

ATHENS 2017



Phytatec
UK Ltd

FROM FISH TO NUTRACEUTICALS

*The Potential of 'Green Solvents' to add
Value to Fish By-products*

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FISH INDUSTRY

	2009	2010	2011	2012	2013	2014 ⁽¹⁾
PRODUCTION (Million tonnes)	145.9	148.1	155.5	157.8	162.9	167.2
UTILIZATION						
Human consumption	123.8	128.1	130.8	136.9	141.5	146.3
Non-food uses	22.0	20.0	24.7	20.9	21.4	20.9
Population (billions)	6.8	6.9	7.0	7.1	7.2	7.3
Per capita food fish supply (kg)	18.1	18.5	18.6	19.3	19.7	20.1

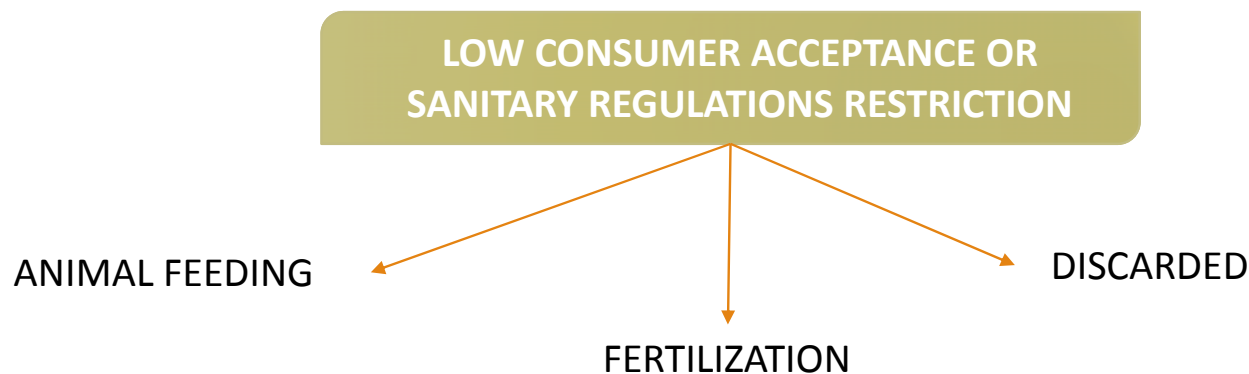
FAO STATISTICS

- Aquaculture (worldwide):

⌘ 73.8 million tonnes of fish (50% of the fish production)

FISH BY-PRODUCTS

- Fish is processed in various steps, producing various by-products:
- Considered of low value:

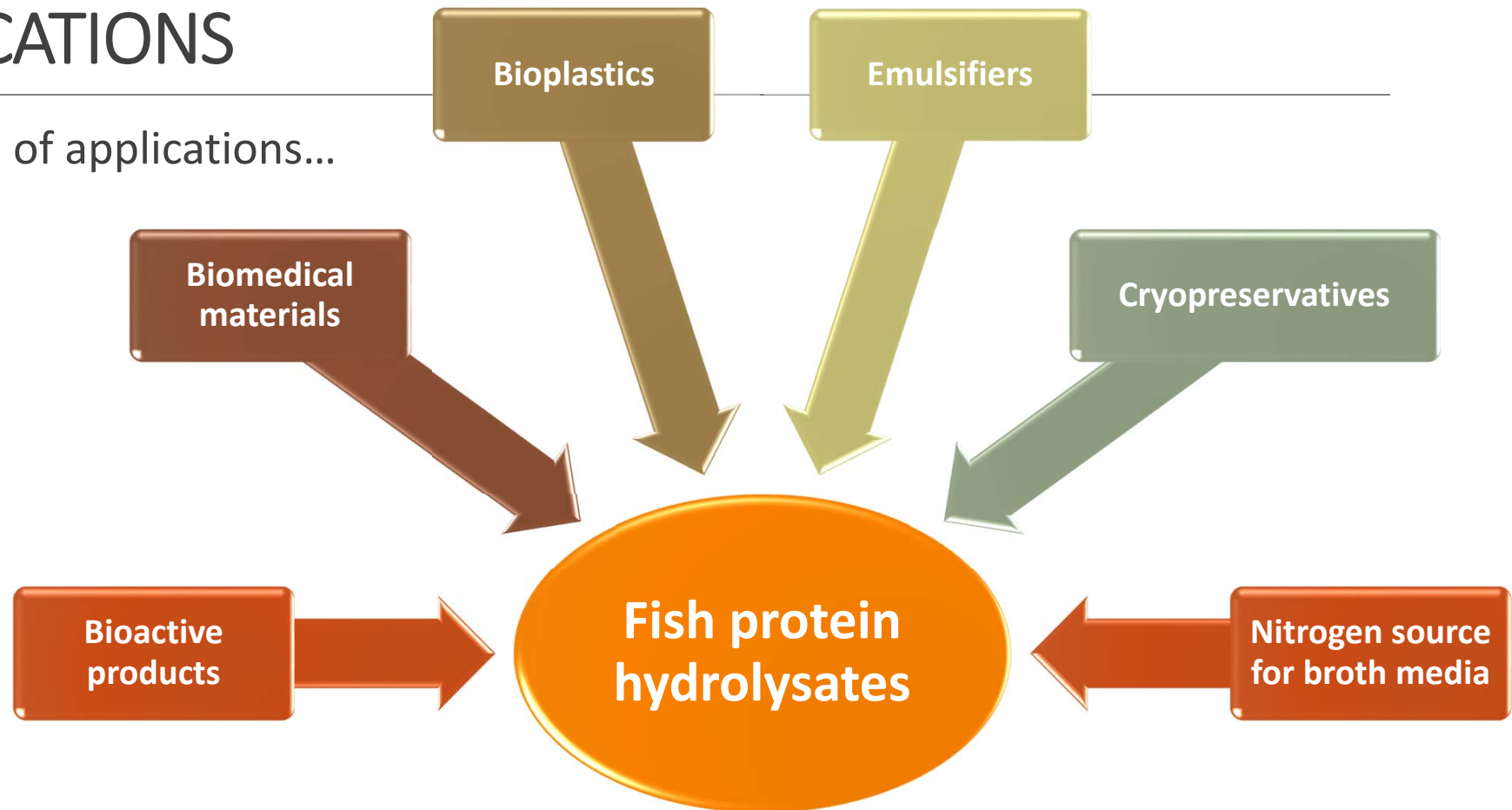


Component	Weight (%)
Head	21
Gut	7
Liver	5
Roe	4
Backbone	14
Fins and Lungs	10
Skin	3
Fillet	36

- Gelatine, fish sauce, fish sausages (and others snacks)

APPLICATIONS

A wide range of applications...



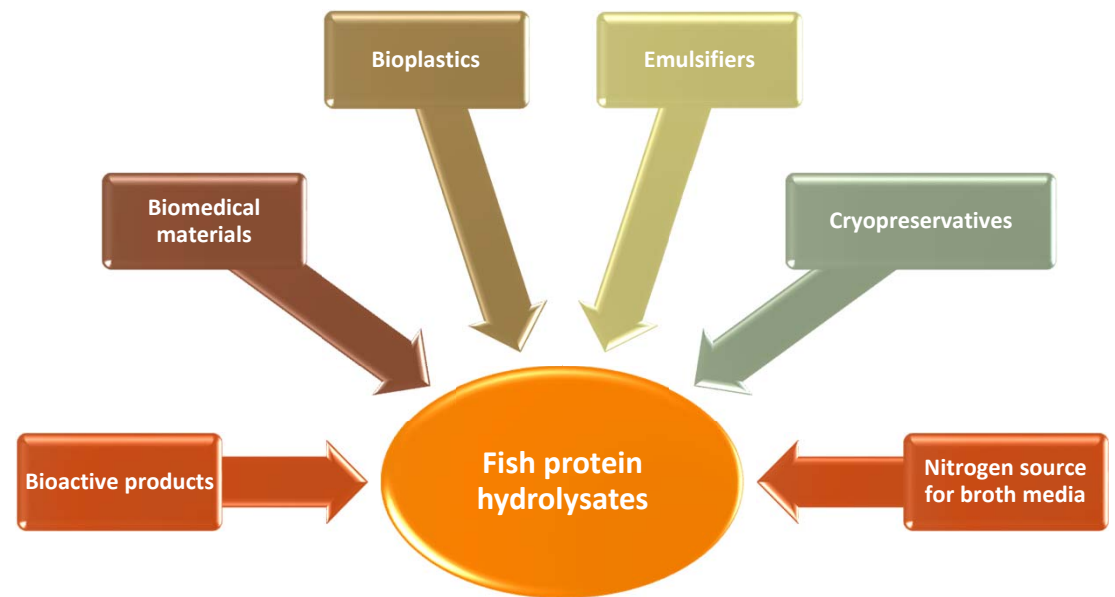
APPLICATIONS

A wide range of applications...

Conventional extractions methods:

- Chemical
- Enzymatic

Other extraction processes are also used...



SUBCRITICAL WATER

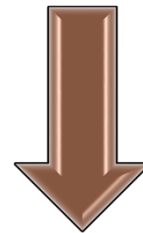
- Across the years subcritical water (SCW) is gaining attention as a method of valuable material recovery.
- Literature shows the efficiency on extracting and/or hydrolyse proteins and amino acids.
- Overcomes a few drawbacks of the chemical and enzymatic methods.
- It is possible to tailor its properties:

AT TEMPERATURES ABOVE 100 °C AND AT PRESSURES ABOVE THE VAPOUR PRESSURE:



IONIC PRODUCT

Increases the power of the hydrolysis reaction



DIELECTRIC CONSTANT

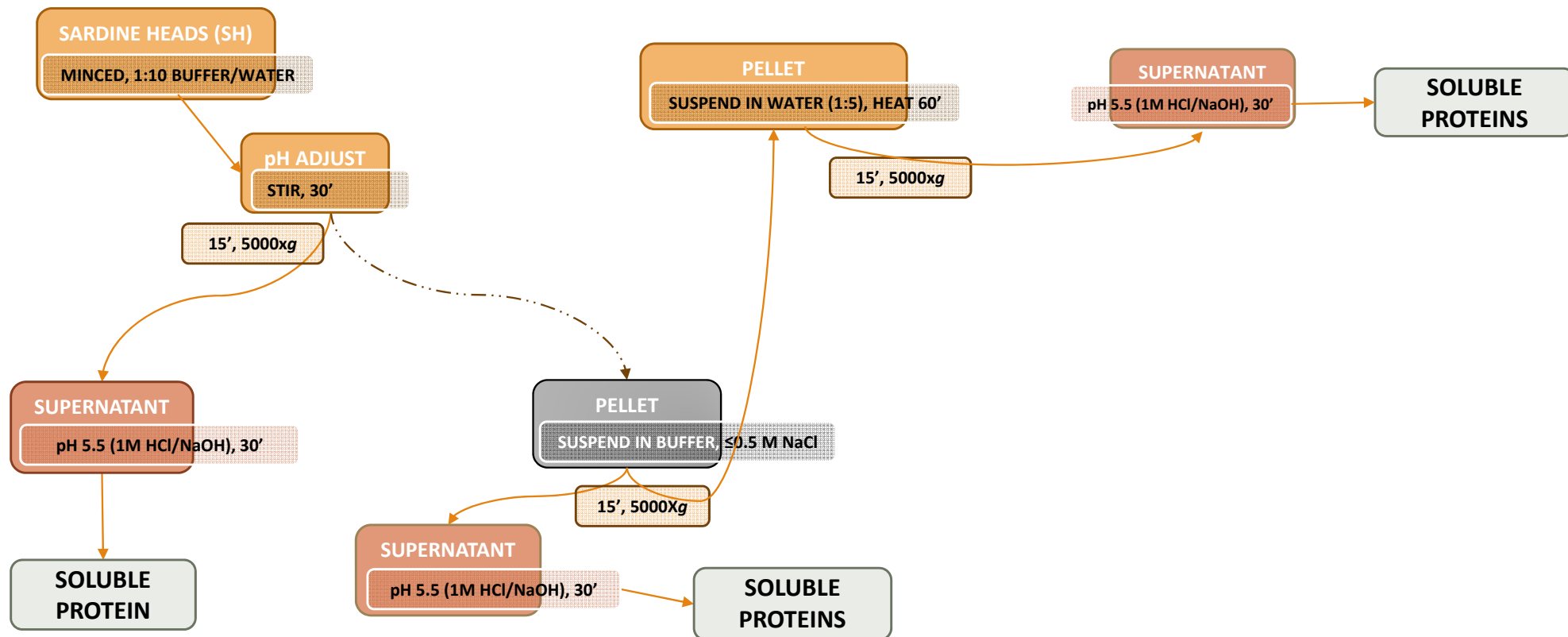
High solubility of less polar compounds

THE BY PRODUCT USED...

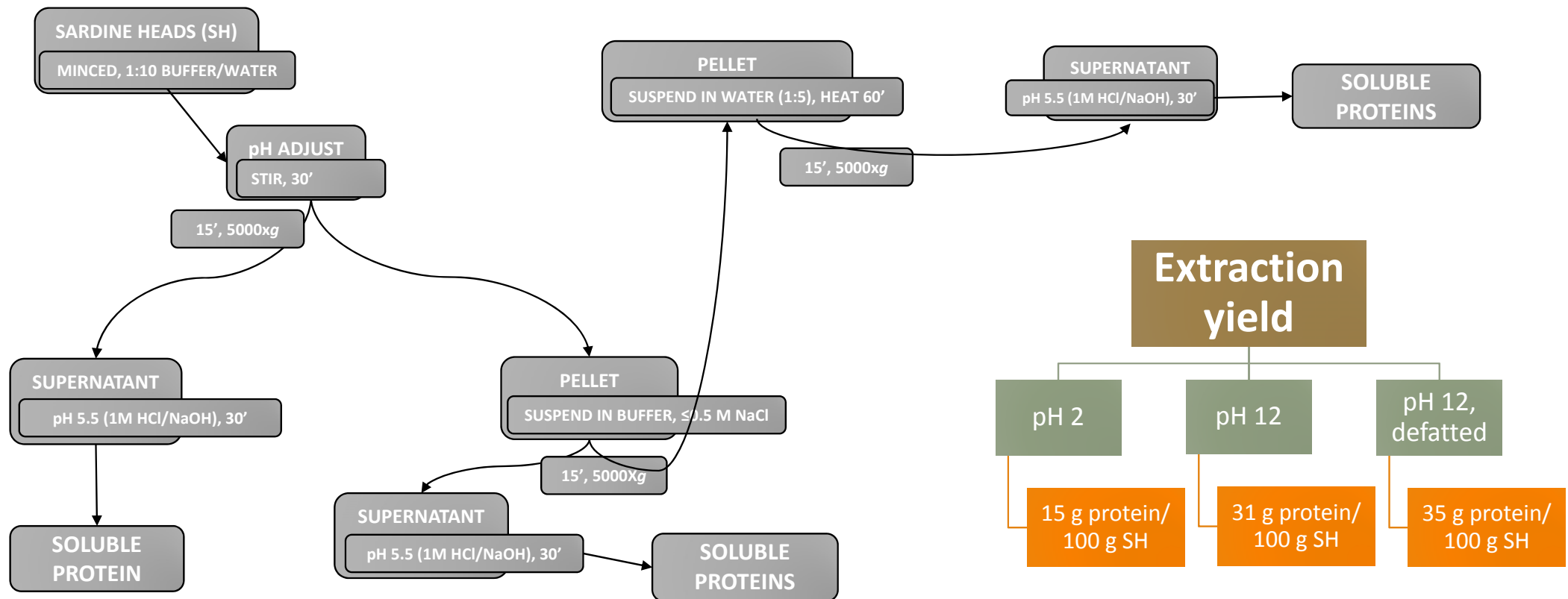
- Sardine heads (SH) that results from the canning industry
- Freeze-dry and stored at -20 °C
- Comparing the protein extraction between a conventional method and the subcritical water process



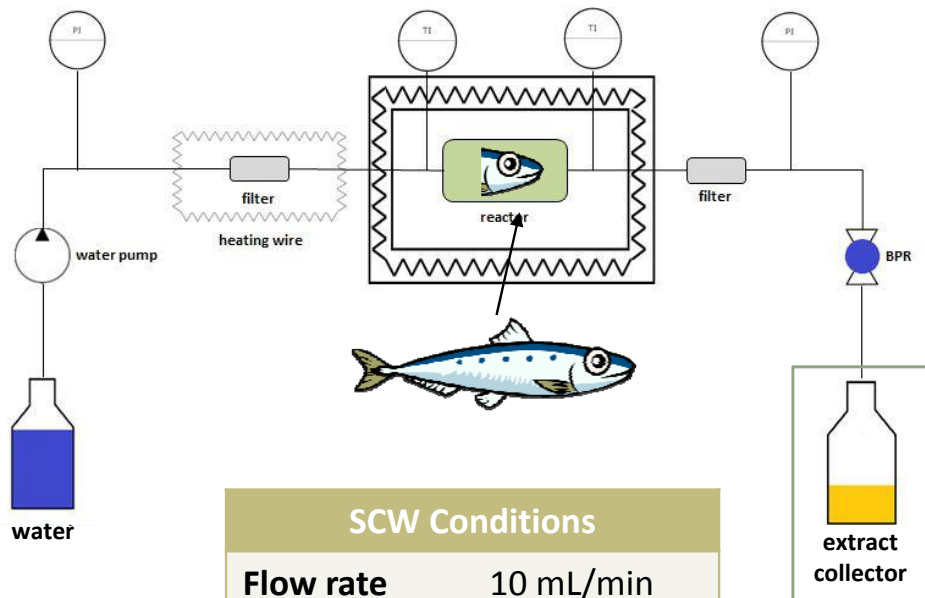
ACIDIC & ALKALINE EXTRACTION



ACIDIC & ALKALINE EXTRACTION

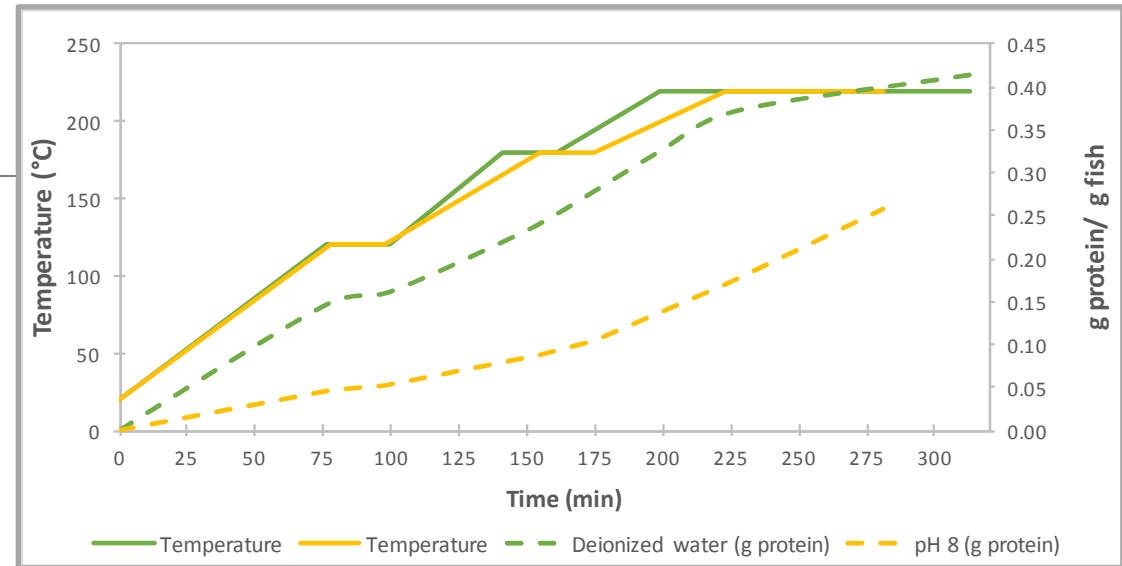


SCW EXTRACTION



SCW Conditions

Flow rate	10 mL/min
Pressure	70 bar
Temperature	20 – 220 °C



EXTRACTION YIELD

Deionized water (pH 5.5)

41 g protein/
100 g SH

Water w/
NaOH (pH 8)

26 g protein/
100 g SH

CONCLUSIONS

- Fish residue is a good source of proteins, with a wide range of applications
- Alkaline extraction shows better extraction results than the acidic extraction.
- SCW has similar extraction yields when compared to the conventional alkaline extraction and better than the acidic extraction.
- SCW shows to be very efficient for extracting proteins, having a low environmental impact (when compared to the chemical extraction).

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Thank you for your attention