach to aquaculture, evaluating the ecological carrying capacity for bivalve aquaculture could help to determine the maximum production levels that can be achieved without negatively affecting ecosystem functioning (Byron et al., 2024). This eventuality is unlikely as exceeding the carrying capacity would compromise the quality of the final product and the profitability of the activity. In any case, this concept cannot be applied in the same way to fish cages and off-bottom shellfish cultivation.

The accumulation of faeces and pseudo faeces that deposit on the seabed can lead to **benthic impacts**. In the case of on-bottom cultivation dredging for spat collection or for final product harvesting can also impact negatively on both the seabed and benthic populations. At the same time, it can have a positive impact by putting the deposited material back into suspension and oxygenating the seabed. Furthermore, some farmed species that burrow, such as clams, will contribute to the oxygenation of the substrate. Moreover, on-bottom aquaculture can also contribute to the improvement of the seabed through the activity of detritivorous species (e.g. sea cucumbers). These organisms, by moving through the sediment, help oxygenate the mud and prevent anoxic conditions.

Regarding **biodiversity impacts**, spat introduction from others areas can unintentionally introduce locally absent species into the open waters. This can also occur when fragments of the aquaculture structures are accidentally lost and carried to new areas. On the other hand, both systems, contribute to increase biodiversity creating sheltered area for reproduction and breeding of many wild species. Shellfish farm are no-fishing areas contributing to marine population restoration. On-bottom system can be can be assimilated to natural reefs, while off-bottom systems can be defined as "Other Effective area-based Conservation Measures" (OECMs).

Concerning **waste management**, off-bottom facilities can also impact ecosystems due to the use of plastic material such as ropes, netting, meshes, bags. It is essential to prevent their dispersion in the environment by adopting suitable disposal procedures and by ensuring careful maintenance to avoid breakages of the systems and waste of the related material. Furthermore, according to EU rules, such structure must be removed when farming activity is stopped.

Section 3, sub-section 3.1.6. page 21
The EU aims to prevent, minimize, and mitigate the adverse impacts posed by invasive alien species (IAS) on native biodiversity and ecosystems ~~services~~. IAS are animals and plants that are introduced accidentally or deliberately into a natural environment where they are not normally found, with serious negative consequences for their new environment. The Invasive alien species regulation

includes a set of measures to be taken across the EU in relation to IAS, with a list of invasive alien species (IAS) of Union concern (Union List) in its core.

Section 4

Comments:

- There are some available studies on LCA and PEF applied to shellfish farming: some of them should be cited:
  - Life Cycle Assessment of Oyster Farming in the Po Delta, Northern Italy (2019) - E. Tamburini - Resources 2019, 8(4), 170;
  - Life Cycle Assessment (LCA) of Two Different Oyster (Crassostrea gigas) Farming Strategies in the Sacca di Goro, Northern Adriatic Sea, Italy (2023) - D Summa - Resources 2023, 12(6), 62;
  - Carbon footprint of Scottish suspended mussels and intertidal oysters (2012)- SARF078;
- Regarding pollution from plastic materials, it appears in several parts of the document that aquaculture has a significant negative impact. However, if we consider the quantities of plastic materials used in aquaculture, compared to many other activities, the impact of aquaculture appears very limited. Furthermore, in the case of shellfish farming, it must be underlined that microplastics, mostly attributable to other anthropic activities, represent a problem for the sector.
- There are ongoing projects to set up alternative materials or to allow the recycling of the plastic material currently used: these projects should be mentioned.
  Lifemuscle project (https://lifemuscles.eu/en/)
- Some AAC previous recommendation should be cited:
  - Recommendation on carbon sequestration by molluscs - AAC 2022-16 - April 2022
  - Recommendation - Shellfish farming as a nitrogen sink - AAC 2023-8 - July 2023

Section 5 - Table page 76-80

Comments:

- Points 7 to 6 do not concern shellfish and seaweed (marine non-fed aquaculture): it should be specified.
- Point 13 do not concern shellfish on-bottom systems: it should be specified.

Section 5 - Table 8 page 81-83

Comments:

- Points 1 to 5: as far as only negative impacts are considered shellfish farming is not concerned. This observation clearly demonstrates that the intent of the authors of this document, to deal negative and positive impacts separately, is totally meaningless, especially when complex nitrogen and phosphorus biological cycles are involved.
- Point 6 of table 8 is a repetition of point 8 of table 7.

Whole document 5

Comments:

- The legislative context relating to environmental aspects is correctly reported in section 3, but the legislative context relating to concessions and authorisations, as well as the legislative context of health aspects, are not considered at all. In order not to further increase the discrepancies between the various regulations that regulate aquaculture activities, it is necessary to standardize the requirements and provisions to avoid superposition and regulatory conflicts.

- **CNC (Comité National de la Conchyliculture) - Comments on the draft from June 2024**

VERSION 1: Feedback from Shellfish farmers to the environmental indicators

- We would like to recall that the identification of environmental indicators and more largely, being able to monitor and assess the environmental performance of aquaculture production, is not an end in itself.
- As part of the Strategic guidelines, it is a means to ensure a further development of aquaculture in the EU that contributes to the Green Deal's growth strategy; a means towards an aquaculture that is competitive and resilient.
- We therefore ask the Commission to take into consideration the following general comments:

  - A lot of "non-fed-cultures" are not included in the 2.2 part. Especially the bottom cultures are not identified. You might find some details in the following regulation : https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009R0710. Algae, holothurias are not mentioned either.

- We find it regrettable not to have this "fed/non fed" distinction in the indicators while they are clearly distinguished in the description of the different production systems.

  - Indicators must be applicable to all aquaculture productions or at least, most of the European productions. As you could see in the Annex below, most of the current indicators are not relevant for shellfish. Consequently, given the time available, we would like to reiterate our request for clear guidance on whether this document will be followed by a complementary document for shellfish or whether we will ensure that for shellfish, the scores associated with these indicators are automatically those reflecting minimal impact because of not concerned by many identified impacts.

  - Indicators must also be able to reflect the positive contribution of aquaculture production systems to the environment (e.g. do not consider only emissions of N and P, but also absorptions; do not only consider (renewable) energy use but also production on farms), etc...

  - Even on a voluntary basis, the number and complexity of environmental indicators must be limited to a few key and relatively easy to use indicators. It is crucial to build on data / parameters / criteria that producers are already required to evaluate in the framework of the licensing and renewal of licences for example.

  - The monitoring of additional environmental indicators would also be favoured if such indicators can be used as an added value towards the customers.

Annex 1: Analysis of the Compatibility and Measure Capacity for shellfish farmers per indicator:

INDICATORS	SHELLFISH COMPATIBILITY	COMPATIBILITY EXPLANATION	SHELLFISH FARMER CAPACITY TO MEASURE THE INDICATOR
1. **Freshwater use**: m^3 or m^3 / tonnes produced. Waterflow measured using a current meter on site for 24 hours at the start, medium, and end phases of the culture (Qn).	NO	Shellfish production neither uses nor consumes water. Moreover, the water filtered by molluscs is completely returned, and in better quality.	
2. **Siltation**: (load of total suspended inorganic solids in source water – load of suspended inorganic solids released in effluents) / mass or units produced (Qn).	NO	Shellfish participate in mineralising the organic and inorganic solid	
3. **Seabed impact footprint**: extent of sediment disturbance (Ql/Qn).	YES	If there may be sediment disturbance, positive impact on sediment do exist.	ADDITIONAL IMPORTANT COST FOR CONSUMERS
4. **Shading**: light attenuation (Ql).	NO	Shellfish clarifies Water because of their filtration system.	
5. **Space dedicated to enhancing biodiversity**: identification of means to provide habitats to enhance biodiversity at the site level (such as the greening of land area or maintaining	YES		YES IF THE AREA CORRESPONDS TO PRODUCTION AREAS.

non-commercial stocked ponds for migrating birds) (QI).			
6. **Density of fish**: Kg fish / m^3 & number of fish / m^3 (Qn).	NO	Metric must be adapted to shellfish productions	
7. **Feed Conversion Ratio**: feed delivered (kg) / final biomass - initial biomass during time interval (kg) (Qn).	NO	There is no food for shellfish	
8. **Biochemical oxygen demand** (BOD_5): (BOD_5 in source water – BOD_5 released in effluents) / mass or units produced (Qn).	NO	There is no oxygen added in Shellfish cultures	
9. **Number of days with oxygen depletion** (below 4ppm) per year (Qn).	NO	See above	
10. **Accumulation of Organic Matter** (AOM): mass of organic matter released in effluents / mass or units produced (Qn).	NO	Shellfish participate in mineralising the organic solid into inorganic matter.	
11. **Emission of Nitrogen**: (load of nitrogen in source water - load of nitrogen released in effluents) / mass or units produced (Qn).	NO	Shellfish sequestrate Nitrogen	
12. **Emission of Phosphorus**: (load of phosphorous in source water - load of phosphorous released in effluents) / mass or units produced (Qn).	NO	Shellfish sequestrate Phosphorus	

13. **Phytobenthos and zoobenthos**: At three levels (surface, middle, bottom) of the water column (Ql/Qn).	YES		IMPOSSIBILITY FOR A PRODUCER ALONE TO GIVE THE INFORMATION
14. **Benthic communities**: habitat complexity, substrate composition, and macroinvertebrate abundance (Ql/Qn).	YES		IMPOSSIBILITY FOR A PRODUCER ALONE TO GIVE THE INFORMATION
15. **Turbidity**: At three levels (surface, middle, bottom) of the water column (Ql).	YES	Shellfish participate in the clarification of waters. Conditions are also very different depending of the area.	POSSIBLE BUT TIME CONSUMING FOR PRODUCERS
16. **Number of days of fallowing** (Qn).	NO	Not relevant for shellfish farming because when you do not produce, you do not have the positive impacts of the synergies associated to this culture.	
17. **Biodiversity surveys** (Ql).	YES		IMPOSSIBLE FOR CONSUMERS TO MEASURE IT ALONE
18. **Changing alfa-biodiversity**: 100*(S-Wd – S-Ws) / mass or units produced, in which: S-Wd = Shannon-Winner diversity index obtained in a similar place not impacted by the farm S-Ws = Shannon-Winner diversity index obtained surrounding the farm.	YES		ADDITIONAL IMPORTANT COST FOR CONSUMERS

19. **Number of escapees**: Records of all escaped (Qn), number of escapees / tonnes of fish (Qn).	NO	There are no "escapees" of shellfish.	
20. **Endangered species**: Number of lethal incidents / ha (Qn), number of mammals killed / tonne of production (specify species as well as accidental versus deliberate animal removals), number of birds killed / tonne of production.	NO	If "authorisation" is not associated with "incident" there is no single incident for mammals or bird to declare for shellfish production, especially regarding the "accidental versus deliberate animal removals" mentioned)	
21. **Introduction of new invasive alien species** (QI).	NO	It does not concern shellfish	
22. **Potential to change the gene pool of the native community**: classification of farmed animals according to a set of defined characteristics and culture conditions, and their potential impact on the native species of the surrounding environment (QI).	NO	For more than 60% of shellfish productions, the producers collect the seeds directly in their environment. The juveniles which have been bought to hatcheries are also very close to the "native species" pool. Furthermore, the impacts of shellfish production on their	

		environment are most of the time very positive (Biodiversity enhancer, Clarification of water/ Sequestration of Nitrogen, etc. etc.)	
23. **Load of applied chemical products**: mass of herbicides, insecticides, anti-algal, antibiotics, and other chemicals applied / mass or units produced (Qn), number of antiparasitic, antibiotic treatments (total and by disease) (Qn), emission of chemicals (Qn).	NO	Shellfish productions require not to use chemicals in their production.	
24. **Pollution by heavy metals**: load (mass) of heavy metals applied / mass or units produced.	NO	Shellfish farmers do not use heavy metal pollutants. Shellfish farming already suffers significantly from heavy metal pollution originating from land sources.	
25. **Pollution by hormones**: load (mass) of hormones applied / mass or units produced	NO	Hormones are not used in shellfish cultures	
26. **Antifouling**: list of products name and antifouling agents included	YES BUT	Shellfish productions require not to use	MEASURABLE

(equipment and vessels) (Ql), mass of the chemicals / production (Qn), Statement (expert judgement) on the end-of-life of the antifouling paints (Ql).		chemicals in their production. This indicator must be adapted for shellfish farming	
27. **Plastic into the sea**: number of plastics lost into the sea (Qn), number of gears and weight of ropes and floats (Qn), abandoned nets and ropes (Qn), lost nets and ropes (Qn).	YES		POSSIBILE APPROXIMATIONS
28. **Mortalities produced**: dead fish (tonnes) generated yearly (Qn), Kg of dead eggs/juveniles (Qn).	NO	Impossible to count and not relevant to count. Indeed, the shells are a very interesting support to enhance biodiversity.	
29. **Sludge produced**: amount of sludge (tonnes) generated yearly (Qn), Kg of sludge treated and disposed (Qn), amount of sludge (tonnes) used directly as fertiliser yearly (Qn), amount of sludge (tonnes) sent to biogas yearly (Qn), amount (%) of nitrogenous in the dry matter of the sludge (Qn).	NO	Shellfish production neither uses nor consumes water. Moreover, the water filtered by molluscs is completely returned, and in better quality.	
30. **Efficiency in the use of energy**: total electricity used for farming (kWh) / tonnes of fish (Qn), energy consumed	YES BUT	must be adapted for "SHELLFISH"	DIFFICULTLY MEASURABLE

(MJ) per tonnes of farmgate production (Qn).			
31. **Energy used**: electricity and fuel used by the fish farming company (Qn), total fuel used for transport (L) / tonnes of fish (Qn), transport distance (km) of inputs (eggs, juveniles, oxygen, feed) to the fish farm (tonnes*km) (Qn).	YES BUT	must be adapted for "SHELLFISH"	DIFFICULTLY MEASURABLE
32. **Proportion of renewable energy**: amount of renewable energy / total amount of applied energy (Qn).	YES		DIFFICULTLY MEASURABLE
33. The number **of eggs used yearly** (Qn).	NO		
34. **Juveniles used yearly**: weight (tonnes) of 5-80, 81-200, 201-500, and 501-800 g.	NO	Not a relevant metric for shellfish regarding that shellfish cultivation do not necessitate to count the quantity of the "juveniles" . Cf Bouchot cultures	
35. **The amount of oxygen** (tonnes) used (Qn).	NO	Shellfish production neither uses nor consumes water. Moreover, the water filtered by molluscs is	

		completely returned, and in better quality.	
36. **Amount of formic acid** used (Qn).	NO	Shellfish production neither uses nor consumes water. Moreover, the water filtered by molluscs is completely returned, and in better quality.	
37. Mass of **products delivered** from the farm (Qn).	YES		YES