Guidance document

on Environmental Performance

Input received from the AAC members

The Aquaculture Advisory Council (AAC) issued a recommendation on the draft guidance on environmental performance focusing on the environmental performance indicators. In addition to this, the AAC members wish to share individual comments on other sections of this draft guidance currently being developed by the European Commission. This addition of contributions does not constitute an AAC position. These comments are based on the draft presented in presented in June 2025.

Contributions listed below:

- ✓ **Recirkfish PO**
- ✓ **European Mollusc Producers Association (EMPA)**
- ✓ **Federation of European Aquaculture Producers (FEAP)**
- ✓ **Eurogroup for Animals**
- ✓ **Associazone Mediterranea Acquacoltori (AMA)**
- ✓ **European Fishmeal and Fish Oil Producers (EFFOP)**

- **Recirkfish PO**

We like the idea of "The document aims to support authorities and aquaculture producers in increasing the environmental performance of aquaculture activities."

For the authorities we believe the doc has to put the EU aquaculture production in relation to the scale of 10% of the EU aquatic food consumption and also in relation to the total EU food consumption (including imports). The EU food consumption environmental footprint.

Then the EU aquaculture production environmental performance can be compared to the total EU food consumption environmental performance[1].

Is a meal of EU aquaculture produced aquatic food on your plate, performing environmentally better than an average EU food plate? Can this be shown?

For the producers the 6 proposed indicators are already part of normal protocol to run a farm. The doc has to explain the relevance of highlight this. If a meal of aquatic food produced in EU aquaculture has

[1] https://www.eea.europa.eu/en/european-zero-pollution-dashboards/indicators/the-eus-consumption-footprint-indicator-2

an environmental performance better than the average EU meal of food consumption, it has marketing use for the farmers.

- ## European Mollusc Producers Association (EMPA)

The inclusion of AAC Comments and feedback is highly welcome and appreciated.

Many aspects have been improved, including the overall balance of the document, its formatting, and the consideration of the various comments made. The additional research supporting the proposals—particularly those building on the AAC's previous work - is also commendable.

The new proposal to effectively update the document, through the EAAM platform, is a very good thing for 2 main reasons: optimising the use of EAAM and Make the document an key document to the MS.

- ## Federation of European Aquaculture Producers (FEAP)

While the document in its second version has improved, it still offers little practical value for its intended end users: aquaculture farmers. The previous list of "Environmental performance indicators" has been replaced with a list of "Environmental performance categories of indicators", which we believe makes it even less directly implementable for aquaculture farmers. The AAC through this recommendation proposes six indicators, however the draft guidance document on environmental performance should suggest a much larger number to be able to cover all types of aquafarming systems and species.

FEAP proposes the addition of the following new indicator:

  - **Food production efficiency.** Given the significant challenges in securing space for aquaculture sites across the European Union, increasing food production per unit of available area is a valuable objective. This indicator can be measured as kilograms of edible food harvested per hectare. (It is important to note that this metric is unrelated to animal stocking density and therefore does not carry any animal welfare implications.)

- ## Eurogroup for Animals

Eurogroup for Animals supports the Commission's commitment to improve the environmental sustainability of the EU aquaculture sector and appreciates the opportunity to provide feedback through the AAC. Overall, we are encouraged by the extent of environmental issues addressed as well as the number of indicator categories included. One critical issue that could be better addressed is that related to feed. For the feed indicator category, we suggest including the feed composition, and specifically the percentage of fishmeal and fish oil ingredients, in addition to the total amount of feed in tonnes. This is important to address the issue of aquaculture's reliance on unsustainable feed sources. Related to this point, we would also like to request the removal of insects as a good practice example of an alternative feed source. More recent scientific evidence suggests that using insects for

aquaculture feed results in a climate footprint that is comparable to the traditional, unsustainable feed sources that are derived from wild-caught fish (Smetana et al., 2019).

Regarding the section on the environmental benefits of Recirculating Aquaculture Systems (RAS), we suggest adding more nuance regarding the purported benefits of efficient waste removal as several of these benefits are not proven and/or not often used (e.g., aquaponics). Effective waste management in RAS requires precise design and careful operational management to prevent nitrate accumulation and inefficiencies in sludge disposal, which can introduce substantial economic costs (Engle, 2023; van Rijn, 2013). Nitrate accumulation in the water is a key issue, as the aerobic filters and external carbon sources used to reduce nitrates are very energy-intensive and introduce additional costs (Engle, 2023; Tom et al., 2021). Furthermore, while ongoing research seeks ways to potentially reuse and recycle the sludge from RAS in the future, most commercial RAS facilities currently in practice discharge sludge in traditional ways (e.g., publicly owned or on-site waste treatment facilities) (Engle, 2023).

References:

Smetana, S., Schmitt, E., & Mathys, A. (2019). Sustainable use of Hermetia illucens insect biomass for feed and food: Attributional and consequential life cycle assessment. Resources, Conservation and Recycling, 144, 285–296. https://doi.org/10.1016/j.resconrec.2019.01.042

Engle, C.R., 2023. The economics of recirculating aquaculture systems. Journal of the World Aquaculture Society 54, 782–785. https://doi.org/10.1111/jwas.13004

Tom, A.P., Jayakumar, J.S., Biju, M., Somarajan, J., Ibrahim, M.A., 2021. Aquaculture wastewater treatment technologies and their sustainability: A review. Energy Nexus 4, 100022. https://doi.org/10.1016/j.nexus.2021.100022

van Rijn, J., 2013. Waste treatment in recirculating aquaculture systems. Aquacultural Engineering, Workshop on Recirculating Aquaculture Systems 53, 49–56. https://doi.org/10.1016/j.aquaeng.2012.11.010

- **Associazone Mediterranea Acquacoltori (AMA)**

We take note of the improvements made to the document and share the need expressed on page 5 to provide for regular updates to further improve the proposed assessment tools and to be able to take into account the latest technical and scientific advances.

We continue to believe that the use of this guidance document at the level of the single company remains very difficult, especially if done within the already complex framework of the regulations listed in section 3. We fear that it will add interpretative difficulties instead of simplifying the fulfilment of the current European rules. It could be considered, both for production companies and local administrations, to open local and specific consultation tables for each type of production for the shared drafting of summary sheets.

We recall that the recent documents evaluating the results of the WFD and MSFD[2] highlighted difficulties in data collection and processing on the one hand, and results below expectations on the other, leading to the conclusion that both documents need to be reviewed.

We look forward to the document on the positive effects of aquaculture and related ecosystem services, recalling the recent communication "roadmap towards nature credits" that further emphasises its importance. In this regard, in sub-section 1.2, we would suggest changing "While this section describes the benefits to the environment that certain types of aquaculture offer, this document …" with "While this section describes both negative and positive impacts on the environment, this document …".

With reference to the project "Life Muscles (https://lifemuscles.eu/en/), we suggest including in sub-section 4.3.4 or 4.3.4. the possibility of recovering and recycling the polyethylene nets used in mussel farming.

Finally, we believe that the document underestimates the importance of assessing environmental performance on a medium-to-large scale, especially with regard to the marine environment where the concepts of 'basin" (e.g. the Adriatic Sea) and 'source-to-sea' are absent although central in the recent 'Ocean Pact'. We believe that the 'ocean observation initiative' contains elements relevant to the assessment of environmental performance. We also believe that the IMTA concept referred to as 'unlocked' is so because it is a prisoner of a perverse logic in which one wants to assess the impact on the scale of a single installation, ignoring tides and sea currents that require assessment on a larger scale. We also believe that an integrated European data management system of environmental, sanitary and socio-economic data would significantly contribute to increasing the environmental performance of the sector on the one hand, and to facilitating climate change adaptation on the other.

- **European Fishmeal and Fish Oil Producers (EFFOP)**

We appreciate the opportunity to review the revised draft and welcome improvements made to its structure and clarity particularly on the concept of LCA. However the rationale behind some of the important recommendations on feed or ingredients would benefit from clearer and consistent grounding with the latest scientific evidence. Some important concerns remain unaddressed, particularly in relation to the balance between actual evidence and policy preferences. Strong normative positions are understandable but greater transparency is needed when these are not directly supported by data. For this benefit we have provided some useful references in the main document to aid with our organisation's suggestions. From a technical perspective, as it stands, the recommendations the document currently makes on certain aspects of environmental performance for feeds is wrong and this undermines the future sustainability improvements the sector needs to make.

[2] Water & Marine Reports 2025 - From Source to Sea - Volume 1, Water Framework Directive & Floods Directive - Volume 2, Marine Strategy Framework Directive" & "Commission Staff Working Document - Executive summary of the evaluation of Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive)

- **<u>The current draft states at 4.3.1. Nutrient-balanced sites & sustainable feed (page 54):</u>**

"*A sustainable feed system includes* ***sourcing feed ingredients by respecting ecosystems*** *and biodiversity, but also* ***reducing reliance on fish meal and oil made from wild stocks which can be used directly as food*** *(e.g., using* ***alternative protein ingredients*** *or* ***by-products*** *from fisheries and from other industries)*".

EFFOP recommends the sentence be revised to:

<u>"A sustainable feed system includes sourcing feed ingredients responsibly and judiciously, with respect for ecosystems and biodiversity."</u>

- **<u>The current draft adds:</u>**

"...but also reducing reliance on fish meal and oil made from wild stocks which can be used directly as food..."

This part of the sentence introduces a political assumption about how wild-caught fish should be used. Whether such fish are directed toward food or feed is not primarily an environmental question, but one of market dynamics, regulatory compliance, particularly with regard to food/feed safety requirements and limits on undesirable substances, nutritional requirements, and processing suitability. Many of the low-trophic species used for fishmeal and fish oil production in the EU do not have a large market demand for direct consumption and are harvested under science-based management frameworks, with independent advice from ICES. Moreover, marine ingredients are among the most environmentally efficient feed inputs available when assessed per unit of digestible protein or essential fatty acids. Life cycle assessments consistently show that marine ingredients typically have lower carbon footprints than many terrestrial alternatives. So, recommending their exclusion based on theoretical food use — without reference to environmental performance or nutritional function — risks undermining the core sustainability objectives of the guidance. The same argument can be made with the aquafeed industry's heavy use of soy protein or rapeseed oil, which could theoretically also be used for human consumption, but are not — due to similar market dynamics and processing contexts.

- **<u>The current draft states at 4.3.1. Nutrient-balanced sites & sustainable feed (page 54):</u>**

"*As part of a strategy for developing more sustainable feed, alternative proteins such as* ***poultry byproducts*** *and* ***insect meals*** *have shown good environmental performance and could partially replace fishmeal in aquaculture diets*[2] *Research which outlines a framework for feed performance including digestibility, palatability, functionality, and nutrient utilisation*[3] *are being conducted on the main aquaculture species. Building around these principles ensures a balanced and sustainable feed*."

This statement is not supported by a relevant reference (it cites sea bream aquaculture in Italy? which is not broadly applicable or relevant). While the environmental performance and commercial viability of some alternative proteins — such as poultry by-products — are supported by established data, the inclusion of insect meals in this context is premature and potentially misleading. For example, Smetana (2019) highlights the high feed input required to produce 1 kg of dried insect meal — approximately 32 kg of feed. A recent study by Glencross et al. (2025) builds on this concept by comparing conventionally produced insect meal to a protein isolate obtained by directly processing the same substrate — spent brewery grain — instead of first feeding it to insect larvae, in Atlantic

salmon diets. The study found limited nutritional and microbiome benefits from insect meal inclusion and reported a 1000% difference in systemic protein yield, demonstrating that it was significantly more efficient to extract protein directly from the brewery grain than to convert it via black soldier fly larvae into a feed ingredient. Broader assessments (e.g., Biteau et al., 2024) also conclude that insect-based feeds are unlikely to become economically viable in the near future within the current EU framework and finally a recent study by Defra (2024) found that insect meal production has a total climate change impact of 12.9 to 30.1 kg CO_2 eq. per kg of protein, depending on the larvae feedstock. Even at the lower end (food waste), this is approximately 4.2–13.5 times higher than the climate change impact of the fishmeal and soybean meal used in the same study.

This comment is not intended to criticise insect meal itself, but to highlight that some recommendations on environmental performance in this draft guidance are not being based on the available scientific evidence. Rather, they appear to reflect policy preferences over data-driven assessment. Given the economic, logistical, and nutritional limitations associated with many feed ingredients — both traditional and alternative — EFFOP recommends that the guidance be revised to present a more balanced and evidence-based overview which also reflects the pros and cons of each ingredient that could be used in aquafeed formulation. There is a need to align environmental considerations with realistic assessments of resource availability and scalability within the aquafeed sector and that there is a need for more holistic environmental assessments.

References:

Biteau, C., Bry-Chevalier, T., Crummett, D., Ryba, R., & Jules, M. S. (2024). Insect-based livestock feeds are unlikely to become economically viable in the near future. Food and Humanity, 3, 100383

Department for Environment, Food & Rural Affairs (Defra), 2024. *Life Cycle Assessment of UK Insect Protein Production Processes for Pig and Poultry Feed*. Final Report. Project code: C20252)

Glencross, B., Papadimitriou, V., & Huyben, D. (2025). Removing trophic levels from the fish feed-chain: Evaluating the nutritional and microbiome effects of feeding brewery protein isolate as an alternative to insect meal to Atlantic salmon. Aquaculture, 742597.

Smetana, S., Schmitt, E., & Mathys, A. (2019). Sustainable use of Hermetia illucens insect biomass for feed and food: Attributional and consequential life cycle assessment. Resources, Conservation and Recycling, 144, 285-296.

- **The current draft states at 4.3.1. Nutrient-balanced sites & sustainable feed (page 54):**

"*To enhance their environmental performance, aquaculture companies should also prioritise selecting feed based on the origin of* ***raw materials.*** *By choosing ingredients that are sustainably sourced, companies can reduce the strain on natural resources. This approach promotes responsible use of marine and agricultural inputs and contributes to the overall sustainability of aquaculture practices. Moreover, choosing ingredients that are sourced closer to the feed production facilities or farms can contribute both to reducing dependency on imported ingredients as well as the carbon footprint of feed production*".

This is a valuable point and worth considering in other contexts such as regional feed security; however, it is important to recognise that in many life cycle assessments, transport is not the primary contributor to environmental impact. The largest bottlenecks often lie within production practices

themselves — such as ingredient cultivation, processing, and energy use — which typically offer the greatest potential for reducing the overall footprint of aquafeeds.

- The current draft gives an example from FEFAC in **Good Practice 13: Adopting feed formulated with sustainable and circular ingredients (page 58):**

"*Priority is given to **trimmings coming from the processing of wild and farmed fish**, thus improving the contribution of aquaculture to the circular bioeconomy. This is followed by proteins, oils and fats from farmed insects and polychaetes fed with byproducts from products of animal origins. Finally, there is the use of natural marine resources from lower trophic levels and not intended for human consumption, such as krill and zooplankton. The brochure also mentions proteins and oil (omega 3) produced with microorganisms such as bacteria, yeasts, fungi or microalgae*[11,12]*."*

We believe that EFFOPs members would offer a good example of progress in circularity: today, approximately 40% of European fishmeal and fish oil production comes from by-products, sourced from both the fisheries and aquaculture sectors, across 14 producer countries. This demonstrates how responsibly managed marine ingredients can make a meaningful contribution to the circular bioeconomy and could be highlighted in the document as a concrete example—similar to how FEFAC is referenced to illustrate improvements in raw material utilisation. We find that it is quite important that it is recognised that it is the European Marine Ingredient industry—not the feed industry—that has driven the development and upscaling of by-product use as ingredients. The FMFO sector is responsible for the innovation and sourcing and converting these trimmings into high-quality feed ingredients, and this key role is often overlooked. This example could be placed under Good Practice 9: Valorising by-products to obtain ingredients for sustainable aquafeeds.

- **The current draft states at 4.3.5. Circularity & zero waste production systems (page 73):**

"*An initial step towards the circularity is the **efficient management of fish trimmings from processing plants,** transforming them into valuable ingredients for aquafeed. In this context, the legal framework is clear, as the EU Regulation 142/2011(Animal By-products Regulation)* [1] *expanded the definition of fishmeal to processed animal protein derived from aquatic animals permitting the use of aquaculture byproducts for the production of fishmeal and fish oil*[2]*."*

This is an important point and rightly emphasises the value of making full use of aquaculture by-products. However, while Regulation 142/2011 has supported progress in circularity by allowing the use of aquaculture by-products in feed, it also presents limitations that hinder further valorisation. For example, under the current framework, fish oil derived from by-products cannot be used for human consumption unless it is processed in facilities meeting very specific and niche requirements. This restricts the potential to move by-products higher up the food value chain and should be addressed to enable more efficient and sustainable resource use.