Novel Compound Discovery in Newly Domesticated Alaskan Kelp

Supported by Alaska Fisheries Development Foundation

marine biologics

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Dragon Kelp
Eualaria fistulosa

Split Kelp
Hedophyllum nigripes

Bull Kelp
Nereocystis luetkeana

Step 1: Work with local farmers to source samples

September 2024 – May 2025

Sugar Kelp (*Saccharina latissima*)
Pacific Giant Kelp (*Macrocystis tenuifolia*)
Winged Kelp (*Alaria marginate*)
Five-rib Kelp (*Costaria costata*)
Three-rib Kelp (*Cymathaere triplicata*)
Bladderwrack (*Fucus vesiculosus*)

other species included in study

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June 2025

Research scientist: Emile Dantzer

Sample Flow

Catalogue
Dry
Grind
Moisture/Water Activity
Shipping

Step 2: Laboratory setup – seaweed sampling at KSMSC

June 2025

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Step 3: Alginate Extraction/Quantification

Bull Kelp

Split Kelp

Sugar Kelp

Pacific Giant Kelp

Winged Kelp

Five-rib Kelp

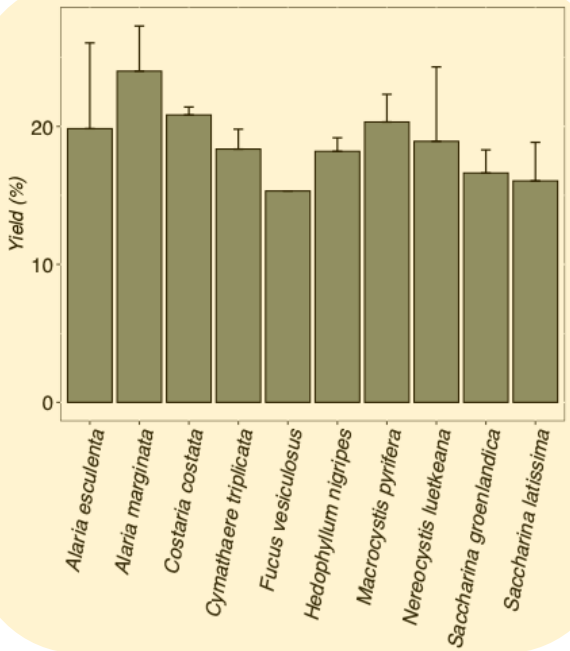
Three-rib Kelp

Bladderwrack

Selective Extraction

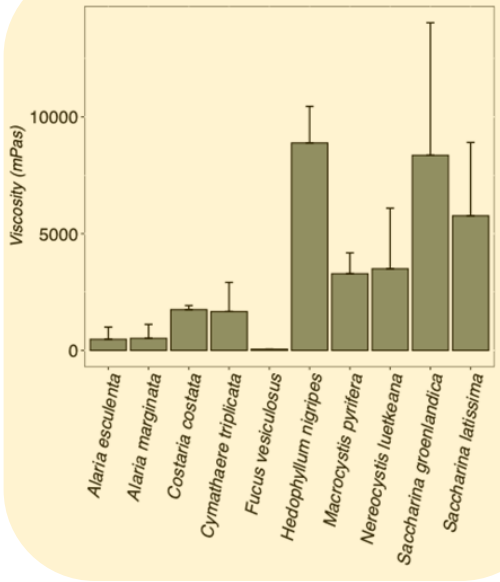
Roscoff, France

Up to 25% alginate yield



Alginate Yield

Function Testing



Viscosity analysis

Data aligns:

2024 Seaweed Tissue Analysis

Alginate 17-20 % DW (estimated)

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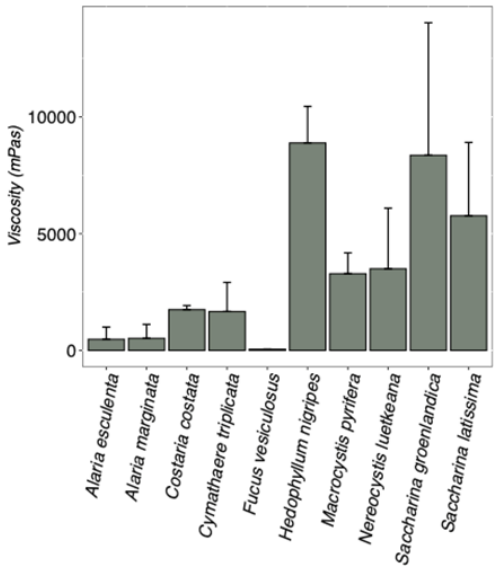
Assessment of Different Alginates Isolated from Alaskan Seaweed



Interpret

Bull Kelp	Medium-High viscosity
Split Kelp	Highest viscosity
Sugar Kelp	High viscosity
Pacific Giant Kelp	Medium-High viscosity
Winged Kelp	Medium viscosity
Five-rib Kelp	Medium-High viscosity
Three-rib Kelp	Medium-High viscosity
Bladderwrack	Low* viscosity

*Bladderwrack contains limited alginate not expected to have a viscous extract

Ranked

Viscosity

1. Split Kelp
2. Sugar Kelp
3. Bull Kelp
4. Pacific Giant Kelp
5. Five-rib Kelp
6. Three-rib Kelp
7. Winged Kelp
8. Bladderwrack

Step 4: Data Interpretation

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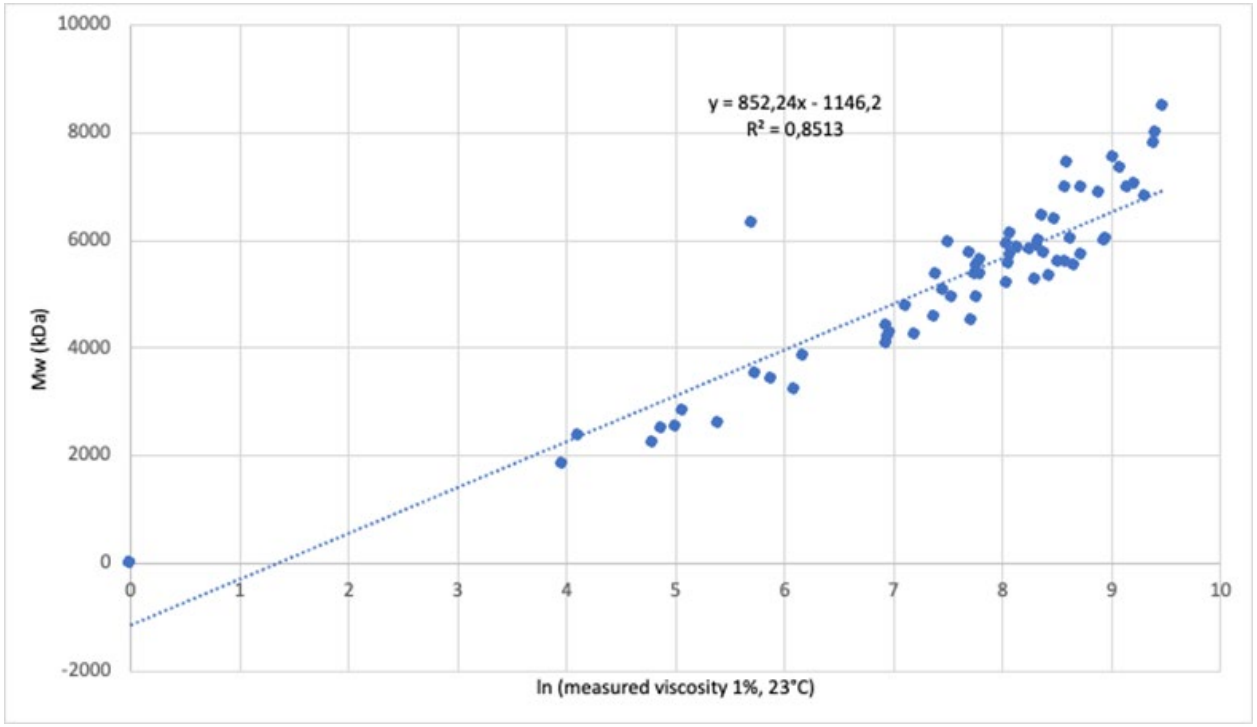
Viscosity and Molecular Weight of Different Alginates Isolated from Alaskan Seaweed



Observed correlation between Molecular Weight (Mw) and ln(viscosity)

$[\eta] = KM^{a}$

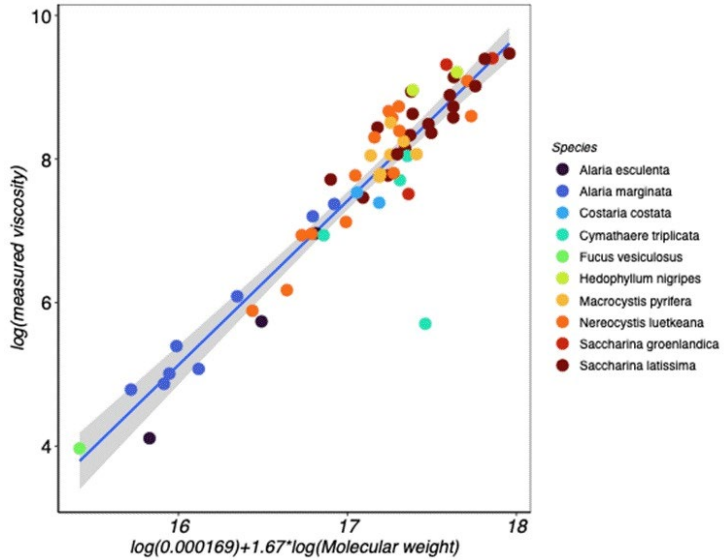
$[\eta]$: Intrinsic viscosity

K: Mark-Houwink constant for a given polymer type (chemistry and architecture) at a given solvent and temperature.

a: A scalar quantity which relates to the conformation of a polymer.

Mark-Houwink formula: viscosity (η) is related to Mw

$$\boldsymbol{log(\eta) = log(K) + \alpha \cdot log(M_w)}$$



Experimental viscosity aligns with experimental Molecular Weight (Mw)

(K = 0.000169; α = 1.67) - Ramsackal et al., 2019

Step 4: Data Interpretation

Molecular weight can be estimated by viscosity measurement
= faster/cheaper method

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- **New protocols developed**: Farm Sampling Plan, Sample drying (KSMSC), Sodium Alginate Extraction, Viscosity Measurement, Size-Exclusion Chromatography

- **Consistent sodium alginate extraction yield**: ~20% across all species

- **High viscosity (>1200 mPas) for many of the extracts**: confirming a composition rich in alginate

- **Viscosity variations between species**: Split Kelp was shown to have the highest extract viscosity, while Bull Kelp was comparatively lower (Figure 6). Unfortunately, specific trends according to time or location could not be identified, due to the limited number of samples by species.

- **A relation between Mw and viscosity**: Data collected in this study showed a correlation of viscosity to M_w. Size-exclusion chromatography requires more specialized equipment than viscosity. Based on this, viscosity measurements can be used to verify alginate molecular weight in seaweed.

Step 5: Report and Conclusions

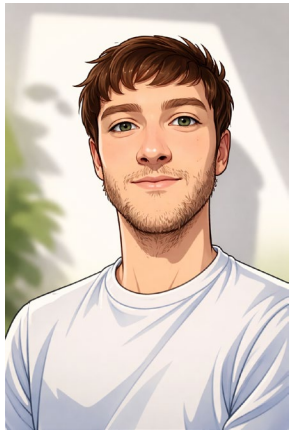
CNRS • SORBONNE UNIVERSITÉ
Station Biologique de Roscoff

Emile Dantzer

- SOP Development
- Sampling
- KSMSC Testing

Fanny Lalegerie

- SOP Development
- Analysis
- Reporting



Paul Montoir

- SOP Development
- Data Collection

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FOODMETRICS LABORATORIES
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