



Fish Processing Wastes: Potential Source of By-products

Hasan Basri Ormanci¹, Ibrahim Ender Kunili², Fatma Arik Colakoglu¹

¹Çanakkale Onsekiz Mart University, School of Applied Sciences, Çanakkale, Turkey

²Çanakkale Onsekiz Mart University, Faculty of Marine Science and Technology, Çanakkale, Turkey

BACKGROUND

- ❖ Each year 170 million metric tons total production
- ❖ Only 50-60% for actual human consumption
- ❖ In worldwide annual discards are 25% of the total catch by-catch species, processing waste and by-products
- ❖ A considerable part of wastes is valorized as a substrate for animal feed, fishmeal, and silage
- ❖ The rest of materials are disposed



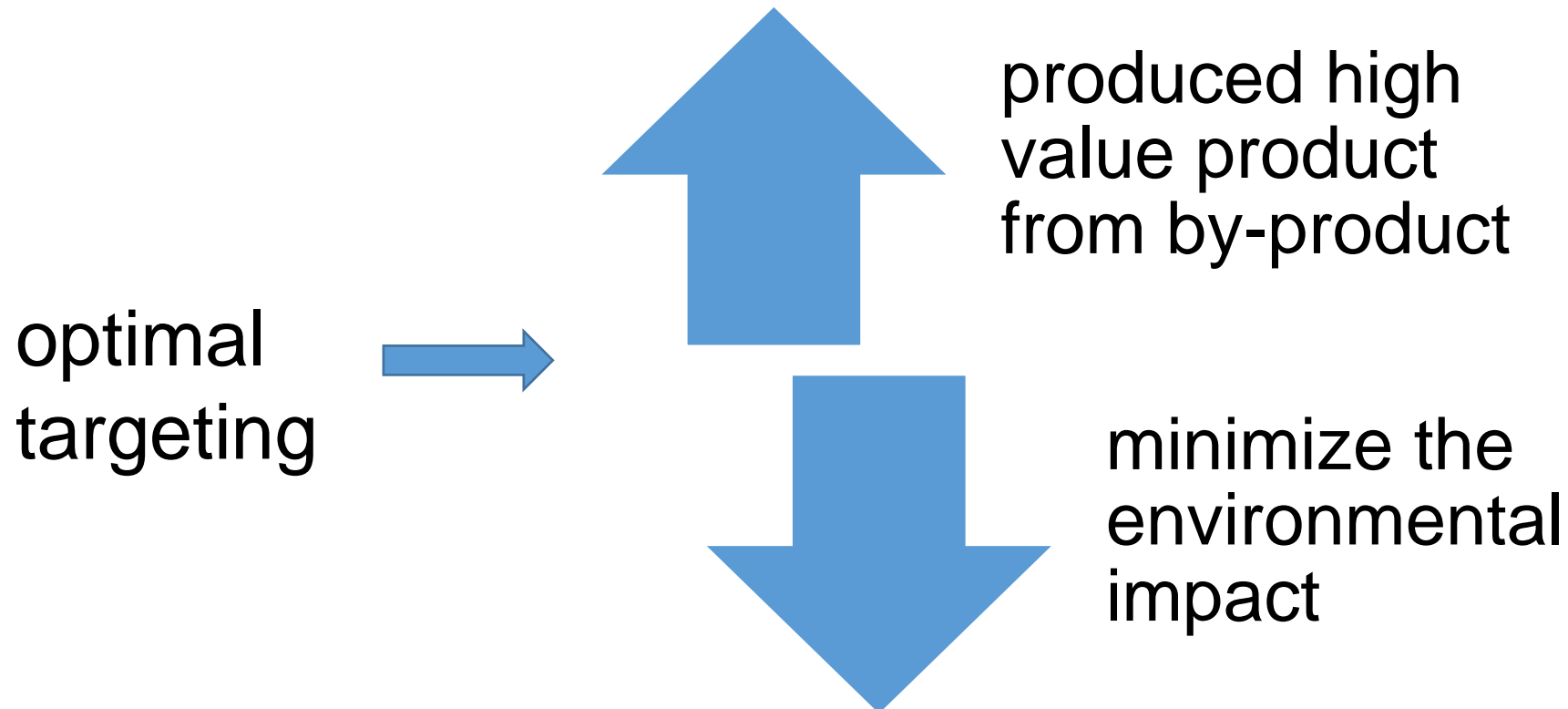
BACKGROUND

- ❖ In EU, a total of 5.2 million tons per year discard
- ❖ A total 3.17 million tons per year (50–75% of the fish) of solid waste and by-products from fillets, salted and smoked fish
- ❖ A 1.5 million tons per year (30–65% of the fish) from canned fish
- ❖ A 0.5 million tons per year (20– 50%) from processed bivalves



BACKGROUND

- ❖ Fishery wastes has becoming a global concern
- ❖ Affected by several biological, technical, and operational factors as well as socio-economic drivers



BACKGROUND

How to evaluate by-products?

- fish protein concentrate
- protein
- fish oils
- peptides
- collagen
- gelatin
- others

Used to
products

- animal feed
- biodiesel/biogas
- dietetic products
- natural pigments
- food-packaging
- cosmetics
- enzyme isolation
- others

Applications

Our goals

summarize the current and potential uses of fish waste in terms of economic and innovative



HIGH VALUE COMPONENTS FROM MARINE BY-PRODUCTS AND WASTE

1. Fish Protein and Oil

- Fish meal
- Fish sauce
- Fish silage



High added value compounds	Marine by-products	Content (% w/w)	Market value (Euro/kg)
Polyunsaturated fatty acids (ω -3 and ω -6)	Algae, cod liver, oil of mackerel flesh residues	50–80% in cod liver, 23% are ω -3 PUFA	24 (as purified cod liver oil)
Free amino acids	Mussels, fresh clams, white fish flesh residues, crustacean shells	0.8–2% of taurine, 2.7% of creatine (on dry matter)	n.a.

HIGH VALUE COMPONENTS FROM MARINE BY-PRODUCTS AND WASTE

2. Chitin and chitosan

- Medicine
- Pharmacology
- Food industry (food additives and packaging materials)



High added value compounds	Marine by-products	Content (% w/w)	Market value (Euro/kg)
Chitin and chitosan	Shrimp and crab shells	15–40%	15–750

HIGH VALUE COMPONENTS FROM MARINE BY-PRODUCTS AND WASTE

3. Collagen and gelatin

- Food material
- Pharmacy
- Photography



High added value compounds	Marine by-products	Content (% w/w)	Market value (Euro/kg)
Collagen and gelatin	Pelagic fish skin, scales and bones	Up to 80% in skin, up to 50% in scales	9–14

HIGH VALUE COMPONENTS FROM MARINE BY-PRODUCTS AND WASTE

4. Hydroxyapatite

- Biomaterials (bone implants, bone cement, and dental paste)



High added value compounds	Marine by-products	Content (% w/w)	Market value (Euro/kg)
Hydroxyapatite	Pelagic fish scales and bones	60–70% in bones, up to 50% in scales	n.a.

HIGH VALUE COMPONENTS FROM MARINE BY-PRODUCTS AND WASTE

5. Antifreeze proteins
- Ice-cream manufacturing
 - Frozen meat technology



High added value compounds	Marine by-products	Content (% w/w)	Market value (Euro/kg)
Antifreeze proteins	Cold water pelagic fish blood and skin	5–35 mg/ml in cold water fish blood	5000

HIGH VALUE COMPONENTS FROM MARINE BY-PRODUCTS AND WASTE

6. Astaxanthin

- Food ingredient (coloring agent for salmon, crabs, shrimp, chicken, and egg production)



High added value compounds	Marine by-products	Content (% w/w)	Market value (Euro/kg)
Astaxanthin	Algae, crustacean shells	2.3–33%	3000–12,000

HIGH VALUE COMPONENTS FROM MARINE BY-PRODUCTS AND WASTE

7. Enzymes

- Cheese
- Red meats
- Fruit juice
- Seafood processing
- Collagen removal



High added value compounds	Marine by-products	Content (% w/w)	Market value (Euro/kg)
Enzymes	Algae, pelagic fish viscera	–	14,400 (cod proteases)

CONCLUSION

- For the long-term sustainability of the fish industry, valorisation of by-products is a must order
- A few high value added components recovered from byproducts are economically more attractive than the target products
- Development of novel and clean technologies to recovery of bioactive nutraceutical compounds from marine by-products will lead to the development of more profitable processes, thus giving rise to many great opportunities to the marine industry

Thank you for your attention

