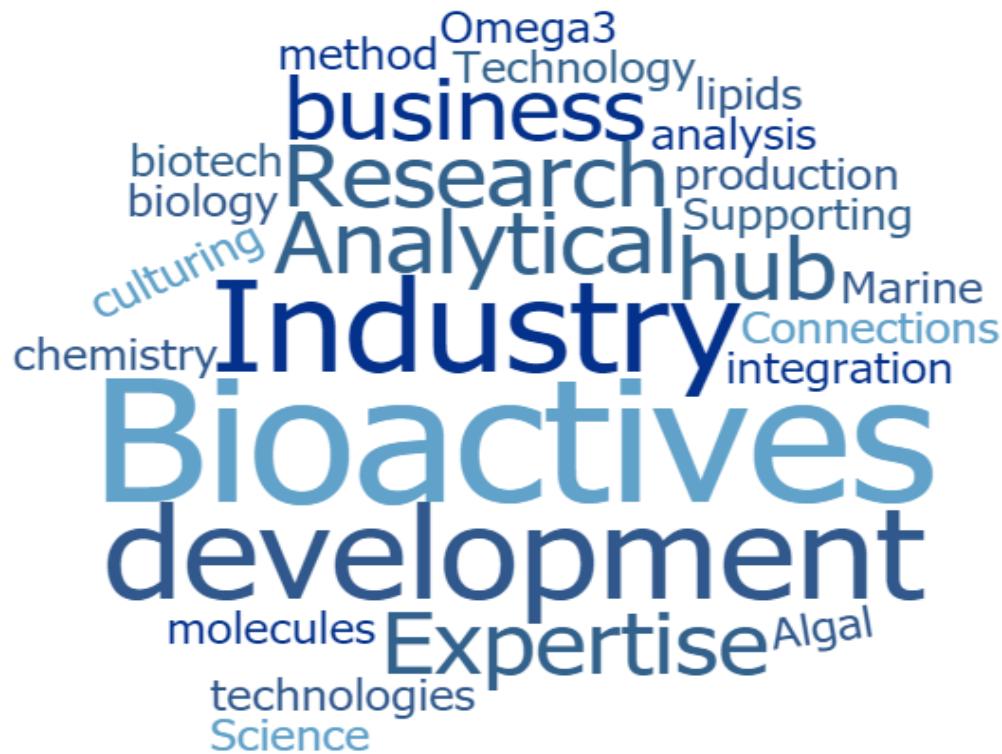


# Extracting Health & Wealth from New Zealand's Marine Resources

## Bioactives Research at Cawthron



*Jonathan Puddick, Mike Packer, Donato Romanazzi, Matt Miller, Serean Adams*

# THE THOMAS CAWTHON STORY



- Philanthropist & visionary
- Recognised science as key to NZ's economic prosperity
- Bequested £233K equivalent of \$127M today
- Cawthon Institute established in 1919.
- Officially opened in 1921

Then....



Now....





## Halifax Street site Research & Testing Labs

Aquaculture Park  
R&D, Industry & Education



# POWERED BY THE BEST PEOPLE

**197**

Scientists and specialist staff

73 coastal and freshwater  
33 aquaculture  
71 analytical and lab services  
20 corporate

Sectors we work in

Aquaculture, biosecurity, dairy, energy, fisheries, food export, oil and gas, seafood

Who we work with

Industries, Crown research institutes (CRIIs), research organisations and universities, Māori, central and local governments

Our talented teams of scientists and specialist staff help New Zealand's leading export sectors stand out from the crowd and take on the world. **Cutting-edge science, it's in our DNA!**



**Aquaculture**



**Coastal & Freshwater**



# NATURAL PRODUCTS TESTING

## Routine testing for NZ industry

- Chemistry
- Microbiological
- Stability

## Accreditation

- IANZ
- GMP
- US FDA
- TGA
- Medsafe

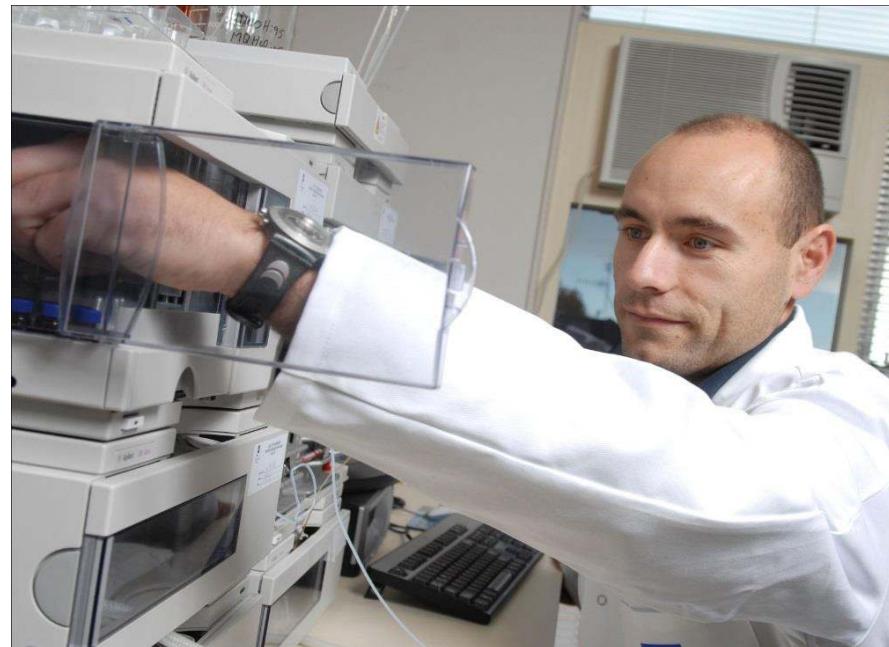
## Robust Internal Quality systems



# NON-ROUTINE ANALYSIS

## Analytical Research and Development

- Analysis of new or novel compounds
- Complex and difficult matrix
- Supplement stability testing
- Unique compound isolation
- Tailor made for your requirements



# SPECIALISED TESTING EXAMPLES

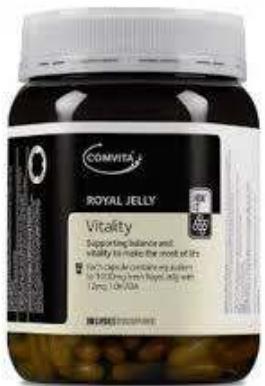
- Immunoglobulin IgG
- Flavonoids
- Phospholipids
- Antioxidants
- Lactoferrin
- Sialic acid
- Astaxanthin
- 10 HDA Royal Jelly



# PRODUCTS WE HAVE ASSISTED WITH DEVELOPING



Olive leaf  
extract



Royal Jelly

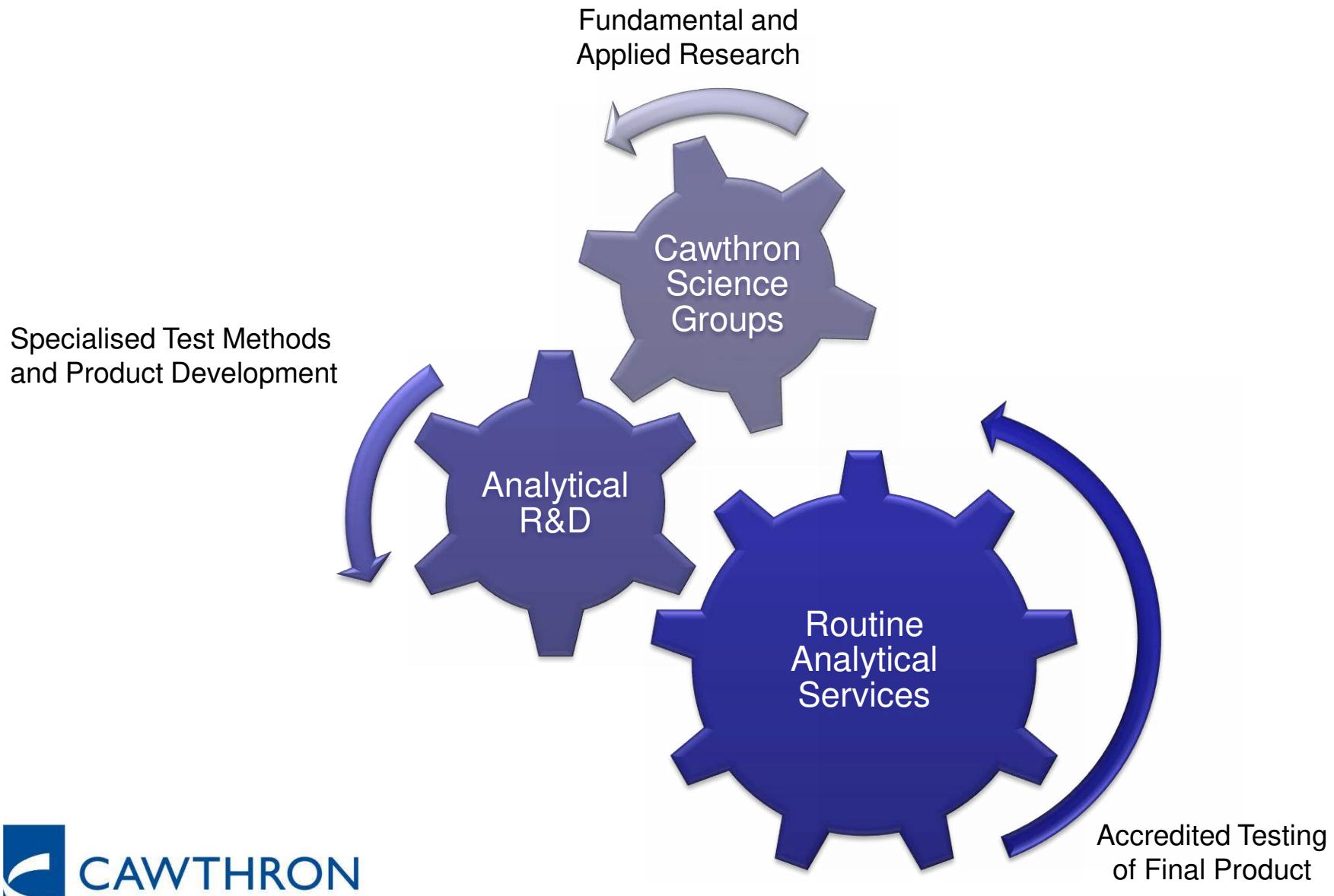


Propolis herbal  
extract



Algae Extract  
Supplements

# INTER-RELATED GROUPS FACILITATE INNOVATION



# BENEFICIAL BIOACTIVES

- Biologically-derived compounds with functional benefit for human or animal health:
  - Pharmaceuticals
  - Nutraceuticals
  - Cosmeceuticals
  - Functional food ingredients
  - High-end pet food
- Might be delivered as:
  - Pure compound
  - Extract
  - Food ingredient
  - Whole food

Decreasing Value



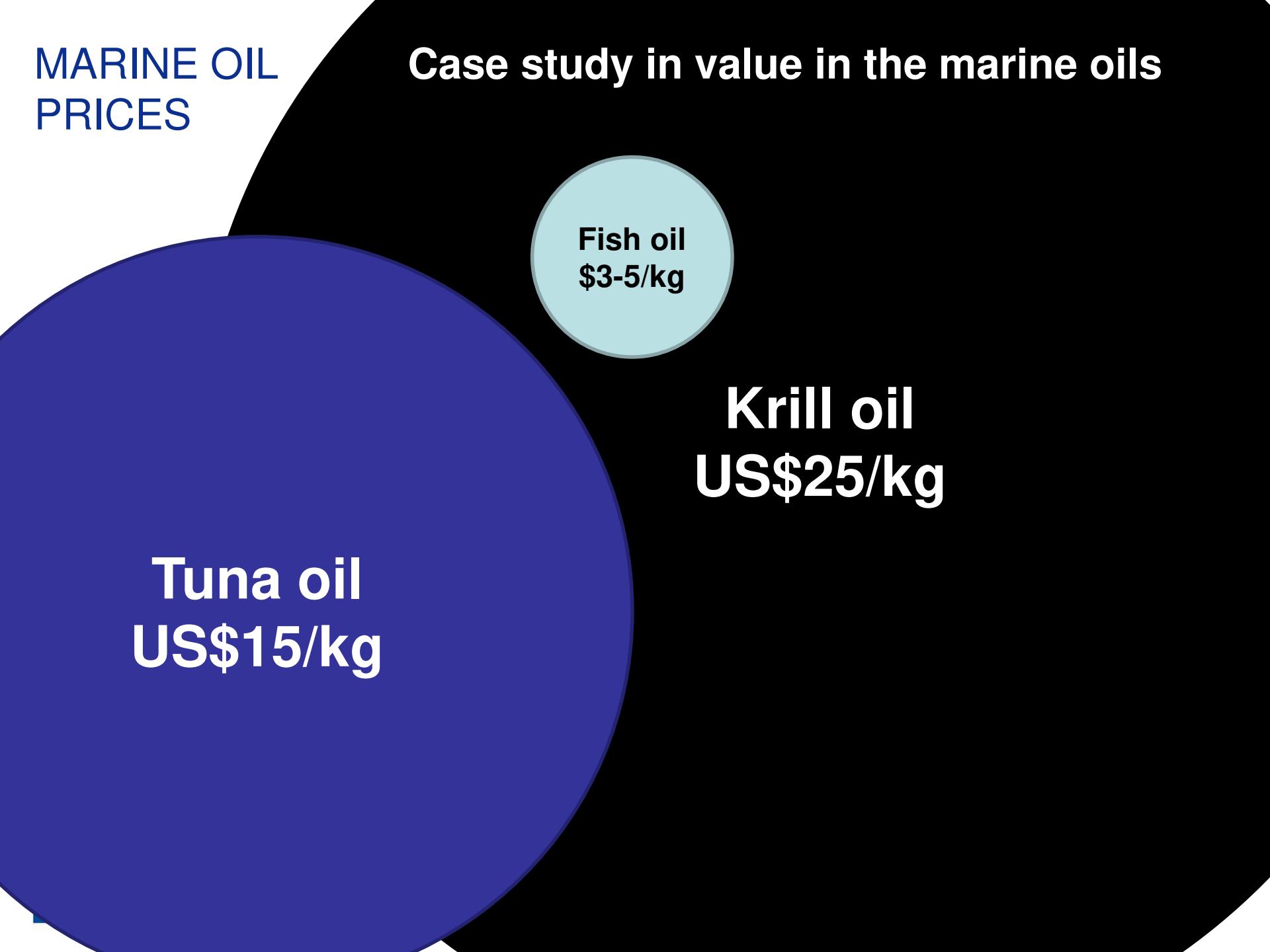
# NZ MARINE BIOACTIVES

- Pristine growing environment adds market appeal.
- Unique endemic species:
  - Greenshell mussel
  - Other shellfish
  - Pāua
  - Kina
  - Seaweeds
- Interesting bioactives:
  - Anti-inflammatory lipids
  - Anti-oxidant carotenoids
  - Bioactive peptides
  - Bioavailable glycolipids



# MARINE OIL PRICES

## Case study in value in the marine oils



Fish oil  
\$3-5/kg

Krill oil  
US\$25/kg

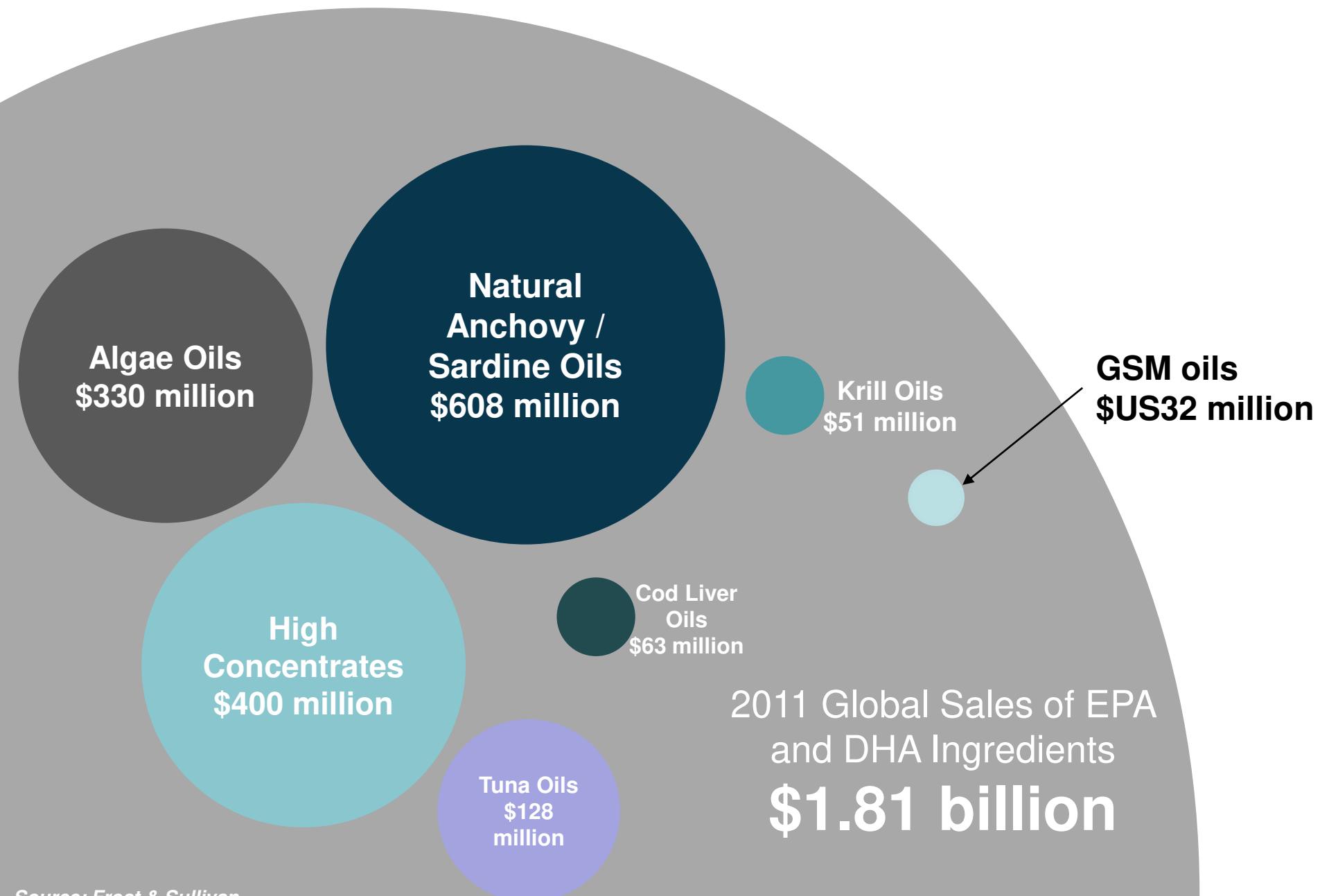
Tuna oil  
US\$15/kg

GSM  
PRICE



GSM oil  
US \$2,300/kg  
(~NZ\$ 3,000/kg)

## VOLUME AND SCALE ADDS PERSPECTIVE



# WHAT WE DO

- Identify new sources of marine bioactives
- Prepare extracts from marine sources:
  - Purification
  - Stabilisation
- Chemical characterisation (specialised testing)
- Efficacy testing (collaborative partnerships)
- Improved yields in source material
- Optimisation of extraction conditions
- Accredited testing of final product

# COLLABORATION IS KEY



Nutraceutical innovation and manufacture



# HEALTHY FOOD INGREDIENTS FROM SHELLFISH AND ALGAE

Funded by MBIE

The efficacy of GSM and microalgae extracts for treating food allergy and inflammatory disorders:

- *In vivo* and *in vitro* models of efficacy
- Algal photo-bioreactor technology for increased algal metabolite production
- Increased extraction efficiency of GSM



# NZ & JAPAN RESEARCH COLLABORATION

Funding by MBIE (NZ) & JST (Japan)

Novel function of fatty acids & carotenoids  
using *in vitro* assays & obesity models.

Extracts and molecules from :

- Microalgae
- Greenshell mussels
- Pāua
- Scallops



# HIGH-VALUE NUTRITION NATIONAL SCIENCE CHALLENGE

Funded by High Value Nutrition SC  
Business-led project with Sanford

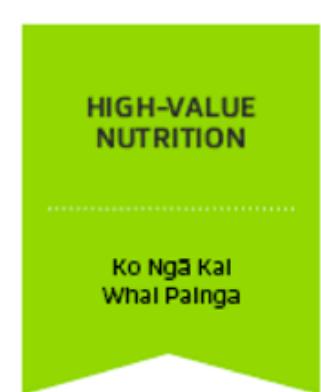
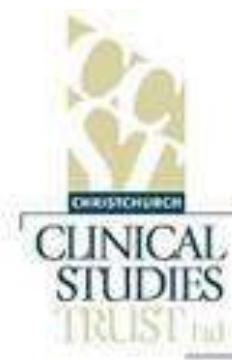
- *Musseling-up: Enhancing mobility with GSM-based high-value formulated foods*
- Greenshell™ mussel and GSM extracts as mobility-enhancing ingredients in formulated high-value nutritional foods.
- Providing industry with rapid analytical tools.



National  
**SCIENCE**  
Challenges



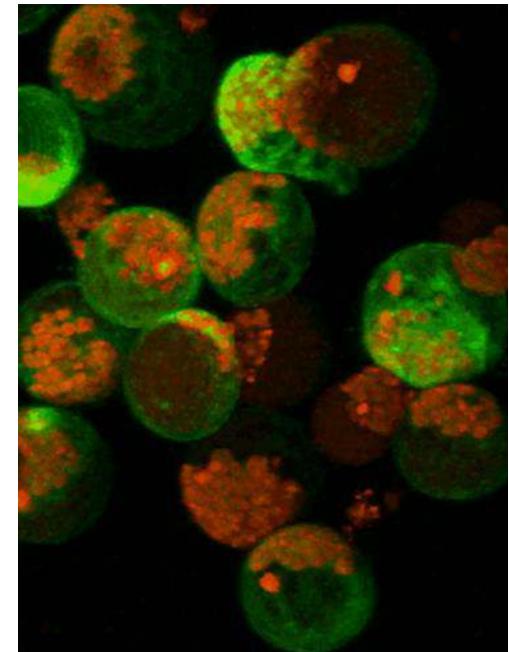
MASSEY UNIVERSITY



# OPTIMIZING LIPID PRODUCTION PATHWAYS FOR MICROALGAE

Funded by MBIE Catalyst Program

- Investigate unique algae strains for carotenoids & functional lipids
- Novel technologies to improve algae 'breeding' and bioactive yield (metabolic fine tuning).
- Applications in aquaculture and HVN sector.



# KINA – DEVELOPING A NUTRACEUTICAL INDUSTRY ON THE EAST CAPE

Funded by Sustainable Seas SC

What's in a Kina?

- Echinochrome A – Potent carotenoid
- Interesting lipids
- Developing analytical capability
- Understanding regional distribution
- Optimising extraction/scale-up
- Verifying the bioactivity of extracts



MASSEY UNIVERSITY



MEDICAL RESEARCH  
**INSTITUTE**  
OF NEW ZEALAND



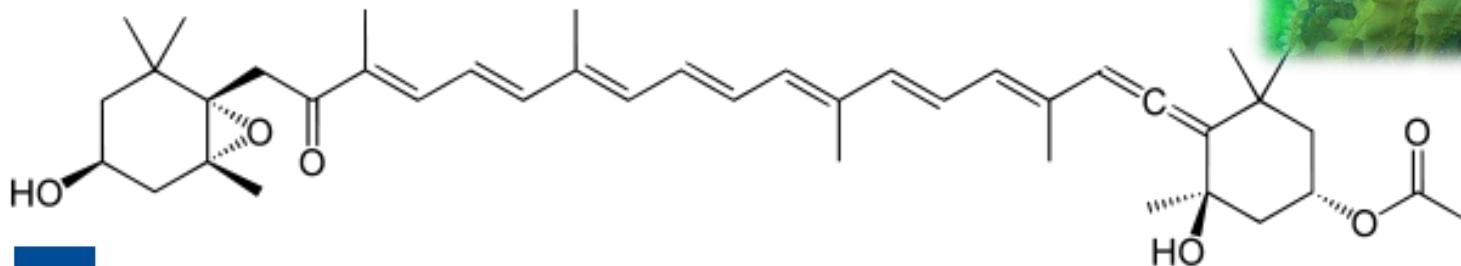
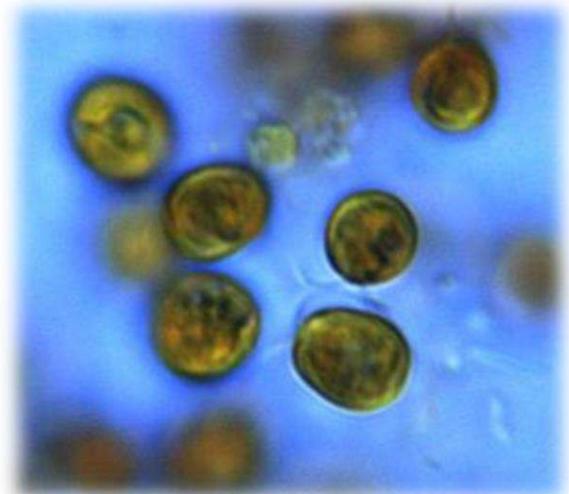
National  
**SCIENCE**  
Challenges

SUSTAINABLE  
SEAS

Ko ngā moana  
whakauka

# FUCOXANTHIN – A CASE STUDY OF OUR RESEARCH

- Carotenoid produced by microalgae and seaweed
- Accumulates in shellfish
- Anti-oxidant
- Anti-inflammatory qualities
- Anti-obesity properties

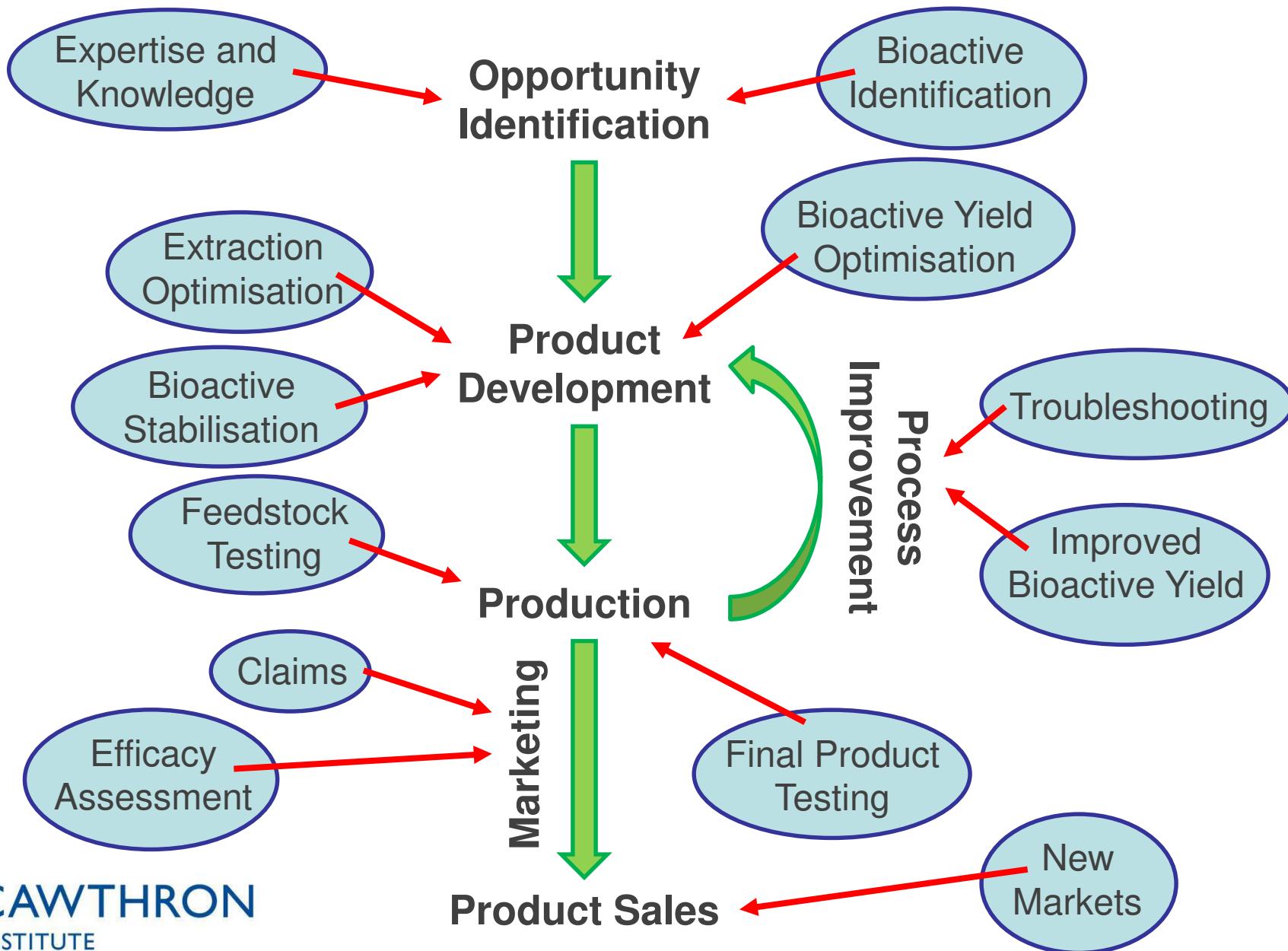


# FUCOXANTHIN – A CASE STUDY OF OUR RESEARCH

- Harvest algae biomass
- Conduct extraction
- Isolation & concentrate compounds of interest
- Put through models to test bioactivity
- Identify growth optimisation



# FEEDING INTO YOUR VALUE CHAIN



# IN SUMMARY

- Bioactivity associated with products increases market value and consumer appeal.
- Bioactive extracts can provide production flexibility.
- Sound science improves product reliability.
- With industry co-funding, government investment is accessible.
- Cawthron provides a unique mix of applied research, product development and robust testing.

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