

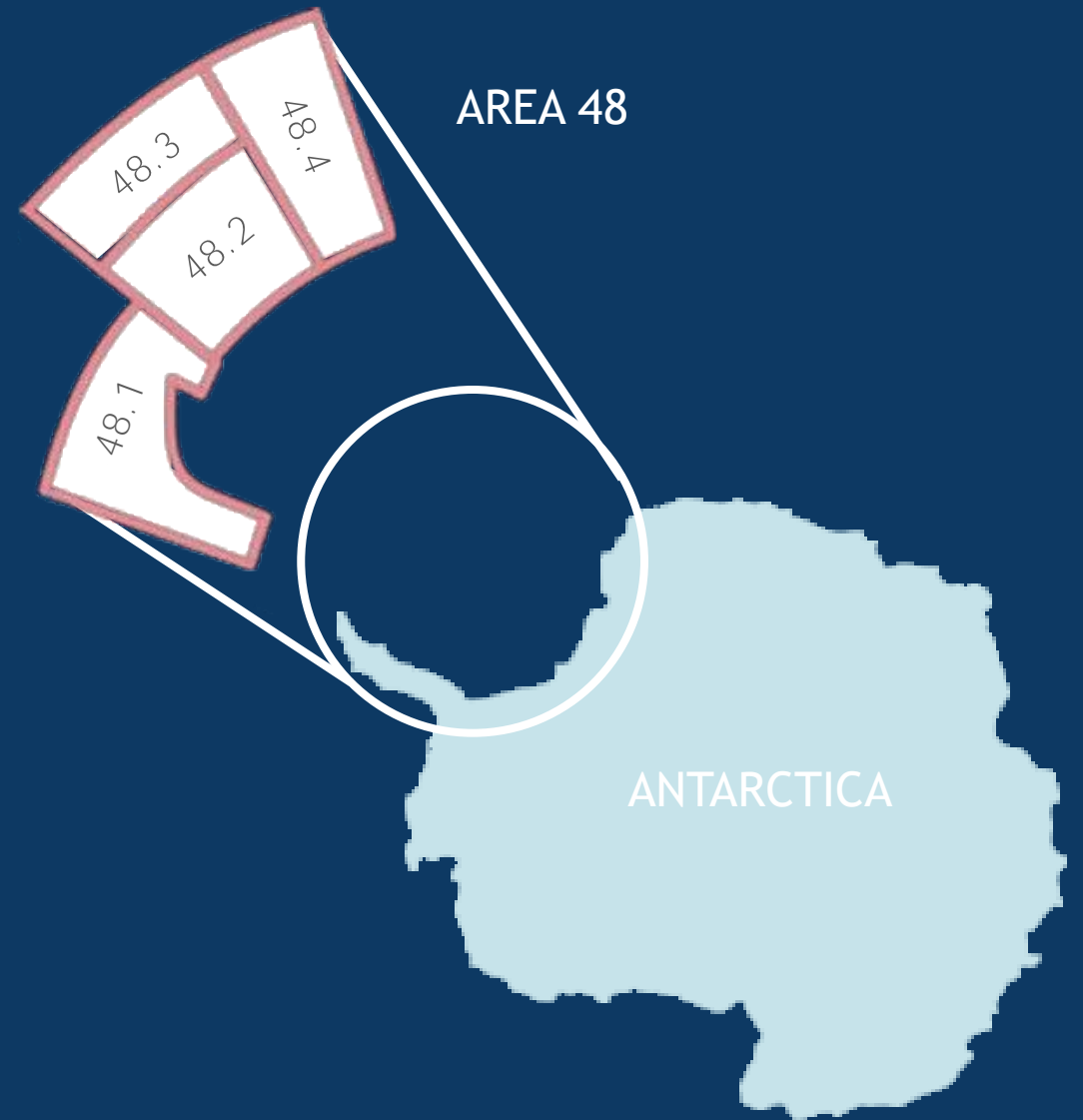


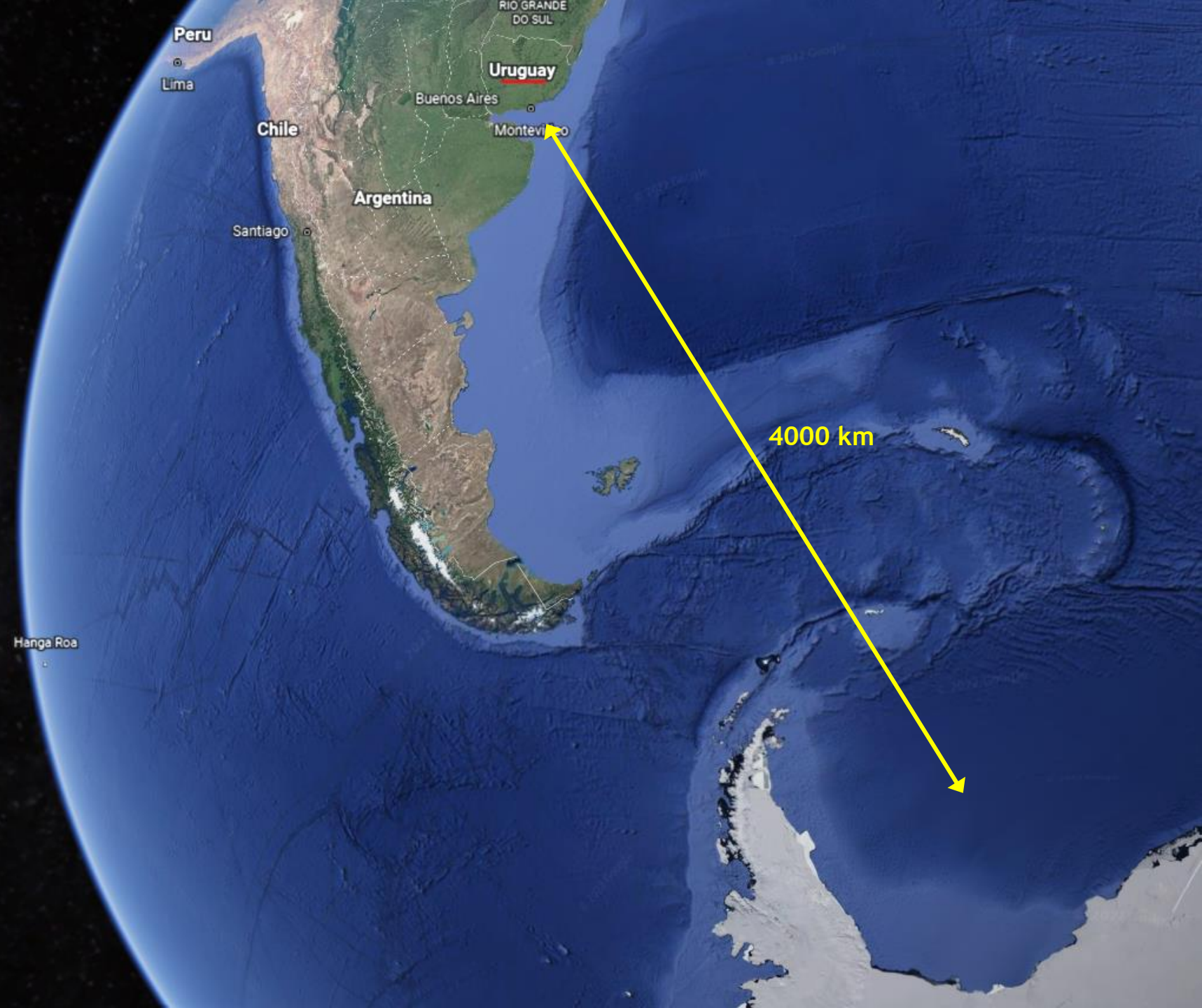
# Use of JMP® in the quality unit of a krill fishery



AKER BIOMARINE

# OUR FISHING GROUNDS





Peru

Lima

Chile

Santiago

Hanga Roa

Argentina

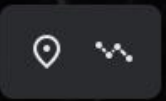
Buenos Aires

Montevideo

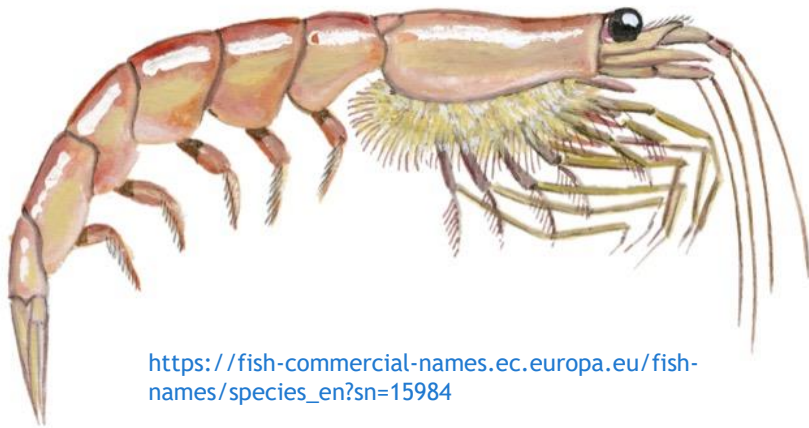
Uruguay

RIO GRANDE DO SUL

4000 km



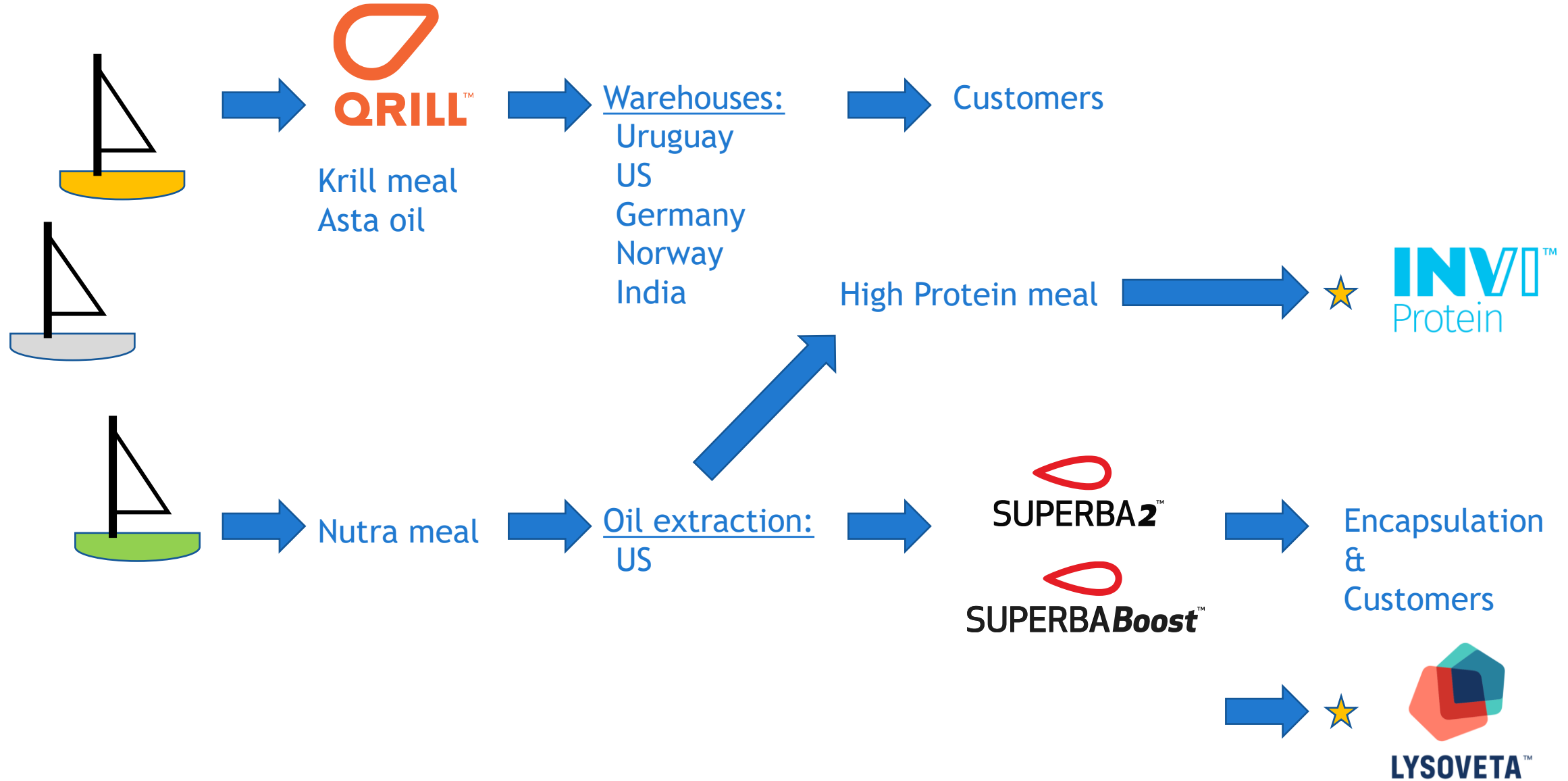
- Species name: *Euphausia superba*
- Krill harvesting only permitted in area 48
- ≈400 Mt total krill biomass
- ≈60 Mt tons krill biomass in area 48
- ≈0,6 Mt total krill harvesting quota



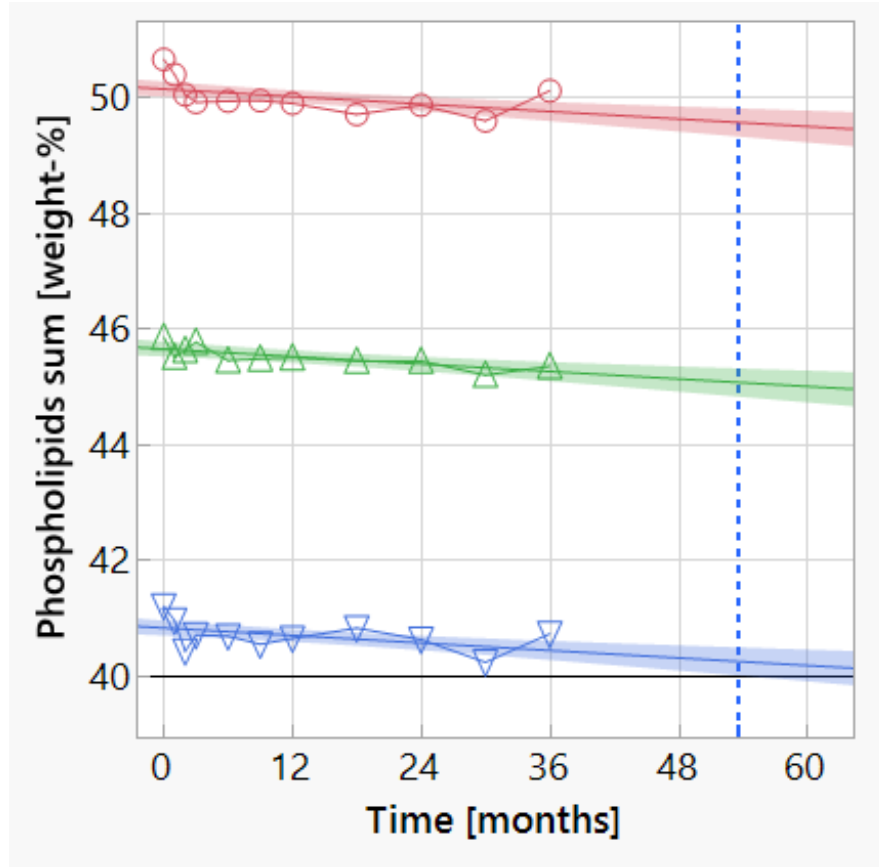
[https://fish-commercial-names.ec.europa.eu/fish-names/species\\_en?sn=15984](https://fish-commercial-names.ec.europa.eu/fish-names/species_en?sn=15984)

- Rich in phospholipid bound  $\omega$ -3 fatty acids
- Source of protein
- Source of choline
- Source of astaxanthin

# PRODUCTS

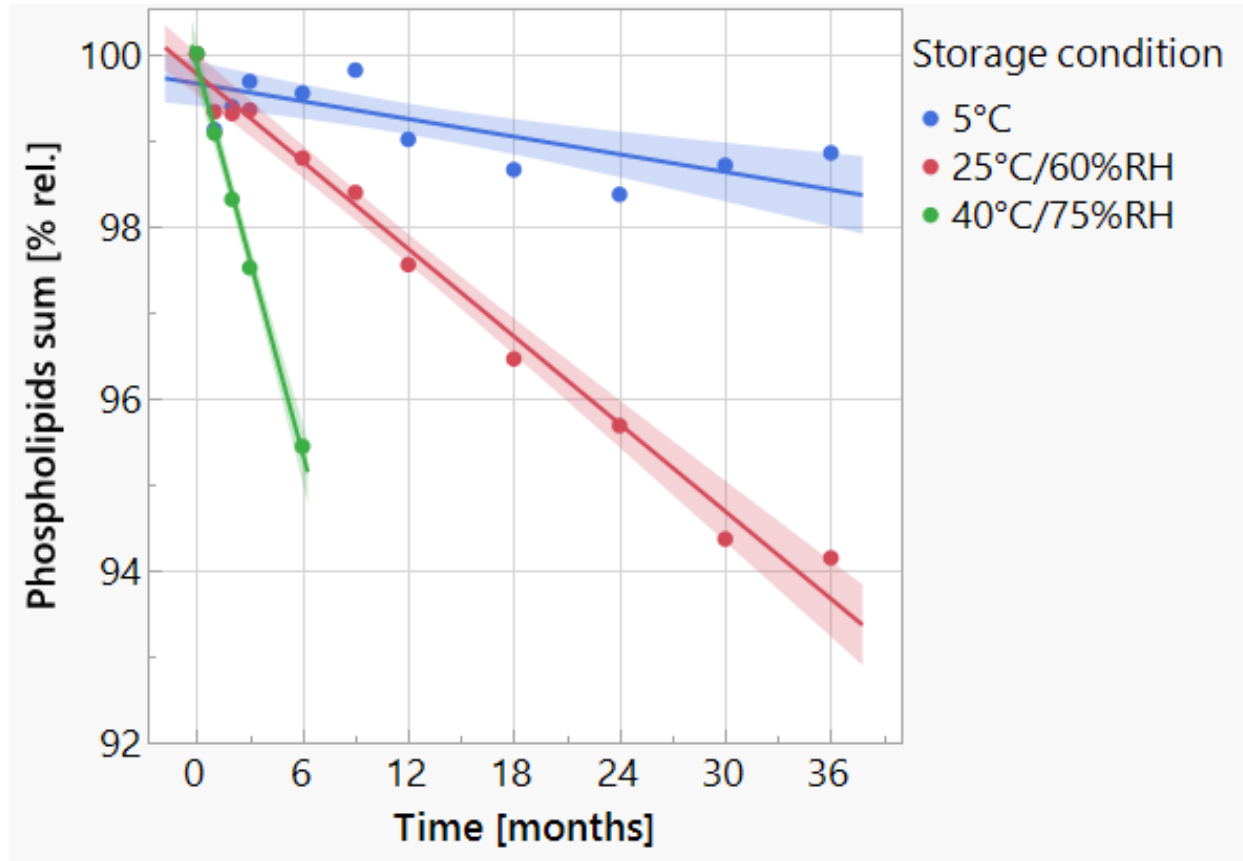


# USE OF JMP® INITIALLY RESTRICTED TO SHELF-LIFE ESTIMATION



- Example from krill oil stability study
- PL concentration is shelf-life limiting

# USE OF JMP® INITIALLY RESTRICTED TO SHELF-LIFE ESTIMATION

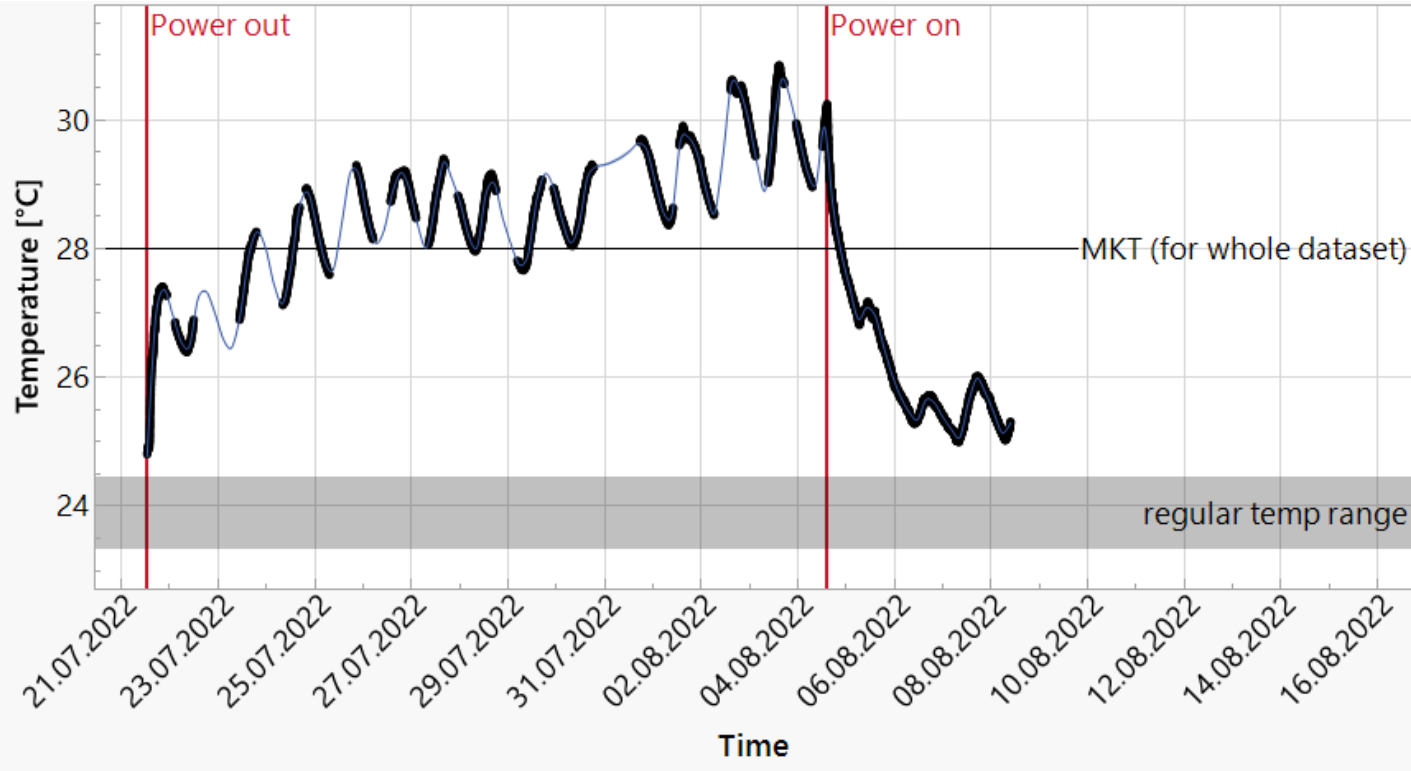


- Example from krill oil stability study



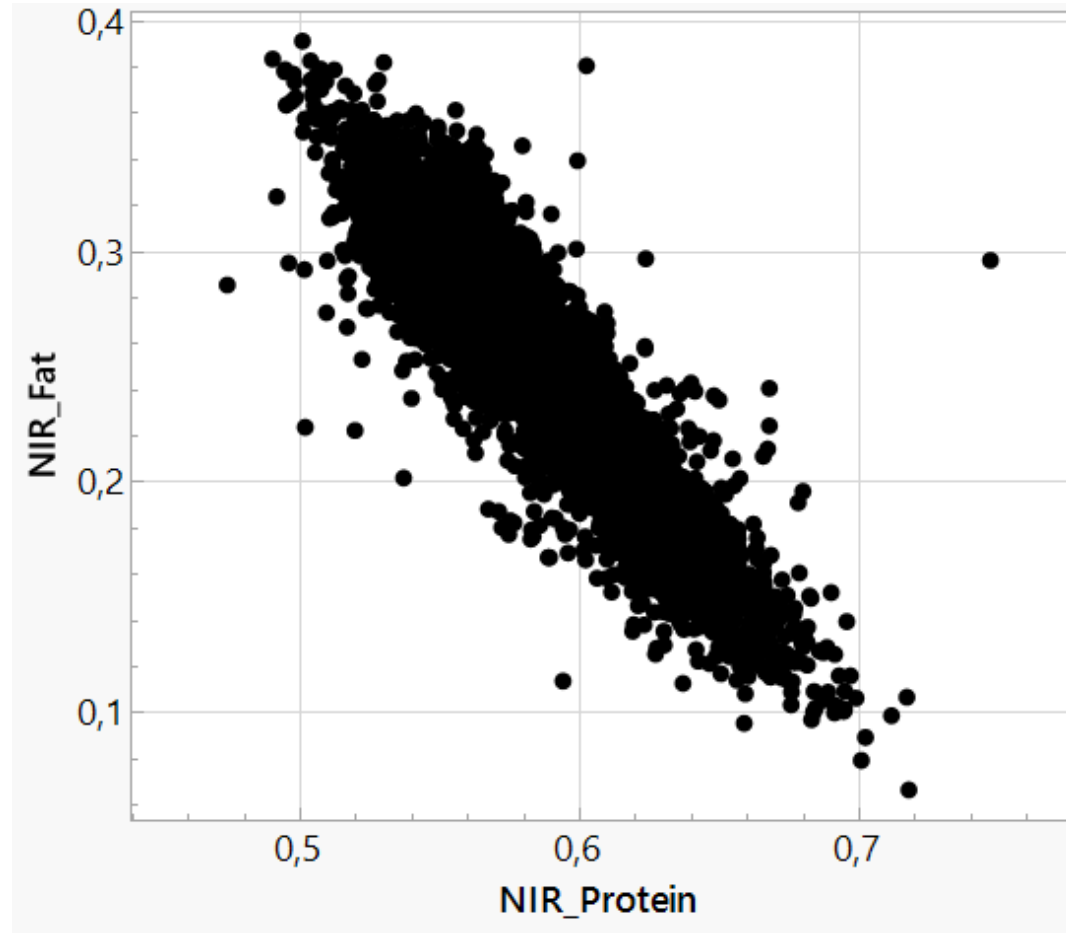


# USE OF JMP® INITIALLY RESTRICTED TO SHELF-LIFE ESTIMATION

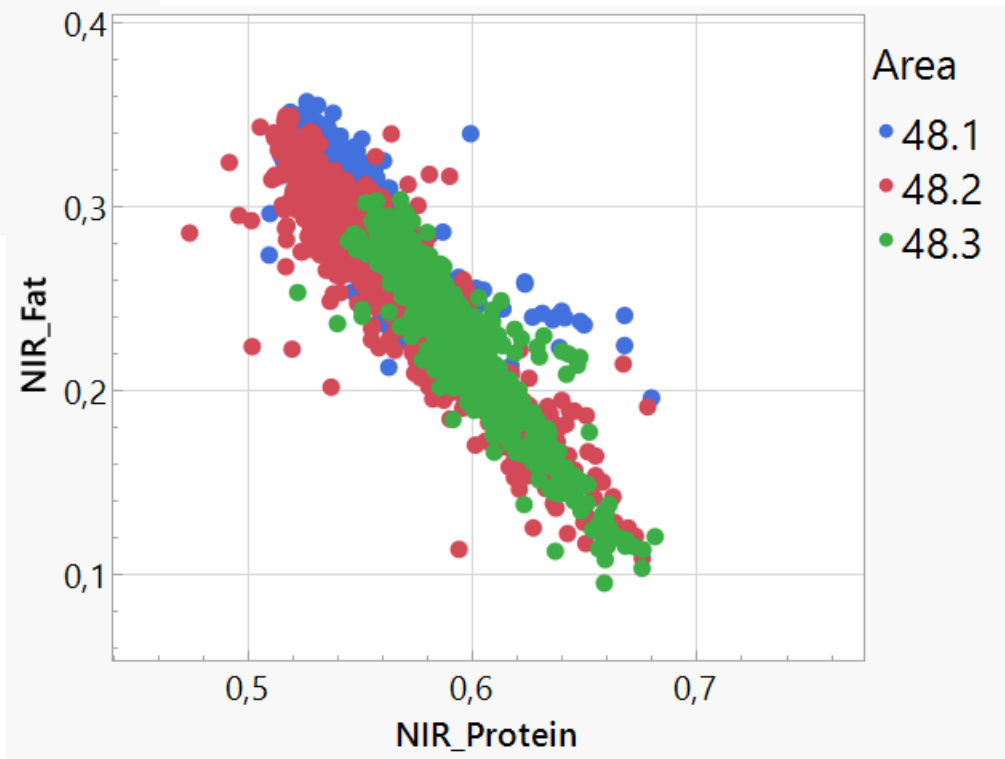
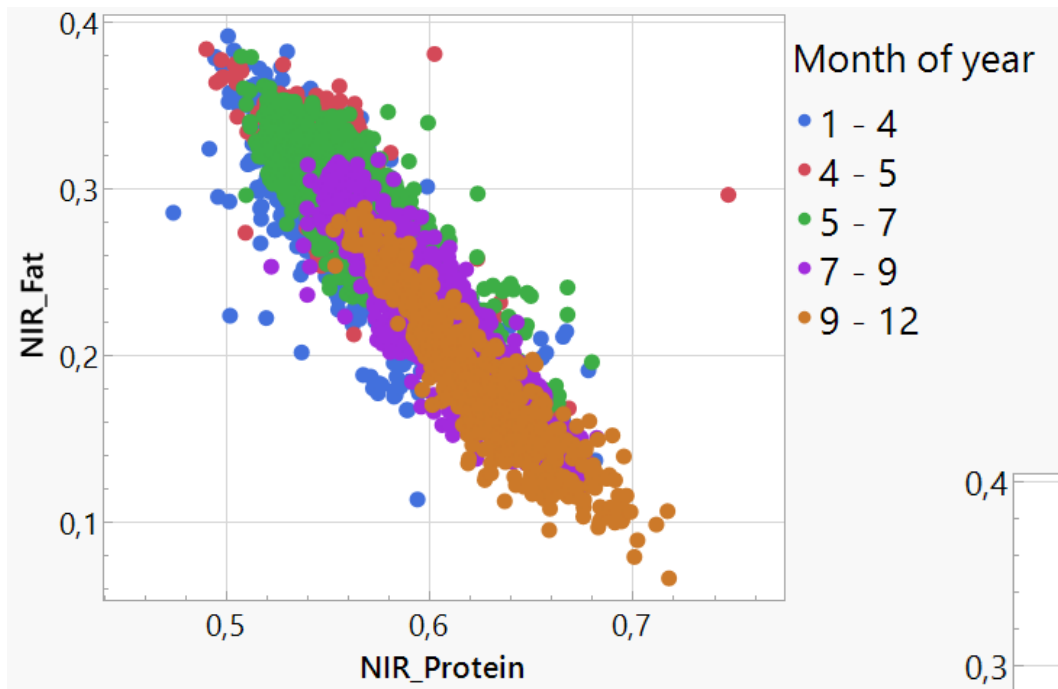


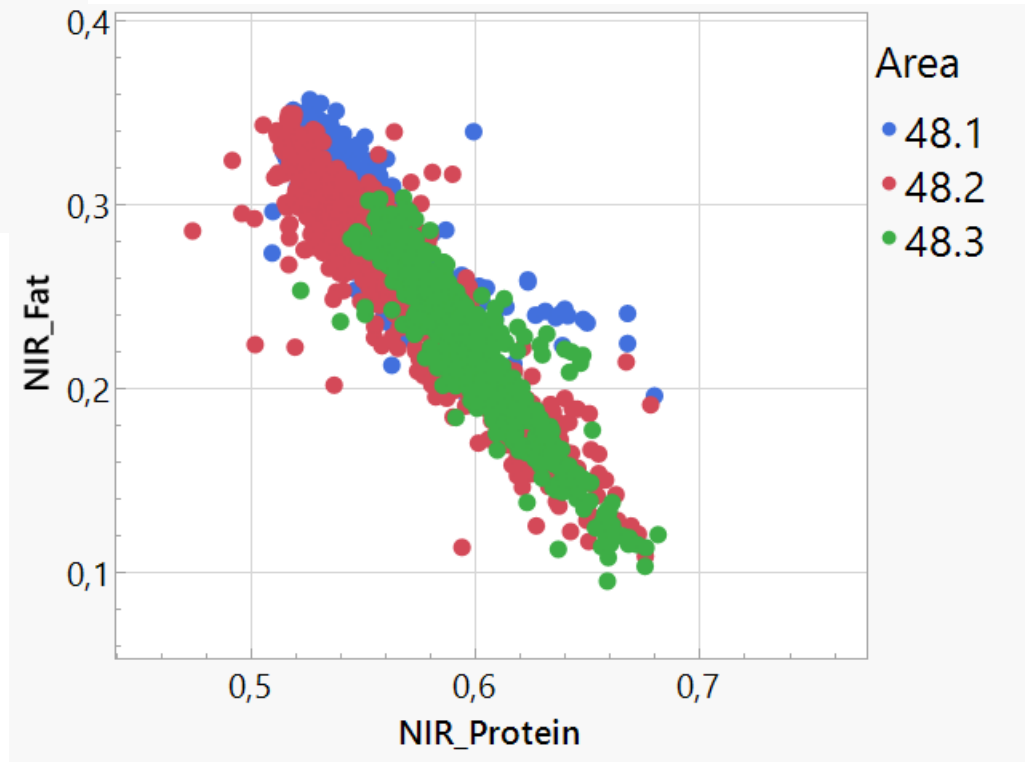
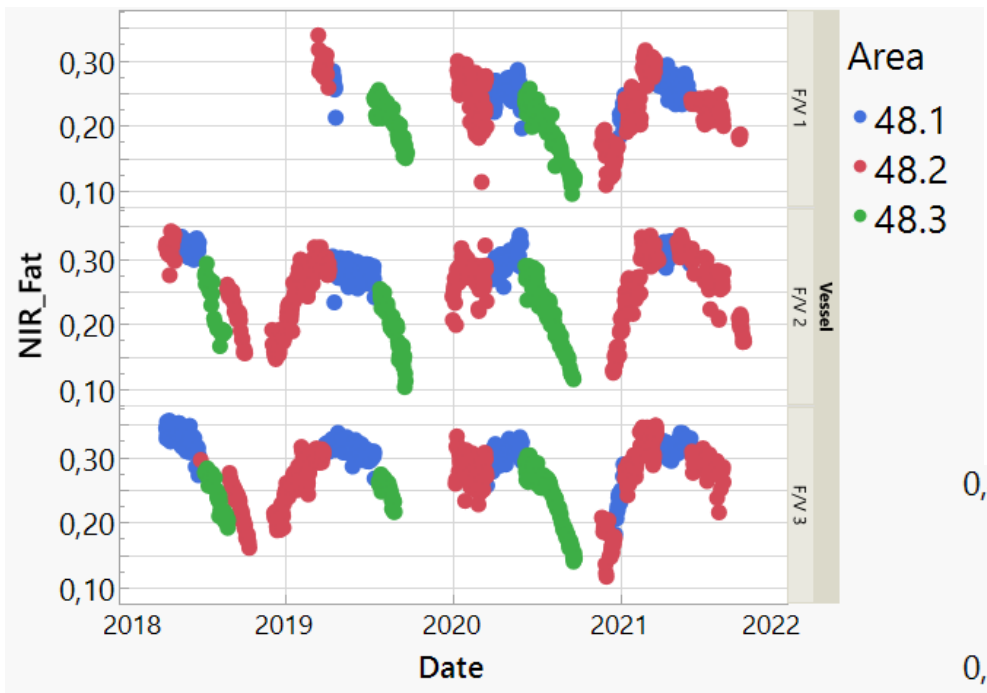
- Readings for warehouse temperature excursion in JMP

# USE OF JMP® WITH DATA WAREHOUSE

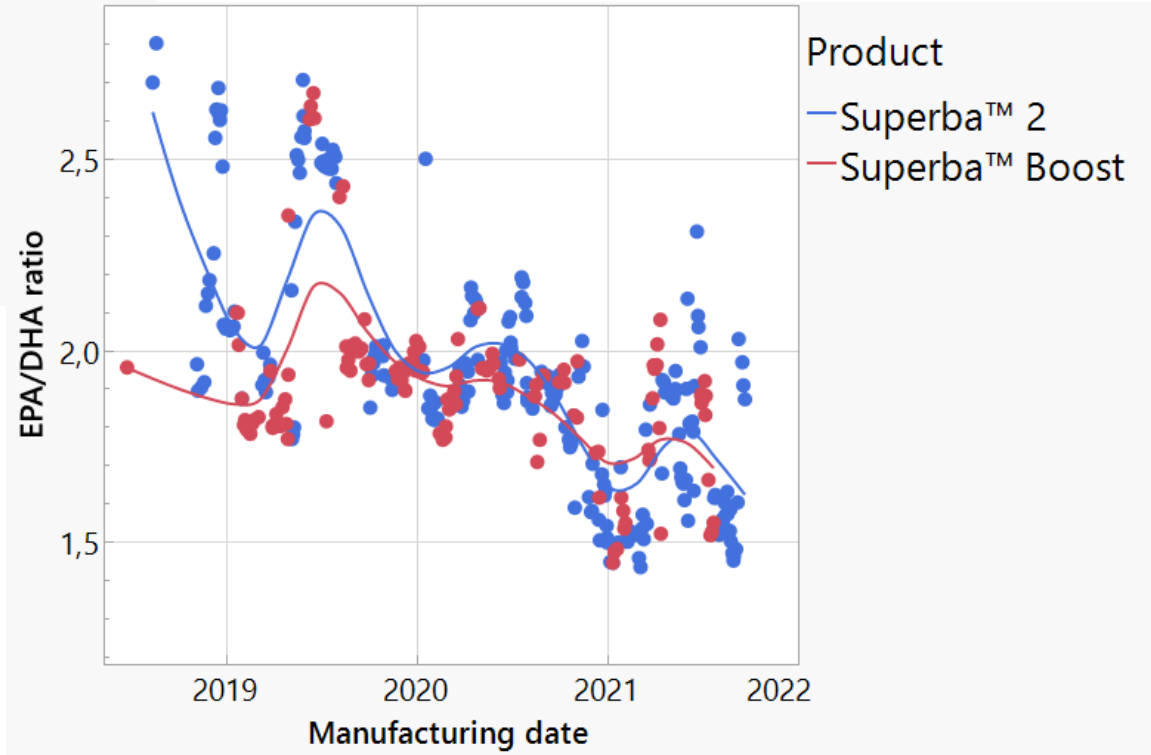
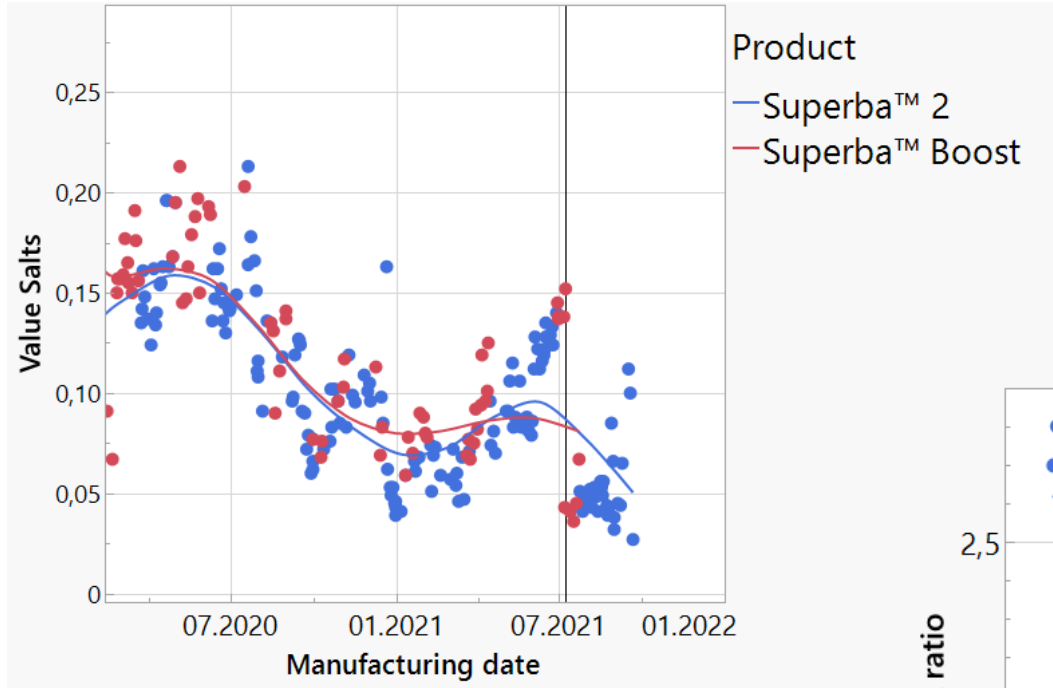


+ ODBC + Graph Builder = learning opportunities

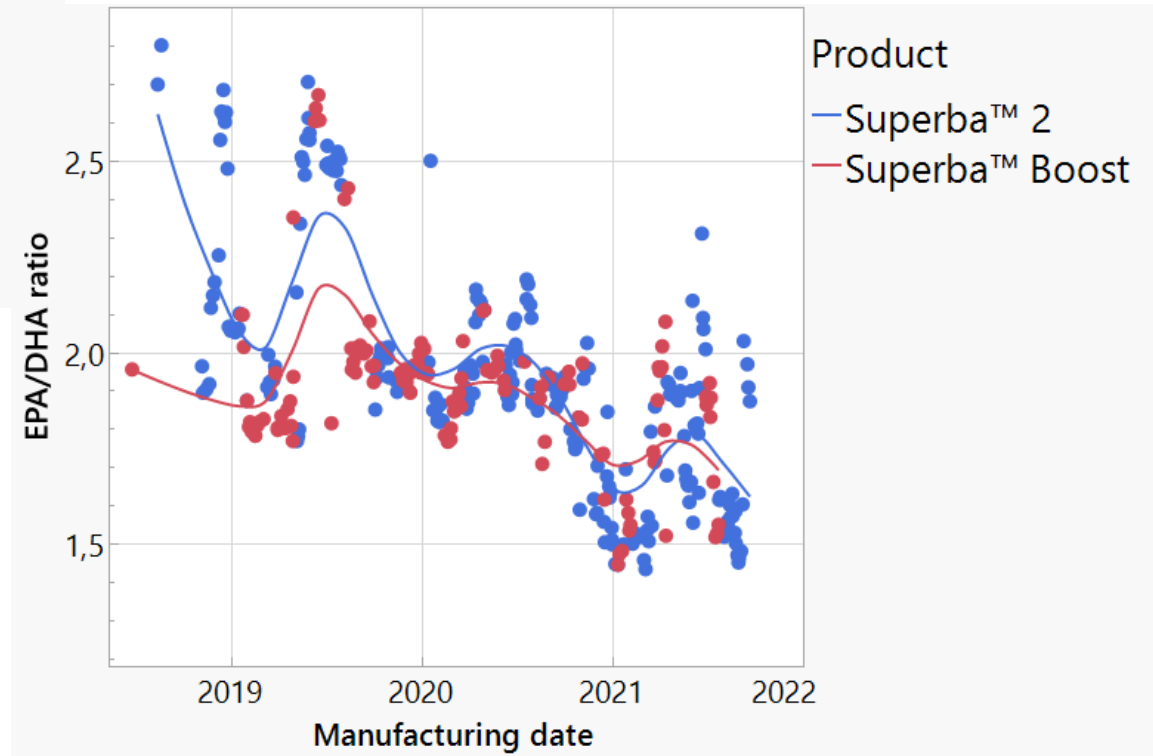
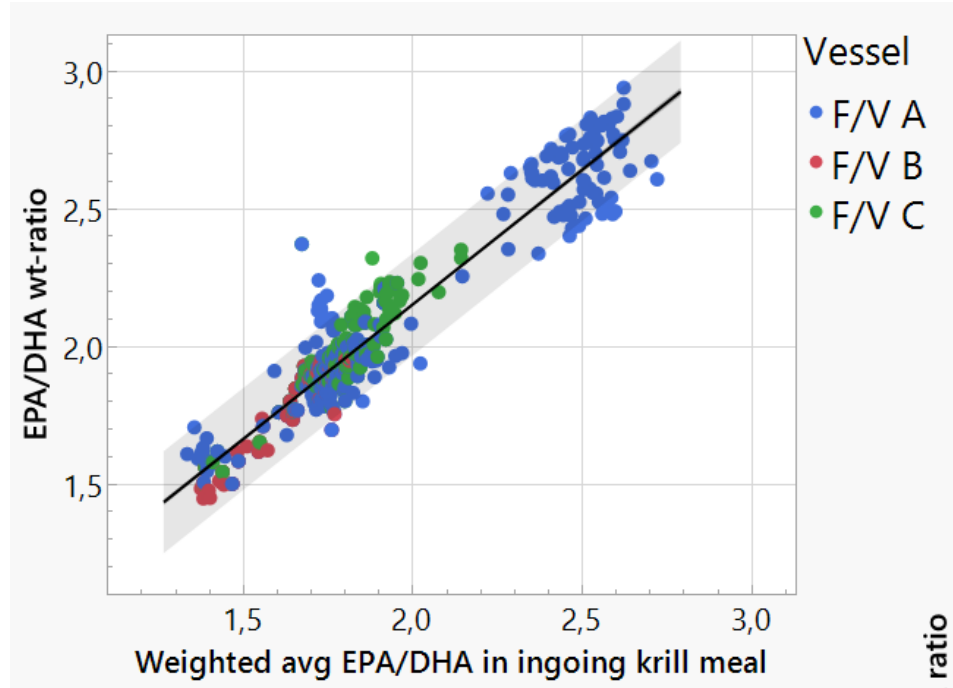




# KRILL OIL MANUFACTURING TRENDS



# KRILL OIL MANUFACTURING TRENDS



- **Hydrolysate**
- **93% protein**
- **Water soluble**





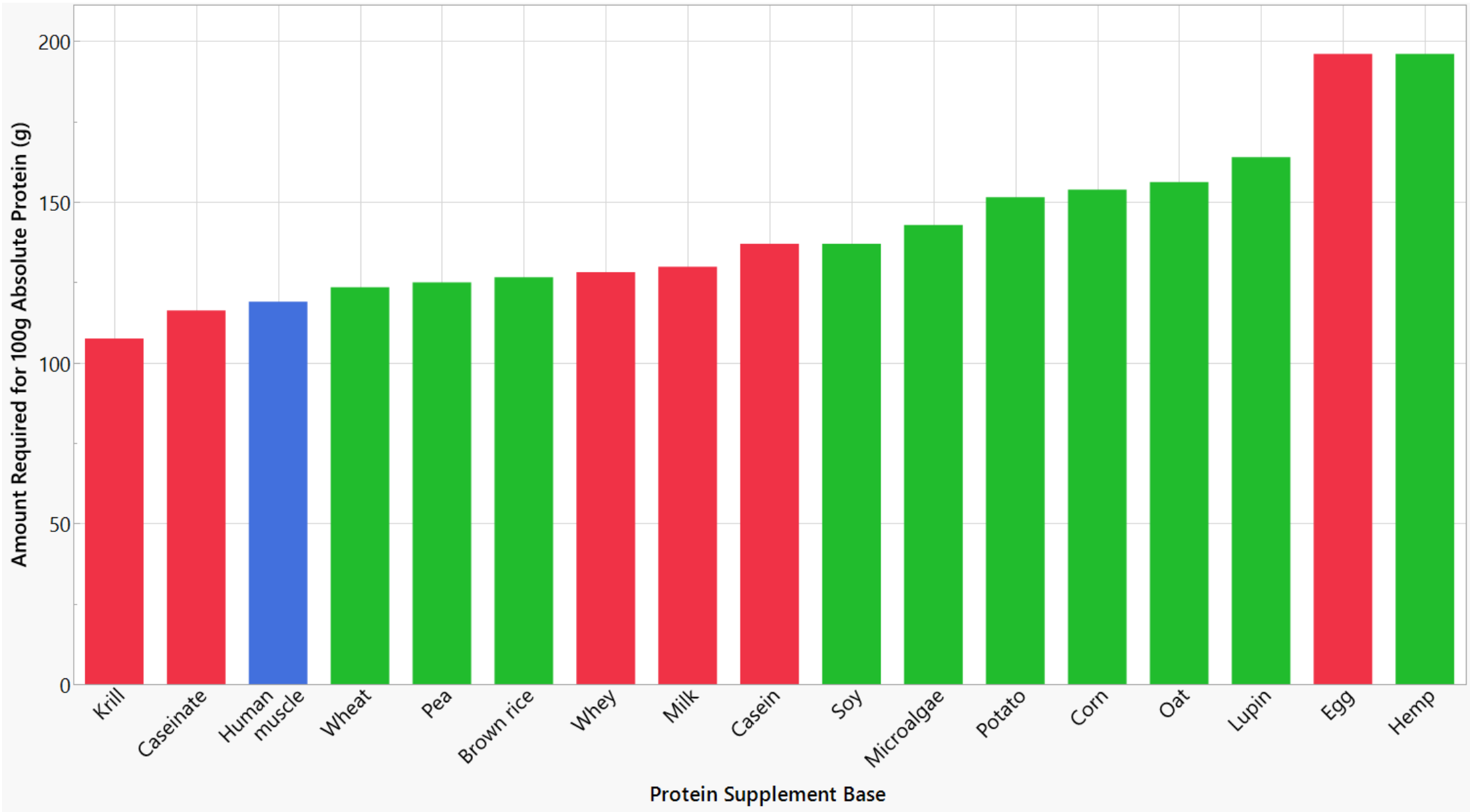
## Need More Protein?

I've been advised to up my protein. Whilst I'll do this mainly with foods, my essential amino acids?

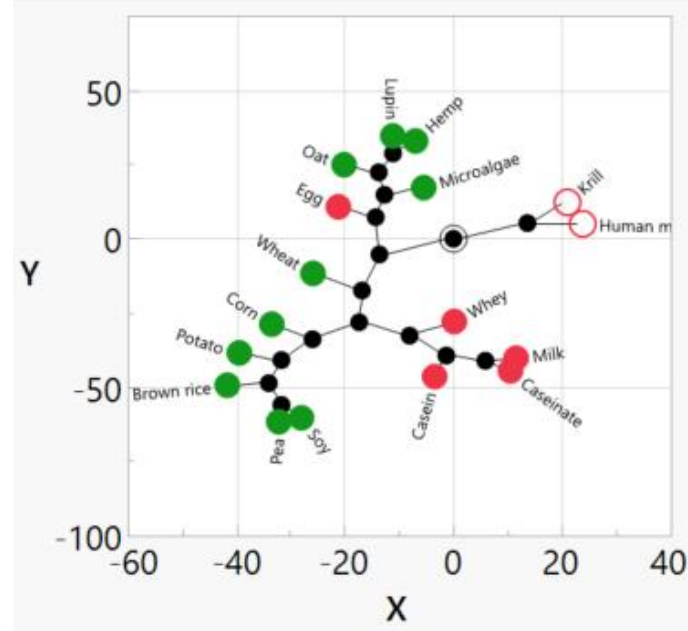
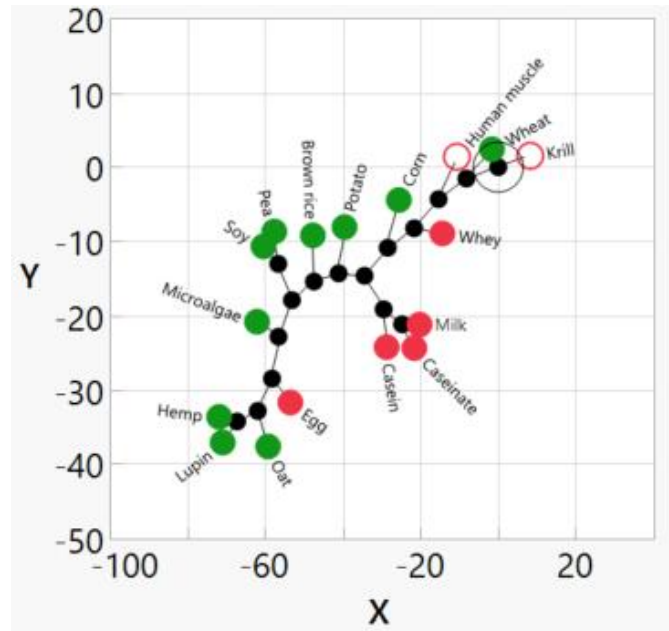
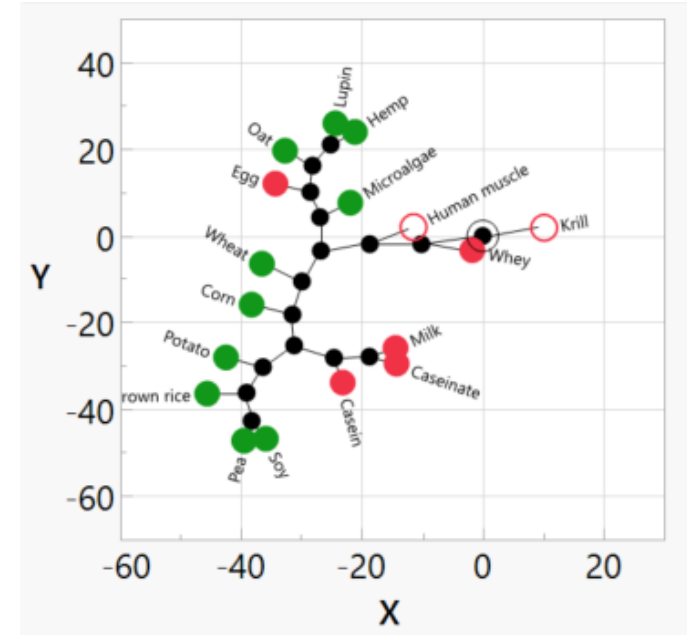
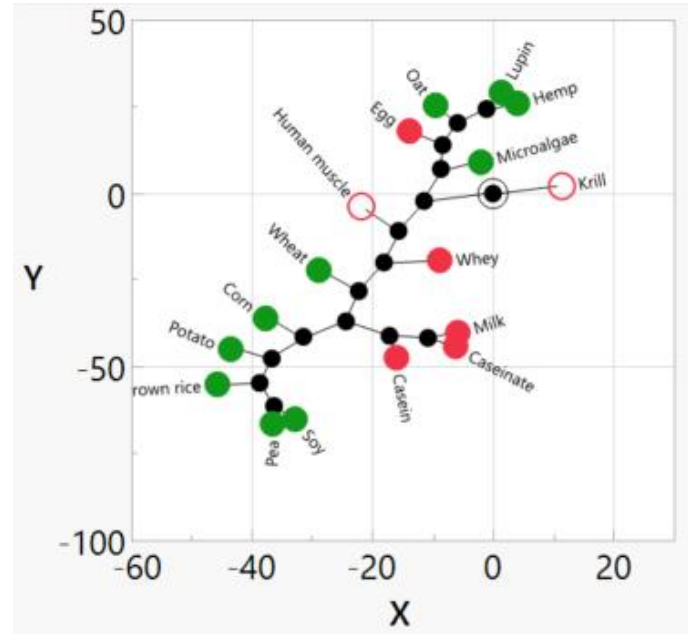
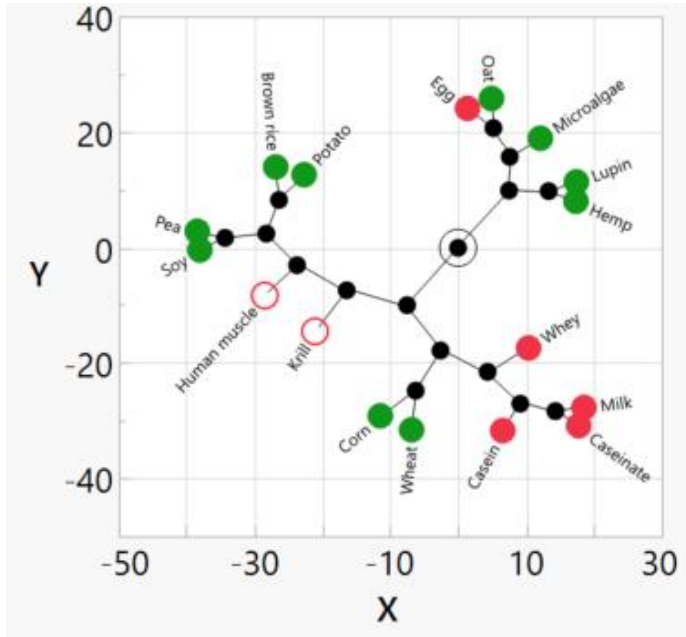
Published: August 21, 2020









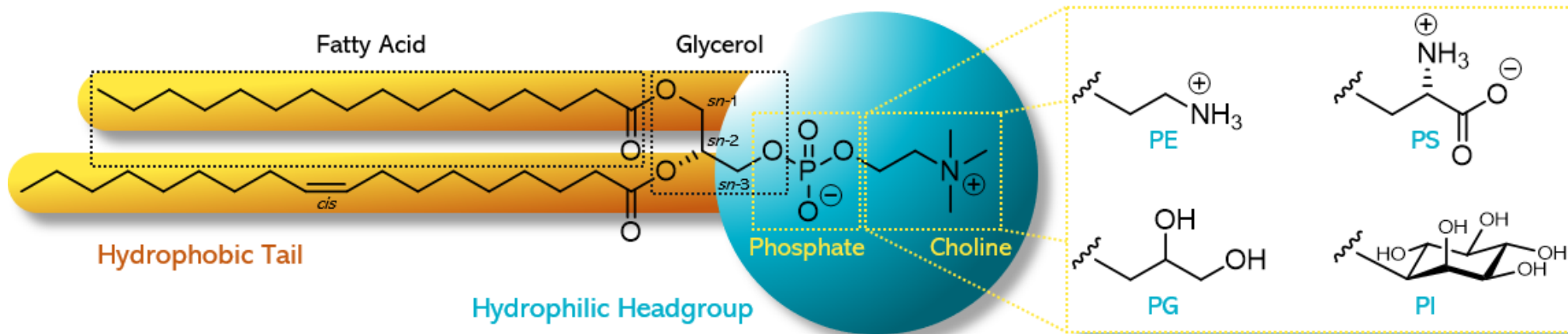


***A novel, highly digestible protein hydrolysate for human health and nutrition***

WHITE PAPER by: Dr Lena Burri, PhD; Annette Forss and Lalen Dogan

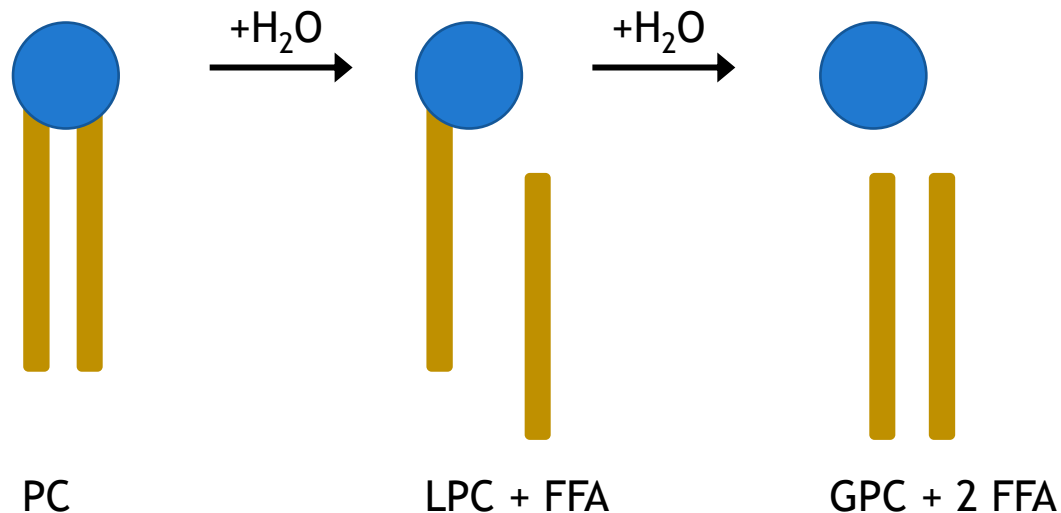
# PDF IMPORT WIZARD APPLIED TO KRILL OIL TEST CERTIFICATES

- Phospholipid (PL) concentration is a critical quality parameter for krill oil
- PLs are water miscible & relatively easily accessible for body compared to fish oil



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- Majority of PL present in krill oil is PC
- PC is susceptible to hydrolysis



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- PC is susceptible to hydrolysis
- Quantification by  $^{31}\text{P}$ -NMR → only sum(PC+LPC) & total PL traditionally logged

TPP	Integral	MW [g/Mol]	Initial weight [mg]	LOQ [Mol%]	Matrix:
Internal Standard	16.84	326.29	15.01		KRL01
Test item			307.59	0.13	
Phospholipid	Integral	MW [g/Mol]	Content [mg]	Mol-%	Weight %
PC	65.60	790.0	141.43	78.88	45.98
1-LPC	1.45	534.5	2.12	1.74	0.69
2-LPC	10.41	534.5	15.18	12.52	4.94
PI	0.00	907.0	0.00	0.00	0.00
PE	3.13	770.0	6.58	3.76	2.14
LPE	0.64	492.5	0.86	0.77	0.28
APE	1.16	1032.0	3.27	1.39	1.06
LPA	0.00	468.5	0.00	0.00	0.00
Other	0.77	812.0	1.71	0.93	0.55
Sum	83.16			100.0	55.64
Phosphorus					2.29

}  $\Sigma = 51.61$

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- Phospholipid (PL) concentration is a critical quality parameter for krill oil
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- Discovered ≈500 pdf CoAs on our server in late 2020 with much information not yet analyzed → pdf Import Wizard

Certificate of Analysis  
AKB76160-1

Spectral Service AG Post box 500122 D-50956 Köln

Aker Biomarine Manufacturing LLC

Houston, TX 77041  
USA

Phone: [Redacted]  
Fax: [Redacted]  
eMail: [Redacted]

Analysis method: quantitative <sup>31</sup>P-NMR spectroscopy according to SAA-MET002-04  
Instrument: Bruker Avance III 600 MHz with automated sample changer and BBO cryo probe  
Internal standard: Triphenyl phosphate Content [%]: 99.9 MW [g/mol]: 326.29  
Initial weight test item [mg]: 354.71 Initial weight internal standard [mg]: 15.00

Sample Ident.: Asta Oil, Ch. -B.: S110000 Lab. No:  
Spectral Service Code: AKB76160 -1 Arrival : 24.09.2018

Phospholipid	Weight-%	Mol-%	MW [g/mol]
PC	8,27	76,39	790,0
1-LPC	0,14	1,89	534,5
2-LPC	0,75	10,19	534,5
PI	---	---	907,0
LPI	---	---	629,5
PS-Na	---	---	833,0
LPS	---	---	555,5
SPH	---	---	812,0
PE	0,73	6,92	770,0
LPE	0,10	1,48	492,5
APE	0,32	2,24	1032,0
PG	---	---	820,0
DPG	---	---	774,0
PA	---	---	746,0
LPA	---	---	468,5
Other PI	0,10	0,89	812,0

Table Preview

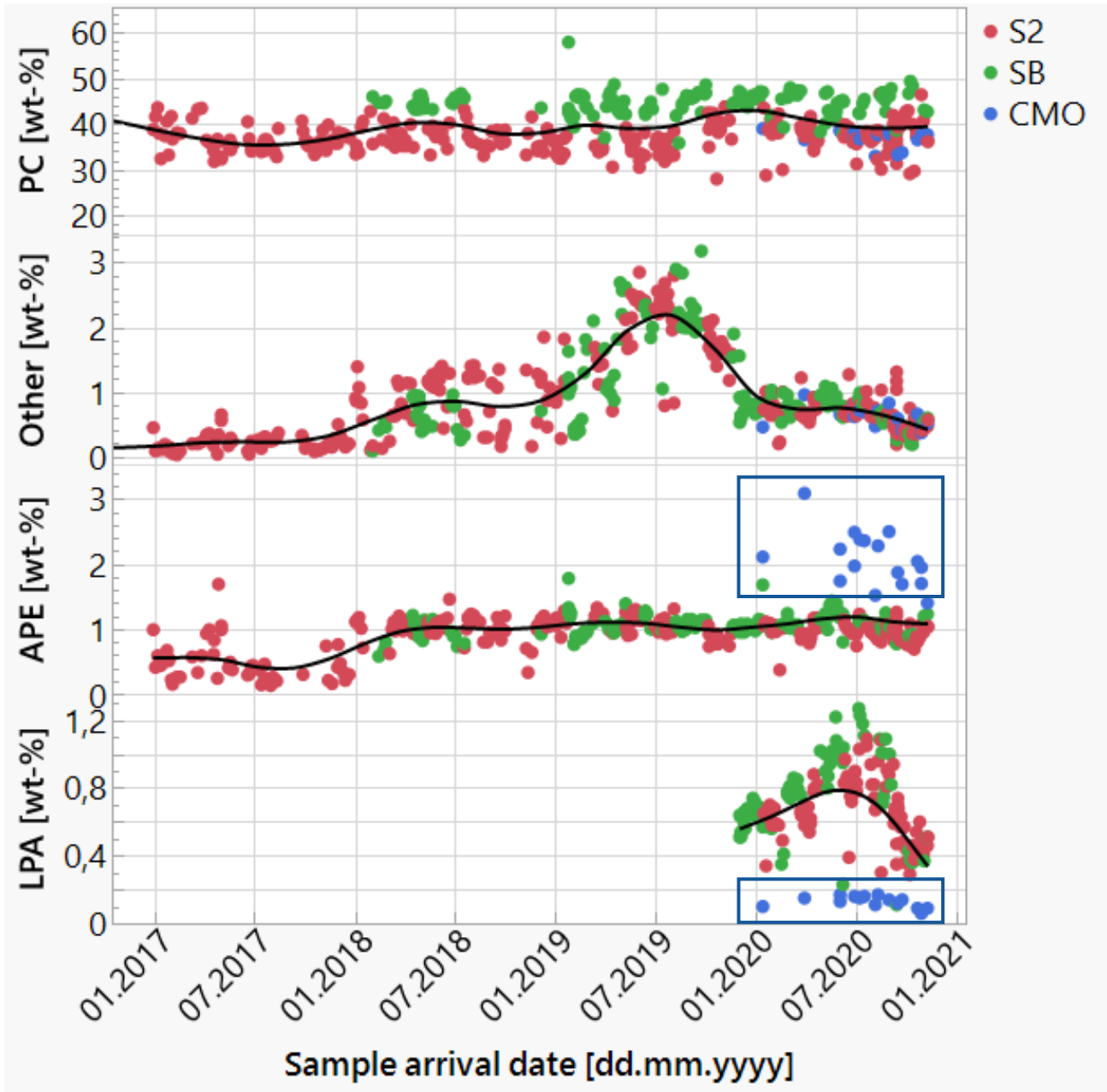
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 Ignore all tables  Individual tables  
 Concatenate tables with matching column names

Minimum column count: 2  
 Minimum row count: 3  
 Number of data tables: 2

Page(1) Table(1) v

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2	1	1	Fax:	[Redacted]
3	1	1	eMail:	[Redacted]
4	1	2	Houston, TX	[Redacted]
5	1	2	USA	[Redacted]
6	1	5	Comment: Integr...	[Redacted]





- Systematic shifts in wt-% of individual species most likely related to different interpretations of NMR spectra
- Differences between different products apparent



**THANK YOU!**