

# Evaluation Possibilities of Fish Processing By-Products and Underutilized Fish as Value Added Products

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In recently, the mostly used proteins in the food industry are derived from soybeans or milk. The soybean and milk industries have concentrated on recovery and usage of proteins from their by-products. The same situation cannot be said for seafood industry, especially underutilized fish species and protein rich by-products, which are used in animal feed fish meal/oil and fertilizer production. However many researches showed that these materials contain valuable proteins, amino acids, oil, enzymes, collagen, gelatin and bioactive compounds. Developments of novel technologies give opportunity to extract proteins from these products and utilize as functional ingredients in food systems.

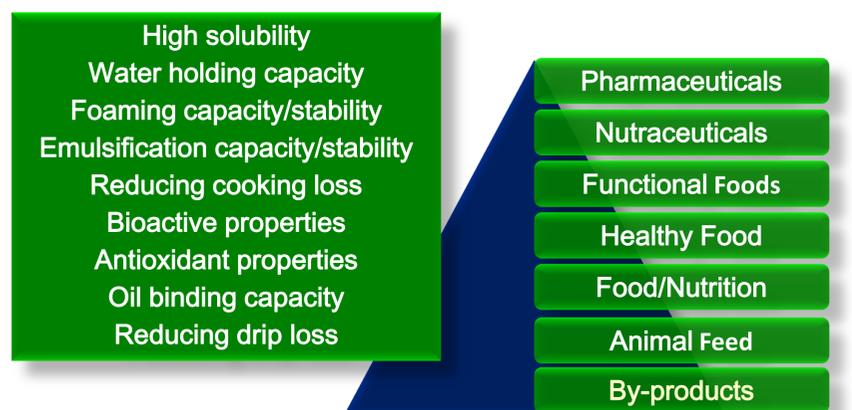
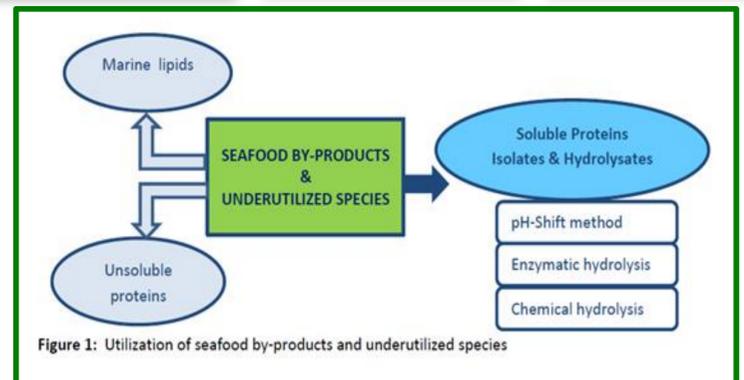
Seafood by-products and underutilized species, causing major environmental and economic problems, can be converted into value-added and ready-to-eat products, contributing to the sustainability of natural resources, reducing waste management costs and producing profitable products with functional features and great usage area.

A promising evaluation route of seafood processing by-products and underutilized species are the production of fish protein hydrolysates and isolates. Protein hydrolysis is the process including chemically or enzymatically broken down the proteins to peptides and/or free amino acids. The other protein recovery method is pH shift method that based on the differences in solubility that muscle proteins in water exhibit at different pH values.

The recovered proteins both have essential nutrients, antioxidant activities and good functional properties such as gelling, water holding, oil absorption, protein solubilization, foaming and emulsifying properties. With these characteristics, they can be used as ideal ingredients for manufacturing different types of food products.

In this study, knowledge about the evaluation possibilities of by-products and underutilized fish as value added products were compiled. It is hoped that the work will be beneficial to all interested actors in the sector.

Key words: By-product, underutilized fish, protein isolate and hydrolysate, pH shift method, enzymatic hydrolysis.



PROPERTIES → PRODUCTS

**Fish Protein Powder Products;**  
milk replacers,  
protein supplements,  
stabilizers in beverages  
flavour enhancers in  
confectionery products  
frankfurter-type fish sausages,  
fish ball,  
functional fish protein gels,  
fish burger,  
fish croquet etc.



Development of fish sausages (Piers *et al.*, 2009), fish balls (Shaviklo *et al.*, 2010) and beef balls (Hayam, 2015) incorporated with fish protein isolate has been already reported. Shaviklo *et al.*, (2016) studied on ingredient optimization of fish burger formulated with fish protein isolated from tuna by-product and its storage stability study. Das *et al.* (2017) tested collagen hydrolyzate produced from aquaculture wastes as a peroxide inhibitor in lipid-based foods.

According to researchers' evaluations, in contrast to synthetic antioxidants, collagen-based antioxidants have contributed to the production of an improved shelf-life and nutritional value by protecting the product. Protein hydrolysates are also used in sports nutrition, weight control diets and nutritional supplements (Mahmoud and Cordle 2000). Other uses of protein hydrolysates as described by Mahmoud and Cordle (2000) include as the nitrogen sources for external feeding of individuals with specific nutritional or physiological needs, such as infants with intact protein hypersensitivity, or individuals with impaired GI function (e.g. Crohn's disease), short bowel syndrome or specific organ disease (e.g. pancreatitis, renal and hepatic malfunction), cancer patients and individuals with AIDS.



## REFERENCES

- \*Aspevik, T. 2016. Fish Protein Hydrolysates Based on Atlantic Salmon By-Products: Enzyme Cost-Efficiency and Characterization of Sensory, Surface-Active and Nutritional Properties, University of Bergen, PhD thesis, 86 p.
- \*Dagtekin, B.B. 2015. Investigation of Quality Changes in Fish Fingers Made from Prussian Carp (*Carassius gibelio*) Protein Isolates Produced by Surimi and pH Shifting Methods During the Frozen Storage, Mersin University Graduate School of Natural and Applied Sciences, Department of Fisheries, PhD Thesis, 152 p., Mersin, Turkey (In Turkish).
- \*Das, J., Dey, P., Chakraborty, T., Saleem, K., Nagendra, R., Banerjee, P. 2017. Utilization of marine industry waste derived collagen hydrolysate as peroxide inhibition agents in lipid-based food. Journal of Food Processing and Preservation, e13430. <https://doi.org/10.1111/jfpp.13430>
- \*Mahmoud M.I., Cordle C.T. 2000. Protein hydrolysates as special nutritional ingredients. In: Doxastakis G, Kiosseoglu V, editors. Novel Macromolecules in Food Systems. Elsevier. p. 181-215.
- \*Özyurt, G., Şimşek, A., Karakaya-Tokur, B., Aksun, E. T., Yeşilsu, A. F. 2015. Functional, Physicochemical and Nutritional Properties of Protein from Klunzinger's Ponyfish Extracted by the pH Shifting Method. Journal of Food Processing and Preservation, 39(6):1934-1943
- \*Ovissipour, M., Rasco, B., Shiroodi, S. G., Modanlow, M., Gholamid, S., Nemat, M. 2013. Antioxidant Activity of Protein Hydrolysates From Whole Anchovy Sprat (*Clupeonella engrauliformis*) Prepared Using Endogenous Enzymes and Commercial Proteases, Journal of the Science of Food and Agriculture, 93(7):1718-1726
- \*Pires, C., Batista, I., Fradinho, P., Costa, S. 2009. Utilization of Alkaline-Recovered Proteins from Cape Hake By-Products in the Preparation of Frankfurter-Type Fish Sausages. Journal of Aquatic Food Product Technology, 18:1-2, 170-190, DOI: 10.1080/10498850802629135
- \*Shaviklo, G. R., Arason, S., Thorkelsson, G., Sveinsdottir, K., Martinsdottir, E. 2010. Sensory Attributes Of Haddock Balls Affected By Added Fish Protein Isolate and Frozen Storage. Journal Of Sensory Studies, 25: 316-331. DOI: 10.1111/j.1745-459X.2009.00260.x
- \*Shaviklo, A. R., Moradinezhad, N., Abolghasemi, S. J., Motamedzadegan, A., Kamali-Damavandi, N., Rafipour, F. 2016. Product Optimization of Fish Burger Containing Tuna Protein Isolates for Better Sensory Quality and Frozen Storage Stability. Turkish Journal of Fisheries and Aquatic Sciences, 16: 923-933. DOI: 10.4194/1303-2712-v16\_4\_20
- \*Sheih, I., Fang, T., Wu, T., Lin, P. 2010. Anticancer and antioxidant activities of the peptide fraction from algae protein waste. Journal of Agricultural and Food Chemistry, 58(2): 1202-1207