Adaption to Change in Shrimp Stocks in Canada

How will the industry adapt this time?

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MARINE INSTITUTE

MEMORIAL UNIVERSITY

Outline for Today

- MI SOF Profile
- Environmental & Ecosystem Trends Affecting NL Seafood Sector
- Shrimp Value Chain Improvement Opportunities
- Summary

MI School of Fisheries

Structure

- 3 applied research centres
- 1 industrial training centre
- 2 undergraduate programs
- 4 Graduate diplomas
- 2 Post-graduate certificates
- 2 Masters programs
- Supporting research based graduate students

By the Numbers

- More than 90 employees
- Manage 90-100 applied research projects per year
- Approximately $8 million research & training project value
- Excess of 1000 participants in industrial training programs annually
- More than 100 diploma/degree students

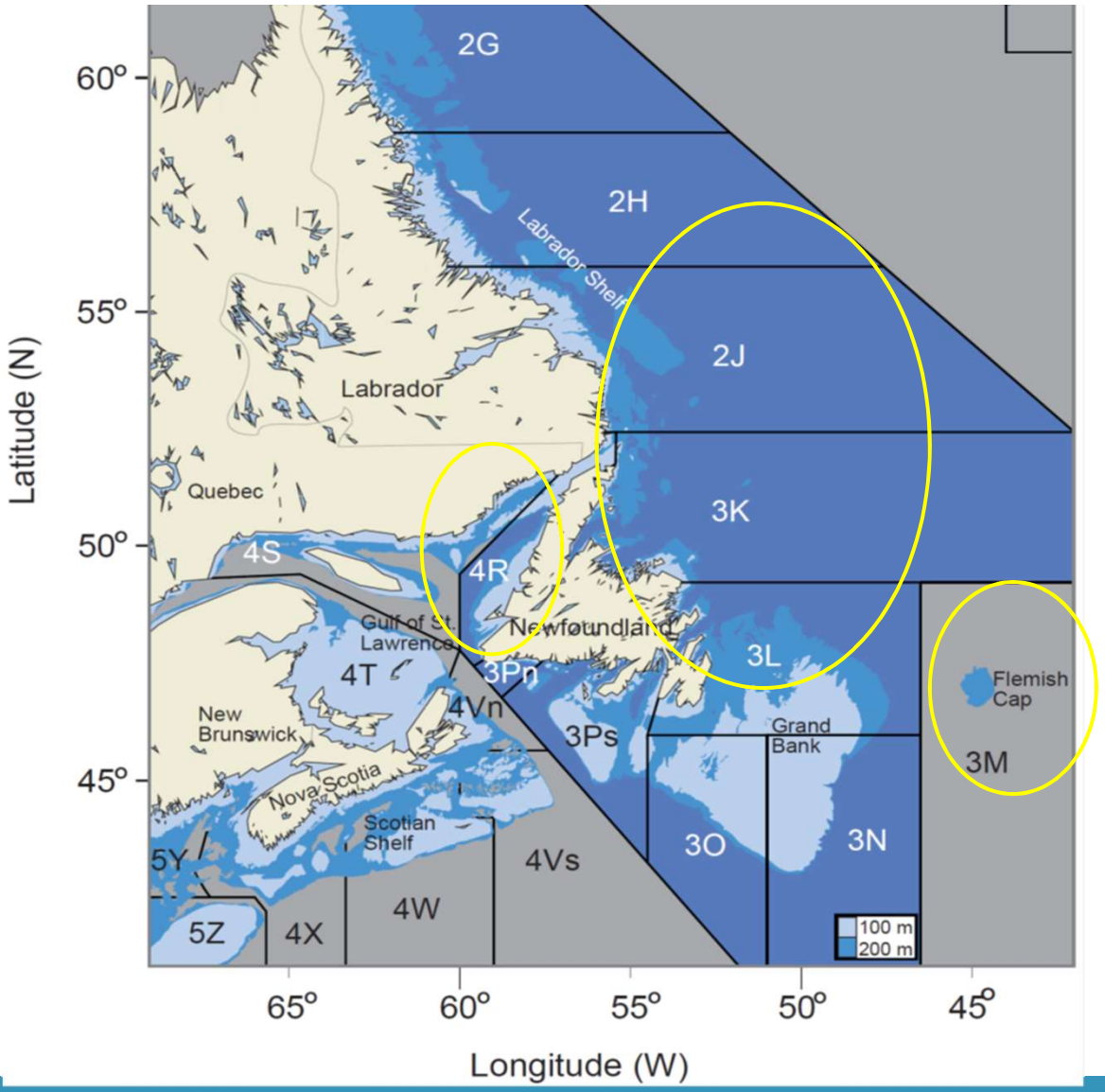
Offers complete seafood value chain approach

Most comprehensive academic and research capacity in Canada

Specialized Research Centres

- Centre for Fisheries Ecosystems Research - Largest non-government research capacity in Canada that studies fisheries ecosystems
- Centre for Sustainable Aquatic Resources - Global leader in sustainable harvesting technology & houses largest flume tank in the world
- Centre for Aquaculture & Seafood Development - Comprehensive industrial response unit focused on seafood processing, sustainable aquaculture and marine bioprocessing.
- Centre for Community Based Education Delivery (CBED) – Supports the industrial response education and training needs of industry

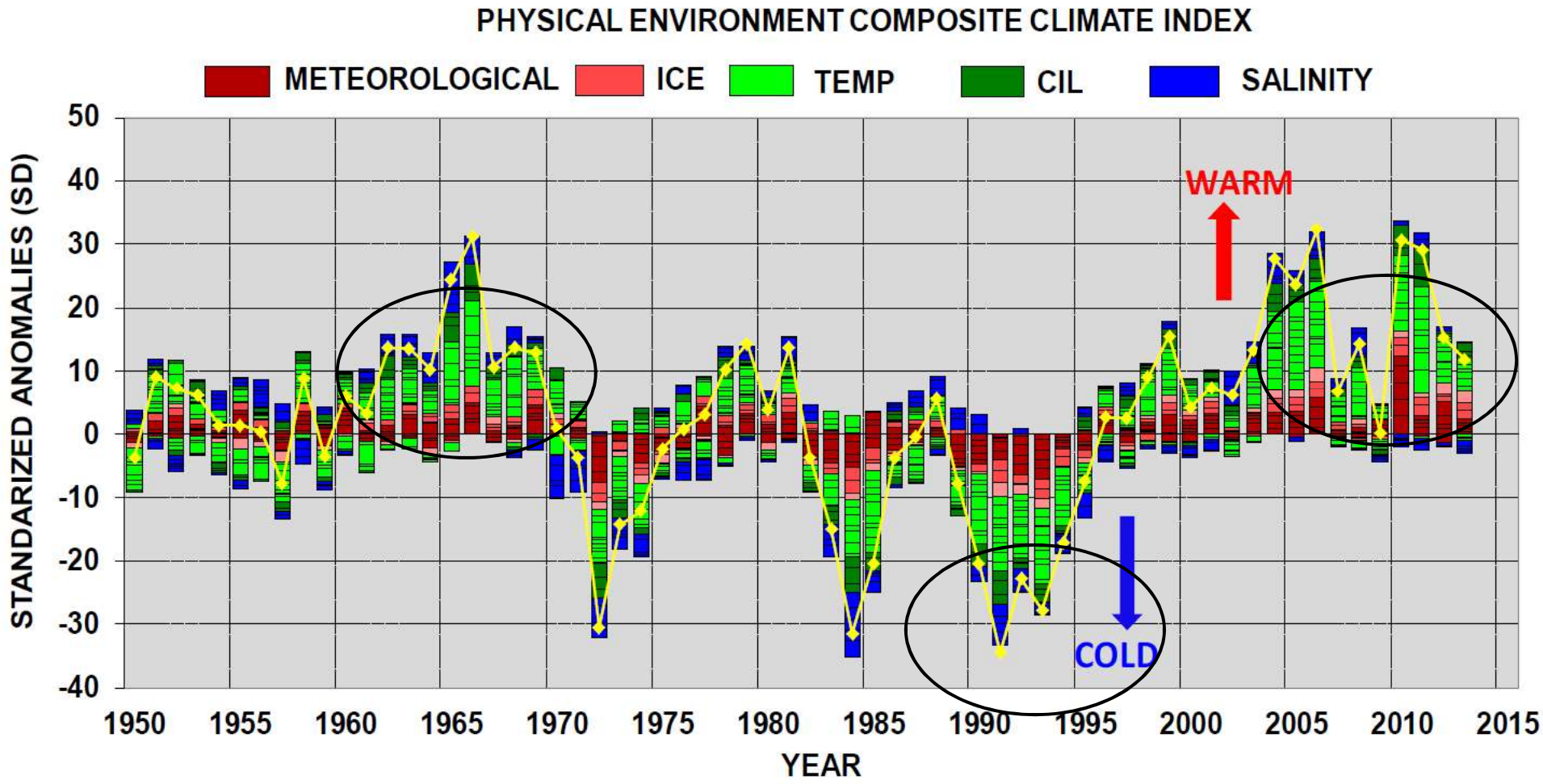
Are ocean conditions affecting shifting dominance? Three case studies



- Shrimp identified as potential 'indicator' of change

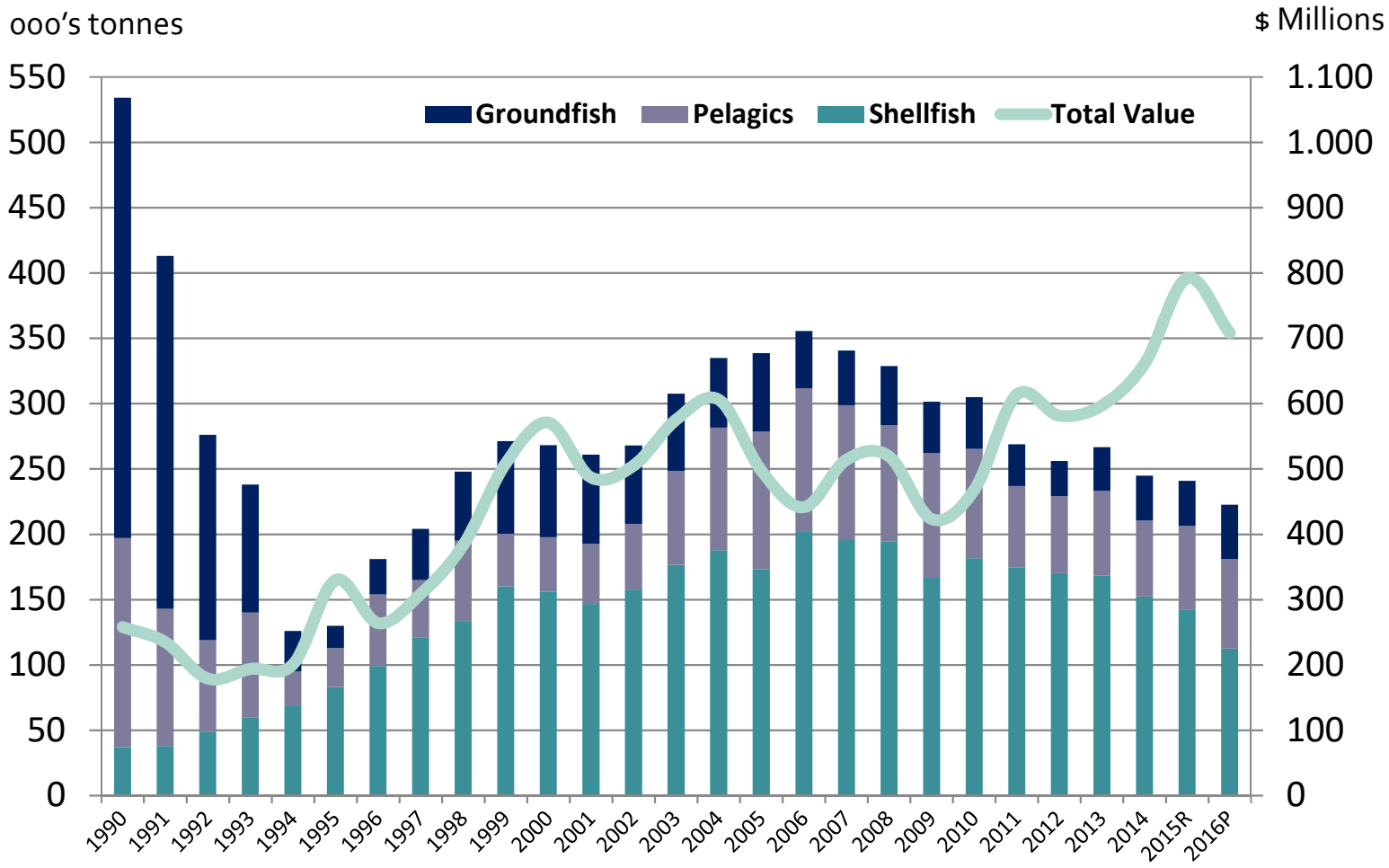
Dr. Jon Fisher
CFER Research Scientist

Exploitation and environmental conditions altered Newfoundland fisheries



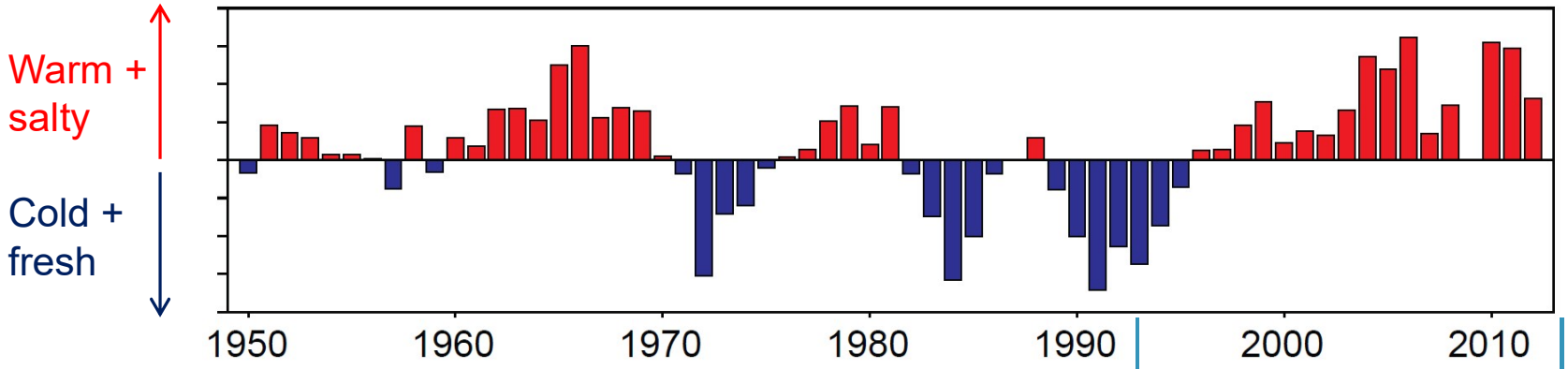
Colbourne *et al*. (2014) Physical Oceanographic Environment on the Newfoundland and Labrador Shelf in NAFO Subareas 2 and 3 during 2013 *NAFO Scientific Council Reports Doc. 14/010*

Fish Landings in NL by Species Group



Source: DFO, FLR

How can sustainability be achieved given changing environmental conditions? - *an open question*



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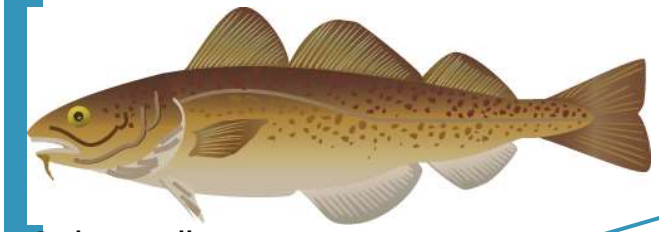
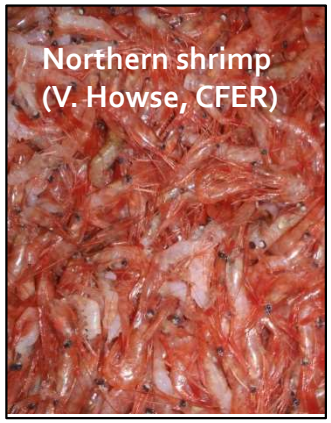
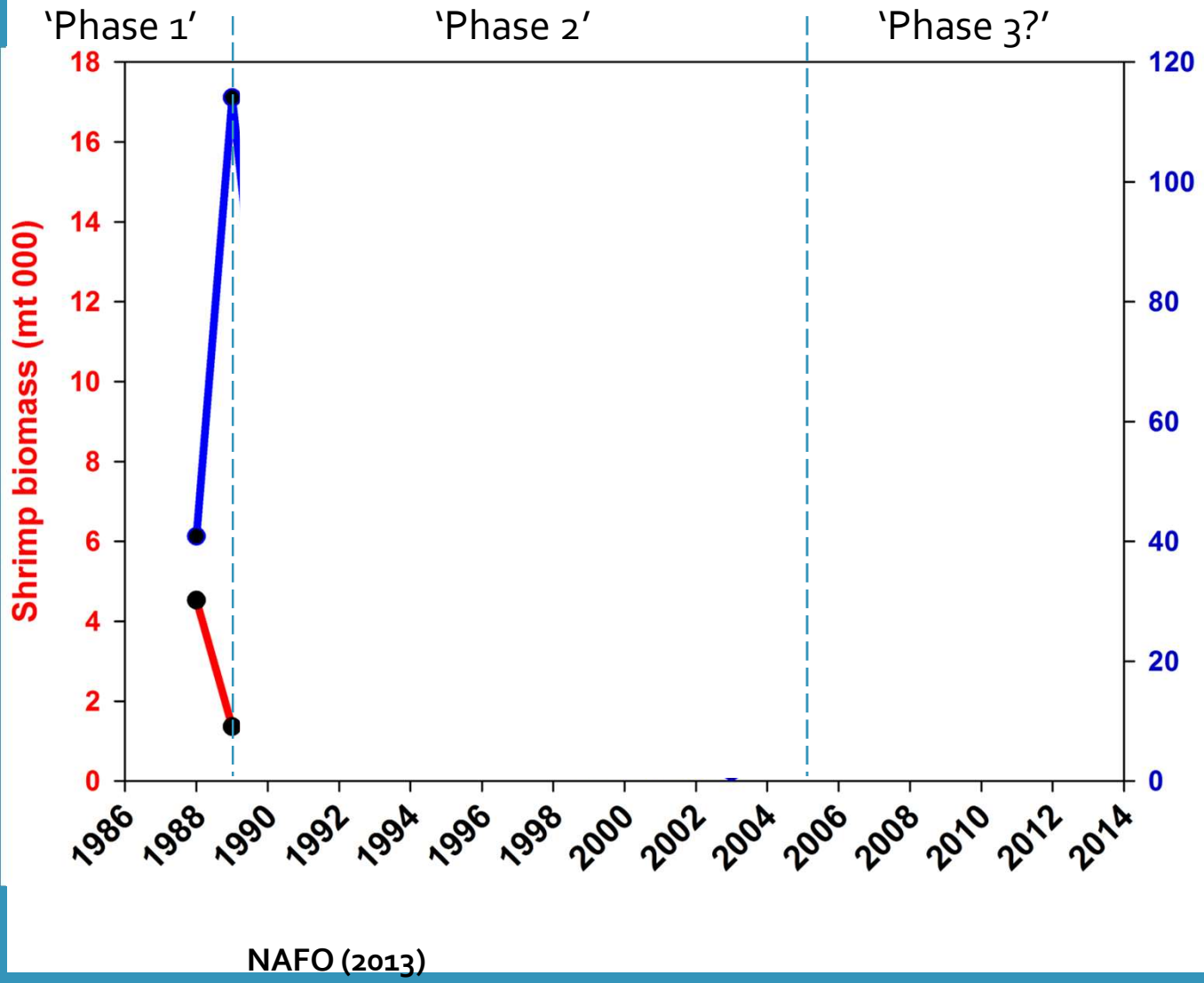


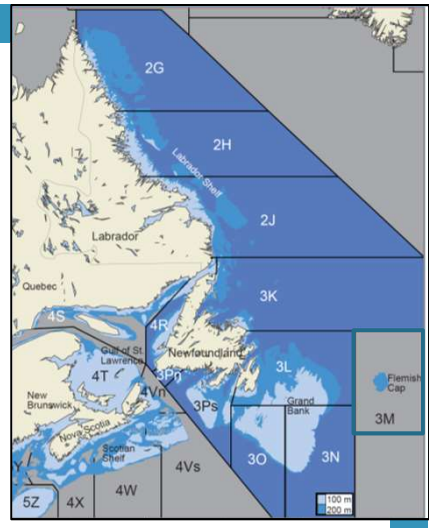
Cod + capelin



Flemish Cap (NAFO 3M)

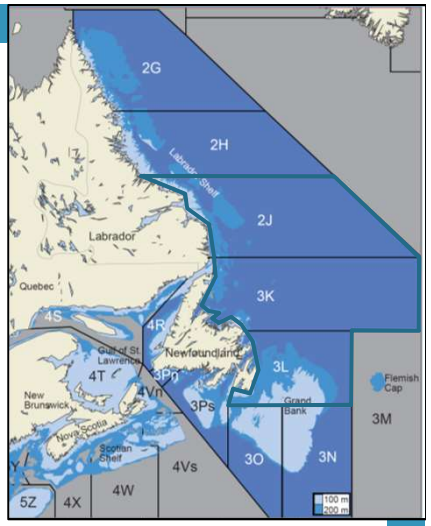


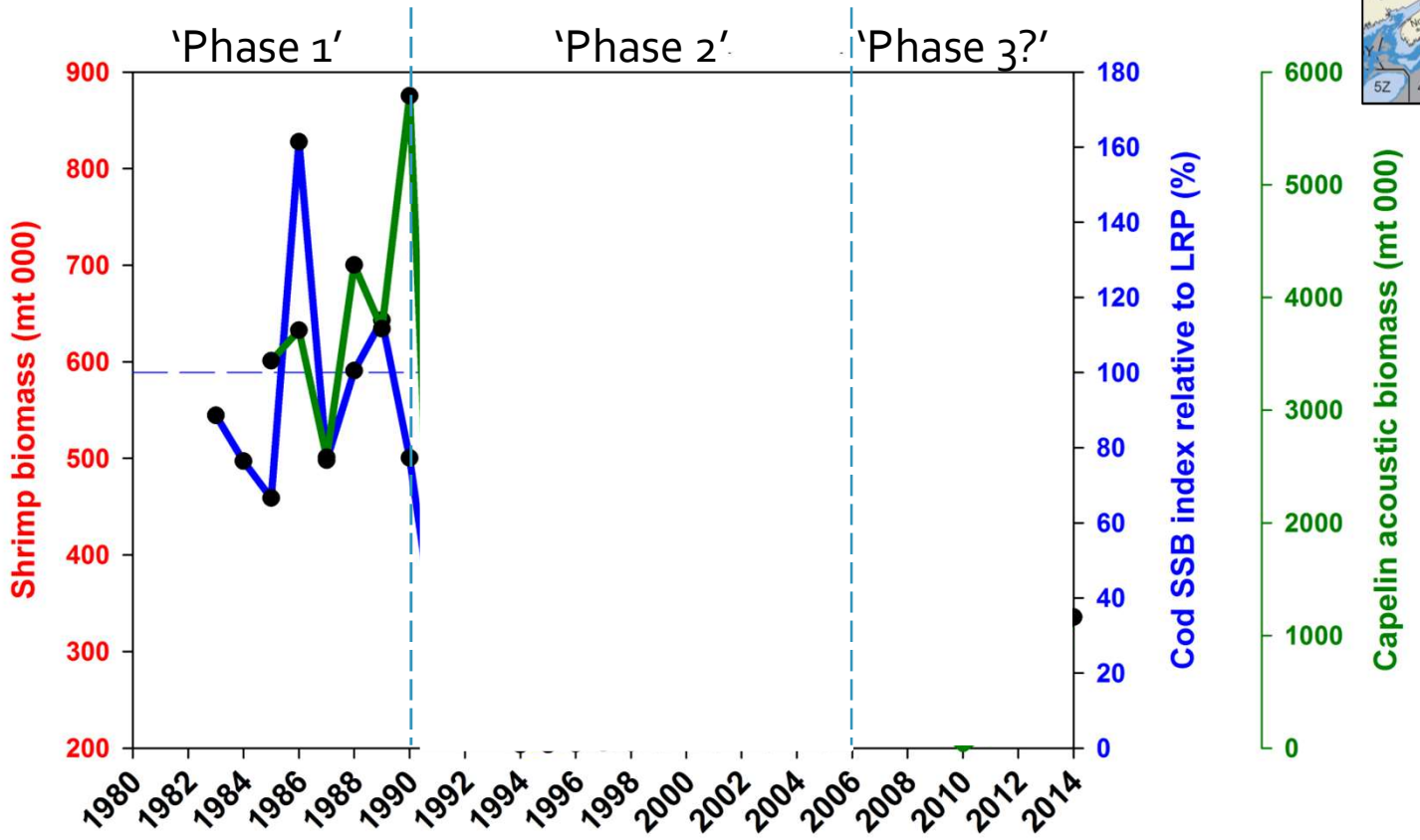
NAFO (2013)



- 2011- moratorium on shrimp
- 2010- cod open

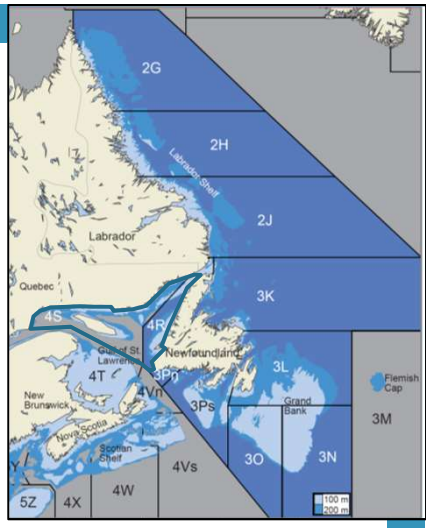
Northeast coast of Newfoundland (NAFO 2J3KL)

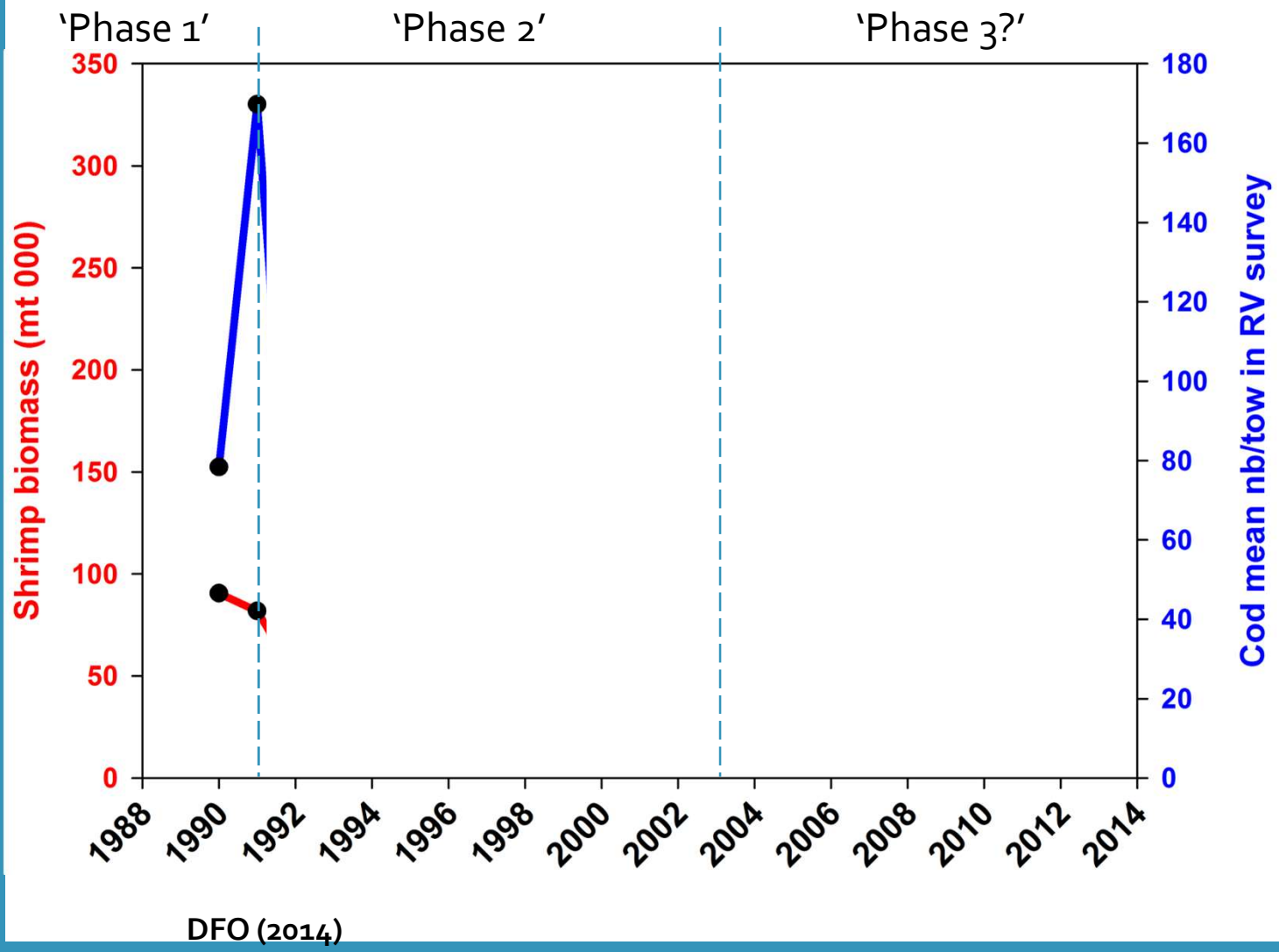




DFO. (2014) Short-Term Stock Prospects for Cod, Crab and Shrimp in the Newfoundland and Labrador Region (Divisions 2J3KL). *DFO Can. Sci. Advis. Sec. Sci. Resp. 2014/049.*

Northern Gulf of St. Lawrence (NAFO 4RS)





DFO (2014)

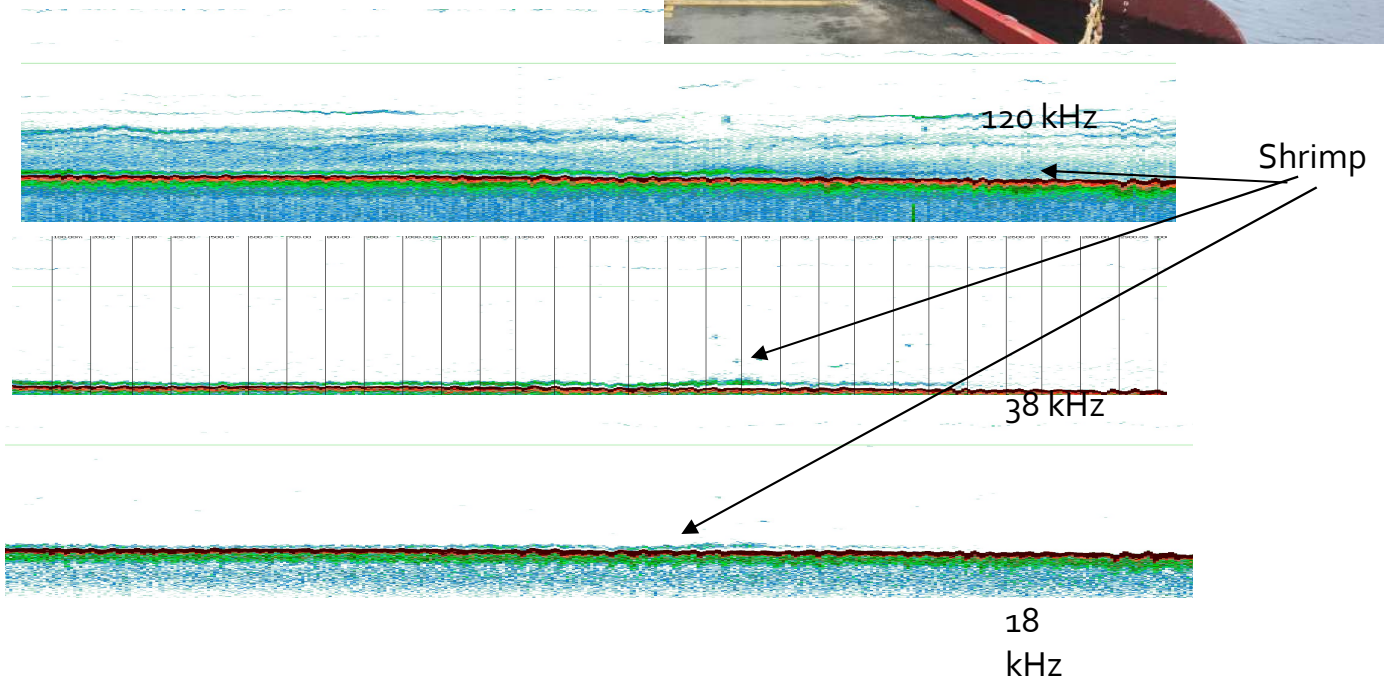
Some take away messages (from Dr. J Fisher)

- Regime shifts are *large, abrupt, persistent changes in the structure of complex systems*
- Despite expanding methods, regime shifts remain difficult to anticipate (or detect) in nature
- Such shifts present both challenges and opportunities for fisheries development and management
- Industry, academic, government collaborations can address key questions and should be expanded to meet science and management challenges

MI RESEARCH ON VALUE CHAIN IMPROVEMENTS FOR SHRIMP INDUSTRY

Shrimp Acoustic Survey

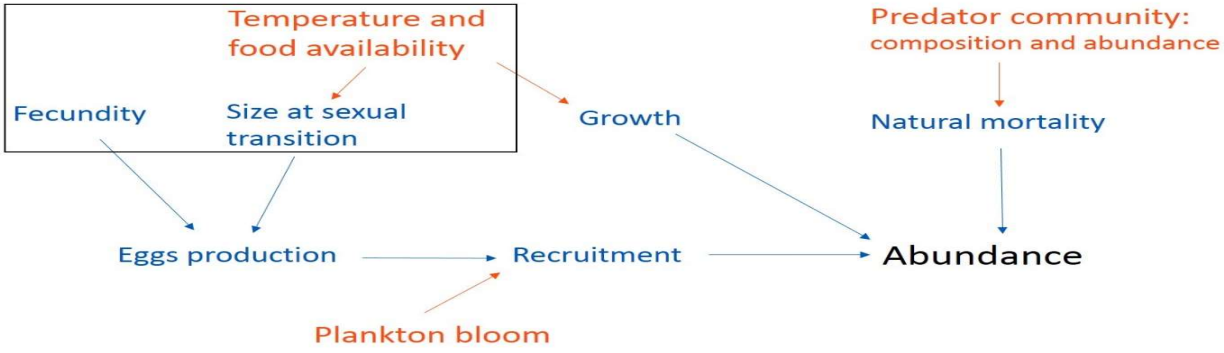
- In 2014 a short experiment was conducted onboard the Celtic Explorer to evaluate the effectiveness of Acoustics (EK60) on Northern Shrimp
- Acoustic signals were verified through use of bottom trawl
- Showed much promise but no further work has been done to date
- Potential for biomass estimation



Fisheries Science | Harvesting | Handling/ Landing | Processing | Logistics | Marketing

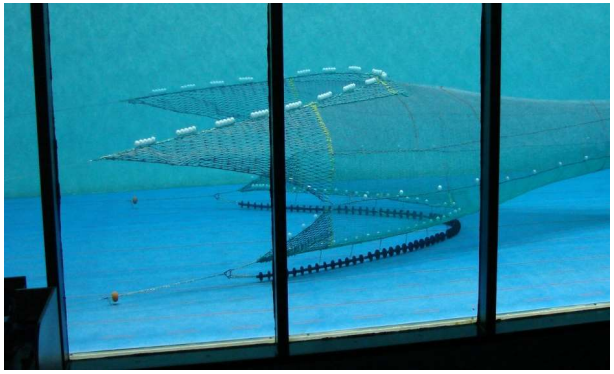
Proposed Development of Innovative Stock Assessment Model for Northern Shrimp

- The goal of the project is to facilitate the development of an innovative stock assessment model for northern shrimp that accounts for climate and ecosystem changes
- Promote the definition of climate and ecosystem informed reference points, and ensure a sustainable shrimp fishery within a NL marine ecosystem dominated by groundfish
  - the specific objectives of this project are: 1) to quantify the spatio-temporal variability in size at sexual transition in the northern shrimp; 2) to evaluate if this variability is related to food, temperature, and population density; 3) to determine fecundity at size in northern shrimp

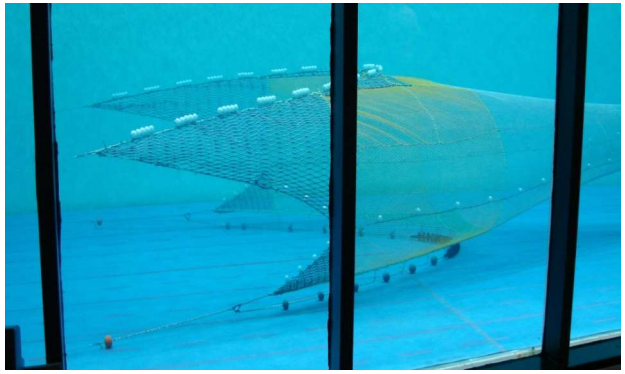


Dr. Arnault LeBris CFER Research Scientist

Improving Fuel Efficiency



Change bridle arrangement
Reduced twine diameter
Lighter footgear



Reduced twine diameter
Increase mesh size
More efficient door design

Mouth drag reduced by 27%

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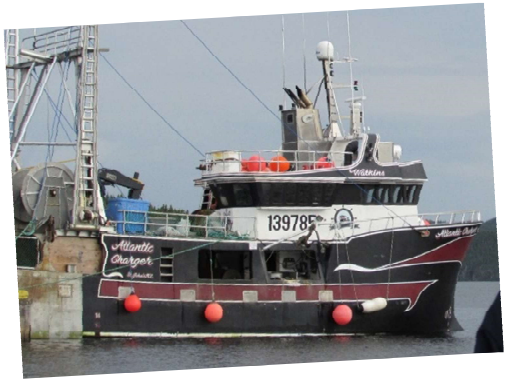
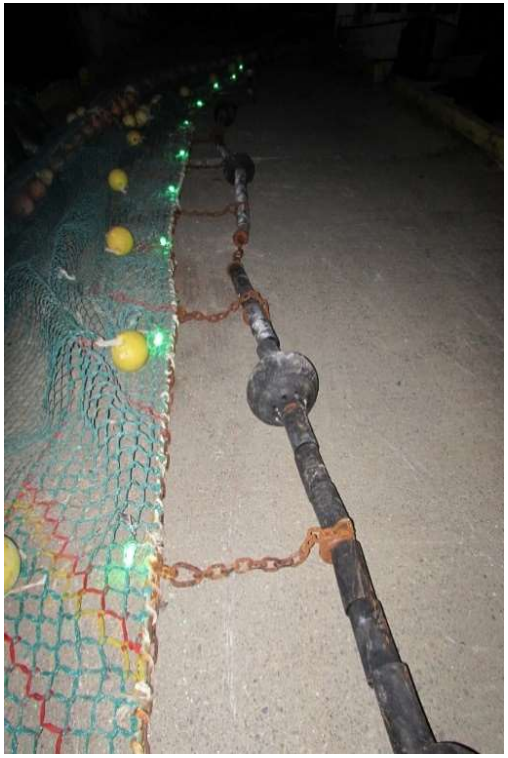
Reducing Bycatch of Capelin





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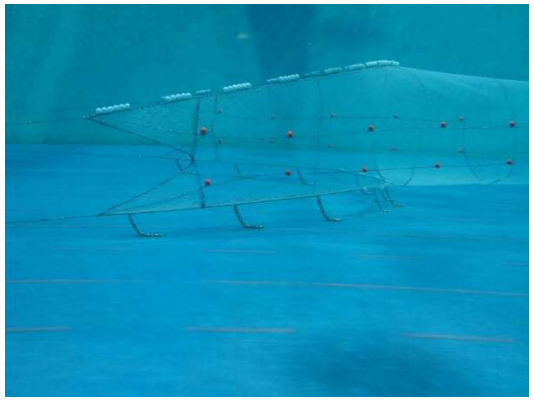
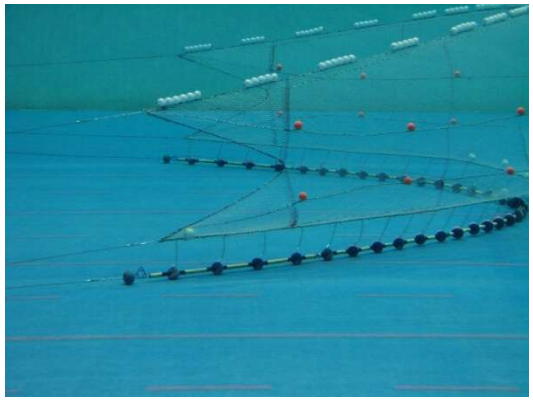
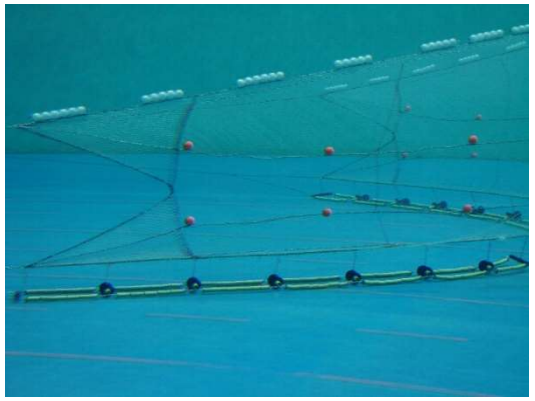
Reducing Seabed Impact



Drop-chain Footgear



Aligned Footgear



Wheeled Footgear

The aligned footgear was most successful. Area of seabed contact was reduced up 61% with an increase in CPUE of 23% for shrimp

Boxing VS Bagging

Benefits of Boxing

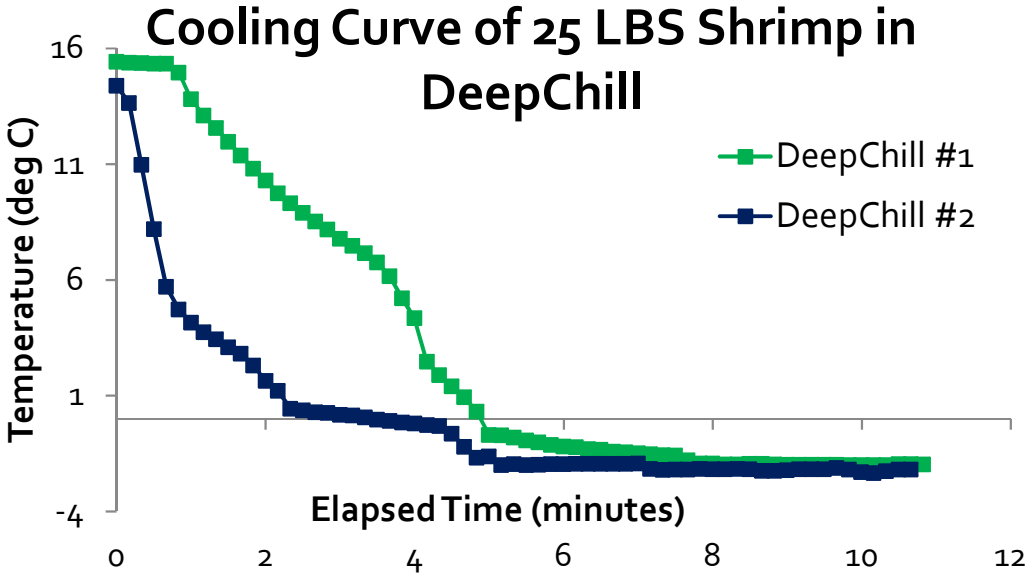
- Increased Shelf Life
- Reduces the possibility of spoilage
- Reduces direct handling of shrimp on board, at wharf, and at plant
- Should not have to re-ice at wharf

Issues with Boxing

- Cost
- Vessel size and size of the hold
- Ice Check – DFO quota reporting
- Some ports may not be adequate

Sunwell DeepChill System

- Technology assessment
  - Evaluate cooling rate of Sunwell DeepChill Ice Slurry in comparison to traditional flake ice
  - Target slurry determined by species and product form
  - Cooling curves for various species and slurry treatments have been conducted
    - Data currently being analyzed



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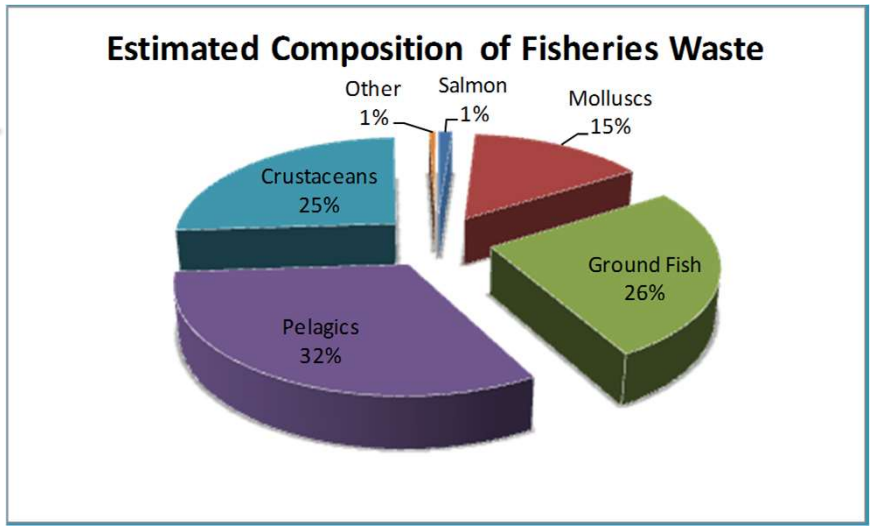
National Fisheries and Aquaculture Processing Discards

Study conducted in 2011 for DFO Aquaculture Management Directorate

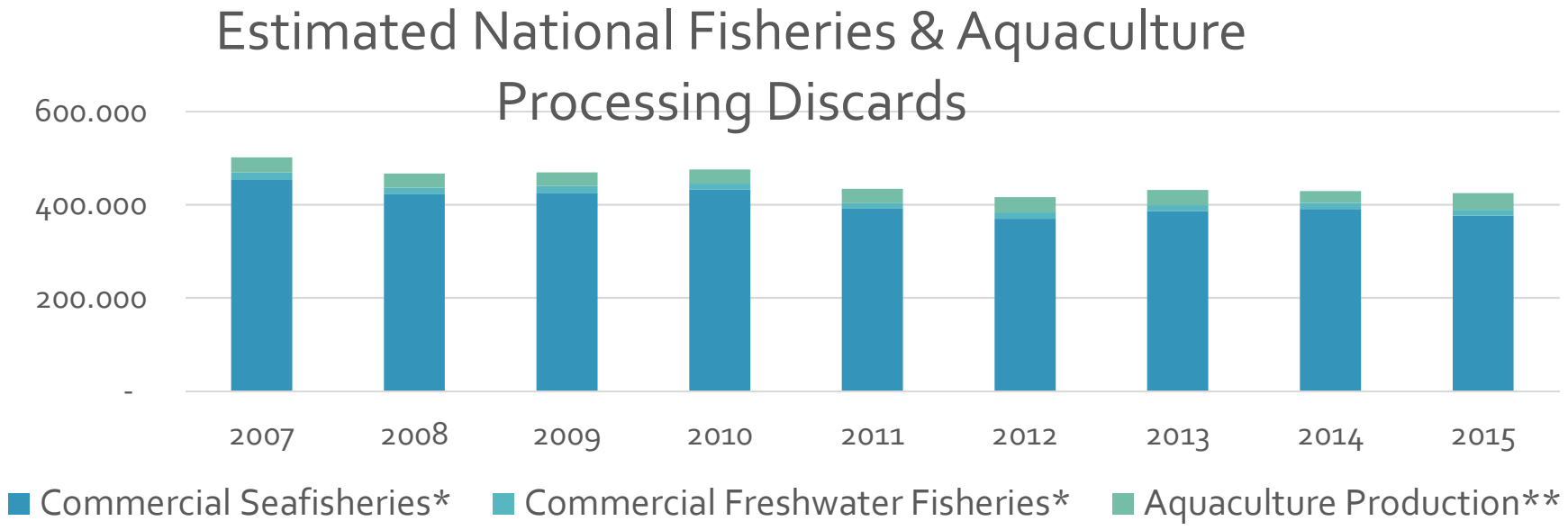
- Canada generates **~46%** processing waste annually from wild capture landings
- Canada generates **~20%** processing waste annually from aquaculture production

National Overview of Fisheries and Aquaculture Waste (2010)



National Fisheries and Aquaculture Processing Discards

Ave = 450,000 t/year

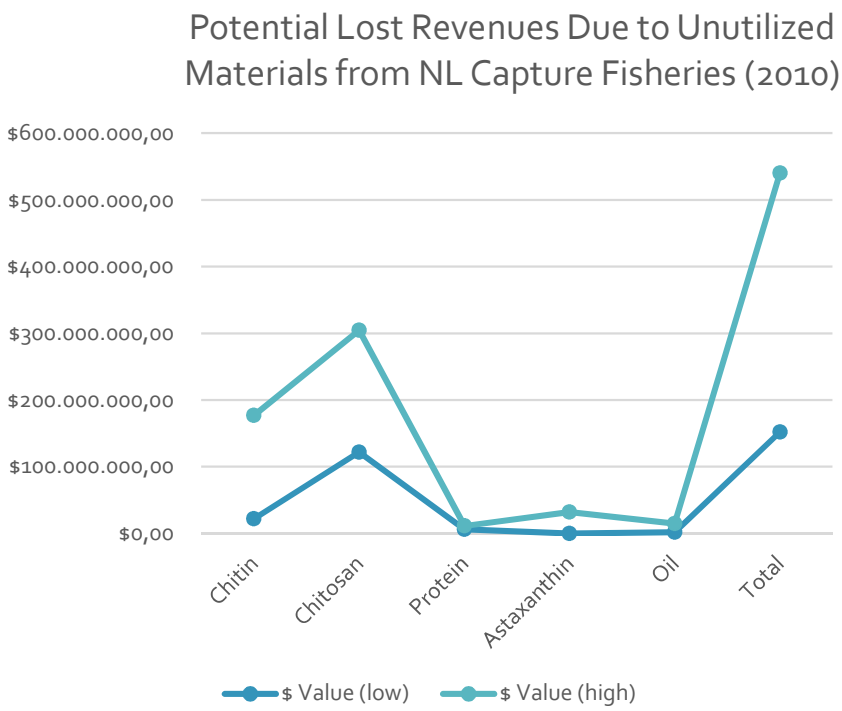


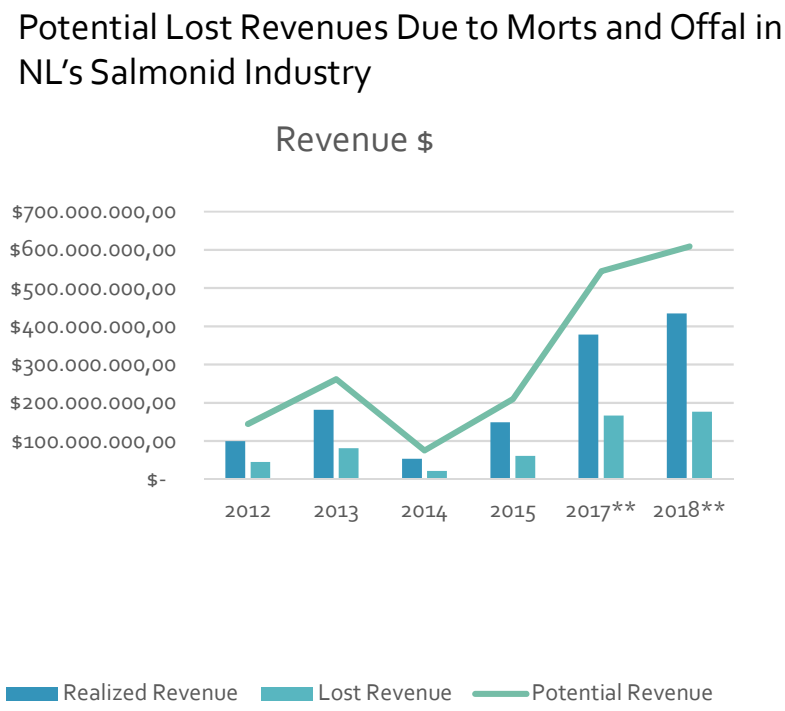
88.6%
(405,358t)

3.0%
(13,305t)

8.4%
(31,084t)

Estimated Potential Lost Revenues for NL's Unutilized Marine Biomass

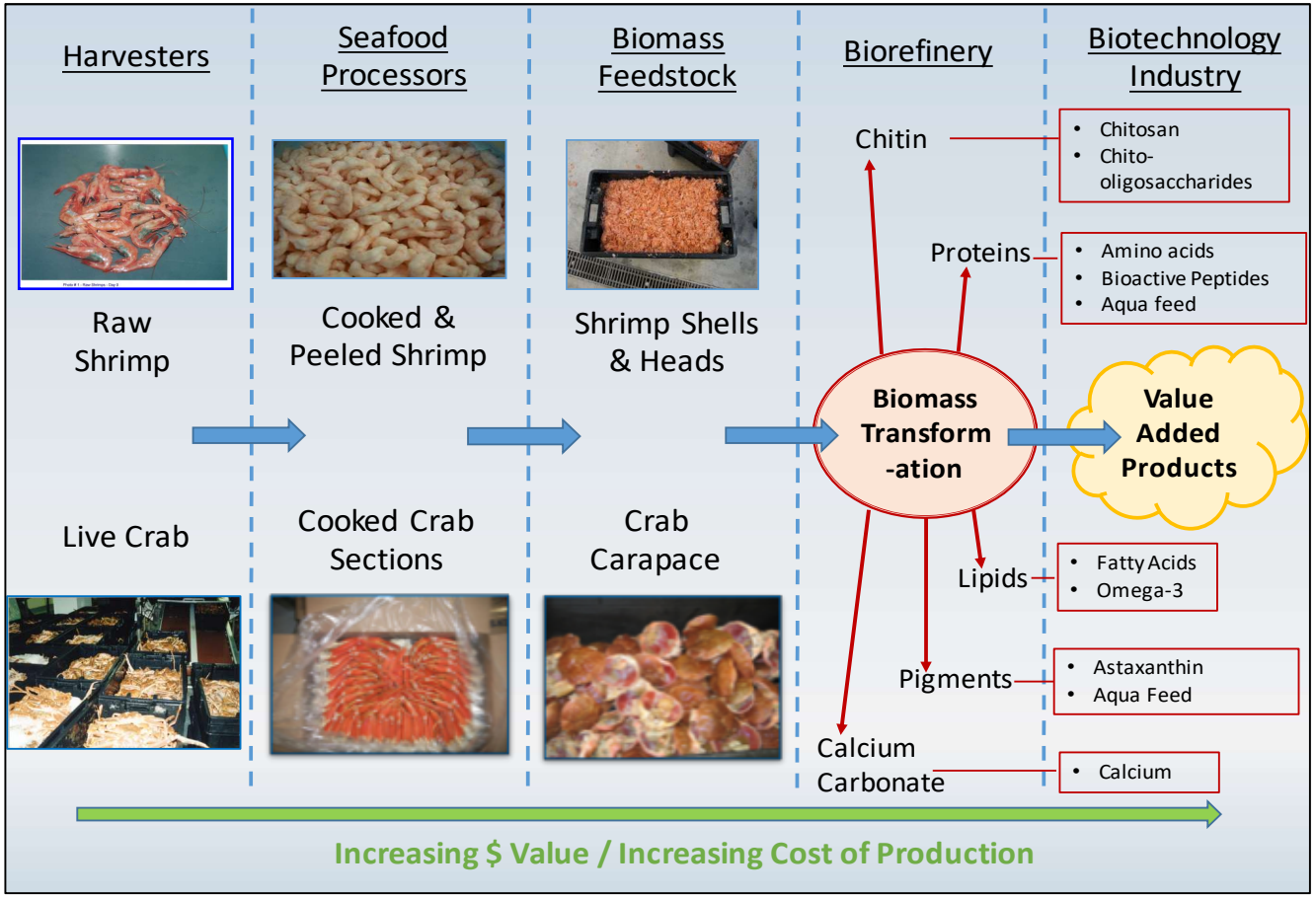




Volumes were estimated from landings and processed volumes reported by DFA 2010 and yield data collected by CASD 2011. $ estimated based on current market prices for similar products.

(Data for 2012-2015 was compiled from Newfoundland and Labrador Department of Fisheries and Aquaculture statistics. Estimates for 2017-2018 are based on personal communications with industry and NAIA)

Biorefinery Concept for Value Chain Optimization of Northern Shrimp and Snow Crab



Laitram CoolSteam Cooker Assessment

- Purpose:
  - To evaluate the CoolSteam cooking technology for shellfish applications and compare with immersion cookers

Fisheries Science → Harvesting → Handling/ Landing → **Processing** → Logistics → Marketing

Laitram Shrimp Cooker Cold Spot Evaluation

- Purpose:
  - To determine slowest heating spot within Laitram Shrimp Cooker to verify controls
- Methodology
  - Leads were positioned across the cooker belt at various spacings
  - Data was collected using the Data Trace System and analyzed in Excel

Data Trace Thermocouple

The data logger assembly with tracer tags

The data logger download assembly

Shrimp Summary

- Continued harvesting & processing sector consolidation likely
  - Driven by demographics & raw material supply
- Fisheries regime shifts due to climate change will require adaptive strategies
- Value chain improvement opportunities available for shrimp sector
  - Innovative stock assessment approaches
  - Gear technology improvements
  - Other quality improvements i.e. boxing, icing, etc.
  - Bio-refinery development
- Creative approaches
  - Utilization of FAS shrimp in inshore processing sector, raw peeled shrimp, etc.
  - CETA – tariff and end use restrictions removal provide direct market opportunities
  - Continued market development efforts
    - Dietary studies on health benefits
- Unique opportunity for marketing, innovation and technology adoption
  - Atlantic Fisheries Fund - $400 + million
- More sector wide cooperation necessary