



GREAT LAKES
ST. LAWRENCE
GOVERNORS
& PREMIERS

UNITED FOR GROWTH

100% Great Lakes Fish

David Naftzger

February 2023





Great Lakes St. Lawrence Governors & Premiers

Nearly 40 years of collaboration among the region's chief executives:

Illinois Indiana Michigan Minnesota New York
Ohio Ontario Pennsylvania Québec Wisconsin

Growing the region's US\$6 trillion economy and protecting the world's greatest freshwater system.

Tony Evers, Chair, Wisconsin Governor
Mike DeWine Vice Chair, Ohio Governor

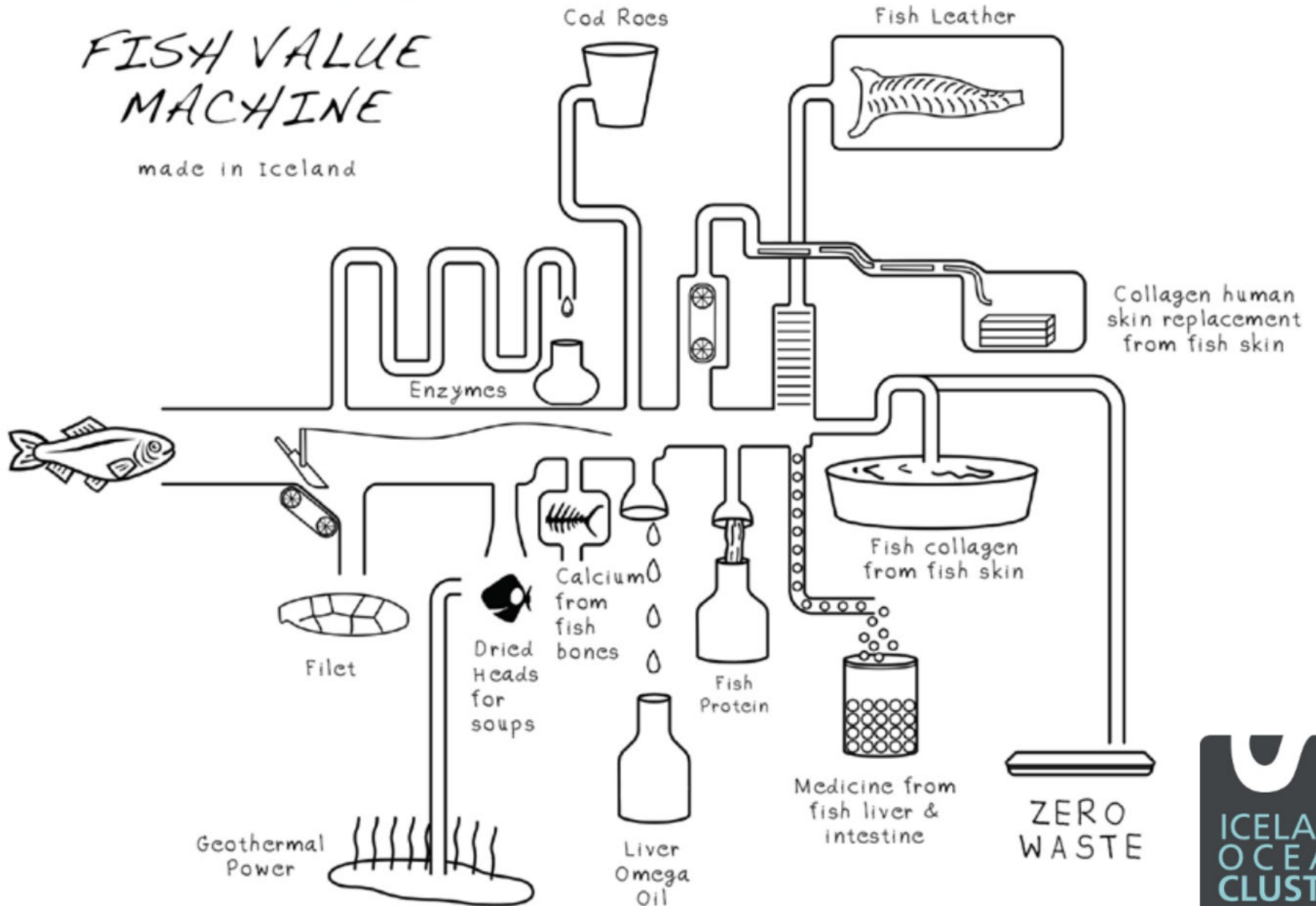


“The Working Great Lakes”

- Maritime Transportation
 - Cruise the Great Lakes
- Great Lakes USA--international tourism marketing partnership
- Great Lakes Impact Investment Platform
 - Commercial Fishery

THE
INCREDIBLE
FISH VALUE
MACHINE

made in Iceland



The Icelandic Model

Driving a New Fish Economy

Cod biomass utilization increase from 40% to more than 80%

New high-value byproducts such as skin and collagen that are processed into a variety of food and non-food products

A cod that used to generate \$12 for filets now generates a remarkable \$4000 per fish in expanded value!

Model now being applied globally



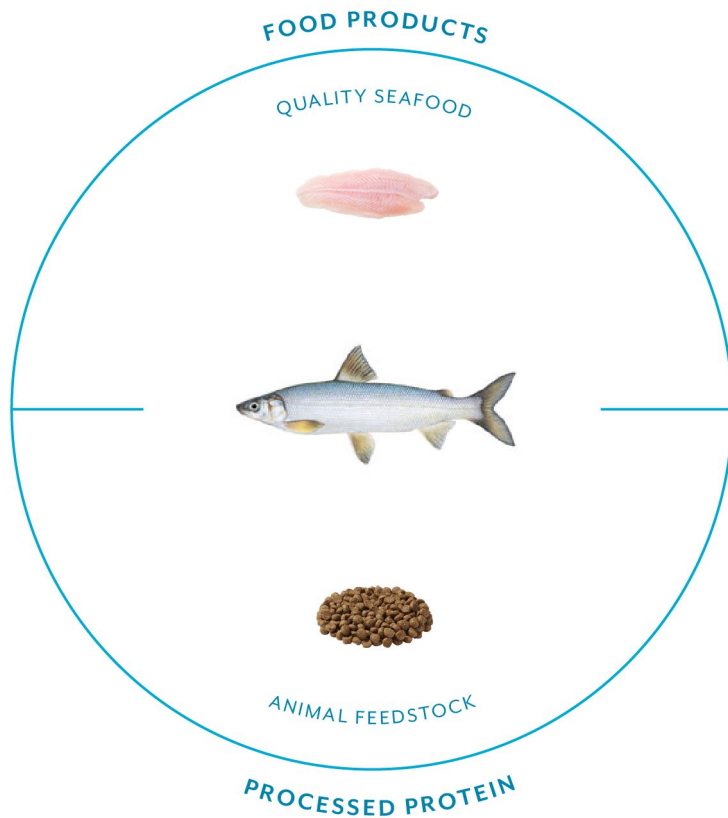


100 %
fish

Icelanders are pioneers in utilizing all parts of whitefish through innovation and industry clustering



Great Lakes Whitefish



Historically low catch rates and yield in recent years

Lack of product diversity

Traditional products facing competition

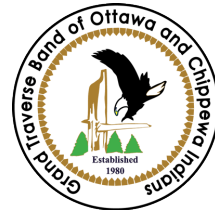
Low biomass utilization

Relatively low value per fish

100% fish opportunity



100% Whitefish Collaboration



This project is supported by a grant from the Great Lakes Fisheries Trust



Tribal Engagement

- **Proper engagement with and involvement of interested federally recognized Tribes in the region is important for the overall success of this project.**
- **In addition to on-reservation rights that various Tribal Nations may have, many also have off-reservation fishing rights including throughout “ceded territories” ceded through treaties with the federal government.**



- **Tribes are not “stakeholders,” but rather sovereign nations that must be recognized and treated as such. Tribes are also uniquely positioned to bring value to the project given their historic relationship to the fishery.**
- **The work plan for this project includes separate steps for engaging with Tribes.**
- **The project team is eager to work collaboratively with Tribes.**

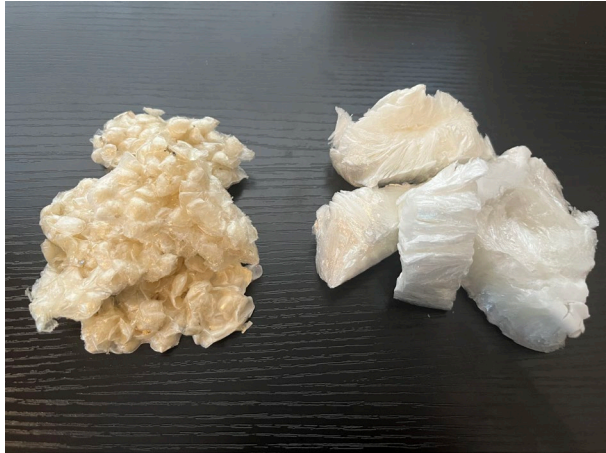


100% Whitefish



- Demonstrating a 100% fish model for commercially caught fish in the Great Lakes
- Biotechnical testing on whitefish from Lakes Superior, Michigan and Huron
- Site visits to Michigan and Ontario by Icelandic experts





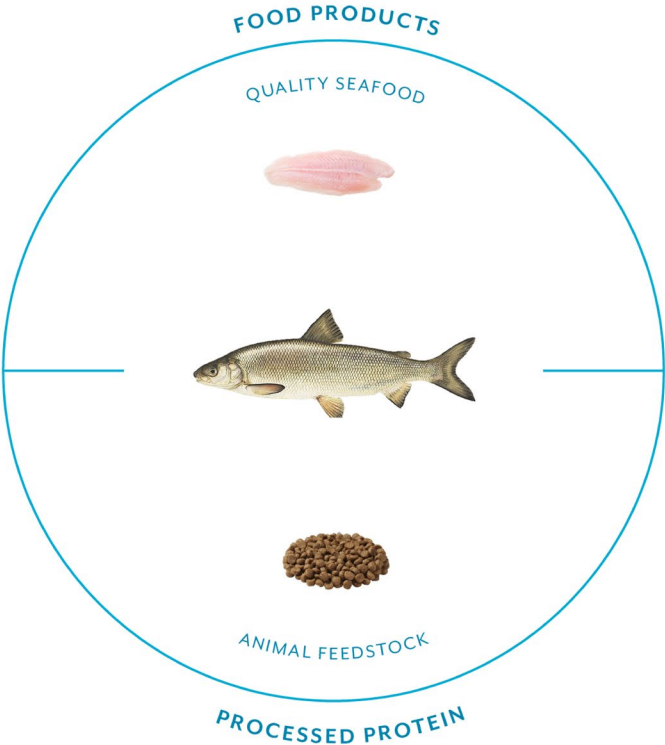
100% Whitefish

- New prototype whitefish products developed—collagen from skin and scales; fish leather
- Report and action plan completed in January 2023
- Research capacity and a network of experts to expand work in 2023 and beyond

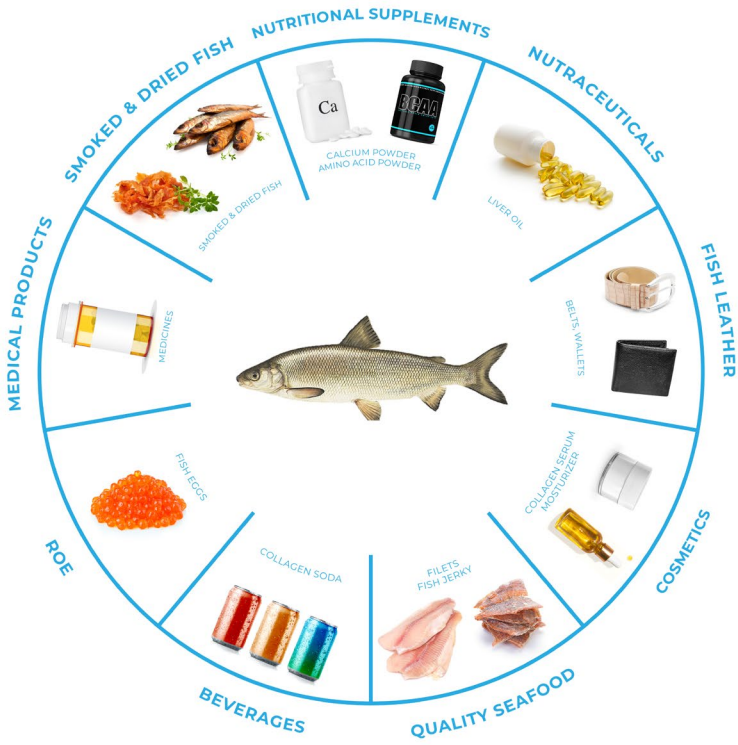


Lake Whitefish

From today...



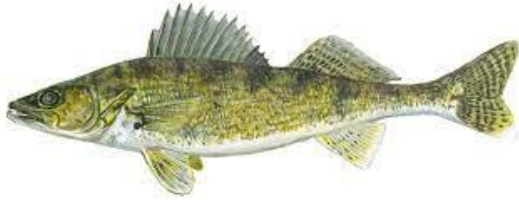
To tomorrow...



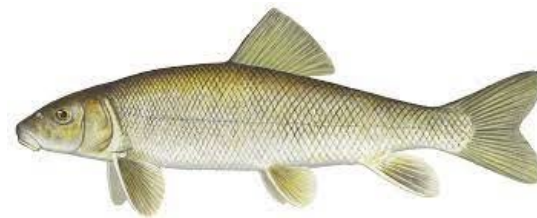
100% Whitefish



100% Great Lakes Fish



- Biotechnical testing on walleye, lake trout, yellow perch and white sucker from the Great Lakes
- New prototype products to be developed
- High-level template for a regional fish research center where value-added products and equipment needed to produce them could be developed and tested
- Report and action plan completed in fall 2023



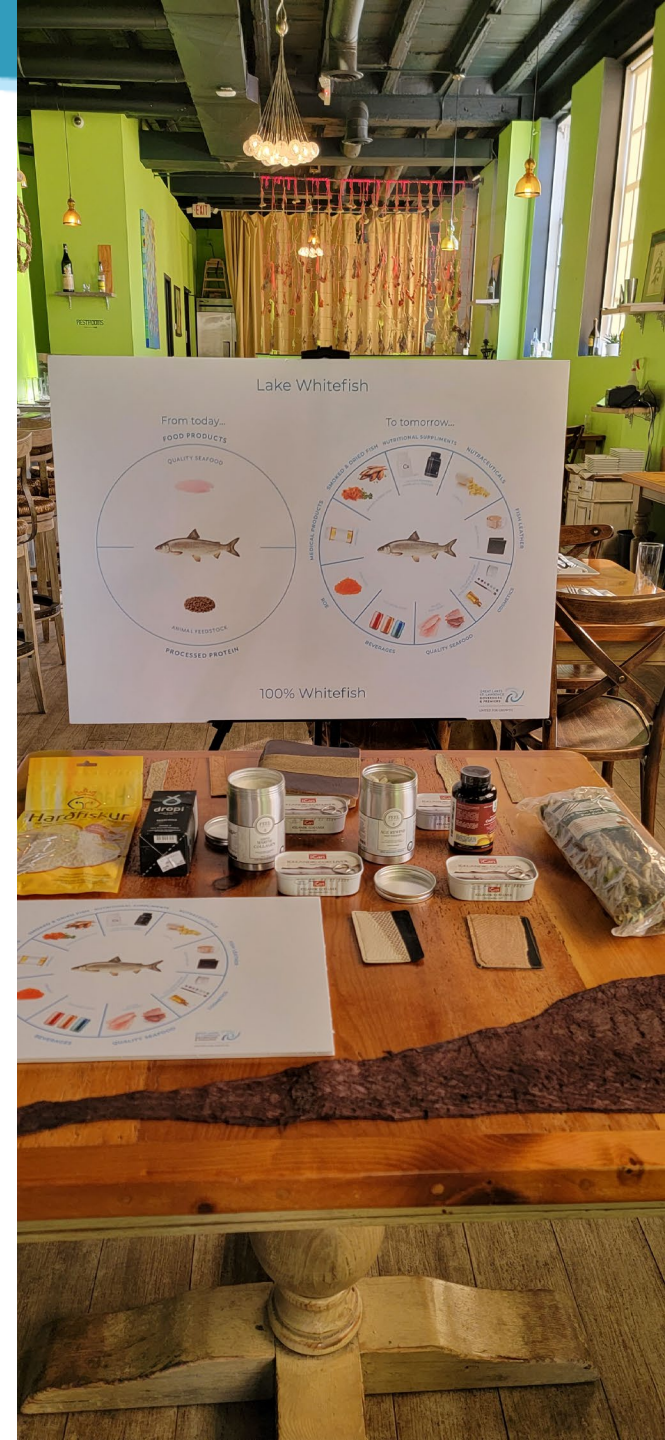
This work is being financially supported by the Great Lakes Fishery Commission



Potential future work

- Create an **innovation challenge** focused on “how to maximize the value of the Great Lakes commercial fishery through a 100% fish approach.” Teams would develop new concepts for products derived from Great Lakes fish and compete against one another for awards.
- Build an **attribute-based model** illustrating values for Great Lakes St. Lawrence fish such as locally caught, responsibly sourced, sustainable, nutritious, connected to local work force, etc.
- Determine the potential for a Great Lakes St. Lawrence **certification or branding program**.

100% Great Lakes Fish



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100% Whitefish

A decorative red wavy line that spans the width of the slide, positioned above the speaker's name.

Dr. Alexandra Leeper

Head of research and innovation

Iceland Ocean Cluster

Outline

Background and aims of the project

Lake whitefish value chain

Analysis for value creation

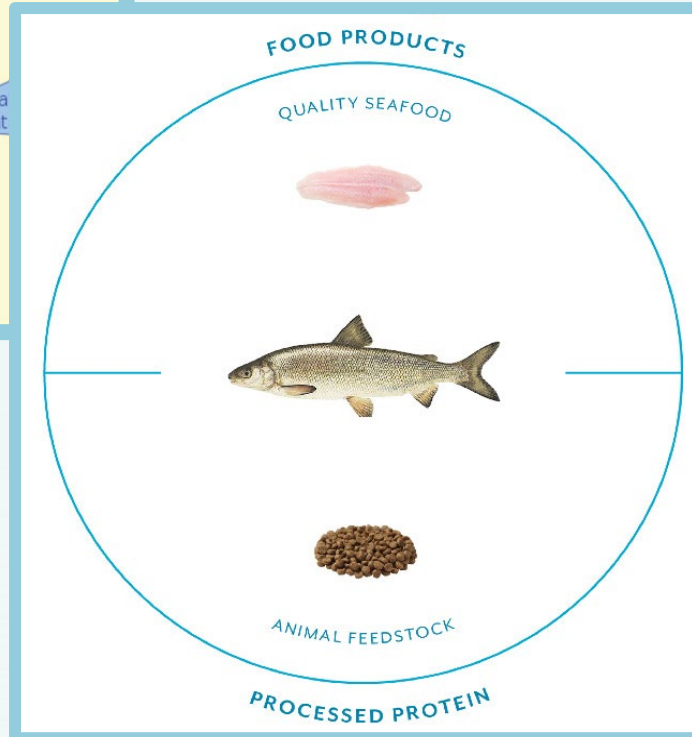
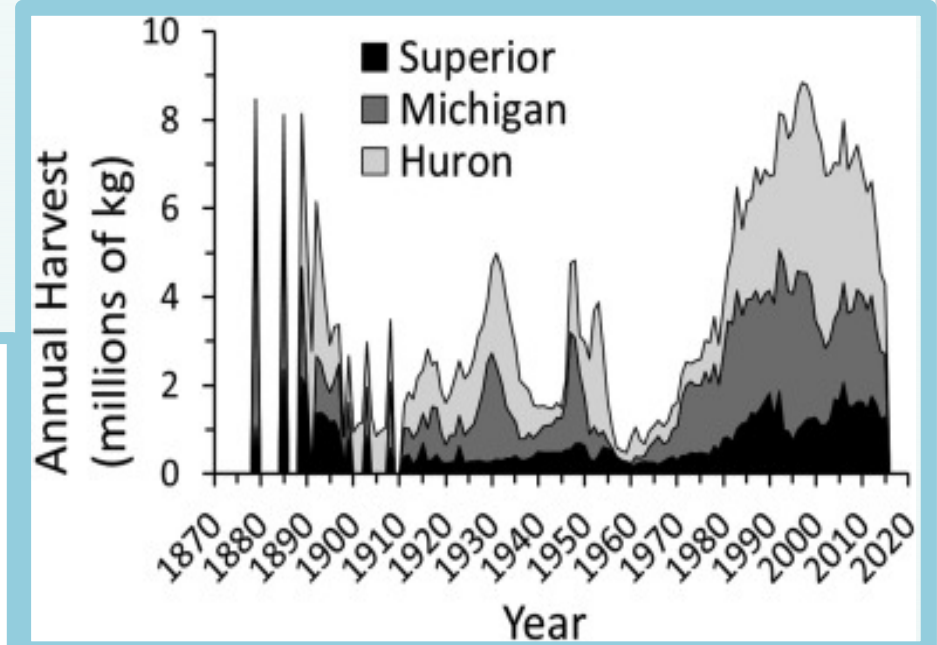
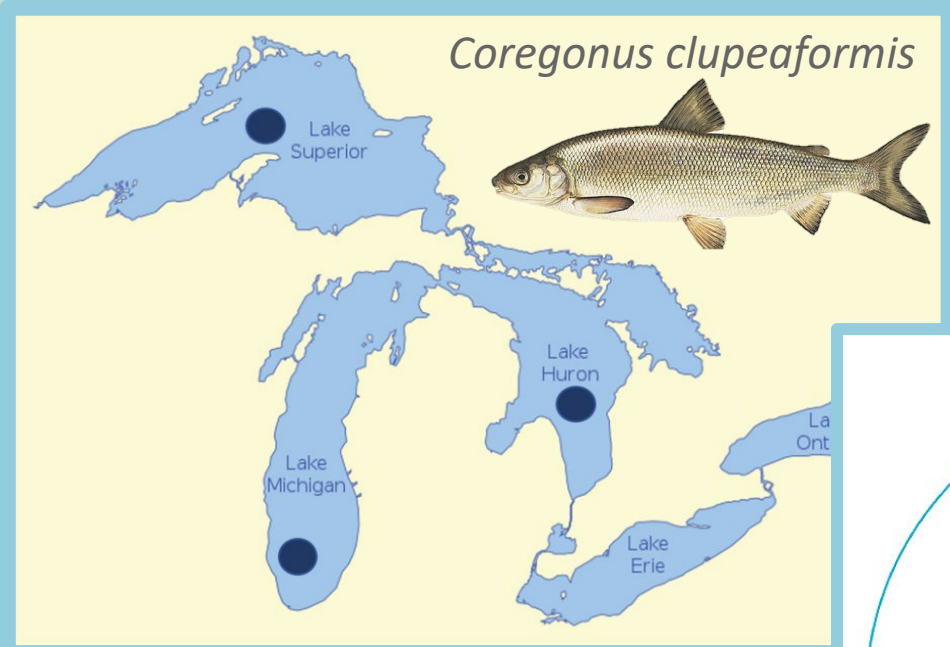
Site visits

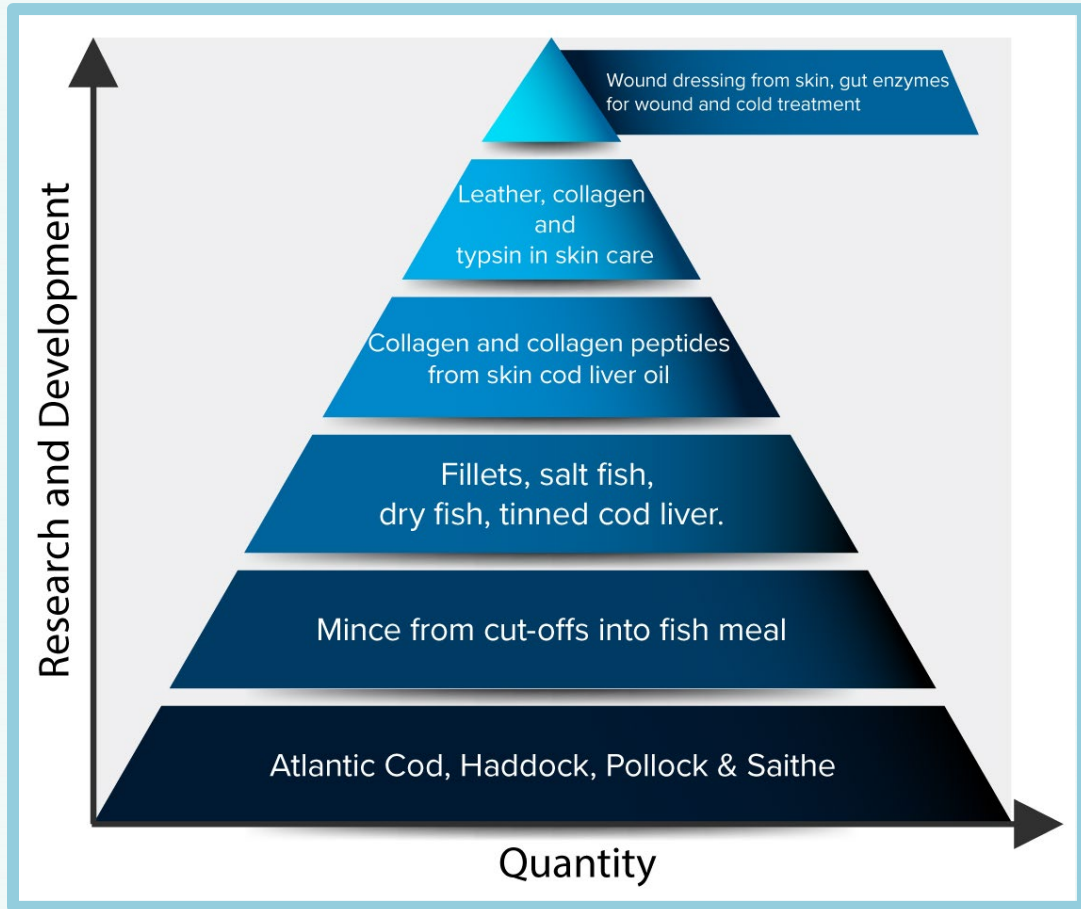
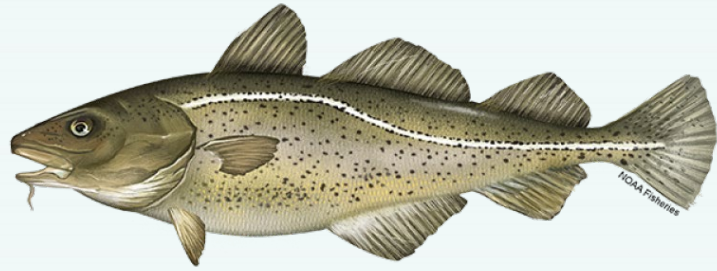
Value chain & SWOT analysis

Best cases

Prototypes and testing

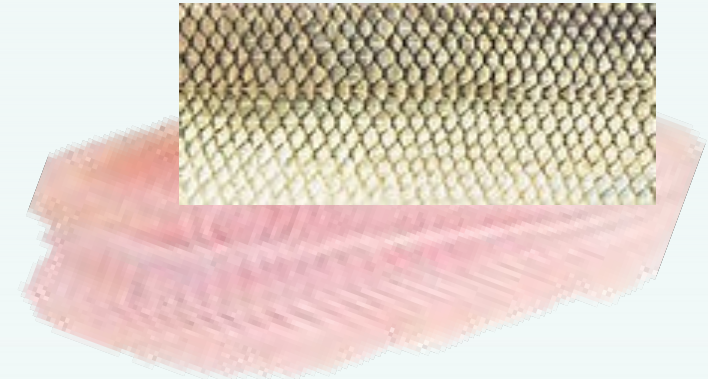
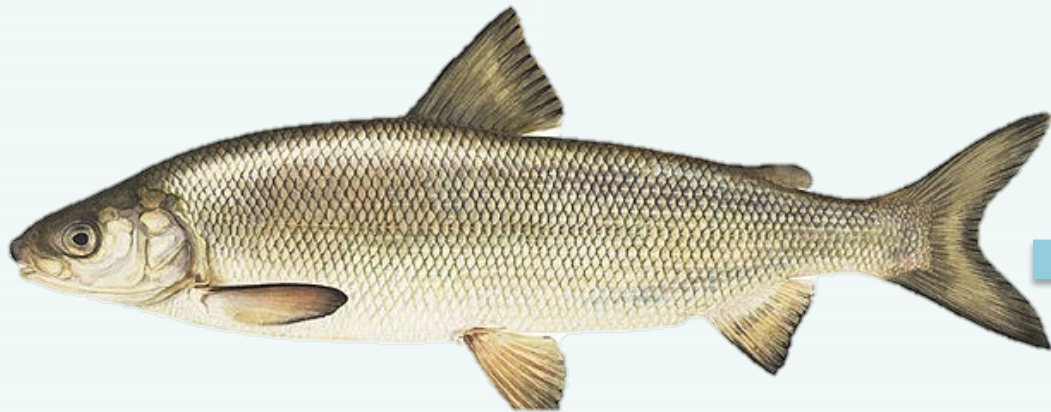
Lake whitefish







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& PREMIERS



Biotechnical Analyses

Whole body composition

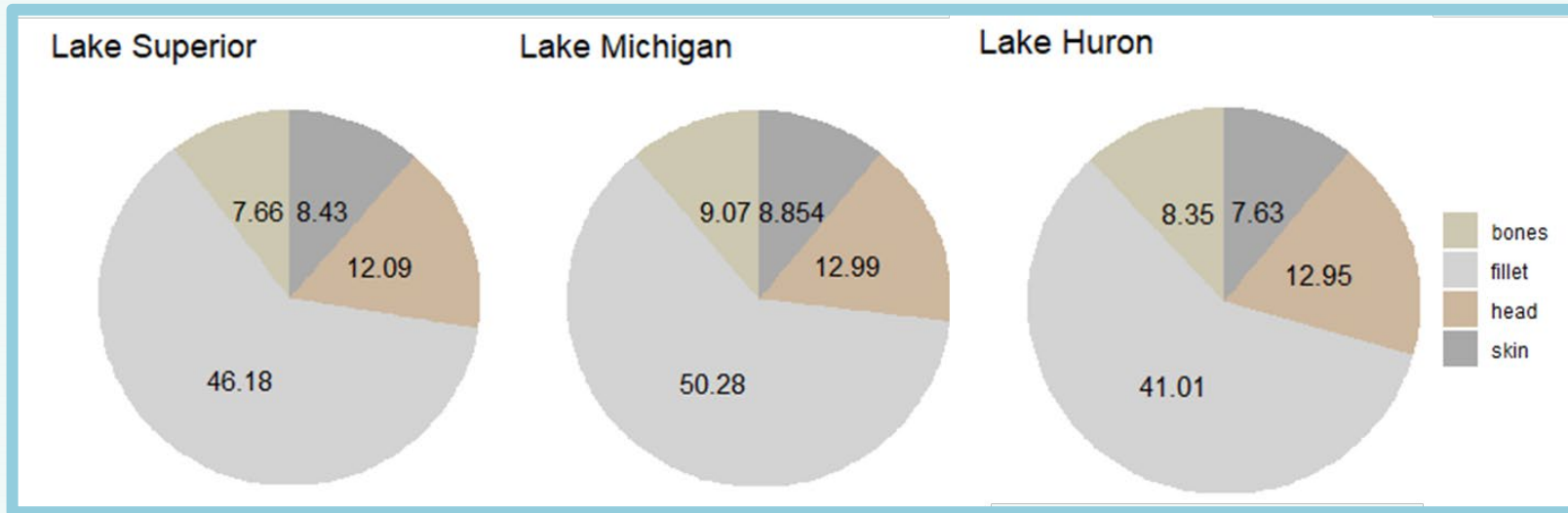
Indicative composition of **fillet**

Macro & EAA composition of **heads***

Macro & mineral composition of **bones**

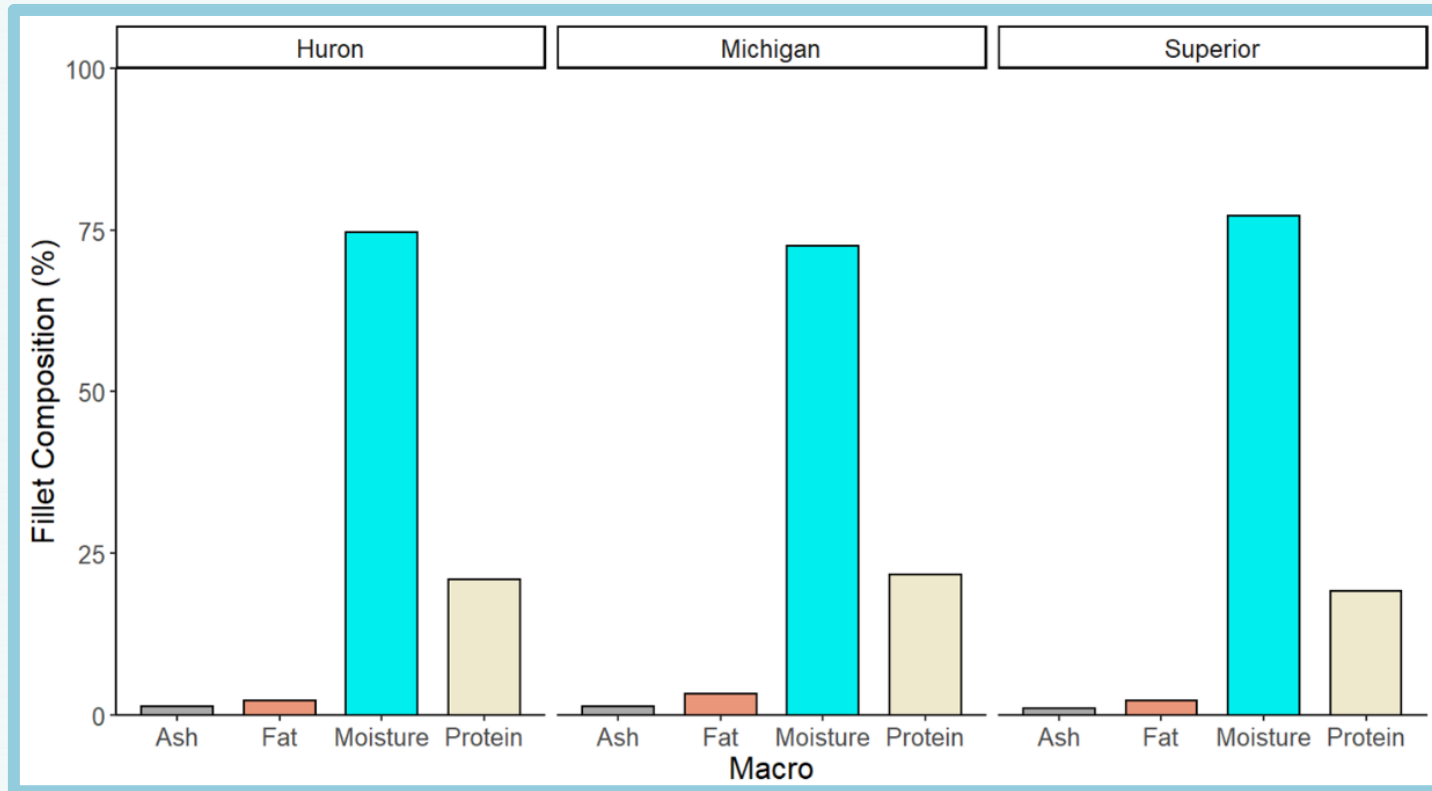
Macro & hydroxyproline composition of **skin**

Whole body composition



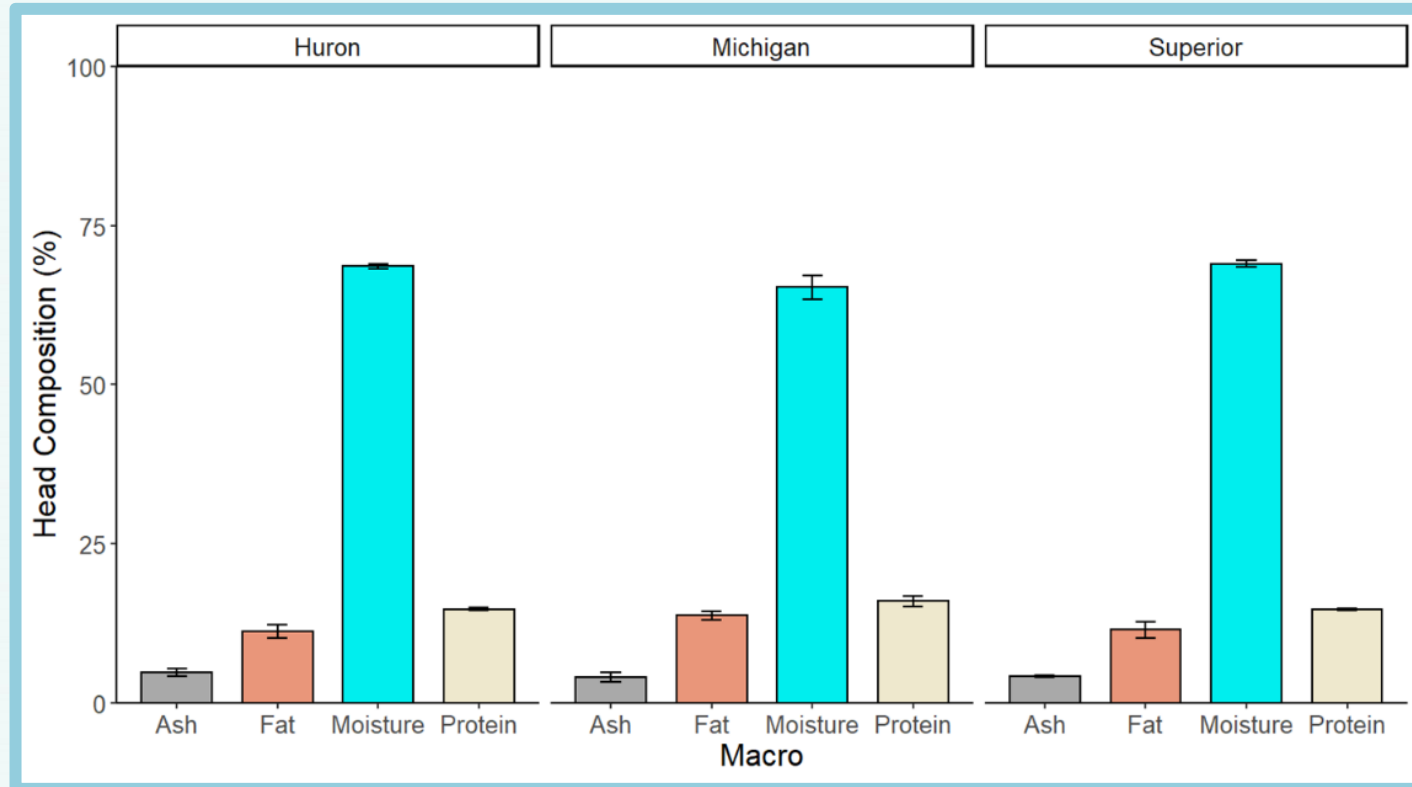
Weight composition comparable between fish from different lakes.

Fillet composition



Fillet composition was used as an indicator and was comparable with other Lake whitefish studies.

Macro composition of heads



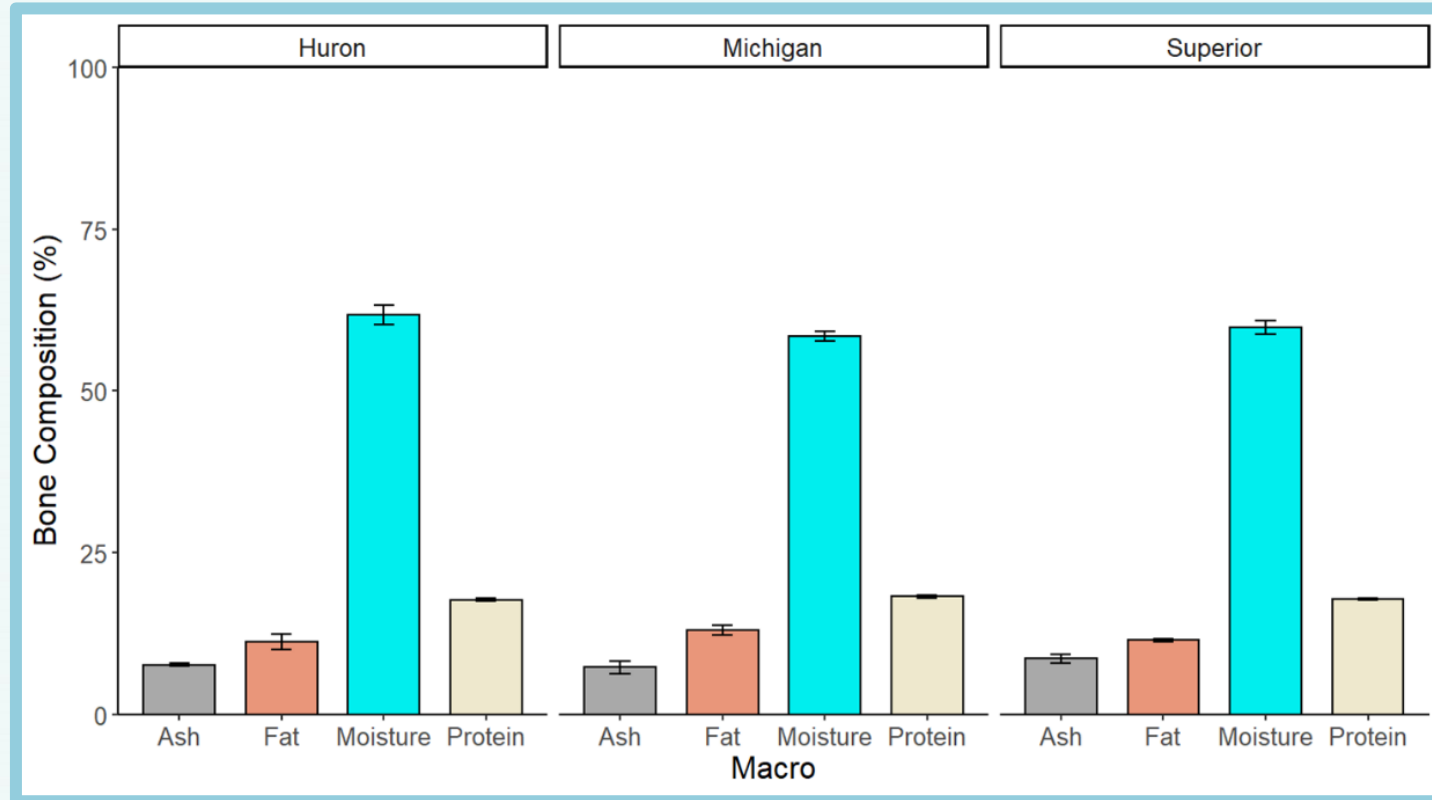
Heads are an indicator of body composition and sample composition high fat & protein content.

Amino acid composition of heads

Amino acid	Quantity (average from the three lakes in g./100g. protein)	Levels analysis	Classification
Arginine	5.55±0.35	High	EAA-FAA
Methionine	2.35±0.15	Medium	EAA
Alanine	6.30±0.23	Medium-High	NEAA
Proline	4.62±0.36	High	CEAA-FAA
Leucine	6.14±0.34	Medium	EAA-FAA
Phenylalanine	3.49±0.19	Medium-High	
Aspartic acid	8.15±0.38	Medium	NEAA
Glutamic acid	11.4±0.67	High	CEAA-FAA
Glycine	8.39±1.16	Medium-High	CEAA
Threonine	3.79±0.19	Medium	EAA
Valine	4.27±0.23	Medium	EAA

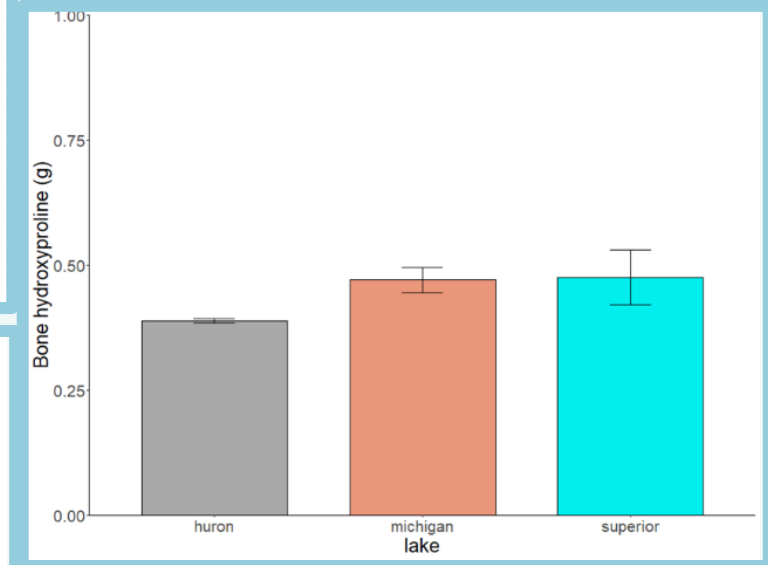
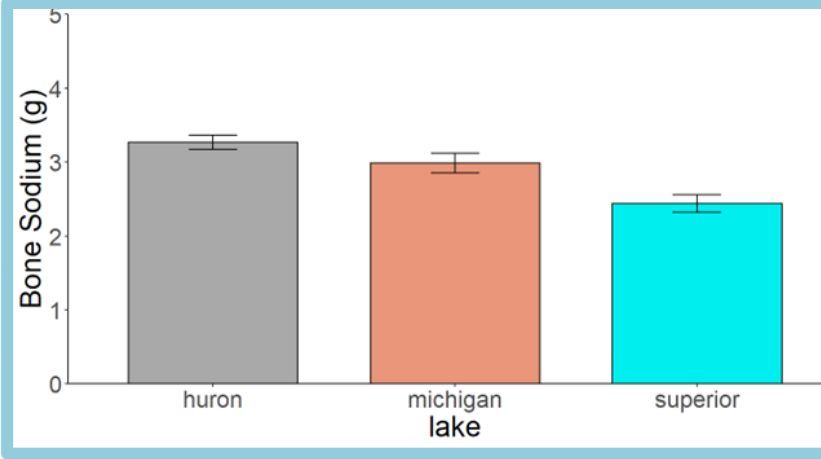
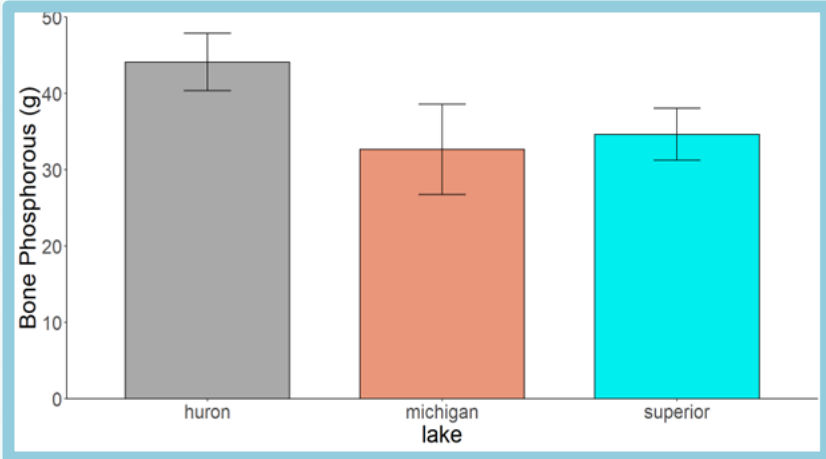
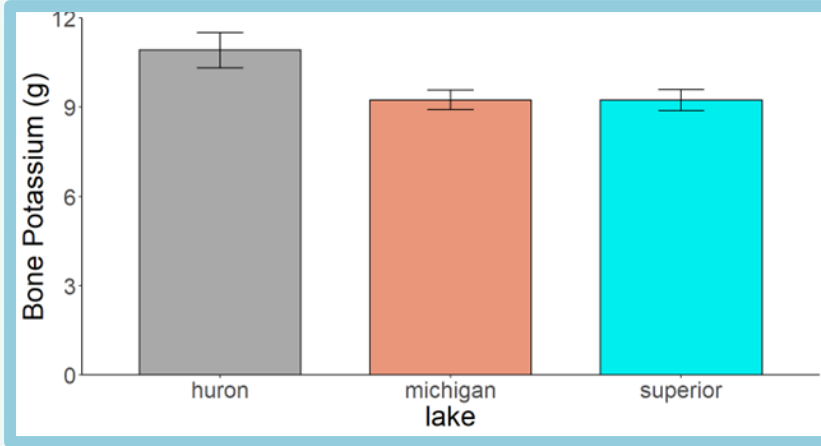
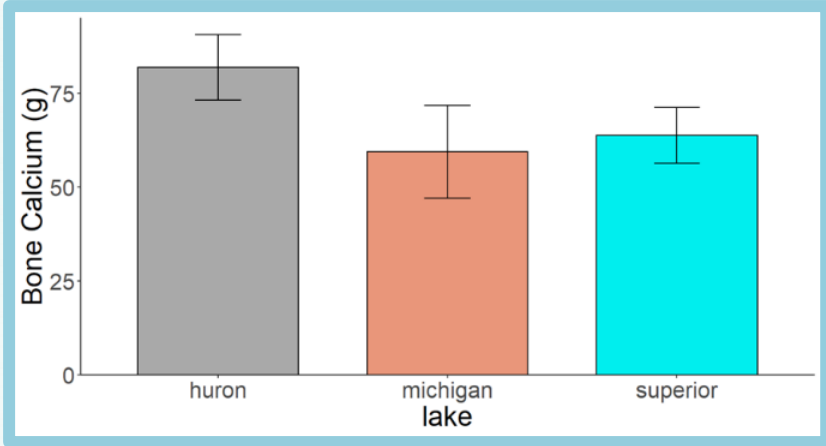
Amino acid content highly favourable

Macro composition of bones

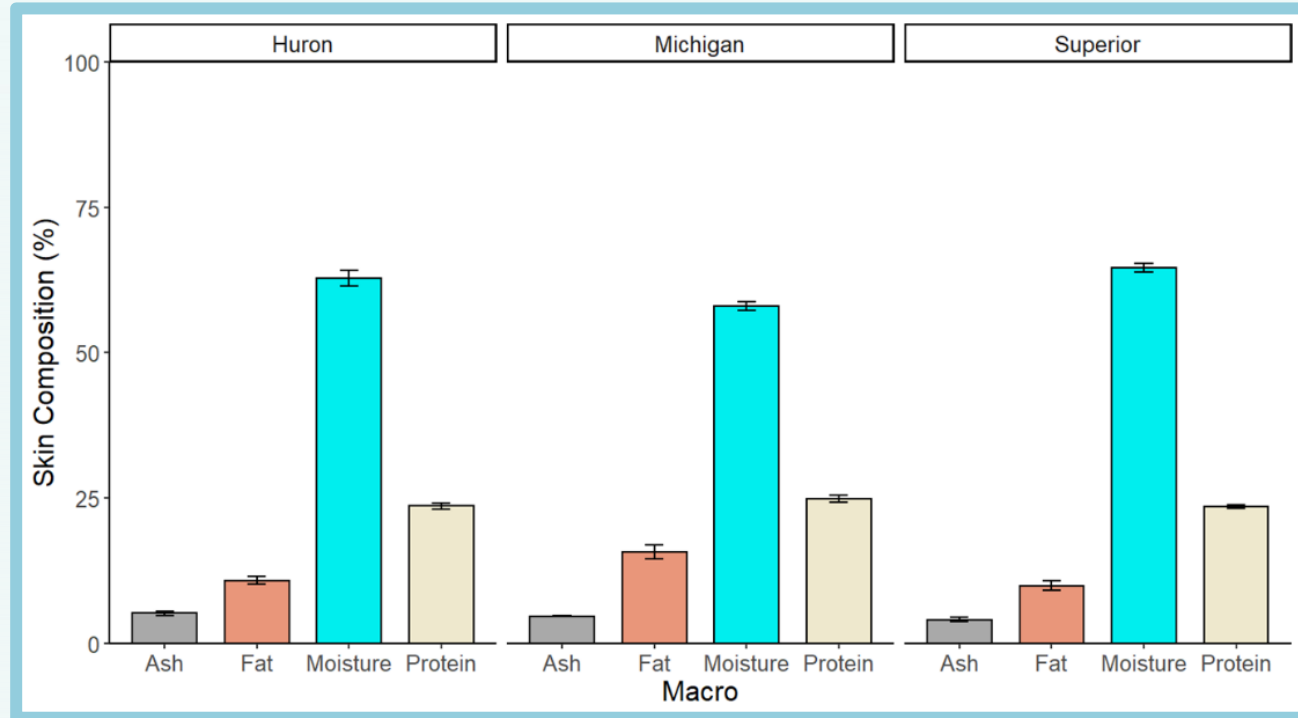


High ash content indicative of high mineral content.

Mineral composition of bones

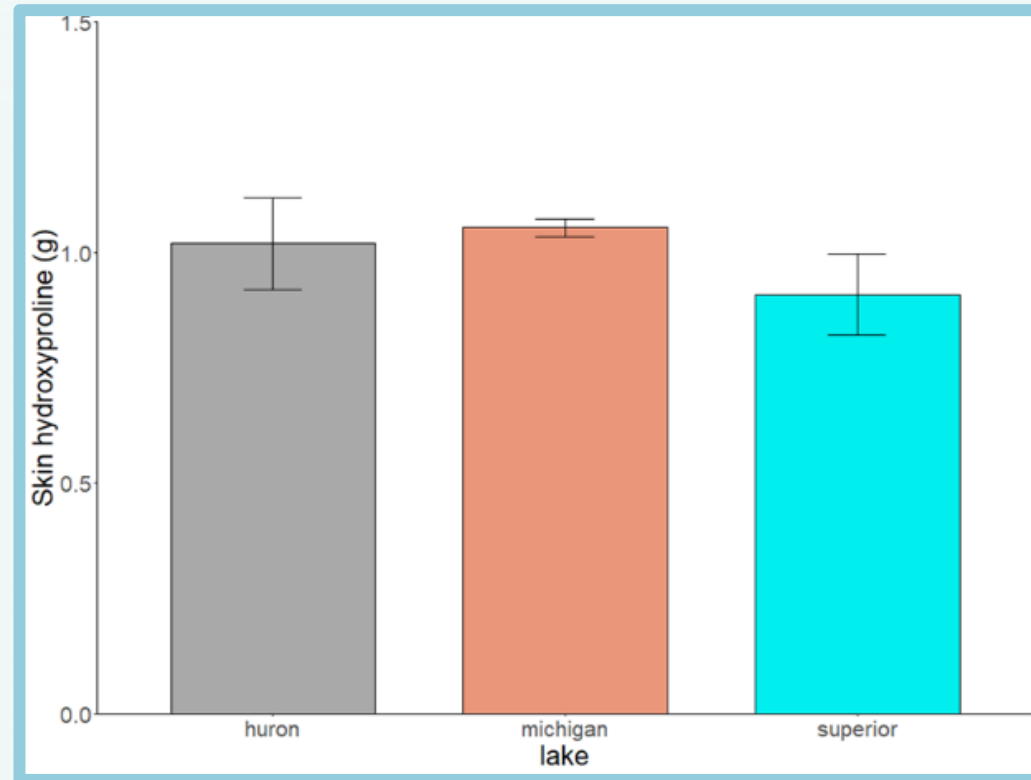


Macro composition of skin



High fat and protein content of the skin-scale combination.

Hydroxyproline of skin



Good potential for collagen and gelatine yield in the combined skin and scales.



Site visit – September 2022



Follow-up analyses

Value-chain analysis

A process to evaluate the activities along the value chain and understand the relationship between each step and how value can be added.

SWOT analysis

A process to examine each step of the value chain in the region and explore internal and external factors which highlight the Strengths, Weaknesses, Opportunities and Threats.

Value chain analysis



- The dominant existing value chain of dressed fish and fillets.
- Value-add across chain is \$9.75.
- Marketing campaigns could increase the value-add.
- Value highly dependent on supply of fish.

Developing a database of sales profit over time would add to this analysis

Value chain analysis



- Filleting primarily done by hand with limited automation.
- Mixed biomass from processing either went to landfill or to this chain.
- Collection for fertilisers/fish meal was small-scale and local.
- Very high value add at the retail level for the fashion sector.
- Other fish meal and fish oil markets could increase value.

A mediator company with a role of collecting waste from multiple smaller processors would help to grow this value-add market with limited change to processing.

Value chain analysis



- Existing consumer market for such products often using cut-offs
- Sausages, pickled fish, smoked fish, salad all add value but the effort:value ratio low (~2\$ more than fillet).

Opportunities for increased effort:value lie in diversified products, high-level branding, marketing and in collaborations with local restaurants and product vendors.

Value chain analysis



- Not currently an existing supply chain in the region.
- Would most cases require separating materials at processing.
- Examples: Amino Acid supplements market at \$12.33/10 tablets (heads) and calcium supplements at \$30/120 capsules (bones), collagen powder \$10-15/kg)

Collaboration with R&D and innovation and startup sectors would be highly beneficial in the development of such products along with a mediator role to reduce the work load for smaller processing facilities.

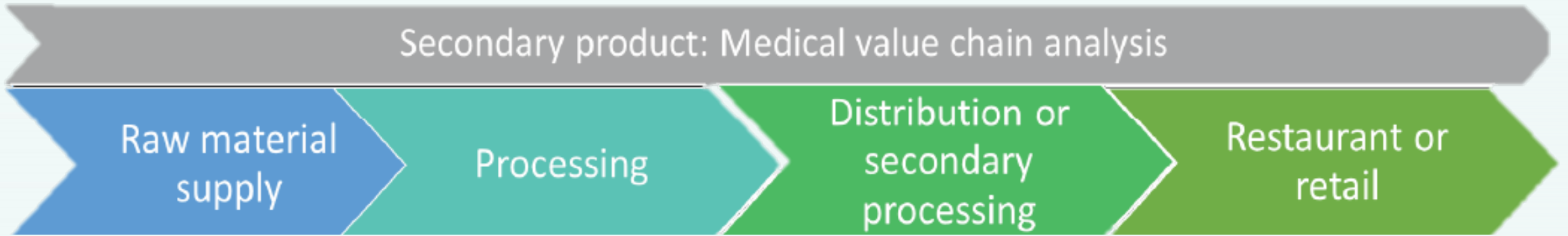
Value chain analysis



- Tanning of fish skin leather is currently not done on a commercial scale in the region but is possible at small local scales.
- In some examples Lake Whitefish were skinned before filleting but other species too the skin was already separated during processing.

Collection and storage of skin would be important for this value chain but high-value products could be developed in fairly small quantities to access the market.

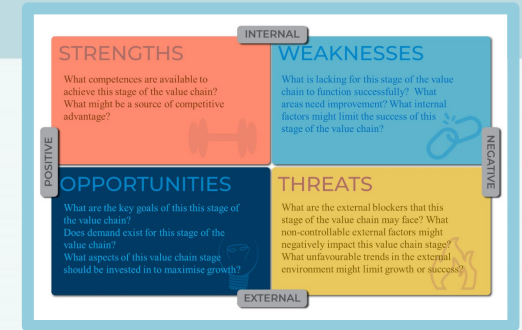
Value chain analysis



A very high value but high hanging fruit that requires specific time-sensitive treatment and care but with a growing market in the US, for example skin-graft from fish skin.

Partnering with innovation and research experts in this field would be the first stage in such a value chain.

SWOT analysis output



Raw material
supply

Key Strengths

- Long-term established monitoring and environmental programs for the Great Lakes.

Key Weaknesses

- Despite management action, declining catch and work force recruitment challenges.

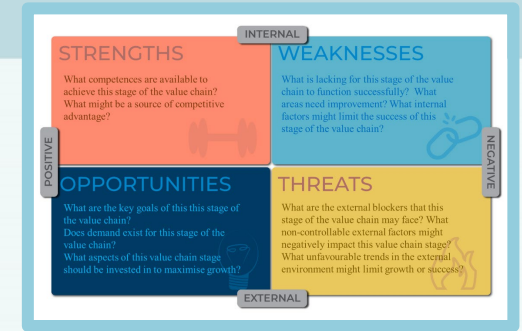
Key Opportunities

- High market demand, interest and reputation of Lake whitefish fillets and products.

Key Threats

- Multiple environmental challenges in the Great Lakes and market stressors

SWOT analysis output



Processing

Key Strengths

- Skilled labour force and short supply chain distances, with steps toward automation.

Key Weaknesses

- Processing limited by cold storage and delicacy of fish which require careful handling.

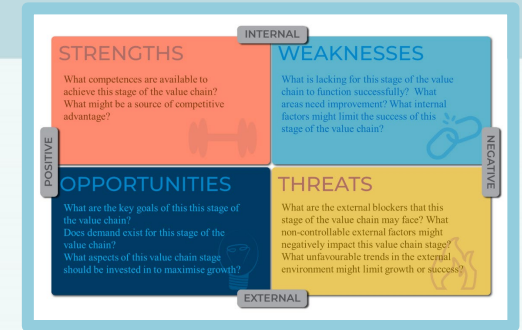
Key Opportunities

- Planned expansions of many processors and opportunities for increased value.

Key Threats

- Competition with imports and dependence on supply of quality product from Lakes.

SWOT analysis output



Distribution or
secondary
processing

Key Strengths

- Skilled labour force and existing secondary supply chains provide strong roadmap.

Key Weaknesses

- Limited value chain actors and infrastructure for new secondary supply chains.

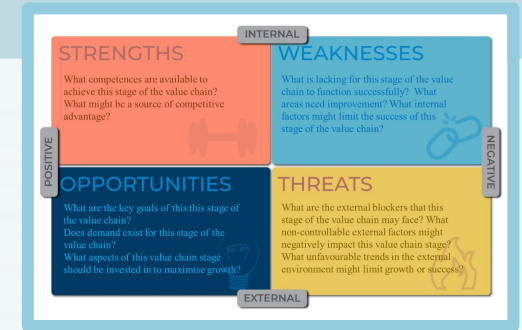
Key Opportunities

- Growing demand for nutritional supplements and shared needs between processors.

Key Threats

- Currently unclear legal framework around use of Lake whitefish side streams.

SWOT analysis output



Restaurant or
retail

Key Strengths

- Diverse culinary sector, advanced logistics and examples for co-product development.

Key Weaknesses

- High transportation costs and currently small co-product market from fish locally.

Key Opportunities

- Currently untapped supply of secondary raw materials and good market reputation.

Key Threats

- Consumer unfamiliarity with fish co-products and potential variation in supply.

Identifying best case value chains



Protein hydrolysates/amino acids

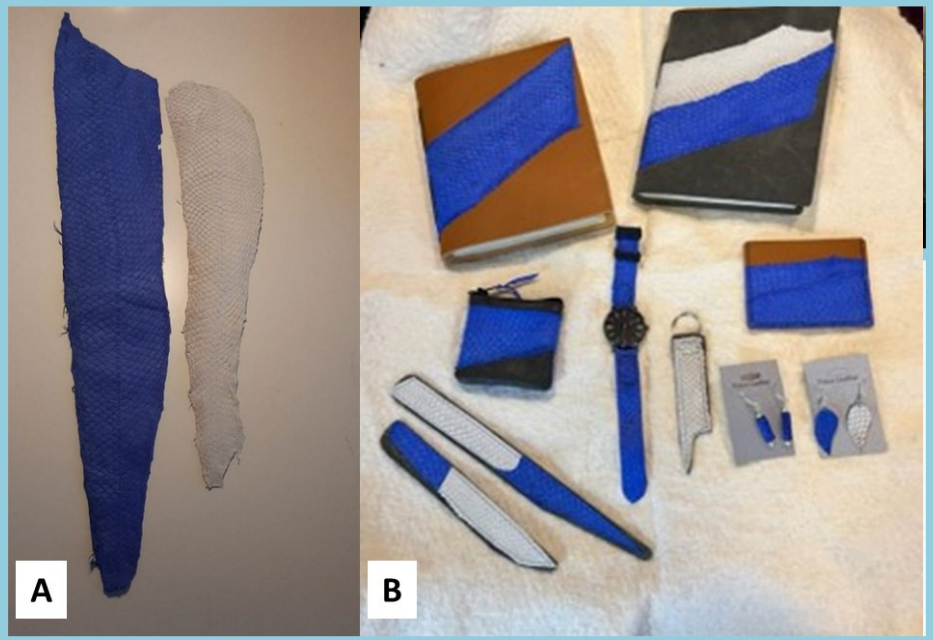


Collagen from scales



Leather from skin

Filleting & prototyping



NORDIC FISH LEATHER | icelandiounand

Conclusions

Full report with detailed analysis and findings available.

Low-hanging fruit identified to be from heads, scales and skin.

High priority

Increased connectivity in chain and mediator role.

Next steps

Applying model to other key Great Lakes species.

Thank you

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Dr. Alexandra Leeper

Head of research and innovation

Iceland Ocean Cluster