INDUSTRY BRIEF

NAVIGATING TOWARDS BIODIVERSITY-FRIENDLY OPERATIONS IN PERU'S FISHING REDUCTION

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Main messages

- Peruvian fishmeal and fish oil perform well as compared to terrestrial feed ingredients and other seafood products in terms of greenhouse gas emissions, but the sector still needs to reduce those emissions further and begin addressing biodiversity impacts to meet client requirements and emerging regulatory standards.
- LCA is expanding towards the inclusion of fishery-specific biodiversity indicators and damage-level metrics that enable fair comparisons with terrestrial feed alternatives.
- Interventions focusing on healthy fish stock management, reduction of marine pollution, and other measures targeting ecosystem quality impacts can measurably reduce environmental impacts while supporting the long-term viability of the industry.

Context

The fishmeal and fish oil (FMFO) sector plays a critical role in global aquaculture and animal feed markets while facing increasing scrutiny over its environmental footprint. The sector must simultaneously address climate change mitigation, biodiversity conservation, and operational efficiency improvements. The main objective of the BAMBOO project, which includes a case study on FMFO, is to identify trade-offs between biodiversity impacts along global supply chains of non-food biomass and to determine leverage points for transformative change to halt and reverse biodiversity loss. This brief presents new biodiversity impact assessment models for the Peruvian reduction fishery, sets out the trade-offs the sector will have to manage, and indicates where environmental reporting needs to change.

The FMFO industry operates within an evolving regulatory landscape shaped by both mandatory compliance requirements and voluntary corporate sustainability initiatives. Growing client demands for environmental footprint measurements, and corporate environmental reporting standards are driving industry transformation. Companies face dual pressures: meeting immediate regulatory compliance while positioning themselves competitively through enhanced sustainability qualifications that influence consumer perception and corporate reputation. Peru is comparatively well placed to respond, as the anchoveta fishery is managed through IMARPE's biomass assessments and PRODUCE's individual vessel quota system, giving the sector a stock-management evidence base that provides the fishery with relative stability.

These pressures can be linked to specific commitments under the Kunming-Montreal Global Biodiversity Framework (GBF), which comprises a set of goals and targets to be achieved by 2030. In the case of the Peruvian reduction fishery, four of these targets are of particular relevance. Target 15 calls on large companies to monitor, assess and disclose their biodiversity risks, dependencies and impacts, emphasizing the need for standardised reporting discussed above. Targets 5 and 7, concerning the sustainable and legal harvesting of wild species and the reduction of pollution risks, including plastic pollution, respectively, are addressed through operational practice. Finally, Target 21 requires that the best available data and knowledge be accessible to decision makers. The latter calls for industry participation in research being decisive, as the modelling gaps identified in this brief cannot be closed without direct primary data feed-in. The three recommendations that follow are structured along these lines.

Figure 1: Purse seining fishing vessels anchored in the port of Chimbote in 2024.

Key results

This brief presents findings from environmental assessments using Life Cycle Assessment (LCA), a standardised comprehensive methodology that evaluates the environmental impacts of products and services across their entire value chain. This approach allows us to identify critical intervention points for reducing biodiversity impacts in the FMFO industry, as well as other environmental impacts. LCA is not yet complete for marine systems, as several pathways relevant to fisheries are not yet operational, and the results below should be read with that limitation in view.

Health of fishing stock

Maintaining stock abundance within maximum sustainable yield through strict fishing quotas enables both healthier marine ecosystems and lower greenhouse gas emissions per unit of product. Our research (Manrique-Muñante et al., 2026) suggests that well-managed fish stocks provide dual benefits: they support biodiversity conservation by maintaining balanced marine food webs and population structures, while simultaneously reducing the climate footprint of fishing operations by requiring less effort to capture fish. However, illegal fishing and the effects of climate change pose threats to this objective. The trade-off is temporal rather than absolute, as quota restraint reduces catch volumes in the current season, but avoids the disproportionate fuel, emission and biomass depletion (i.e., biodiversity costs) of fishing a depleted stock in later years.

Environmental impacts vary considerably across temporal and geographic scales, especially regarding biodiversity. This is particularly so in Peruvian fisheries that are strongly affected by El Niño-Southern Oscillation (ENSO), such as those targeting anchoveta or giant squid. This variability highlights the importance of adaptive management strategies that respond to seasonal and regional ecosystem dynamics, and of reporting impacts as ranges across ENSO phases (e.g., El Niño or La Niña) rather than as single annual averages.

Marine pollution and biodiversity impacts

Antifouling agents and fishing gear constitute key sources of macro- and/or microplastic emissions to marine environments, directly threatening marine biodiversity through entanglement, ingestion, and habitat degradation (Ita-Nagy et al., 2022). Our findings indicate that reduction of these emissions depends heavily on material substitution, yet biodegradable gear alternatives have not yet achieved commercial viability. Additionally, plastic particles already present in ocean waters enter the production system, creating microplastic accumulation in fishmeal and fish oil products. Evidence on the resulting concentrations in fishmeal and fish oil remains limited. Deville et al. (2025) identify this as a knowledge gap rather than a quantified risk. The sector would be well served by establishing baseline measurements itself, before others characterize the issue on its behalf.

Certain antioxidants used in fishmeal preservation contribute to land use impacts and marine eutrophication. These chemical inputs create cascading effects on both terrestrial and marine biodiversity, suggesting that opportunities should be sought for substitution with alternatives having smaller environmental footprints.

Need for ocean-specific biodiversity indicators

Environmental impact assessment for FMFO production should extend beyond conventional LCA impact categories. Because biomass production is a leading driver of global biodiversity loss, assessments limited to climate metrics will misrepresent the performance of biomass-based products, including FMFO (Baptista de Sousa et al., 2026). Our research (Manrique-Muñante et al., 2026) demonstrates the need for these specialized metrics to capture the unique ways fishing activities affect marine ecosystems, including impacts on non-target species and on trophic relationships that conventional assessment methods often overlook.

Damage-level metrics prove essential for fair comparisons between marine and terrestrial feed products, allowing industry actors to communicate environmental performance accurately to clients and stakeholders. These metrics translate diverse environmental impacts into common units that reflect actual damage to ecosystem health and species populations. However, it should be noted that many impact pathways, such as seabed habitat impacts, are yet to be fully operational in LCA and are blind spots that are not accounted for.

Temporal and geographic considerations should be integrated when assessing biodiversity impacts. The industry must also develop strategies to keep pace with methodological innovations in modelling marine-related impacts.

Recommendations

1. Report in a standardized manner

Adopt protocols that include biodiversity loss alongside conventional greenhouse gas metrics in environmental reporting. Incorporate marine-related indicators that capture marine ecosystem impacts, including temporal and geographic variability. Standardize the allocation methodology between fishmeal and fish oil across the industry. All this helps improve supply chain transparency and ensure comparable environmental reporting.

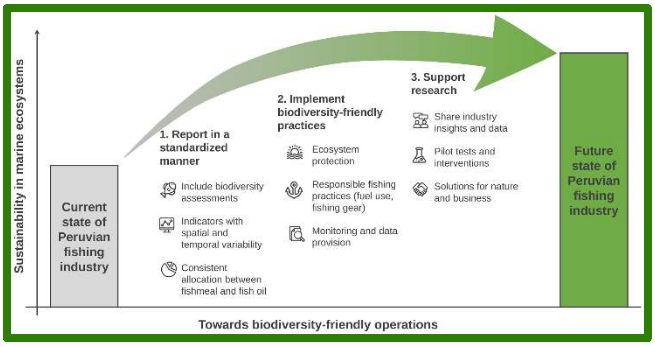

Figure 2: Biodiversity-driven operations in the fishmeal and fish oil industry in Peru.

2. Implement biodiversity-friendly practices and increase monitoring

Protecting marine ecosystems benefits the reduction fishery in the long run by maintaining stock abundance. Increased monitoring helps observe the state of the stocks and keep track of a company's potentially harmful activities, like fleet fuel consumption and abandoned, lost, or discarded fishing gear. Such monitoring can support environmental reporting and provide valuable data for research.

3. Support research

Much research remains to be conducted on biodiversity impact assessment in marine ecosystems. Industry can support such research by sharing industry insights and data, and by pilot testing new interventions suggested by research. Such an industry-research collaboration helps ensure that the interventions are effective in protecting biodiversity while also being commercially viable.

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