



IFFO

THE MARINE INGREDIENTS ORGANISATION

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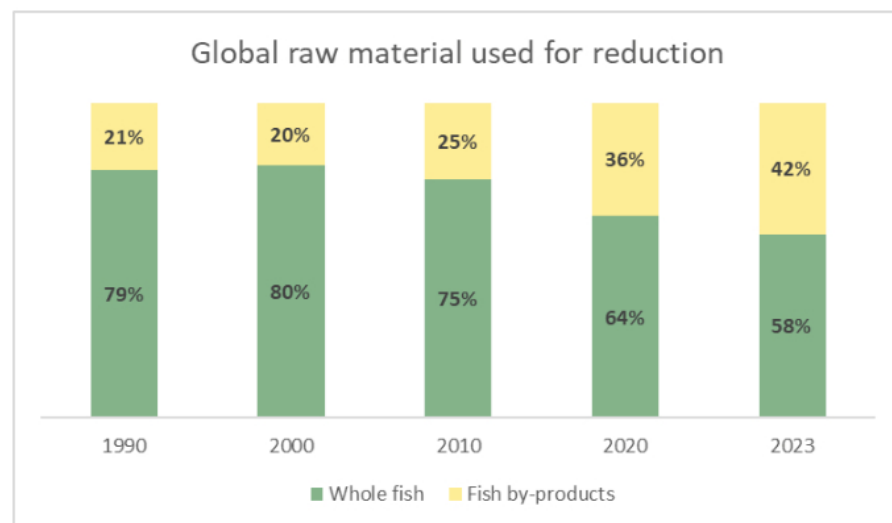
By-product

April 2024

Fish destined to direct human consumption is often processed in a way to make the eating experience easier and quicker for consumers. Such processing gives rise to by-products in the form of heads, viscera, frames, skins and others such as tails, fins, scales, mince, blood, etc. All this raw material can represent between 30% and 70% of the wet weight of the fish, depending on the species and is considered valuable raw material from which fishmeal and fish oil may be produced. Now 42% of the raw material used for marine ingredient production comes from by-products sources of fish processed for human consumption.

It is worth noting that the data for 2023 reflect the impact of the El Niño phenomenon, which significantly disrupted fishing activities and, in turn, temporarily influenced the percentage range between the use of by-products and whole fish.

Figure 1



Note: Figures for the latest years are provisional and subject to revision.

By-products can come from wild caught fish or aquaculture processing. Most of the raw material comes from finfish such as white fish trimmings (pollock, cod, hake, haddock and others), pelagic such as herring and mackerel, as well as

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other species such as salmon (wild and from aquaculture), tuna, pangasius and tilapia.[1]

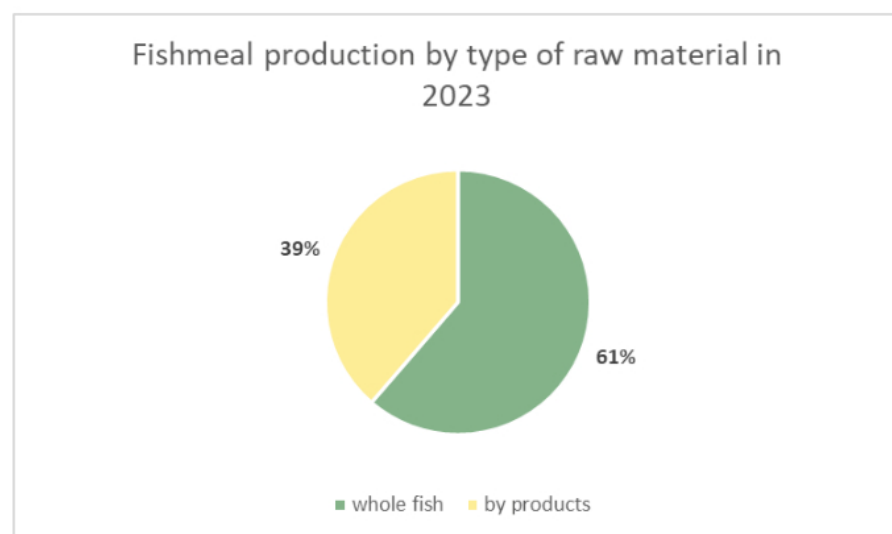
As for the reduction of such by-products into valuable marine ingredients, some fishing vessels are equipped so to preserve or process by-products on board into fishmeal and oil or, alternatively, onshore facilities have developed rapid collection methods to ensure that processors have a reliable outlet for their by-products. More and more large aquaculture operators nowadays tend also to have access to advanced facilities that preserve and process by-product raw material into fishmeal and oil. This is particularly the case for farmed Atlantic salmon, pangasius and tilapia.

According to the latest State of the World Fisheries and Aquaculture report (SOFIA), the UN FAO estimated that total global capture fisheries production reached approximately 91 million tonnes in 2022. This level has remained relatively stable since the late 1980s, due in part to increased awareness and efforts toward sustainable fishing practices. Of the capture fisheries production in 2022, less than 17 million tonnes were used as raw material for producing marine ingredients. Meanwhile, the aquaculture sector continued its growth, achieving a production level of 94.4 million tonnes in 2022, surpassing capture fisheries for the first time in history as the main source of fish for human consumption. This sector has played a critical role in meeting the growing demand for fish, providing a significant portion of the fish supply for global consumption.

The very fact that the fish processing by-product is increasingly used as raw material to produce feed marine ingredients is great news. Indeed, the utilisation of by-products helps reduce waste, and at the same time contributes to the production of high value products that promote health of humans and animals. The increasing use of by-products for reduction (fishmeal and fish oil) since 2000 can be seen in *Figure 1*.

When we look separately at fishmeal and fish oil, we find that the global production of fishmeal from by-products accounts for 39% in 2023 (*Figure 2*).

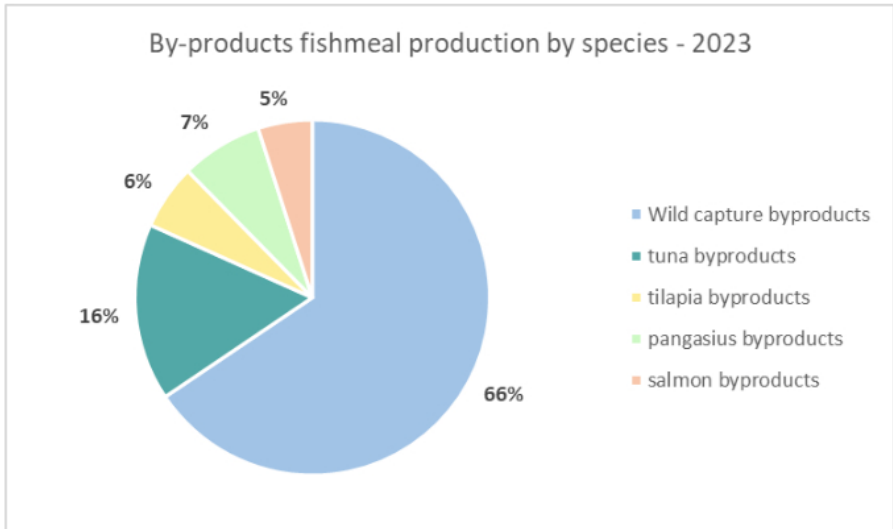
Figure 2



To better understand the origin of the fish by-product, IFFO has carried an analysis of the contribution provided by the different species used for direct human consumption in 2023.

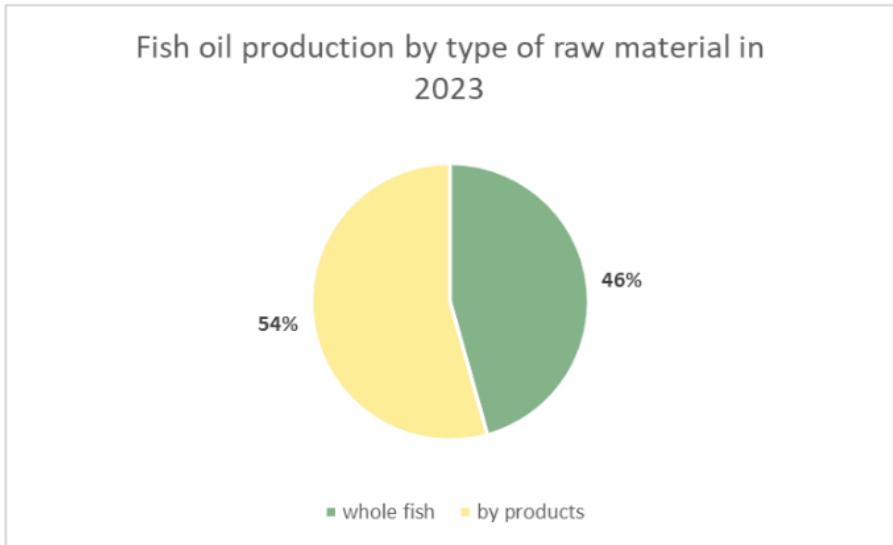
As shown in *Figure 3*, of the raw material coming from the filleting processing facilities and used to produce fishmeal, only 66% came from wild capture fisheries. 16% came from tuna trimmings and offal, followed by 7% from pangasius off-cuts, 6% from tilapia by-products and finally 5% from salmon trimmings.

Figure 3



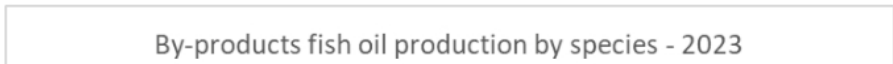
Fish oil production share from by-products is even higher, representing 54% of the total fish oil output in 2023 (*Figure 4*).

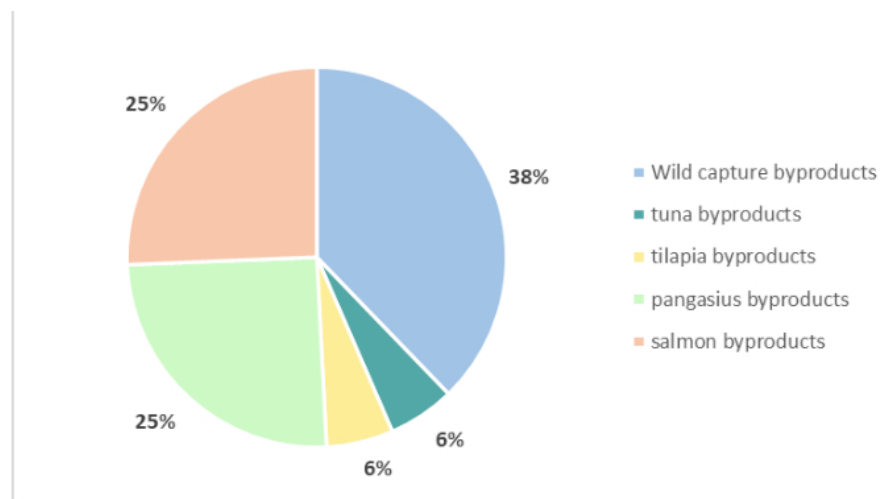
Figure 4



This higher percentage is primarily due to the high oil yields from salmon and pangasius trimmings. As shown in *Figure 5*, in 2023, of the by-products used to produce fish oil, of the ones coming from wild capture species provided only 38% of the total, with the rest coming from farmed species. 25% came from pangasius off-cuts and other 25% from salmon trimmings, followed by 6% from tuna trimmings and offal and 6% from tilapia by-products.

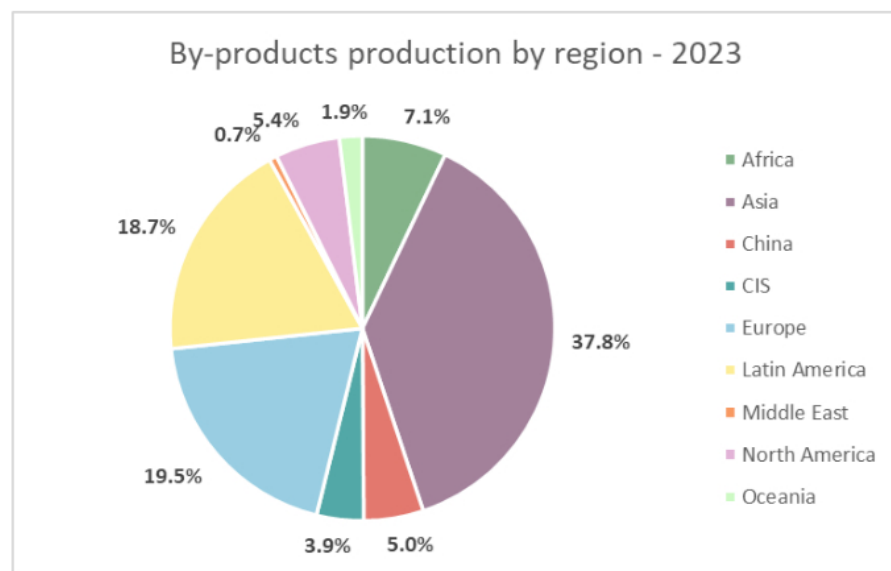
Figure 5





In *Figure 6*, we finally summarise the current regional breakdown of marine ingredients produced from by-products in 2023. Asia is by far the region where the recycling of precious fish raw material occurs more, and from where around 38% of marine ingredients based on by-products is coming nowadays. Europe and Latin America follow suit, although all regions appear committed to reduce waste to some extent.

Figure 6



Although these numbers tell us a promising story, as previously highlighted by Jackson and Newton (2016)^[3] there is still a large proportion of the by-product of fish for human consumption that is wasted instead of being turned into high value products that contribute to the supply of nutrient rich food.

Jackson and Newton have estimated that globally there is already a potential of almost 12 million tonnes of by-product produced in processing plants that are not collected for the production of marine ingredients. Asia is by far the area with the largest potential for the utilisation of by-products, although other regions such as Europe and Latin America are also believed to have a great unutilised tonnage of offcuts.

In addition to this, world fishery production is expected to continue to grow, mainly due to the growth in aquaculture fish production. It goes without saying that the increased production of farmed fish will also ensure a growing

that the increased production of aquaculture will also ensure a growing potential supply of raw material for the production of marine ingredients.

Developing and optimising the collection and processing of this valuable source of raw material should thus be encouraged as much as possible.

Dr Enrico Bachis, April 2024

[1] Other raw material sources include cephalopods such as squid, and crustaceans such as shrimp (both wild and farmed).

[2] In this analysis we are not including the large volume of farmed shrimp waste, which does not yield any oil but only meal.

[3] A. Jackson, R.W. Newton, Project to Model the use of Fisheries by-Products in the Production of Marine Ingredients with Special Reference to Omega-3 Fatty Acids EPA and DHA, 2016