

Valorization of canned sardine and mackerel residues through the extraction of bioactive compounds

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Introduction

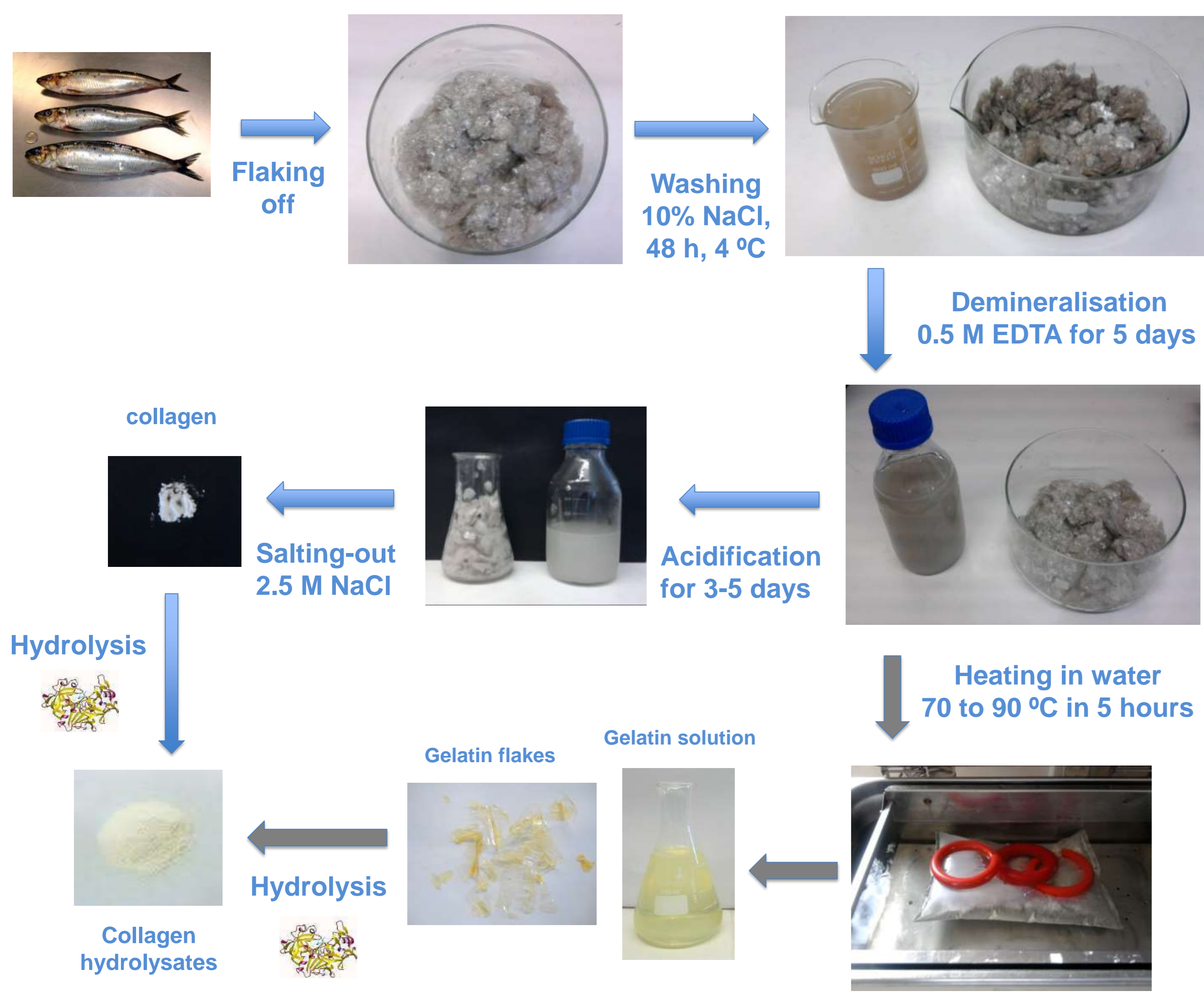
- Canned fish such as sardine, sardine-type and mackerel are highly consumed by the Mediterranean populations. Large amounts of by-products and wastes are generated along the processing of these species.
- Discarded heads, viscera, scales, bones, skin and flesh residues account in fact for 40-50% by weight of the whole fish.
- High valuable compounds can be recovered from the fish canning residues and employed in fields such as medicine, food and cosmetic.
- Minerals, proteins, lipids, biopolymers, amino acids and enzymes can be recovered either from wastewaters or from solid residues (head, viscera, bones, scales, skin, tails and flesh) generated along the canning process of sardine and mackerel (salting, cooking and filleting stages).

Objectives

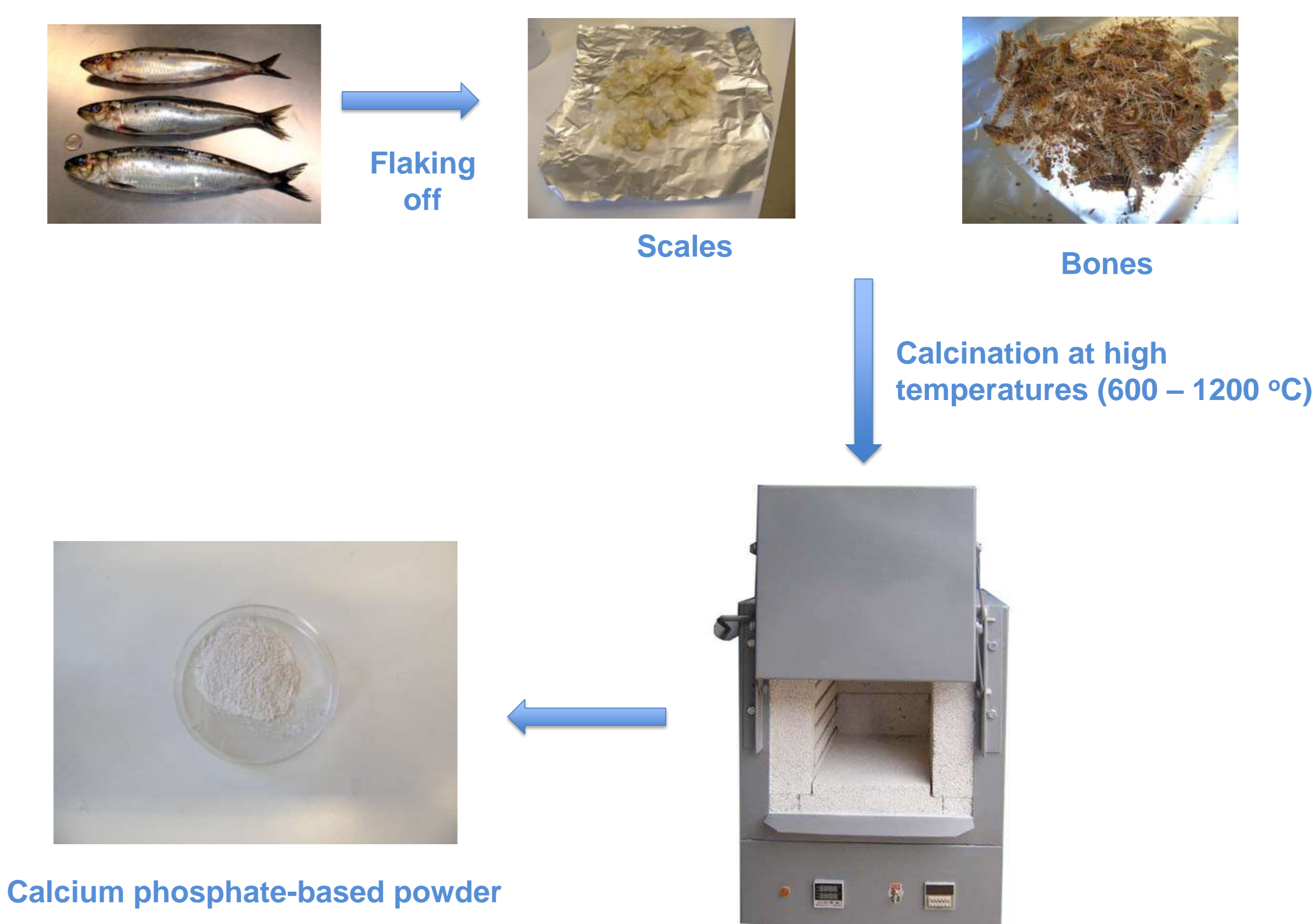
- Sardine and mackerel scales were processed for the recovery of **collagen** and its hydrolysed derivatives, either enzymatically, such as **collagen peptides**, or thermally, such as **gelatine**.
- **Hydroxyapatite** ($Ca_{10}(PO_4)(OH)_2 - HAp$), **chloroapatite** ($Ca_{10}(PO_4)Cl_2 - ClAp$) and **tricalcium phosphate** ($Ca_3(PO_4)_2 - \beta-TCP$) based materials were extracted from bones and scales with a calcination process.
- **Fish protein hydrolysates** and **biologically active peptides** were recovered from flesh or cooking wastewater through enzymatic hydrolysis of muscle proteins.

Methods

SCALES PROCESSING: Collagen, gelatine and collagen peptides



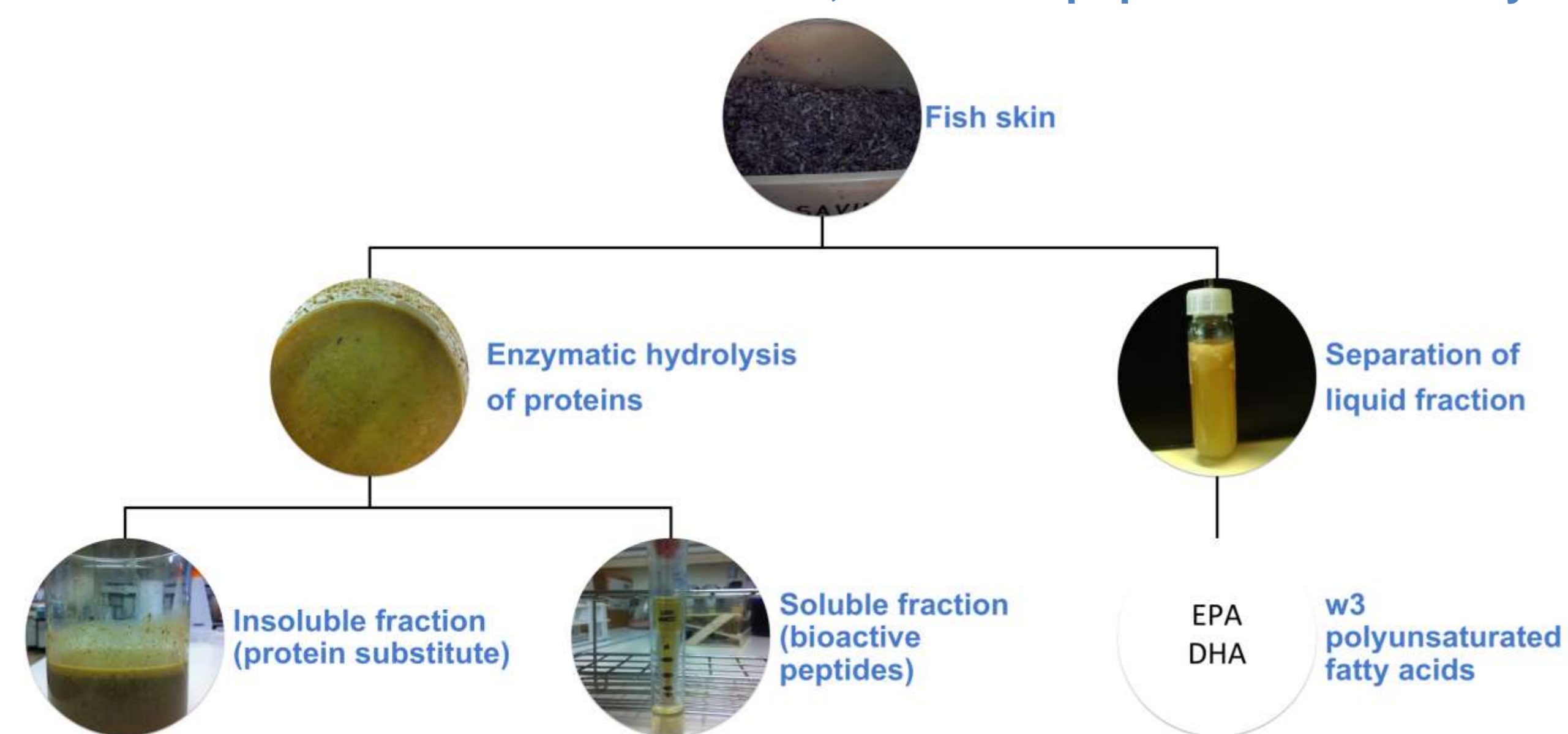
BONES AND SCALES PROCESSING: Hydroxyapatite and calcium phosphate-based materials



Calcination temperatures	Product
600 – 1200 °C	Biphasic material HAp – β -TCP

Calcination temperatures	Product
600 – 700 °C	Triphasic material HAp – β -TCP – NaCl
800 – 1200 °C	Biphasic material ClAp – β -TCP

SKIN PROCESSING: Protein substitutes, bioactive peptides and w3 fatty acids



Conclusions

- Collagen and collagen peptides could be employed in cosmetics and biomedicine, while gelatine could be used in low-fat food formulations, due to its fat-like melting properties, which can contribute to a smooth and creamy mouth-feel.
- HAp, ClAp and β -TCP could be used for the development of biocompatible bone cement for craniofacial, oral-maxillofacial and orthopaedic defect repair, and coating for femoral components; HAp ion-exchange properties makes it also suitable for wastewater treatment (heavy metals removal).
- Anti-hypertensive peptides from flesh residues, as well as collagen peptides (<3000 Da) could be employed in the development of functional foods and drinks formulations.
- This research shows the potentials for the valorisation of bioactive compounds from sardine and mackerel canning residues through the development of products with beneficial effect for the society/consumers and reduction of environment impact.

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