



# From Bones to Bucks: Unlocking the Value of Marine side streams

**Rachel Durand, SINTEF**  
[rachel.durand@sintef.no](mailto:rachel.durand@sintef.no)





## FOODIMAR

sustainable climate-Friendly quality fOOD  
Ingredients from Marine side-stReams

Budget: €1,580,812

Duration: May 2024 – April 2027

To develop new industry-relevant solutions for valorising key side-streams from fisheries and aquaculture in climate-friendly, sustainable, high-quality, food market applications

### Target Compounds

-  Collagen
-  Gelatin
-  Glycosaminoglycans (GAGs)



Maximize the utilization of seafood side-streams and by-catch to reduce food loss



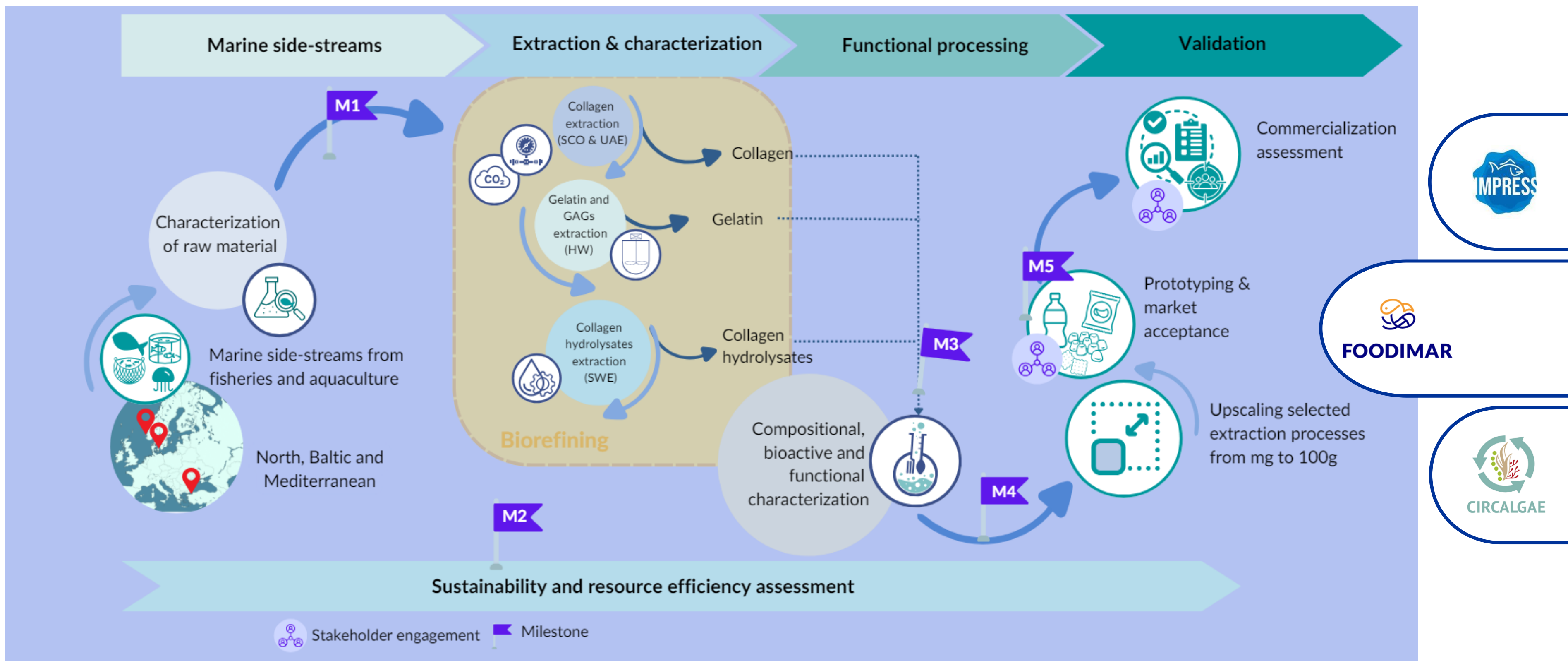
Raise the value of seafood side-streams by transforming them into high-value products



Promote capacity building and the development of business models














## The regional pilots



 Norwegian white fish fisheries side-stream

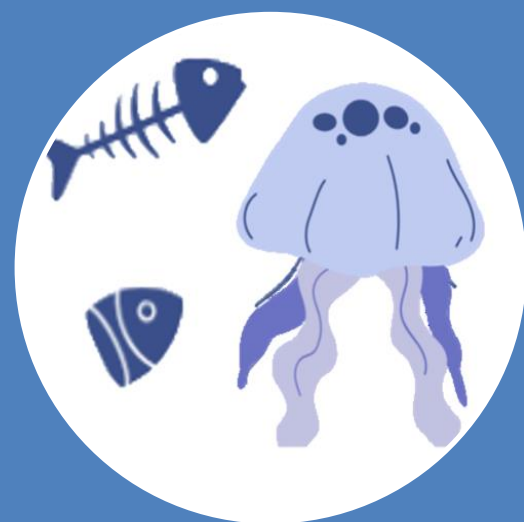
 Danish jellyfish by-catch

 Turkish seabream aquaculture side-stream and jellyfish by-catch

-  Pilot
-  Functionality testing & product development
-  Characterization & processing of marine biomass
-  Market assessment & commercialization
-  Sustainability & resource efficiency assessment
-  Engagement & transferability



# Value Creation throughout FOODIMAR



Identification of  
valuable fractions  
and compounds



Green and industry  
applicable  
extraction methods



Product prototypes  
development and  
end- consumers  
involvement



Commercialisation  
potential and  
policy  
recommendations

Resource efficiency and environmental, economical and social impacts

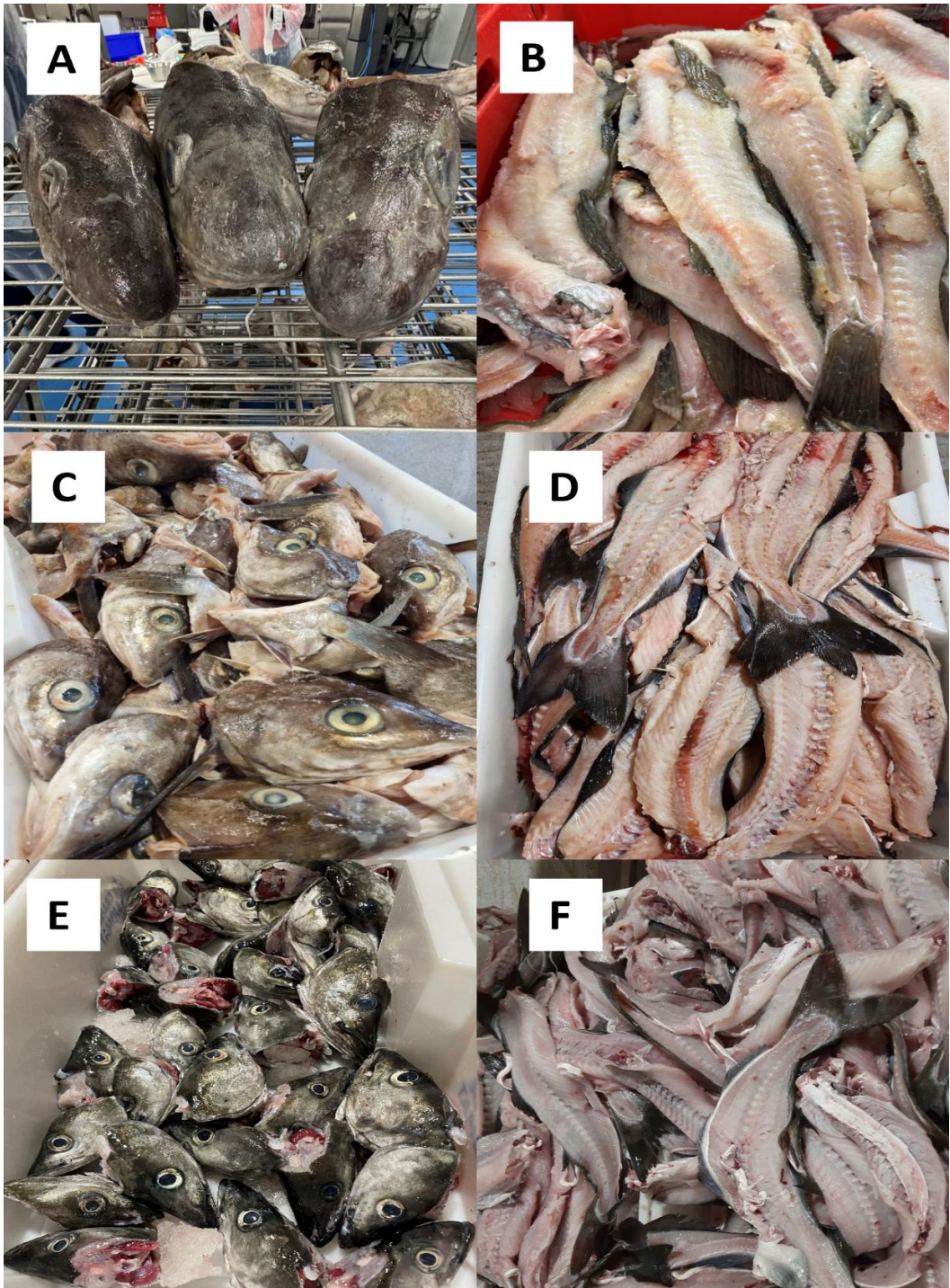






# Whitefish side-streams production in Norway

**Target Species:** cod (*Gadus morhua*), haddock (*Melanogrammus aeglefinus*) and saithe (*Pollachius virens*).



Tons	Production 2024	Head*	Backbones*
Cod	204 000	40 800	20 400
Haddock	74 000	11 840	7 400
Saithe	195 000	19 500	19 500



## Challenges for collagen extraction:

 Raw materials are a mix of bones and flesh

 High mineral content in the bones

 Lower yield and quality of gelatine and collagen

\* Norske omregningsfaktorer, 2018



## Side streams fractionation step

Screw separator of  
backbones and heads



Flesh



Bones

Seafood  
product



FOODIMAR



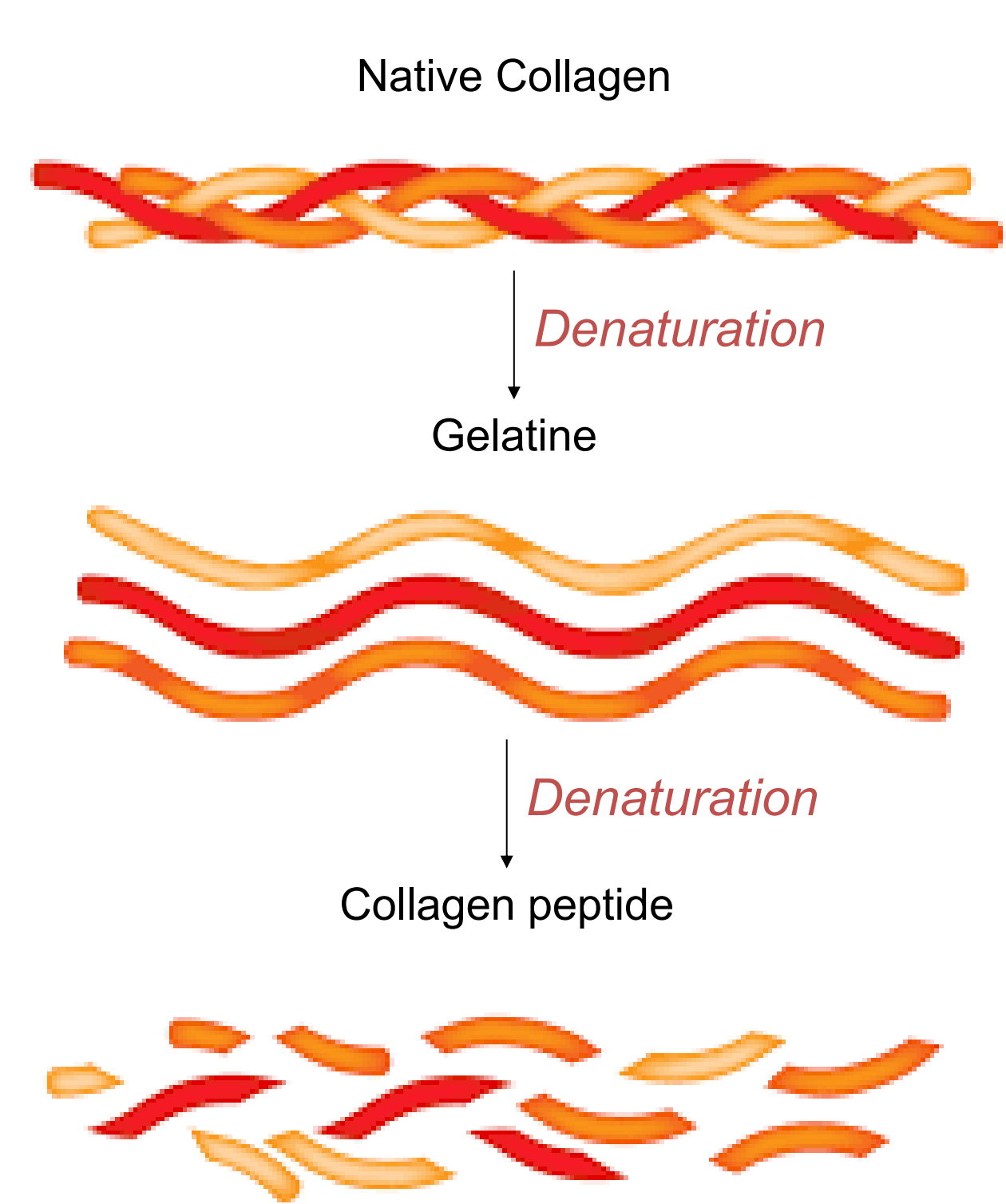
Gelatine -  
collagen



Co-funded by  
the European Union



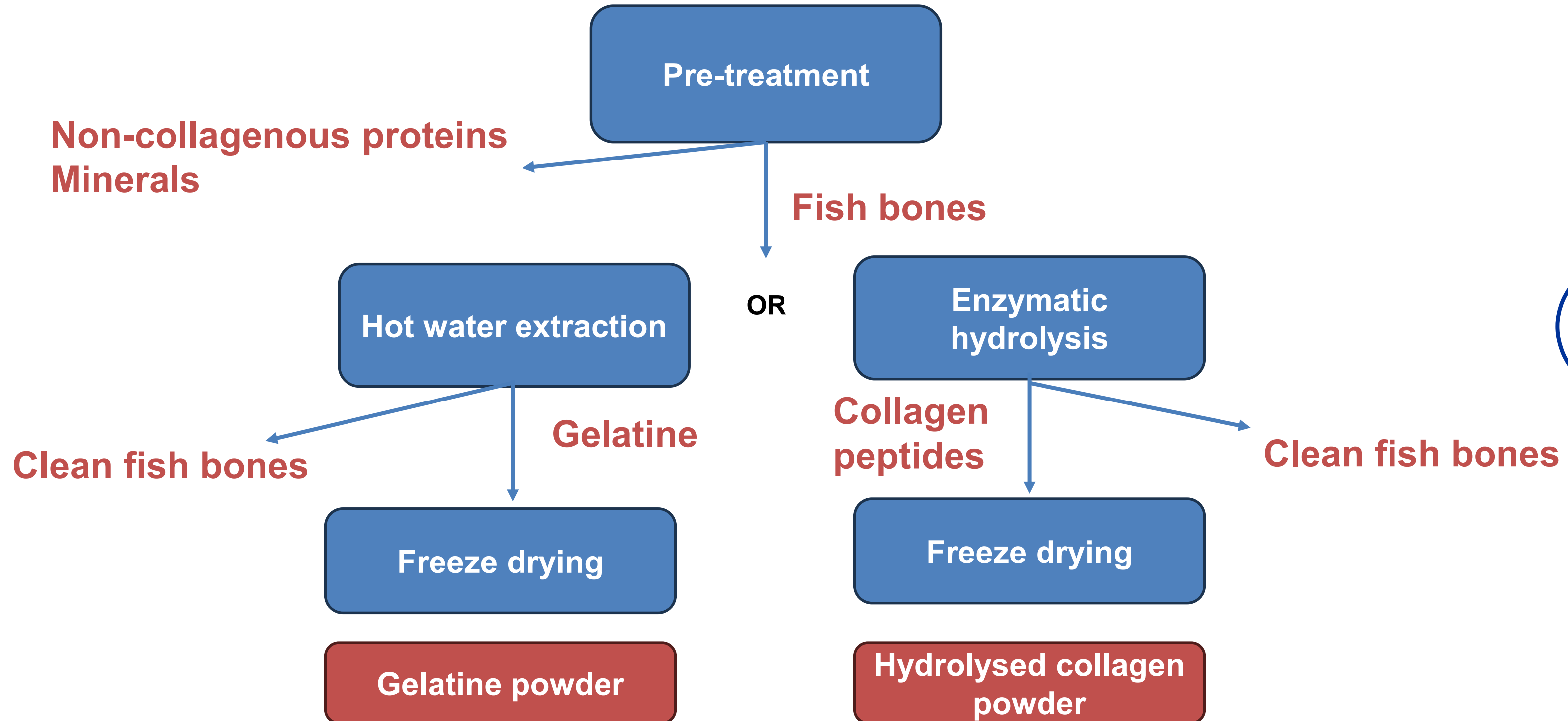
Collagen, gelatine or hydrolysed collagen, What is it?



	Native collagen	Gelatine	Hydrolysed collagen
Structure	Intact triple helix	Partially denatured	Broken into small peptides
Molecular weight	~300 kDa	~50-100 kDa	~1-5 kDa
Extraction	Acid or low temperature	Heat extraction (60°C-100°C)	Enzymatic hydrolysis
Solubility	Poor	Soluble in warm water, gelling	Soluble
Digestibility	Low	Moderate	High
Main uses	Biomedical	Food, cosmetic	Nutraceutical, cosmetic
Market value	\$\$	\$	\$\$\$



# Gelatine and hydrolyzed collagen extraction



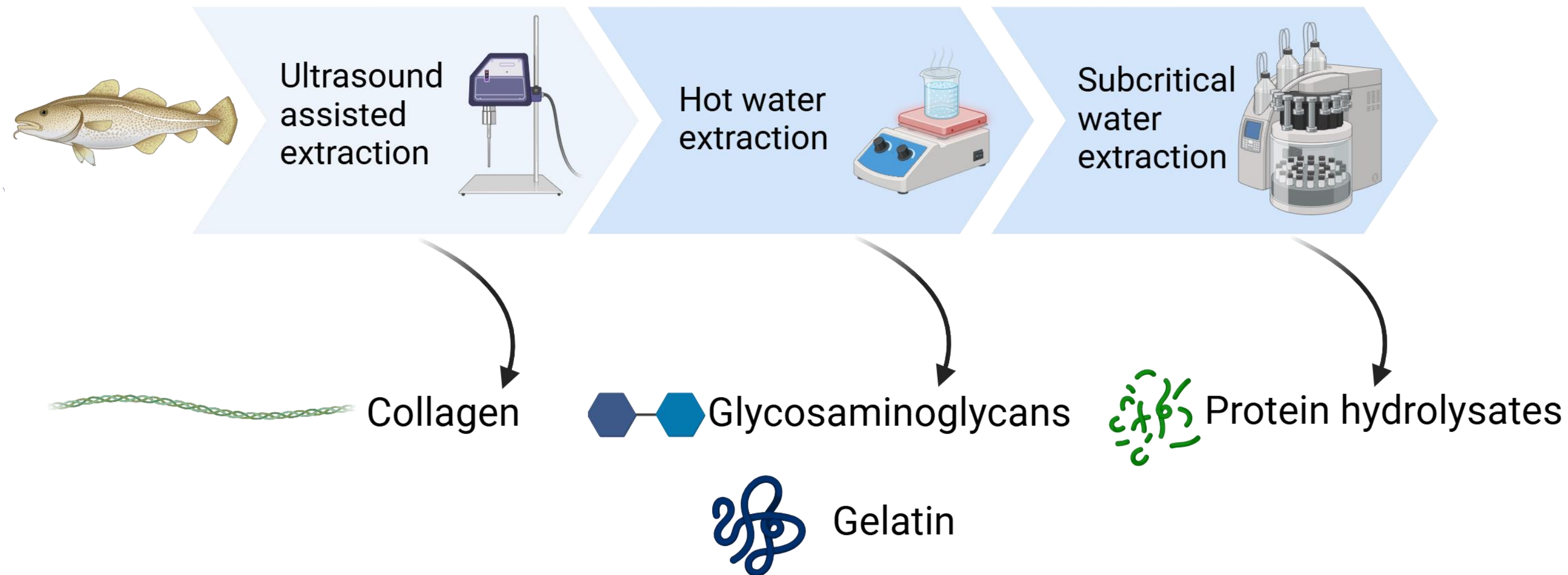
FOODIMAR



CIRCALGAE

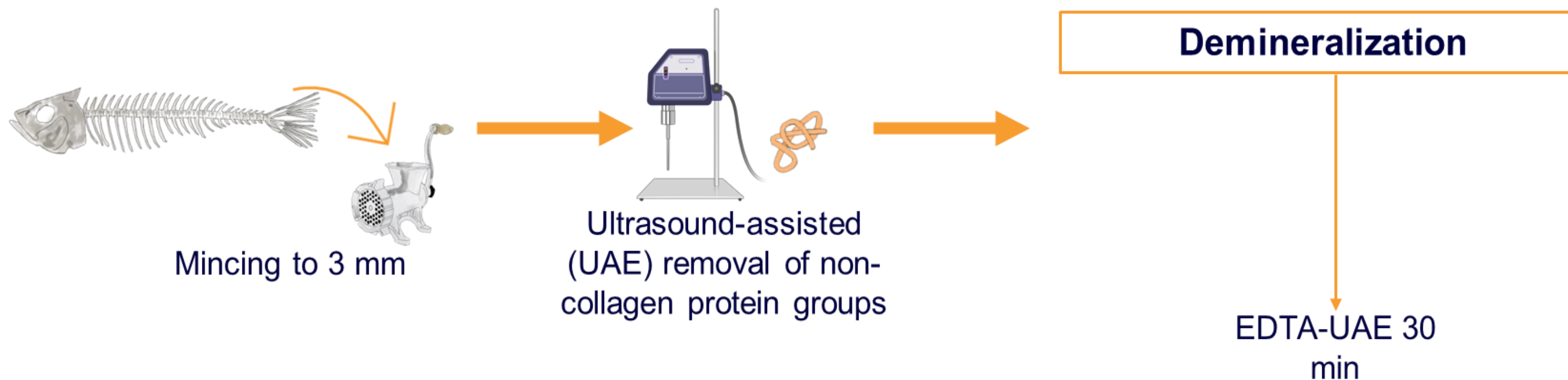


# Cascade collagen extraction





# Cascade collagen extraction



FOODIMAR



CIRCALGAE



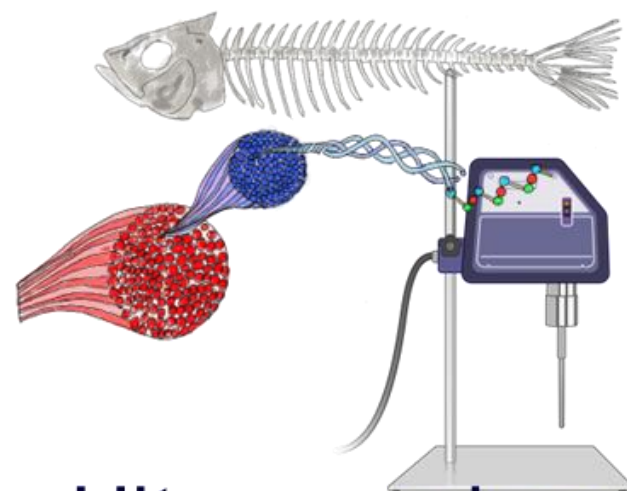
CHALMERS

Co-funded by  
the European Union

1. Demineralization with EDTA, does not make a difference in terms of the OM extracted compared to the no-demineralized material
2. **Finally, optimization of collagen extraction was carried out with no-demineralized bones**

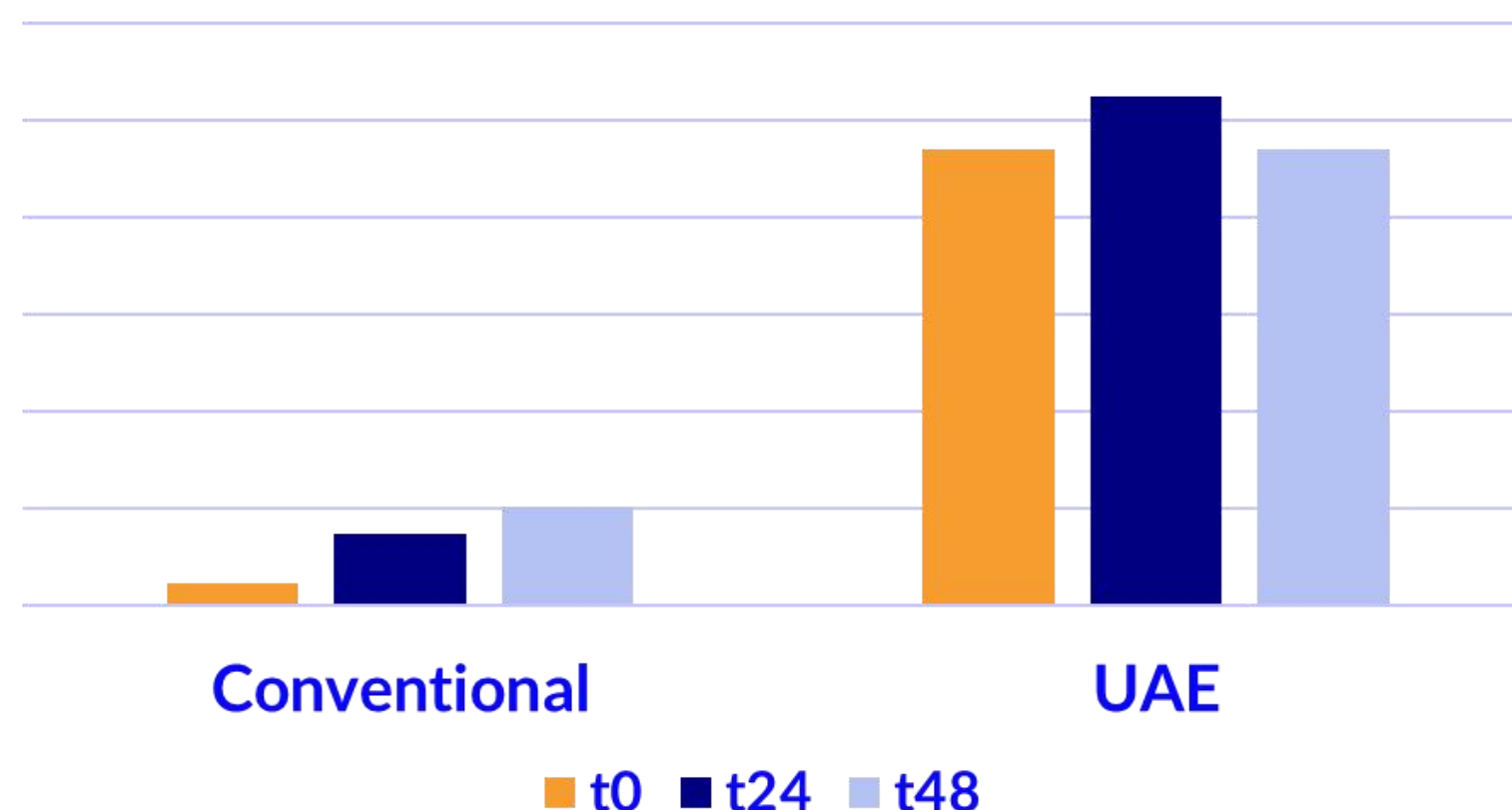


## Cascade collagen extraction



Ultrasound-assisted  
extraction of collagen  
(UAE)

% of collagen extracted (HYP) at different times of extraction



**UAE increase four times the yield of extracted collagen after only 30 minutes of extraction compared to the conventional method**



FOODIMAR



CIRCALGAE



CHALMERS



Co-funded by  
the European Union



## Take home message

- Norwegian whitefish side streams (heads and backbones) are a good source of high value products:
  - Protein rich mince -> development of healthy seafood products
  - Bones fraction -> Collagen, gelatine or hydrolysed collagen
- Marine collagen demand is increasing and could reach 2,3\$ billion in 2032 and fish skin is highly competitive access\*.
  - Fish bones = cheap and available raw material alternative
  - Range price for gelatine 15-60\$/kg and hydrolysed collagen 30-100 \$/kg





Thank you



Picture: seafoodfromnorway

*GET IN TOUCH*



[www.foodimar.eu](http://www.foodimar.eu)



FOODIMAR

[rachel.durand@sintef.no](mailto:rachel.durand@sintef.no)



FOODIMAR



CIRCALGAE



Co-funded by  
the European Union