Treatment and valorisation of by-products

Some activities in Ireland

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Utilisation of by-products

- Fish Waste production
- Functional Foods research programme

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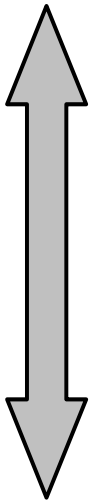
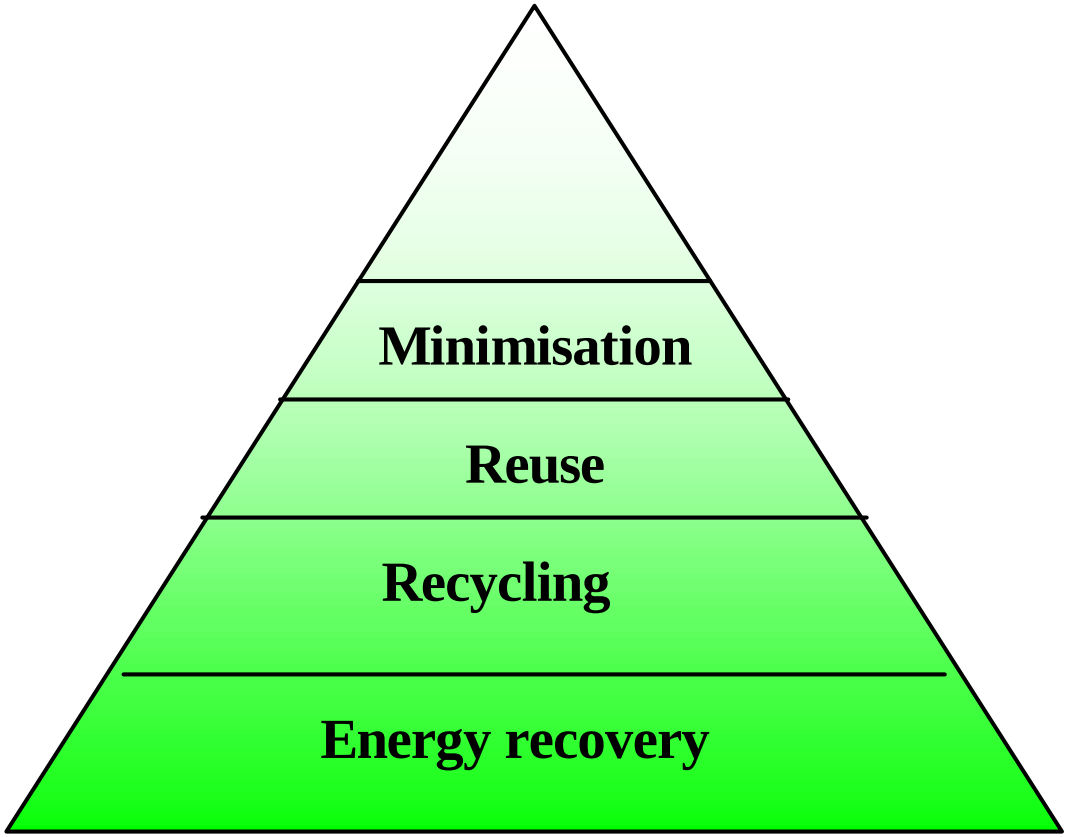
Utilisation of Fish Waste

Most favoured option

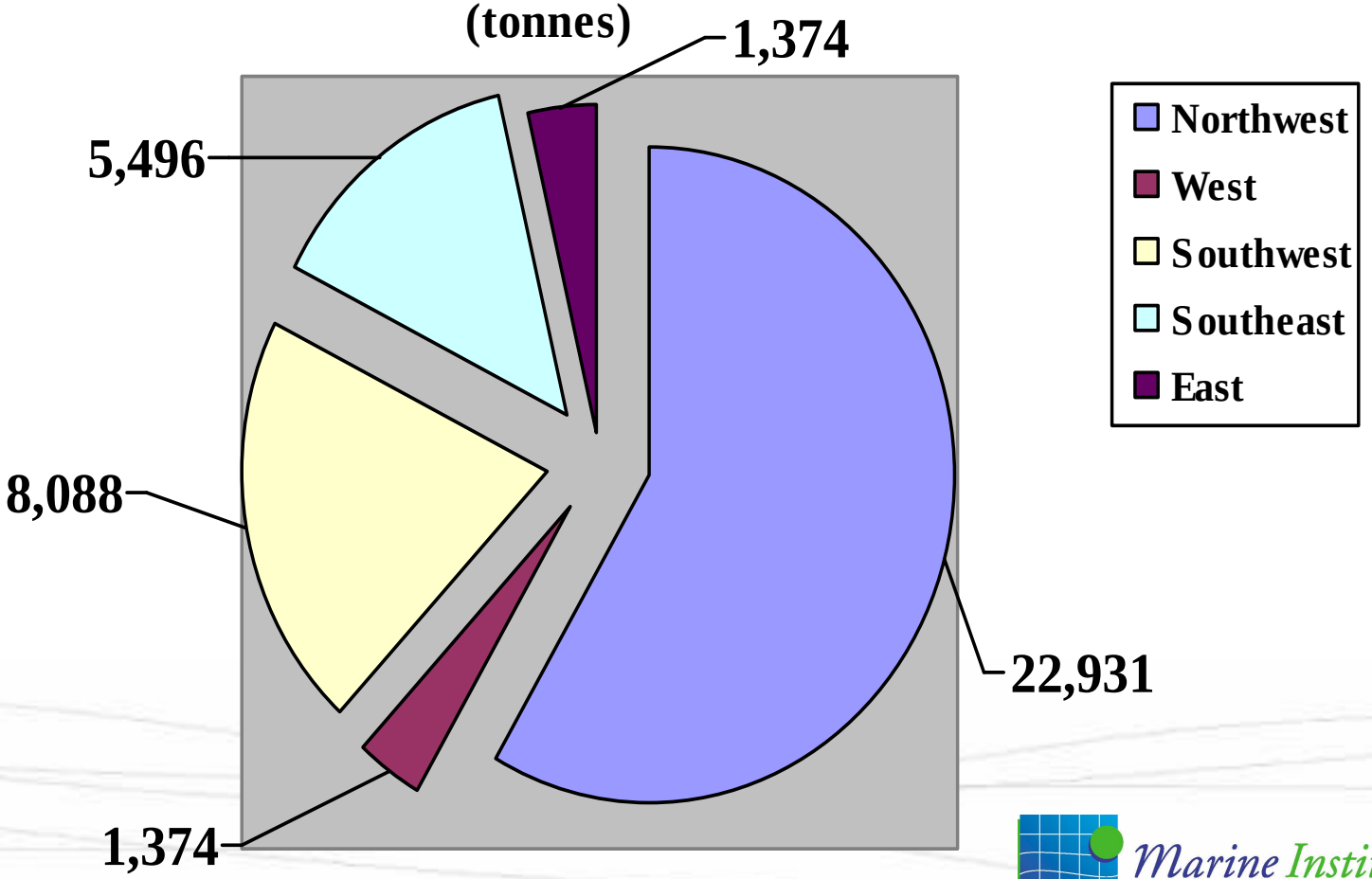


Least favoured option



Fish Waste Volumes

Figure 3.4 Estimated solid waste arisings from processing of herring and mackerel 2000, related to distribution of processing plants (tonnes)



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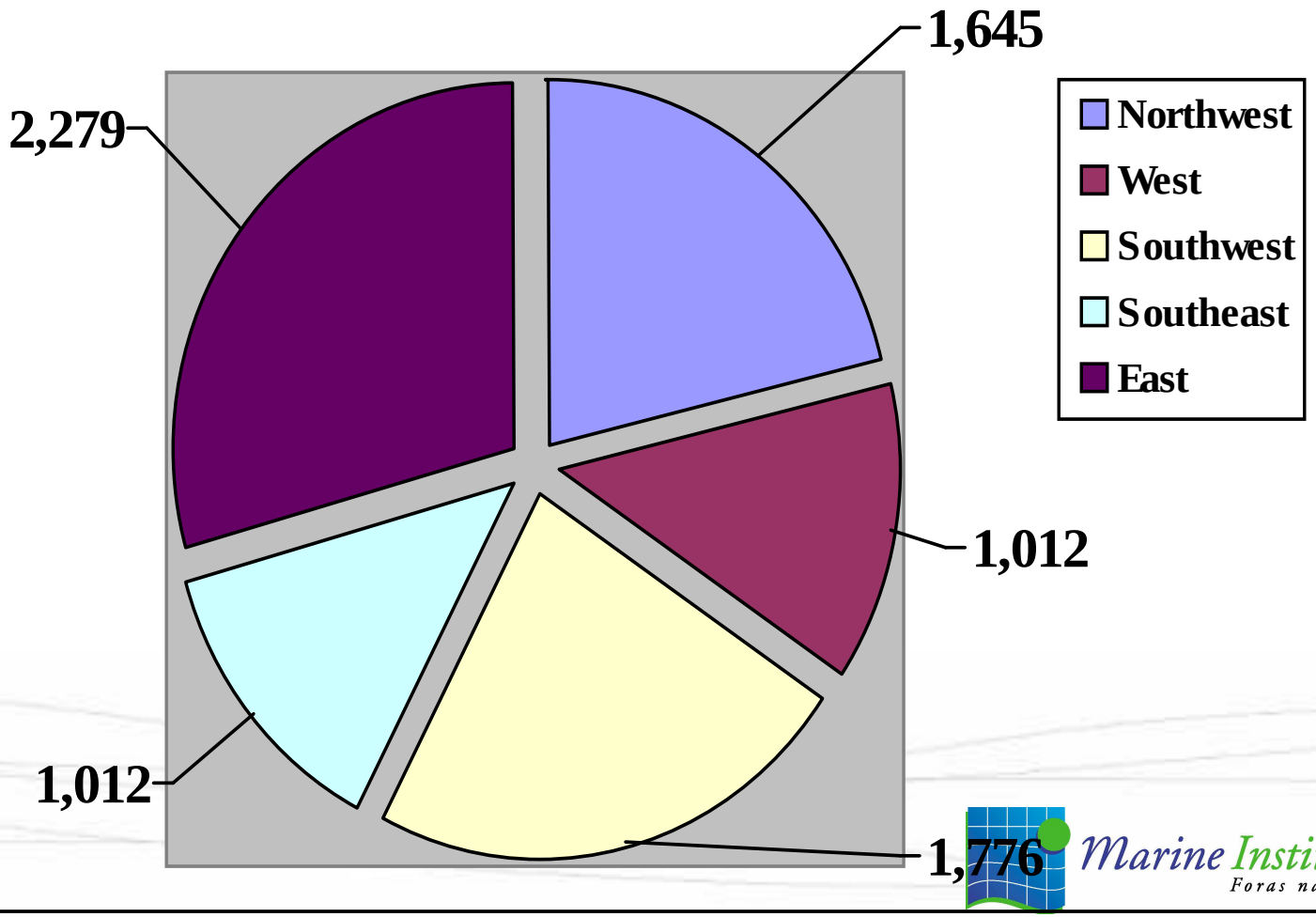
Fish Waste Volumes (Whitefish)

Figure 3.2 Estimated whitefish waste arisings 2000, related to distribution of processing plants (tonnes)



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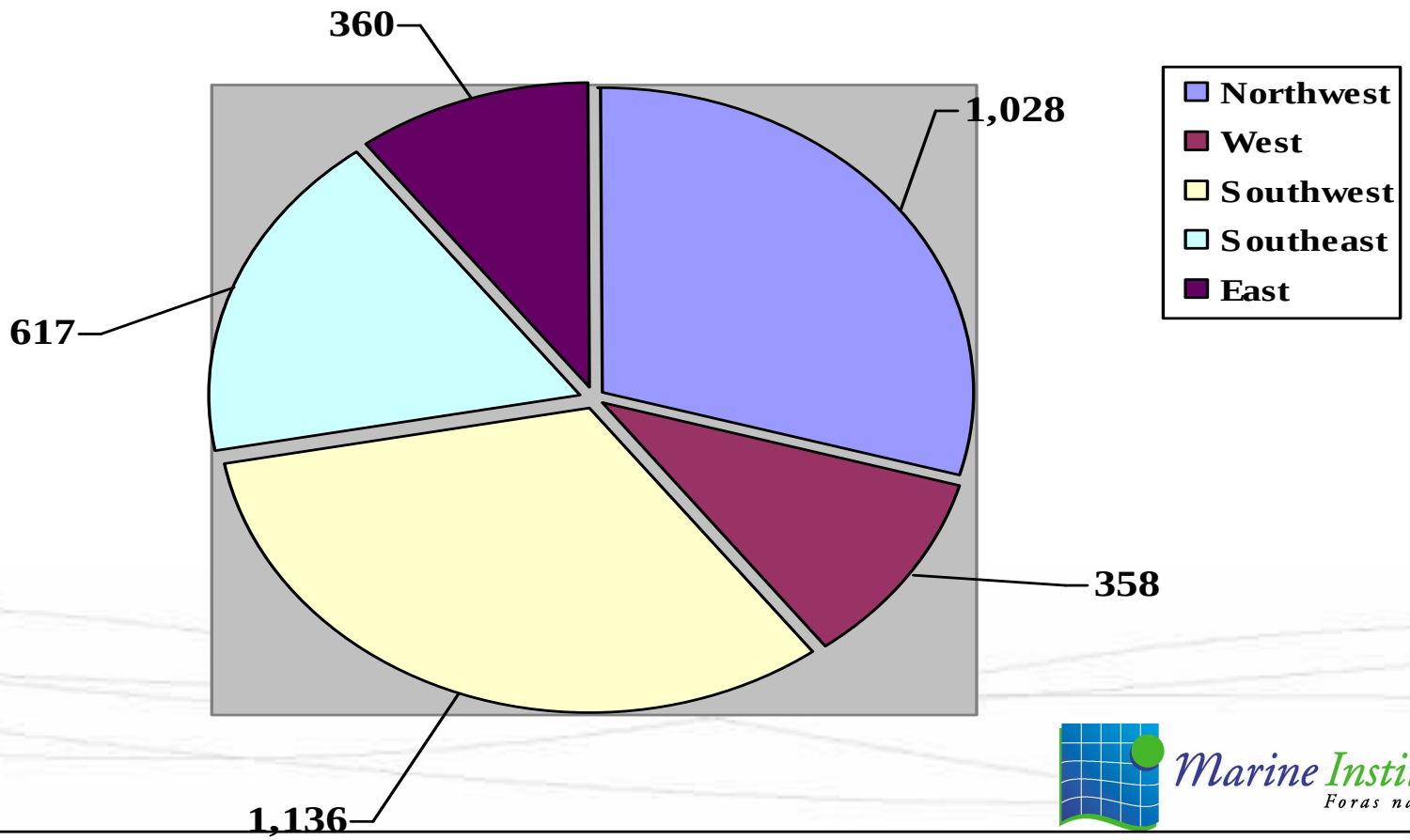
Fish Waste Volumes (Crustacea)

Figure 3.8 Estimated regional solid waste arisings brown crab and prawn processing, 2000 landings and imports (tonnes).



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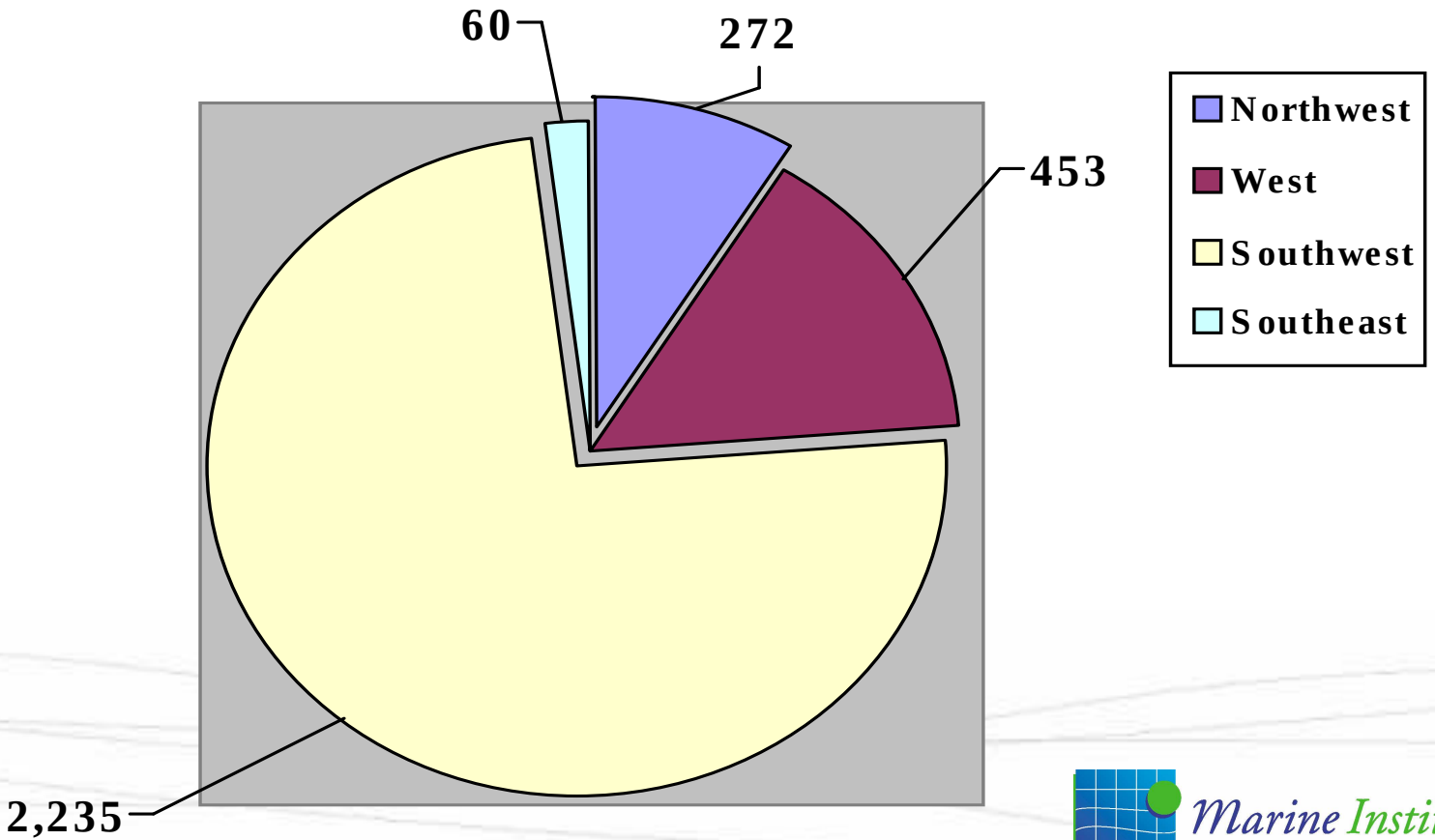
Fish Waste Volumes (Mussels)

Figure 3.10 Estimated regional reject and solid waste arisings for harvesting and processing of rope mussels 2000.
Total waste 3,020 tonnes



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Summary Findings of Study on Fish Waste (2000)

- **Few opportunities exist in Ireland for the development of high value by-products due to insufficient and inconsistent waste volumes. The short-term focus is therefore on ensuring any waste produced provides some revenue to processors rather than it representing a cost.**

Recommendation :

- ***Research into novel by-products applicable to the specific characteristics of Irish waste streams (highly dispersed, sporadic, low volume) should be supported.***

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Research- Adding Value to Crab-Shell Waste

- Objective: to address the problem of waste remediation in the crustacean processing industry by examining the potential for the production of high-value products from the waste stream rather than regarding the waste as a problem for disposal.

- Production of chitinase enzymes, which degrade chitin to low molecular weight soluble and insoluble oligosaccharides and may have potential as biopesticides, and other compounds such as antifungal agents and antibiotics which may be produced using crab shell waste as the growth substrate.

(Letterkenny Institute of Technology)

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Research- Taurine status of fish and fish products

Project is examining:

(i) the taurine (beneficial for cardiovascular health) content of a range of fish species,

(ii) enrichment of tuna cubes (by tumbling) and salmon sides (by injection) with additional taurine (circa 1% in the flesh as eaten) thus converting these products to potential functional foods,

(iii) taurine retention in tuna cubes following processing and reheating/cooking.

These trials are a component of the EU SEAFOODplus Integrated Project (www.seafoodplus.org).

(Teagasc –the Agricultural Research Institute)

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Findings of Workshop on Marine Functional Foods (2007)

- **Generally Ireland is weak at sourcing and 'mining' marine ingredients**
- **Need for assurance on raw-material supplies and permitting for accessing/use inc. use of aquaculture**

•Need for screening platforms and protocols for identifying marine components with impact on human health

•Clinical trials need to be addressed

•Areas need to have some critical mass already in Ireland

•Potential in microalgae Novel bacteria,Starfish, urchins, shellfish

•Look at range and content of variability in the organisms

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Marine Functional Foods-Programme Goals

1. **Find, identify, characterise materials**
2. **Understand actions and impact on health**
3. **Develop into ingredients that add value**

CAPACITY and CAPABILITY ENHANCEMENT

- **Build teams to position Ireland as an international player**
- **Develop and research staff in marine functional ingredients**
- **Encourage strong national collaboration to develop specialise knowledge**
- **Enable Irish researchers to compete for leadership roles in FWP**
- **Raise the levels of research performance and knowledge exploitation in the sector**
- **Maximise the contribution of funds from other sources to support MFF research**

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Marine Functional Foods- Research Themes

Extracts from seafood processing discards – enzymes, lipids, proteins

Creating novel marine ingredients – find proteins, antioxidants etc

Applications for novel marine ingredients – new product concepts

Marine origin consumer foods – identify and use of new species, improved processing

Marine functional foods - exploit inherent functionality, increase bioactive materials

Nutrition and health – bio-availability and absorptions, justify claims

Safety of marine functional foods – develop tests, assays, protocols

Consumer and market analysis – consumer insights, research opportunities, new markets

Marine ecology – resource management – location, distribution, availability and sustainable

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Marine Functional Foods Final Programme

- Develop a National repository of GRAS marine resources to serve as raw materials for inclusion in marine origin functional foods
- Assess markets and consumer attitudes to marine origin functional foods.
- Develop a database of bio-molecules isolated from marine sources- antioxidants and pigments, polysaccharides, peptides and amino acids and fatty acids
- Develop high through-put bio-assays to assess the bio-activity of marine origin biomolecules- anti-microbial activity, anti-thrombiotic activity, anti-infective activity, anti-proliferative activity, anti-hypertensive activity, immunomodulatory activity and prebiotic/bifidogenic activity

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MFF Programme (cont.)

- Validate using cell and animal models and dietary intervention studies the health promoting effects of marine origin bio-molecules
- Optimise processes for delivery of marine origin bio-active substances into foods and the small and large intestine
- To develop model foods enhanced with marine origin functional ingredients with enhanced sensory properties
- Develop platform technologies for pilot scale production of marine origin functional foods and ingredients

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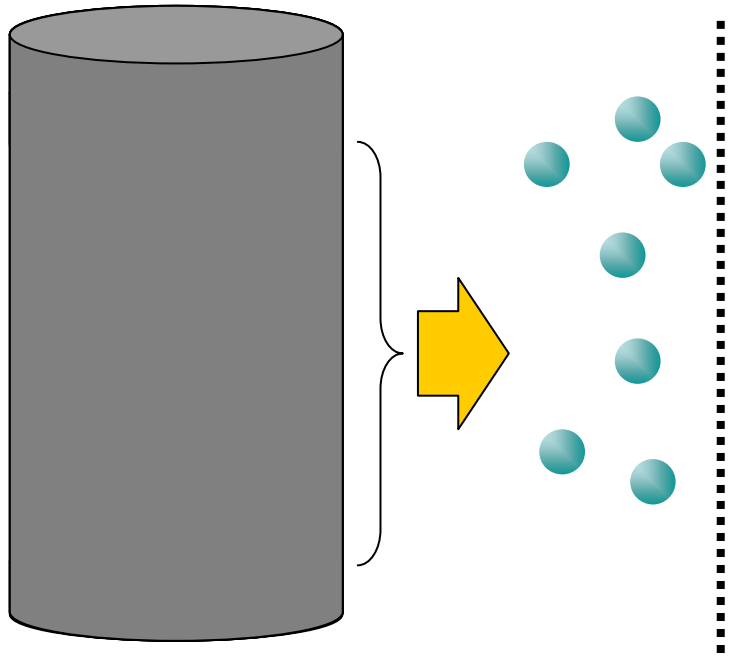
BIOTEC PHARMACON

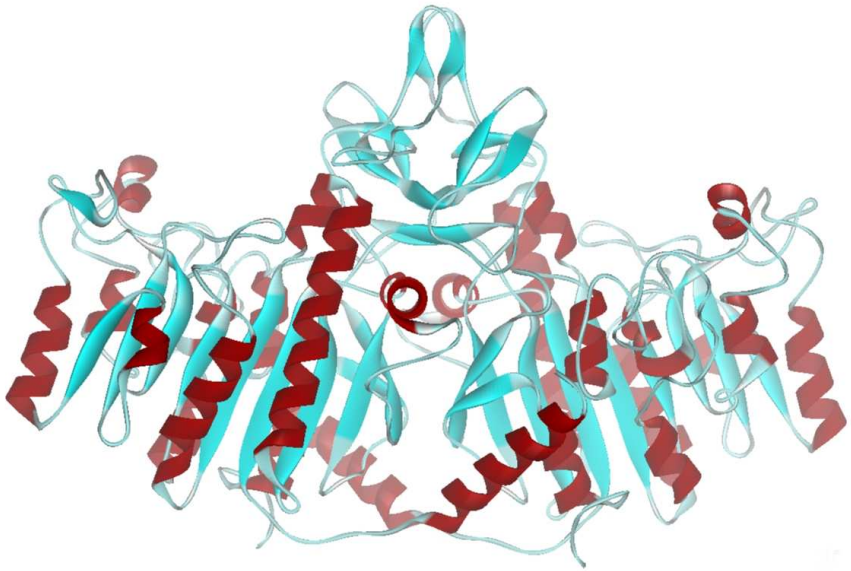
Production of Cod pepsin

- Autolysis of cod stomachs:
  - Pepsins break down other proteins
  - Cells are broken down, fats are liberated and flotated, some proteins precipitate
  - Pepsin can be concentrated by ultrafiltration
  - A crude concentrate is spraydried
- Result:
  - approx. 50 kg product from 1 ton
  - 5 % purity



High-purity enzyme: Shrimp Alkaline Phosphatase

- Used as a research tool
  - Dephosphorylation of DNA
  - Removal of nucleotides from PCR products
    - Before sequencing
    - Before genotyping
- Key property: completely inactivated by heat
- Produced from Shrimp thawing water
- Requires extensive purification
  - Free of DNases
  - Free of RNases
  - Free of proteases



MarBank Marine Biobank