

ANALYTICAL SOLUTIONS TO ADD VALUE TO THE NATURAL PRODUCT INDUSTRY



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THE CAWTHON STORY

- Thomas Cawthon: investor, businessman, philanthropist, visionary.
- Left £231K in his will, the equivalent of \$127M.
- Pioneering science since 1921.
- NZ's largest independent science organisation.
- 300 Scientific & Technical staff over 4 sites contributing to a wide range of research and analytical work.
- \$48 million p.a. Revenue



THEN....



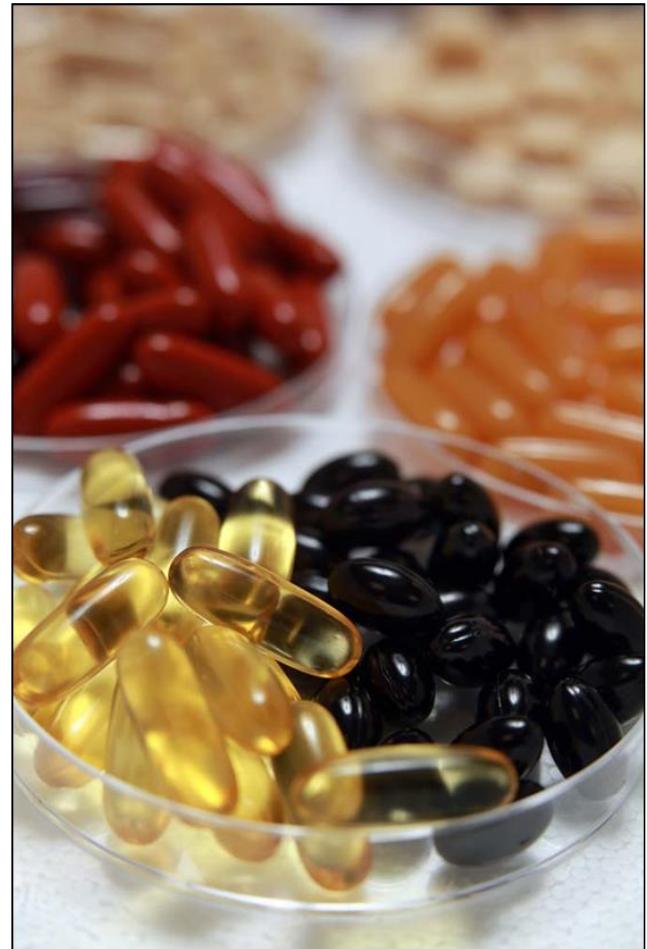
NOW....



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CAWTHON CAPABILITIES INCLUDE:

- Algal Technologies
- Marine Biosecurity
- Coastal & Freshwater Resource Management
- Aquaculture management & Selective breeding
- **ANALYTICAL SCIENCE**
 - Food safety & quality
 - Natural products and dietary supplement testing
 - Research & Method Development



NATURAL PRODUCTS TESTING

Routine testing for NZ industry

- Chemistry
- Microbiological
- Stability

Accreditation

- IANZ
- GMP
- US FDA
- TGA
- Medsafe

Robust Internal Quality systems



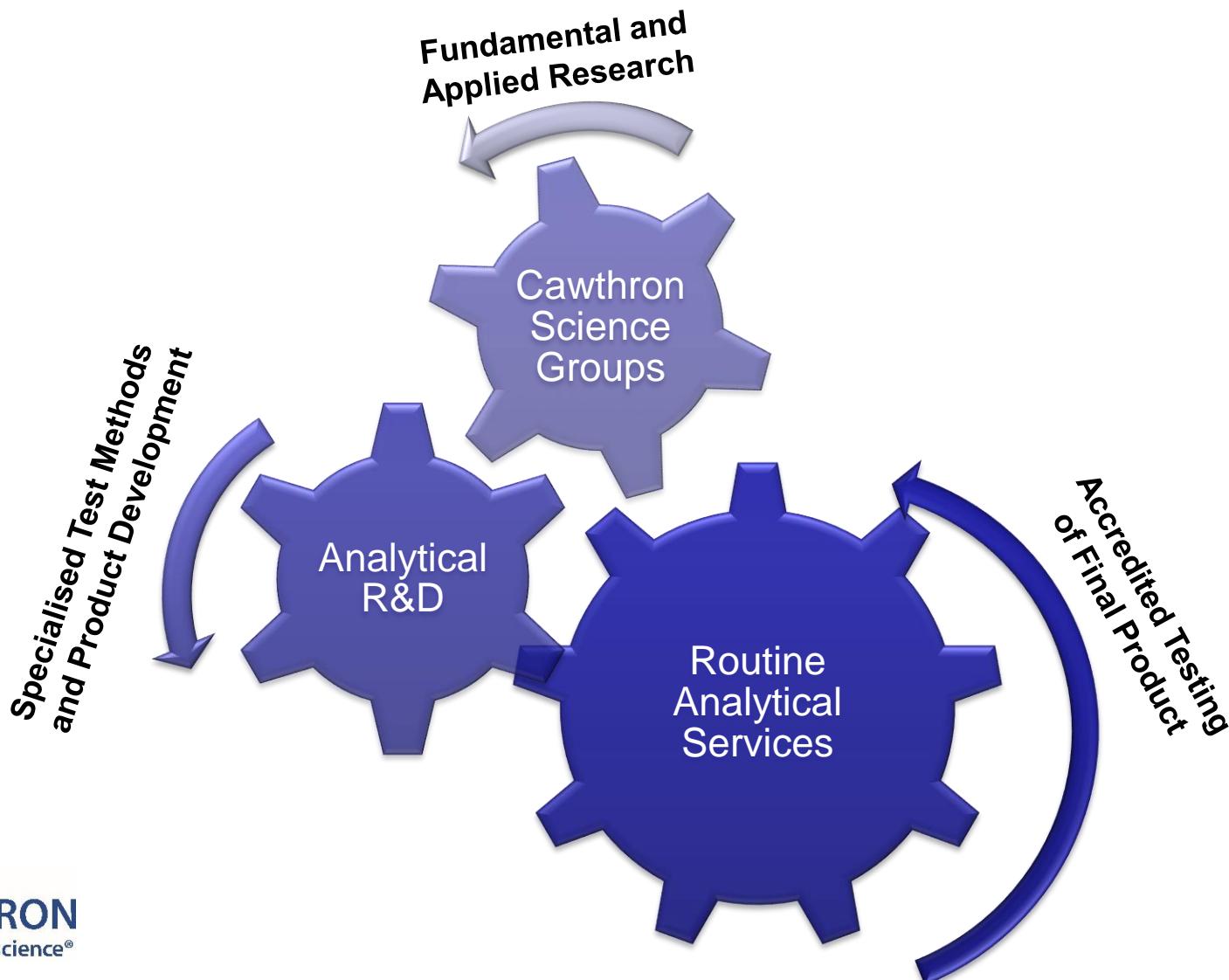
INSTRUMENTATION

- Liquid Chromatograph Mass Spectrometers (LC-MS)
- High Performance Liquid Chromatographs (HPLC / UPLC)
- Preparative LC (FPLC)
- Gas Chromatographs (GC)
- Inductively-Coupled Plasma (ICP MS)
- UV-Vis Spectrophotometers
- UV-Vis & Fluorescence plate readers
- FTIR spectrometer
- Near infrared (NIR) spectroscopy
- Supercritical CO₂ extractor



CAWTHON UNIQUENESS

INTER-RELATED GROUPS FACILITATE INNOVATION



EXAMPLES OF HOW CAWTHON IS ADDING VALUE



EXAMPLE RE-VALUING THE MUSSEL WITH HVN

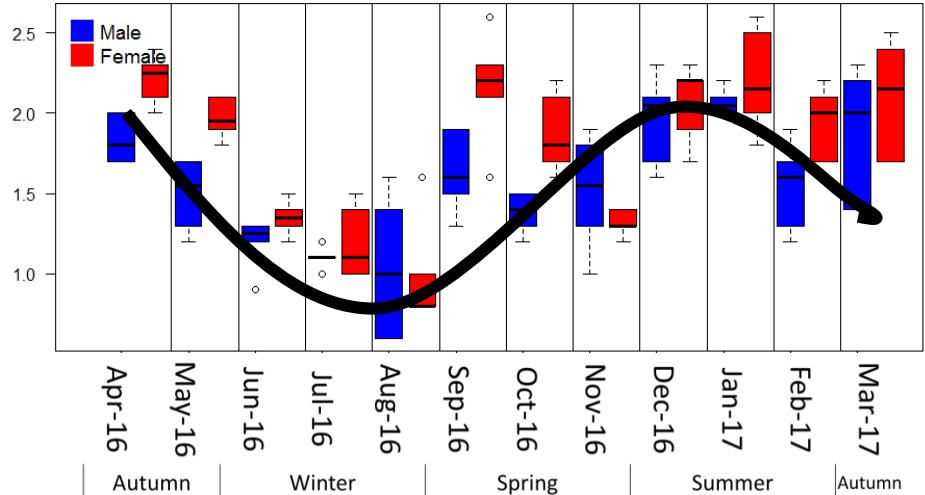
- Aim to increase the value of Greenshell Mussel™ (GSM) food exports.
- By determining the effect of GSM products (and bioactives within) on joint and bone health while reducing inflammation
- Cawthron Institute and Sanford Ltd business led research
- Customer focus
- Aiding industry shift



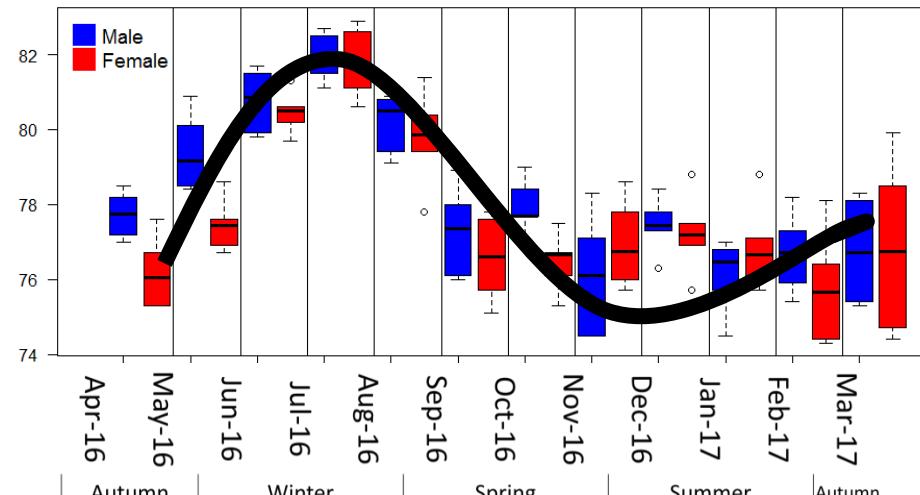
PROXIMATE COMPOSITION OF GSM OVER 12 MONTHS – FAT, CARBOHYDRATES, PROTEIN AND MOISTURE

Miller, M. R. and H. Tian (2018). *Aquaculture Research* **49**(3): 1153–1165.

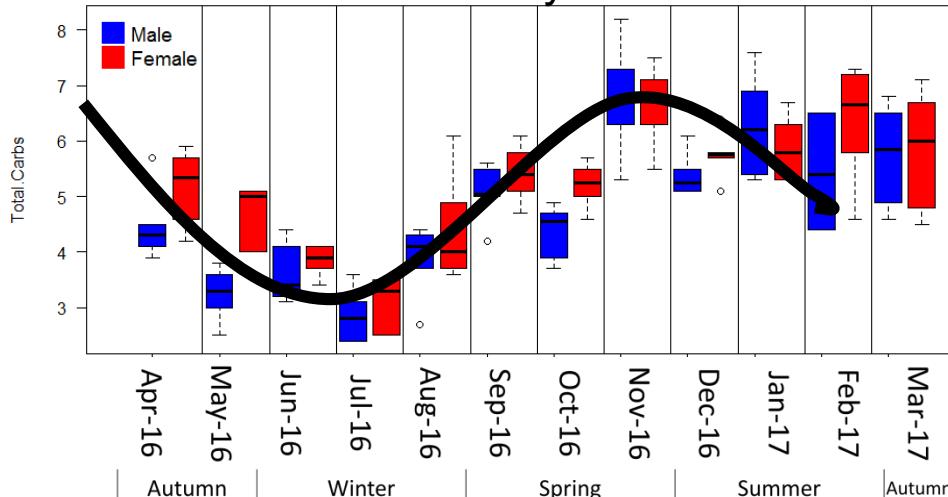
Fat



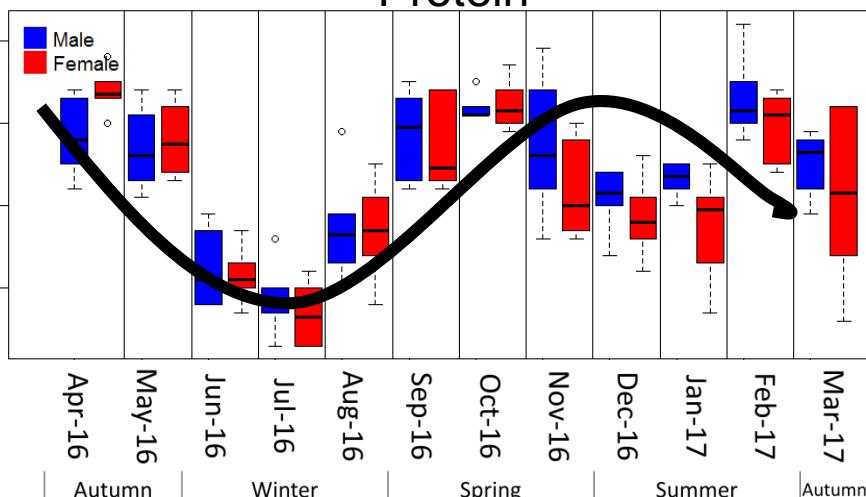
Moisture



Carbohydrate



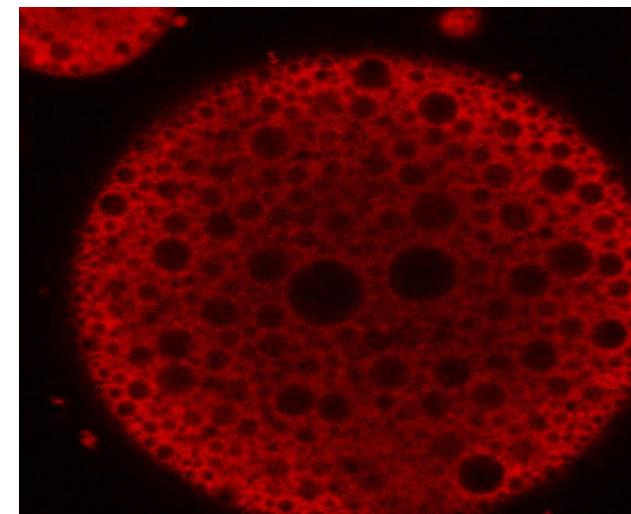
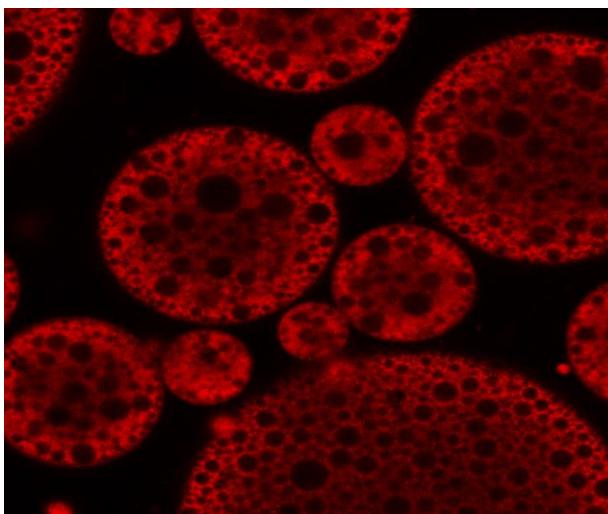
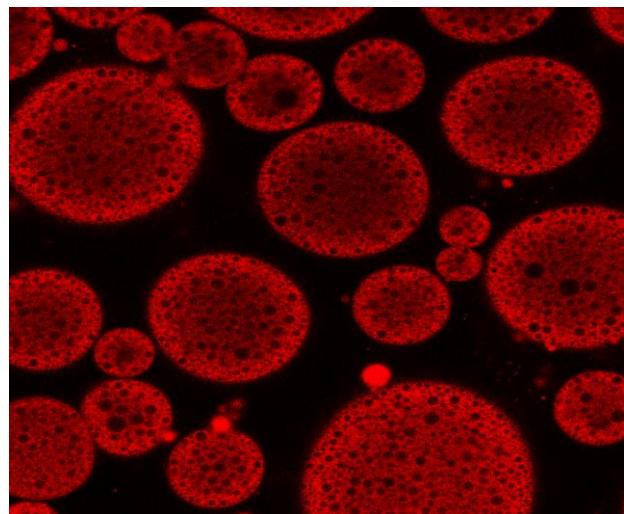
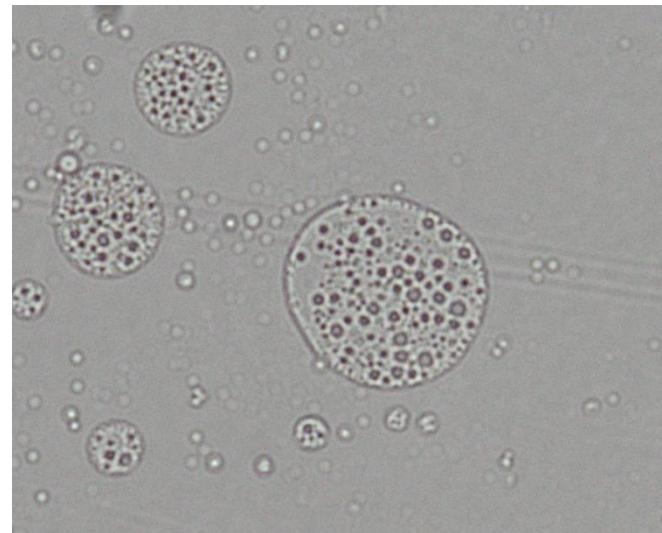
Protein



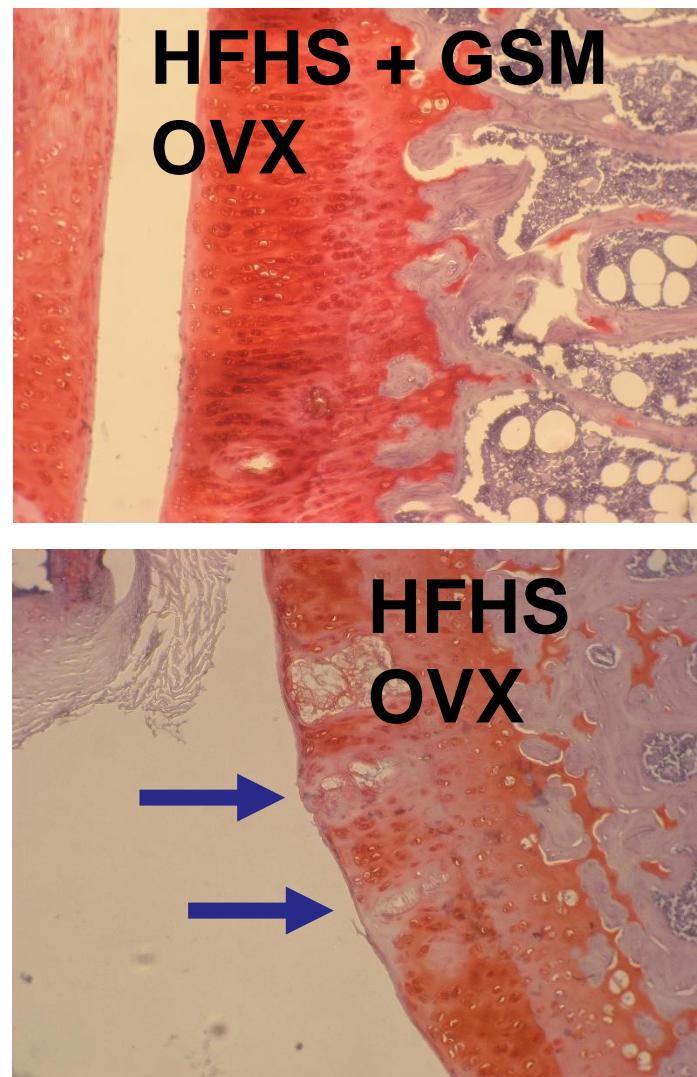
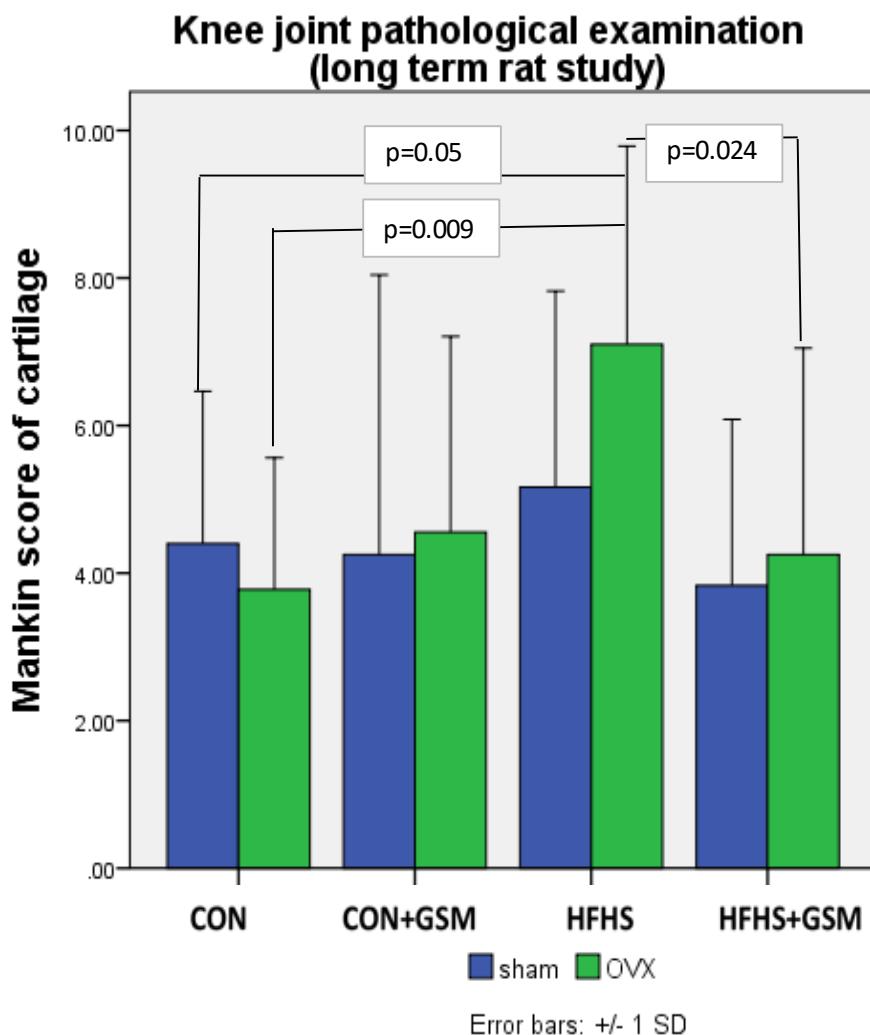
FOOD DEVELOPMENT

In collaboration with Massey School of Food and Advanced Technology

- Developing new food ingredients and food products – can travel
- Encapsulation
- Spray drying
- Smoothies and health beverages

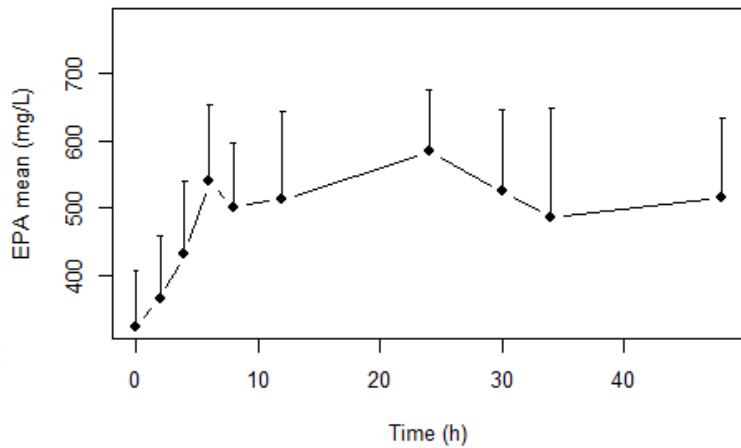


EFFICACY OF BIOACTIVES

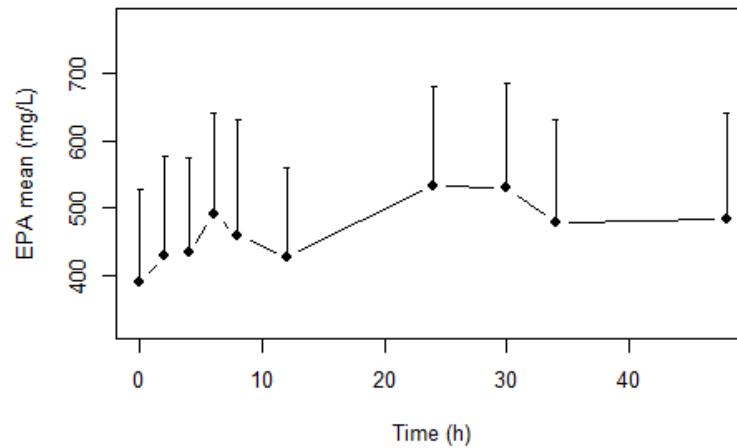


CLINICAL TRIALS – PHARMACOKINETIC

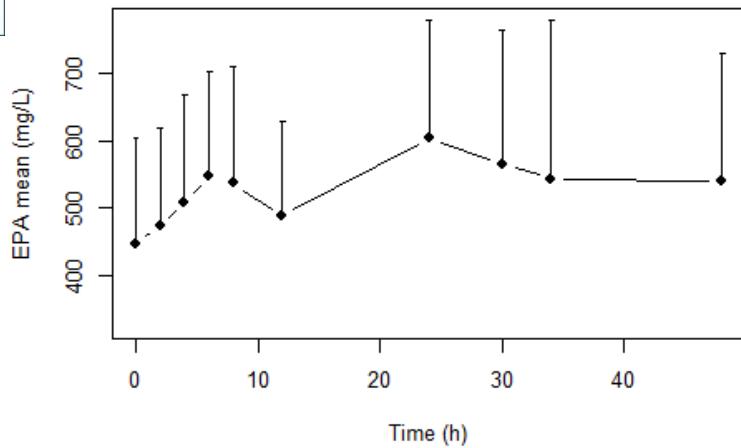
Frozen half-shell GSM



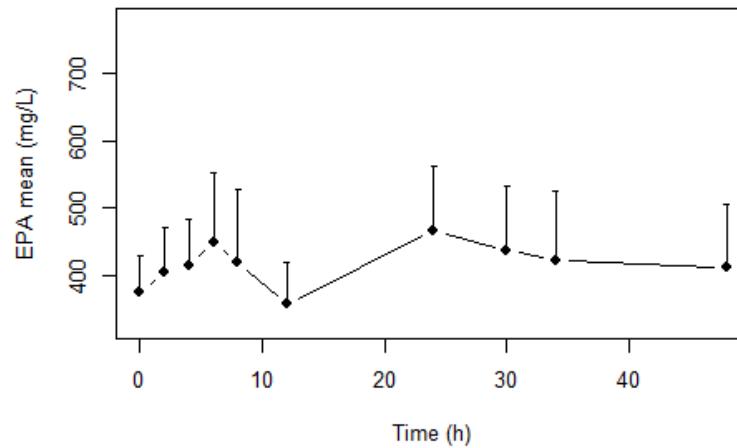
GSM food ingredient



GSM powder



GSM oil



Mean (SD) of blood plasma concentrations of EPA (ug/mL) from time 0-48 h post-administration of mussel soup (n=8) Miller et al (in prep)



CLINICAL
STUDIES
TRUST Ltd



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EXAMPLE 2 – ENHANCING CAPABILITY WITH NOVEL TOOLS NIR – NEAR INFRARED SPECTROSCOPY



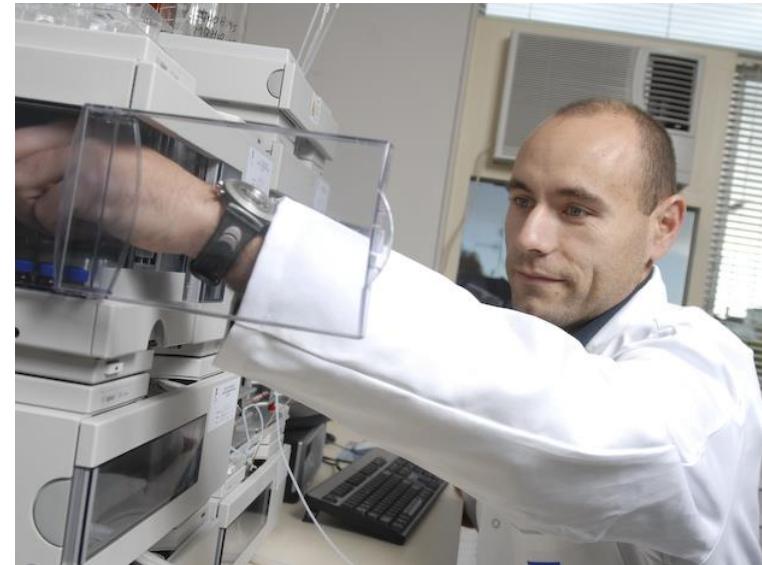
RAPID ANALYSIS

Standard (chemical) lab techniques: Food lab accredited lab

- Well established methods
- Precise and reproducible
- Accredited

However

- Cost
- Timeframe



Rapid NIR analytical techniques:

- Fast (10 seconds), cheap, high throughput
- Method development (\$\$)
- Doesn't need precision of lab methods – screening
- Can determine – most things in abundance over 1-2%



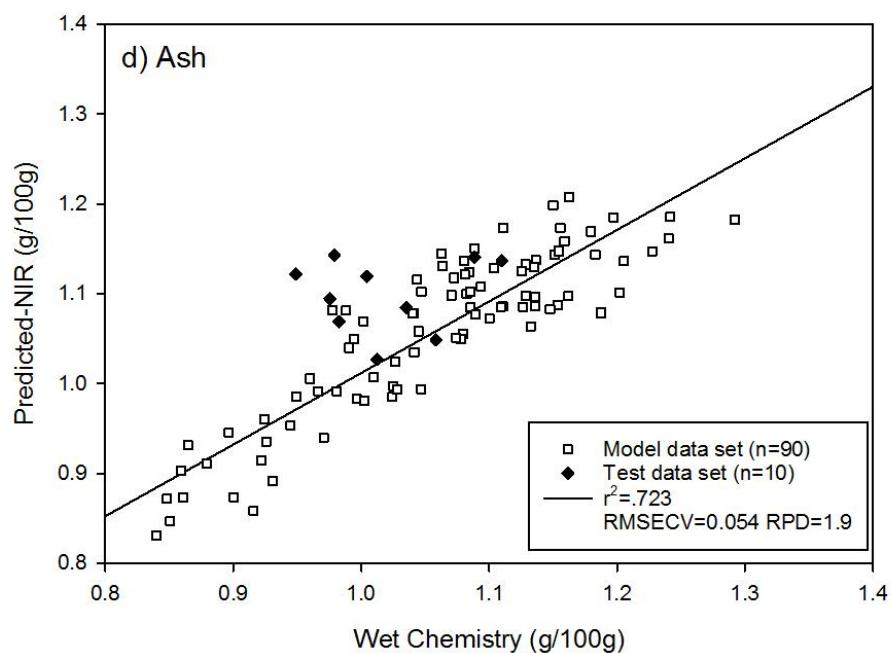
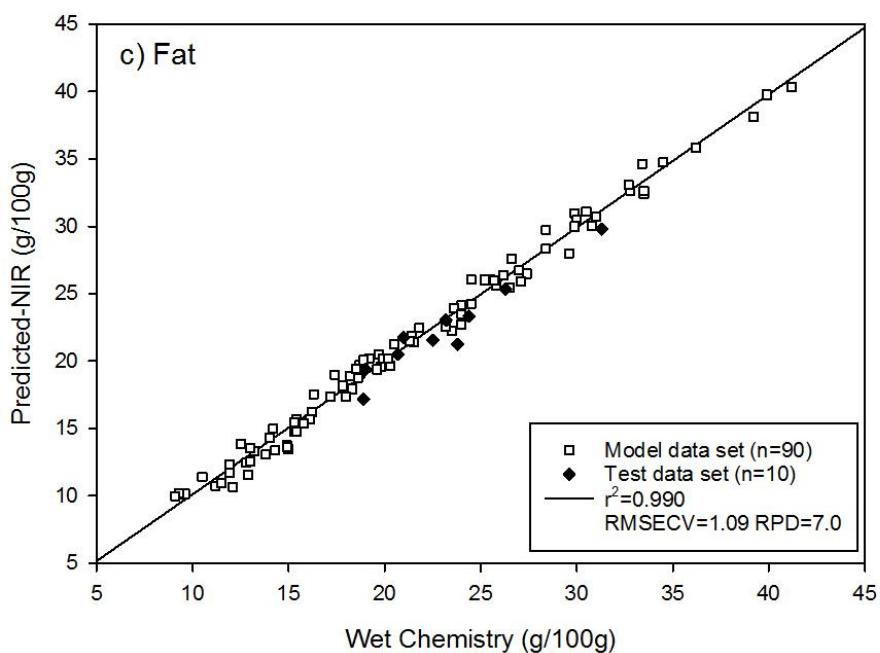
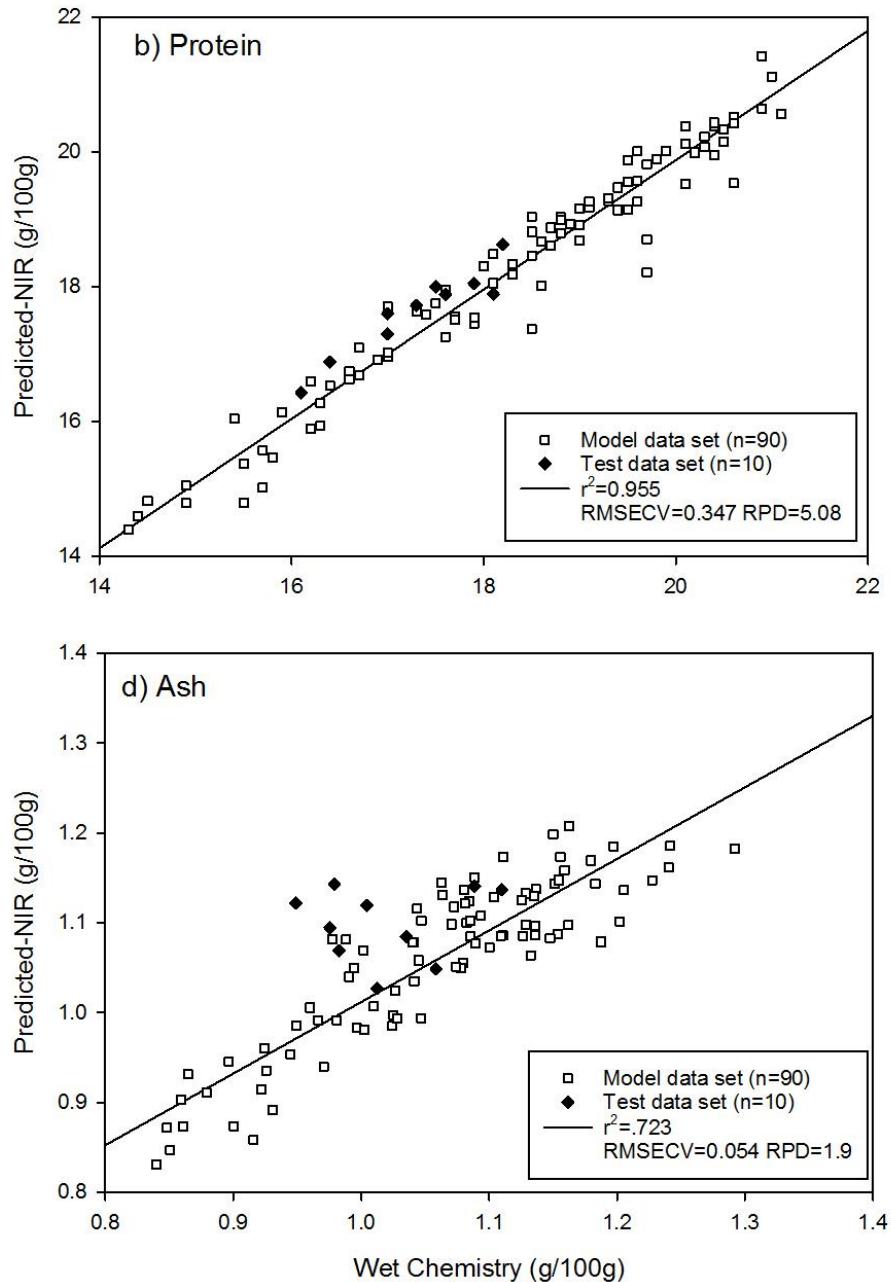
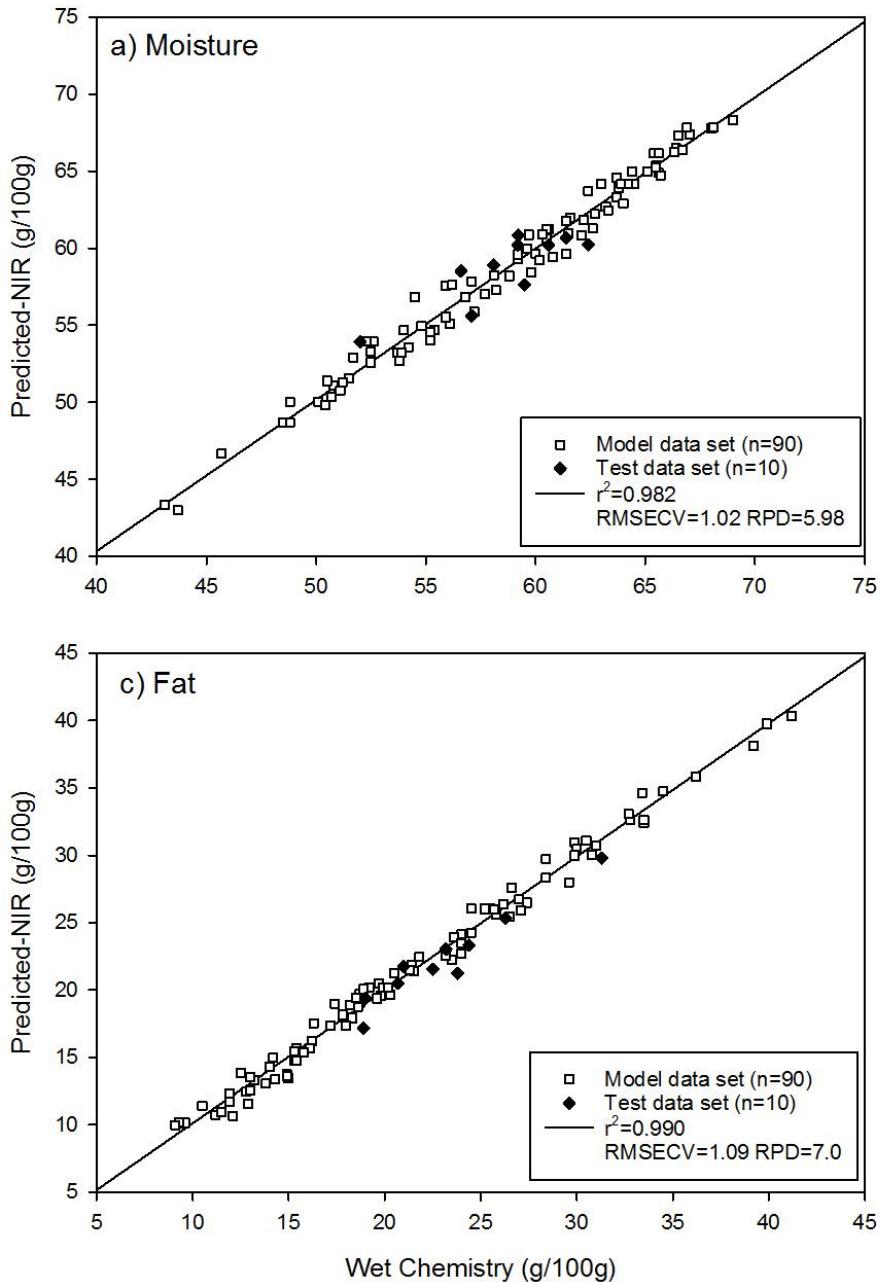
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VIDEO



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NIR MODELS



EXAMPLE 3: HUATAUKĪNA TŌ IWI E: DEVELOPING MARINE BIOACTIVES ECONOMIC OPPORTUNITIES FROM TAIRĀWHITI KĪNA TO COMBAT DIABETES, HEART DISEASE AND INFLAMMATION



AIMS OF PROJECT

- Produce groundwork knowledge to build a viable kīna marine bioactives industry
- Development of a health-promoting supplements.
- Stimulate economic development in Tairāwhiti
- Partnership between Hikurangi Bioactives Limited, local hapū and Cawthron Institute.
- Move from low-value commodity to high-value products
- Increase diversity and complexity of New Zealand seafood exports
- Greater economic benefits, particularly for remote rural communities.

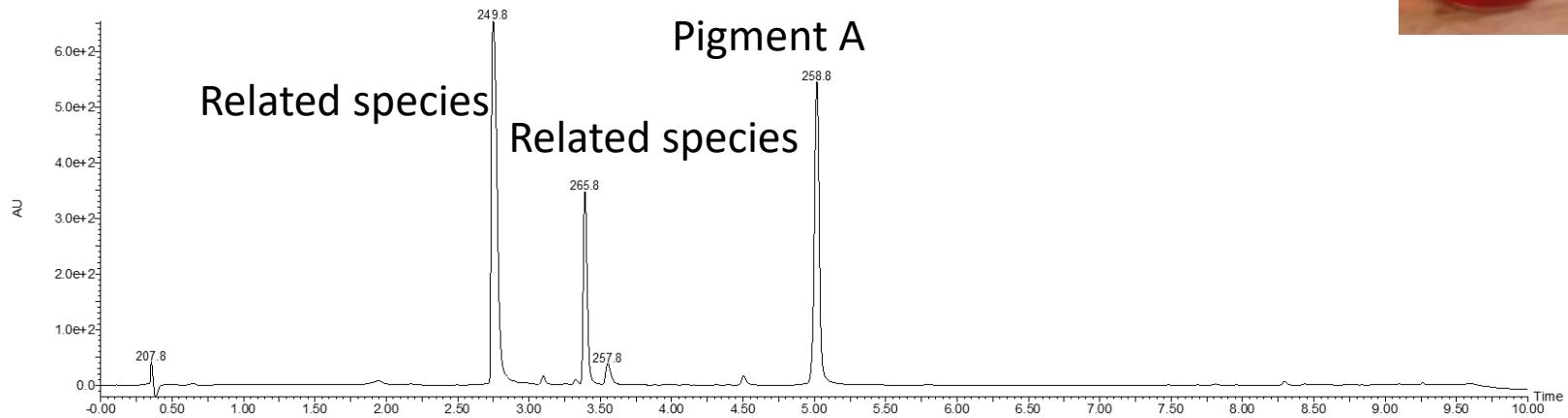
National
SCIENCE
Challenges

SUSTAINABLE
SEAS

Ko ngā moana
whakauka

DEVELOPMENT OF METHODS

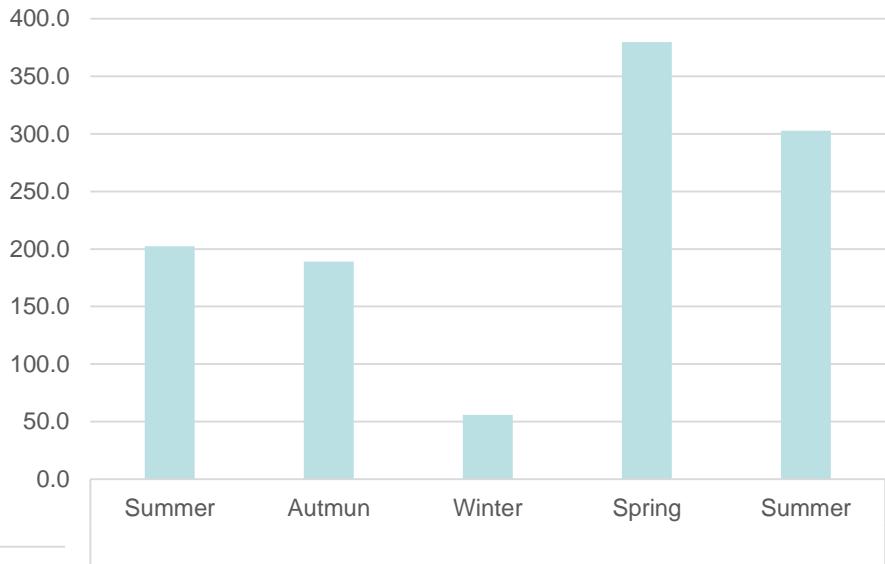
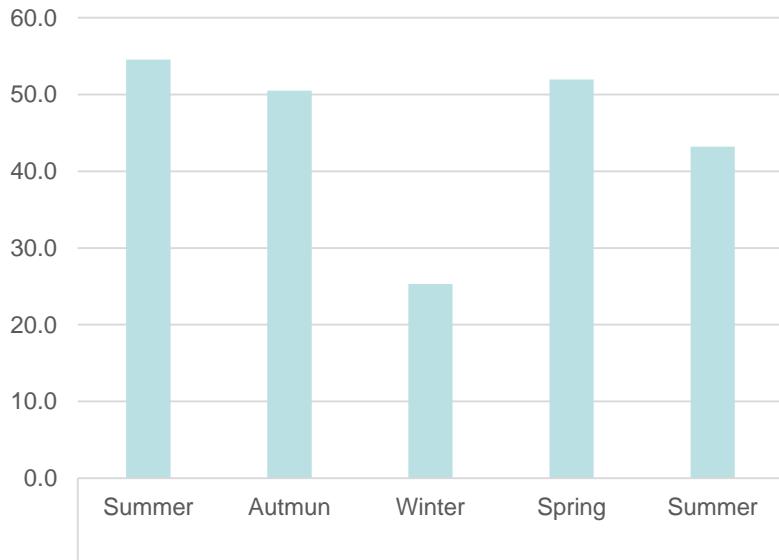
1. Pigment B



PIGMENT B EXTRACTION

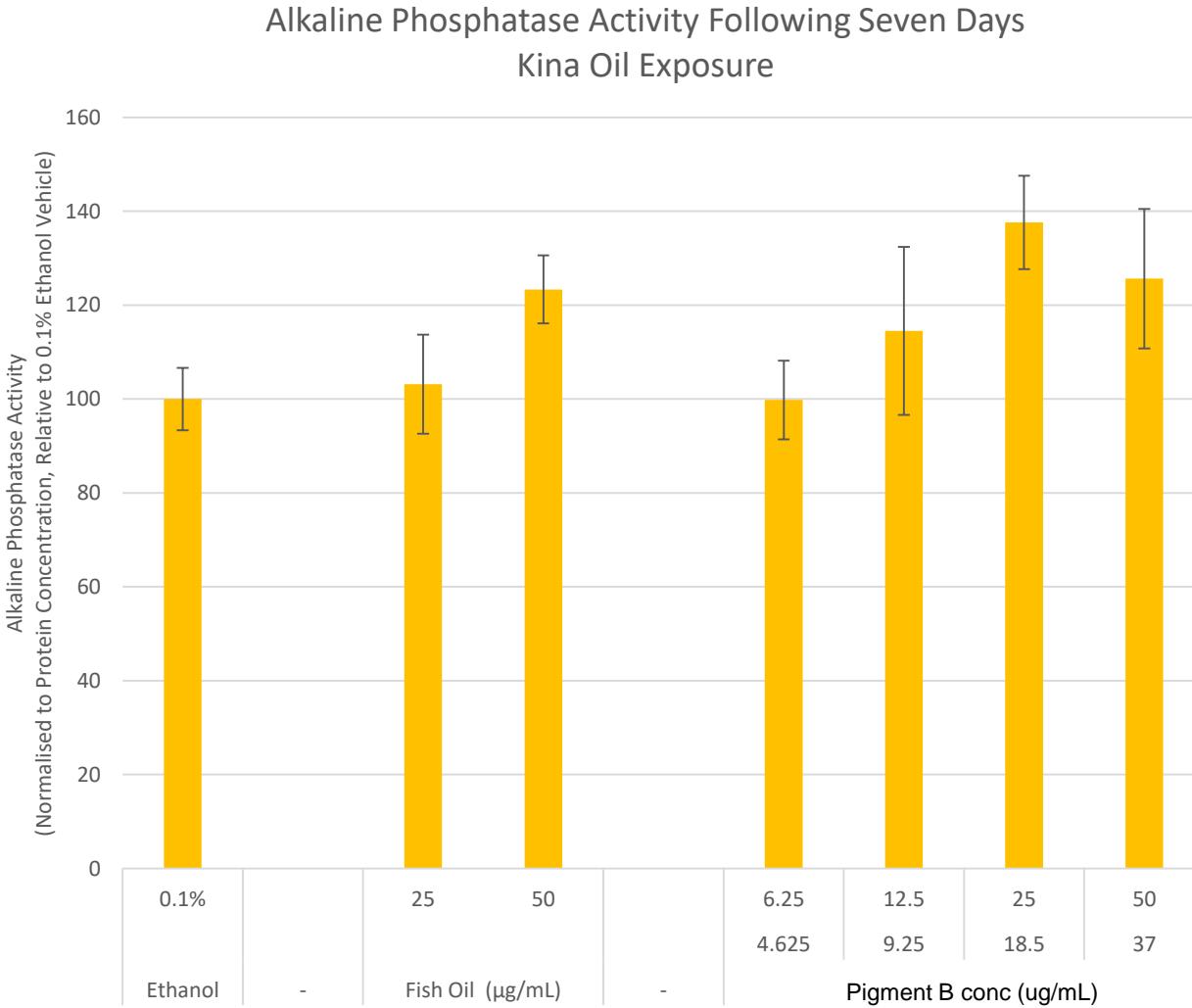


SEASONAL DIFFERENCES OF BIOACTIVES



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DEMONSTRATE PRE-CLINICAL EFFICACY ENHANCES BONE DEPOSITION



- Kina extract increases ALP activity in MC3T3-E1 mouse osteoblasts
- ALP activity is a marker of bone deposition
- Increased ALP activity indicates echinenone may enhance bone formation



MASSEY UNIVERSITY

NATURAL PRODUCTS FROM THE MARINE ENVIRONMENT



OPPORTUNITIES FOR 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



ADDING VALUE TO 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



OUR RESEARCH CAPABILITY INCLUDES:

- Identification of new sources of marine bioactives
- Preparation and stabilisation of extracts
- Chemical characterisation (specialised testing)
- Efficacy testing (collaborative partnerships)
- Improved yields in source material
- Optimisation of extraction conditions
- Stability testing of final product
- Access and advice on government funding



WHO WE ARE WORKING WITH



COLLABORATION IS KEY – OUR RESEARCH PARTNERS



MEDICAL RESEARCH
INSTITUTE
OF NEW ZEALAND



MASSEY UNIVERSITY



**CLINICAL
STUDIES
TRUST** Ltd



IMAS
INSTITUTE FOR MARINE
& ANTARCTIC STUDIES

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