

# Availability, conditions and alternative management procedures for postharvest fish losses in local stakeholders (WASTE2TASTE Project)

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Post-harvest fish losses (PHFL), including fish discards and fish by-products, are a hugely important global issue considering three key perspectives: i) **Ecological point of view**: PHFL alter marine trophic webs, negatively impacting the sustainable exploitation of marine resources and industry viability; ii) **Loss of biomass**: PHFL represent a wasted resource that could otherwise be upgraded and utilized for valuable products; iii) **Negative social perception**: PHFL contributes to a poor public image of the fishing industry and its sustainability practices. Nowadays there is a lack of reliable and current post-harvest fish losses data which arises from several challenges, including a lack of standardized methods for tracking losses and waste, inconsistencies in what is classified as "by-product", "discards" or "wastes," or lack of biological or economic significance of post-harvest fish losses. This makes it difficult to get accurate figures on PHFL volumes and real management for assessing their potential for commercial uses, with much of the existing data focusing on physical losses rather than accurate amounts, quality or nutritional aspects of raw materials. **Adequate monitoring and assessing of PHFL** will help to implement prevention and management measures to reduce economic losses, protect ecological systems, and create new value-added products, thereby contributing to a more sustainable management of marine resources. Analyzing the generation of PHFL is crucial as represent a valuable, underutilized resource that can be converted into high-value products for pharmaceuticals, food, cosmetics, and animal feed, reducing waste and improving economic returns. **Waste2Taste project focus** on the study of postharvest fish losses which are generated at different stages of fish food value chain (figure 1). Particularly, **discards** and **non-indigenous species (NIS)** generated as a consequence of fishing activity in different fleets and also on fish **by-products** generated during transformation of fish for human consumption in fish processing industry and fresh fish retailers.

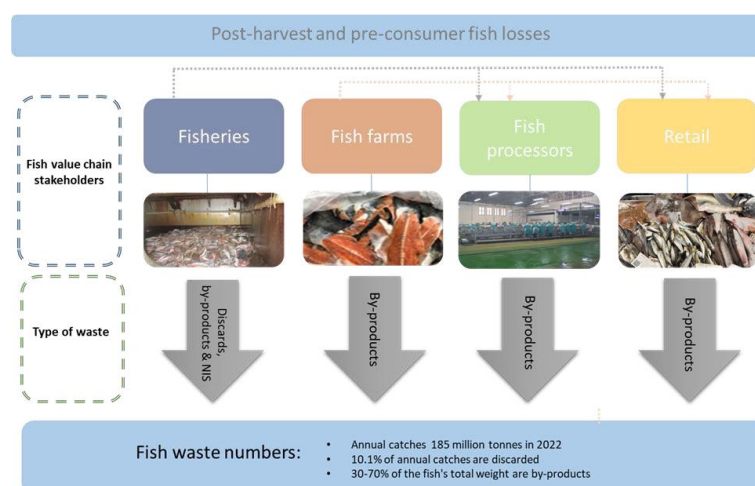


Figure 1. Postharvest fish losses which are generated at different stages of fish food value chain.

**A specific aim of this project was first to understand current practices in the generation, utilisation and valorisation of fishery by-products, but also to identify the limitations that hinder their effective use. With**

this aim a prospective análisis, cuantitative and cualitative, was conducted in fishmongers and fish processing industry, aimed at assessing the availability and conditions of raw materials.

The análisis carried out highlighted several key findings;

- ✓ Fish by-products such as skins, viscera, and livers are widely available in fishmongers and processing industries, although their quantity and composition vary by species, season, and processing practices. Monkfish and blue shark dominate the supply in Galicia, while salmon skins offer unique compositional advantages.
- ✓ Most by-products are classified as Animal By-Products (ABP) not intended for human consumption, restricting their potential for food applications. Reclassification to a food-use category is essential but requires significant changes in infrastructure, logistics, and compliance with strict hygiene and safety standards.
- ✓ By-products are highly perishable due to microbial and enzymatic activity. Maintaining the cold chain and minimizing storage time are critical to preserving quality and enabling the extraction of biocompounds such as collagen and oils.
- ✓ Skins are rich in protein, particularly collagen-related amino acids (hydroxyproline, glycine, proline), while viscera, especially livers, are the main lipid reservoirs. Salmon skin stands out as the most versatile raw material for combined collagen and lipid recovery, whereas monkfish liver is the best candidate for oil extraction due to its high lipid content and low heavy metal levels.
- ✓ Heavy metal analysis revealed significant variability among species. salmon skin and monkfish liver comply best with EU safety limits, while catshark viscera and ray skins present high contamination risks. These findings underscore the need for rigorous selection and monitoring of raw materials for food applications.
- ✓ Beyond collagen indicators, by-products also contains essential amino acids that could support the development of high-protein ingredients and functional foods. Protein integrity markers (e.g., Tyrosine) highlight the importance of proper storage to prevent degradation.

As collagen extraction from fish processing by-products is a leading strategy for circular economy valorization, and following the qualitative and quantitative characterization of by-product generation across the fish supply chain, **our second objective was to evaluate how fish by-product management influences collagen extraction** yield and purity. With this aim collagen was extracted from the skin of Atlantic pomfret (*Brama brama*), and Total Volatile Basic Nitrogen (TVB-N) levels were measured at different time points during storage at 4°C. These results are useful for determining the most appropriate storage conditions, specifically time and temperature, for optimizing collagen extraction from the skin of this species. Preliminary findings indicate that maintaining skins at 4°C for 15 days results in a concurrent increase in collagen yield, degradation, and TVB-N levels. This could be related with the **loss of tissue integrity and softening caused by the activity of endogenous proteinases** leading to degradation of non-helical collagen telopeptide. This effect has been previously observed in fish muscle collagen (Sato et al. 2002).