

# Soft-Shell Green Crab in Prince Edward Island: New Strategies and Techniques

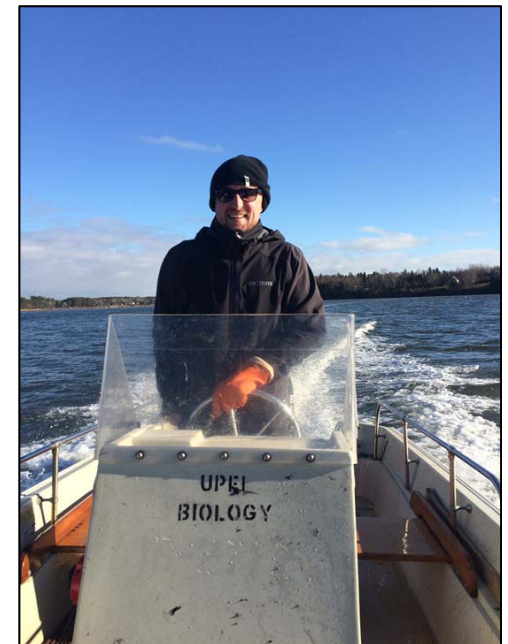
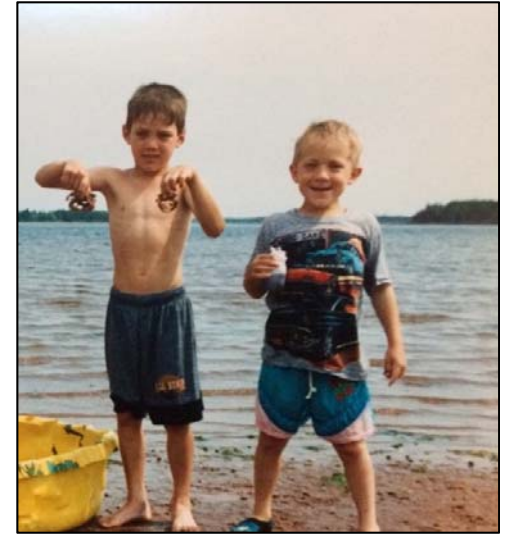
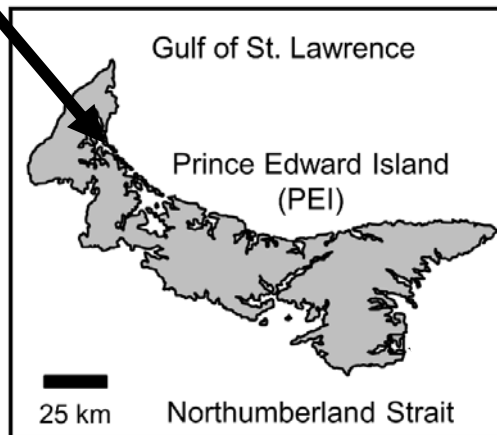
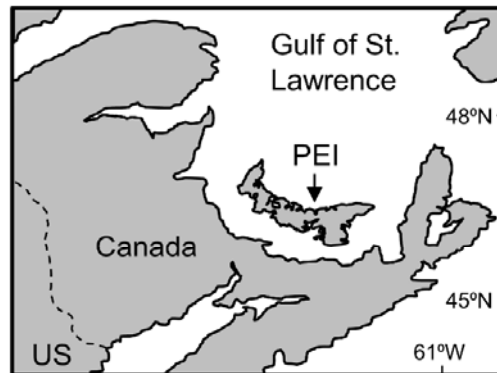
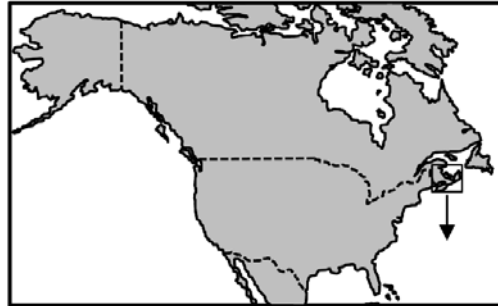
Dr. Luke Poirier

Green Crab Working Summit: Portland, ME

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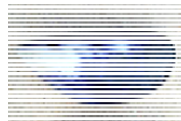
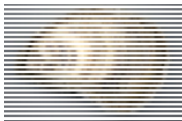
# A bit about me

- Introduced to Marine Biology at a young age...
- Cascumpec Bay
- UPEI, Acadia, UPEI
- Chance to work with local shellfishers



# Introduction... not that it needs it

- The European Green Crab (*Carcinus maenas*)
  - One of the world's most successful invasive species
  - Continuing it's spread in Atlantic Canada (up to NFLD)
  - Productive coastlines, ample habitat
- Negative impacts
  - Competition
  - Habitat modification
  - Predatory effects
  - Economically important bivalves



# Local Management Efforts

- Most management strategies have failed
  - Prevention, detection, eradication, mitigation
    - Some have focused on effect reduction
- A federally managed fishery is being gradually implemented
  - Two purposes
    - Control populations in ecologically and economically sensitive areas
    - Provide economic benefit to those affected by the species
  - However, a need for marketable products is quite evident

# Research Objectives 2013-2017

- Explore and analyze Green crab range expansion on PEI
  - Aid in estimating range expansion parameters
- Examine impacts on vulnerable shellfish
  - Conservation of an economically and ecologically important species
- **Develop a product for the proposed directed fishery**
  - **Enhance the viability of success for the fishery**
- **Test a novel bycatch reduction device for fyke nets**
  - **Further their potential selection for use in the directed fishery**

# Moulting Synchrony in Green Crabs

- Soft-shell Crab
  - Venetian “*moleche*”
  - Very high value (50-75€/kg)
- However...
  - Not much was known
    - Timing
    - Modernization?





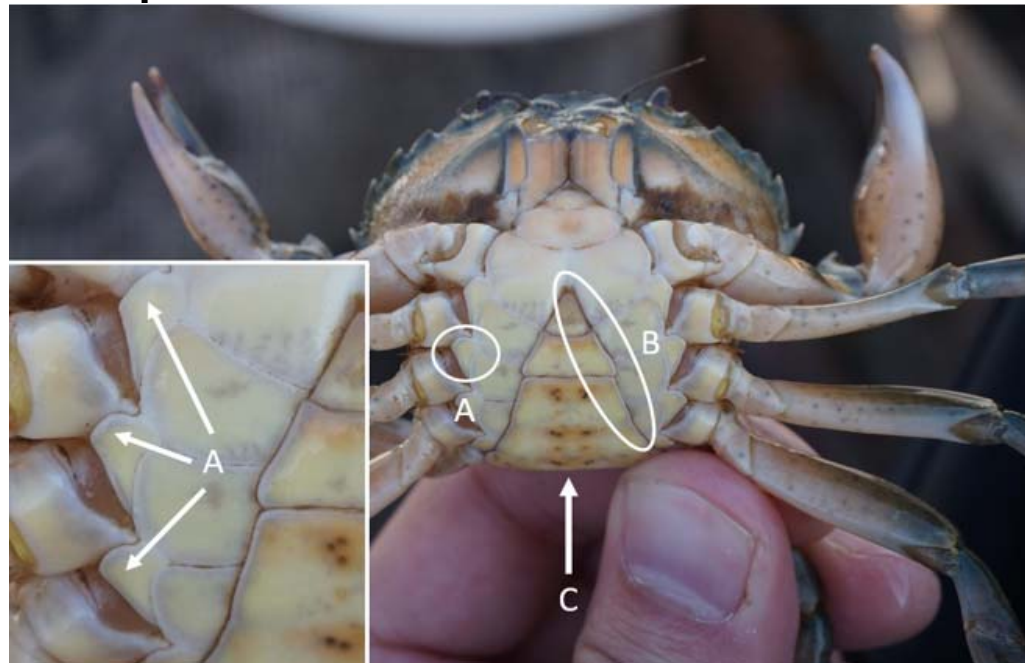
# Chioggia, Italy

- Exploration of “old world” fishing methods
  - “Molecante” fishermen of Venice
    - Bepi, Christiano, and Armando
    - Use complex fyke net system
    - Sort and hold crabs based on external characteristics
    - Synchronous event
    - Temperature related



# Moulting characteristics

- A) Presence of “halo” on episternites or area of carapace that protects first joint of appendage
- B) A darkened Apex line, sometimes indented
- C) A loosening of the shell where the dorsal and ventral carapace meet





# PEI Moulting Results

- 7 groups of crabs were collected in Montague River
  - June and July of 2014 (3) and 2015 (4)
  - Male and female in 2014, only male in 2015
- External characteristics recorded, but no sorting (2015 only)
- Crabs held in individual compartments in the lab and field due to cannibalism
  - Temperature regulated in the lab, and recorded in the field
- Checked daily for molting events

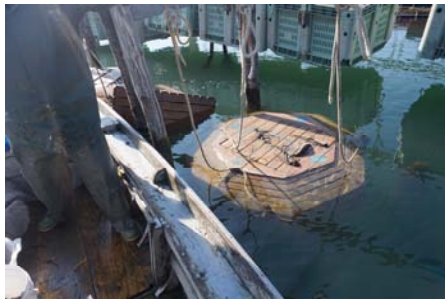
# PEI Moultng Results

- Results
- In 2014, only 1 group of crabs had moults
  - But, a male-specific moulting pattern was observed
    - Later confirmed in second trip to Venice
- Relationship with Canada's Smartest Kitchen
  - Trial recipes
    - Taste profiles
- In 2015 – lab and field experiments yielded much higher moult rates
  - Higher in lab than the field
    - No sorting

# Improving Fishing Methods:

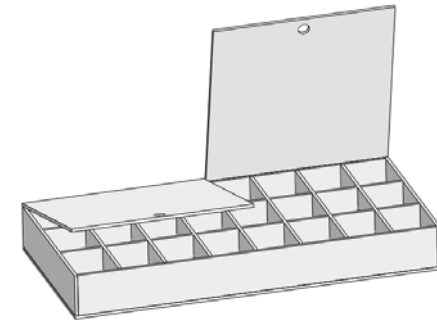
## Moulting equipment and sorting

Chioggia Method



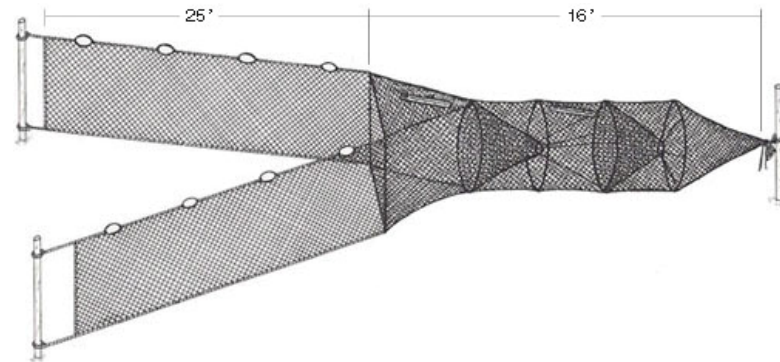
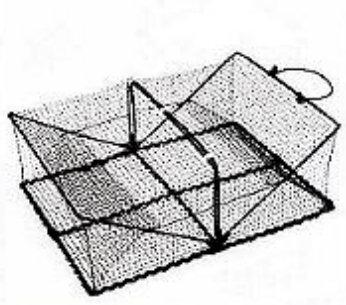
- Sorting, sorting, sorting!!
- Holding containers
  - Modified
  - Logtek separators
- Holding time
  - Zero in on region specific molting times
- Induced molting?

Canadian Method



# Improving Fishing methods: Innovative trap designs

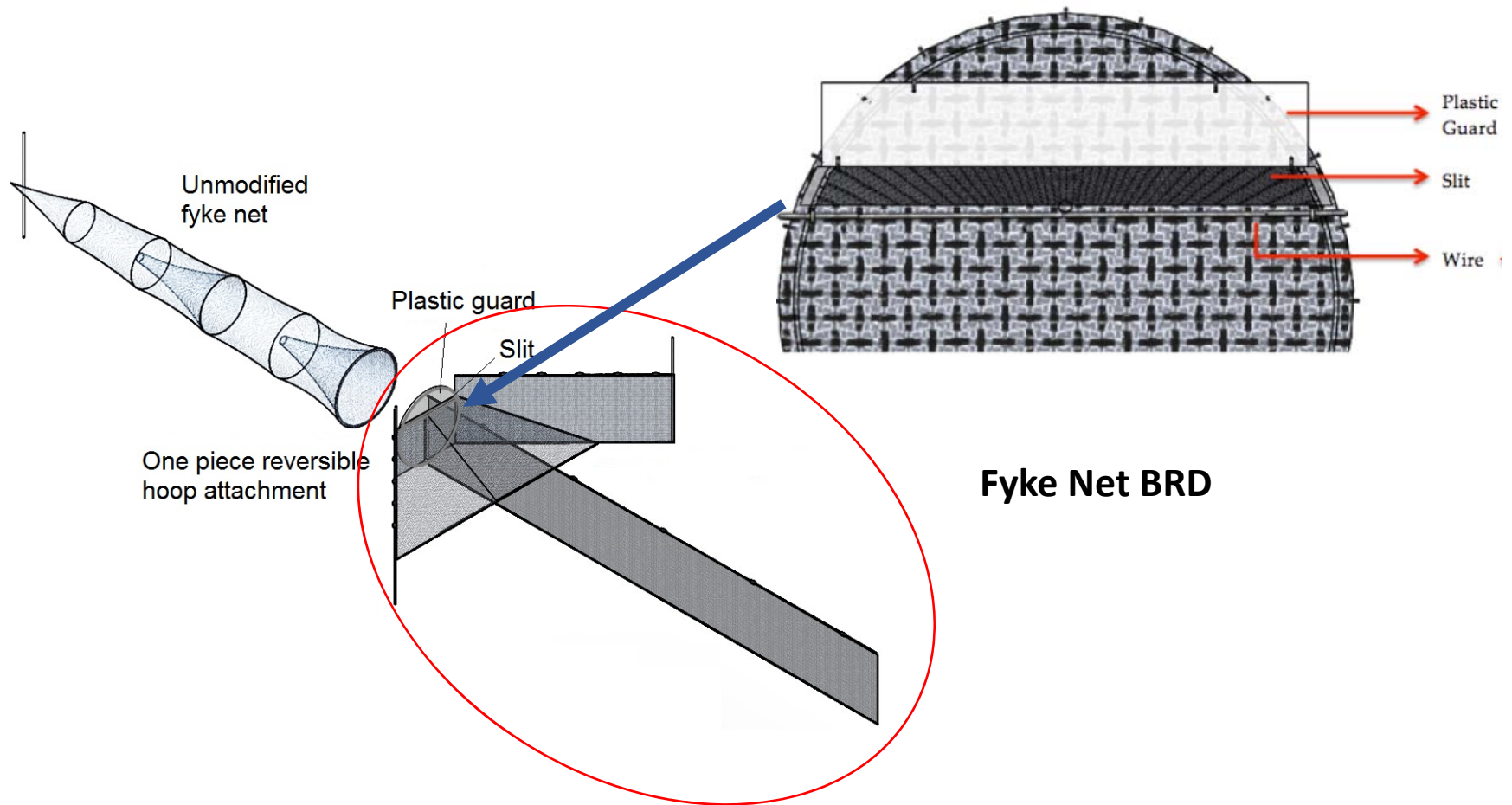
- Crabs that are about to moult are unlikely to be feeding
  - Increase odds that crabs caught will be moulters
  - Passive vs Active trapping



- Fyke nets
  - Traditionally used for the American Eel fishery in Atlantic Canada
  - Relies on the flow of the tides and natural movement of fish and crabs
  - However – catches EVERYTHING
    - Bycatch is a concern when out of season
  - Question: How to reduce bycatch, while increasing odds of catching moulting crabs?

# Bycatch Reduction Device (BRD) for Fyke nets

- Rationale
  - Currently high start up costs for fishers
  - No bait needed
  - More reflective of Italian fishing method
    - Soft-shell crab
- Attempting to reduce bycatch
  - Alternative worth exploring
  - Especially for ecologically and economically important species
- Comparing both original and BRD equipped Fyke nets

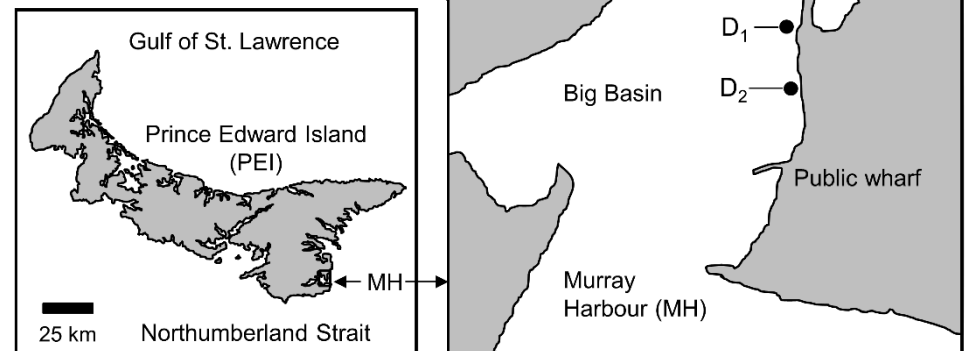


- One-piece 30° barricade ramp with a removable hoop
  - Entrance slit similar to a coin slot
  - Ramp is attached to the first hoop of the fyke net
  - Completely reversible, does not permanently modify the fyke net



# Testing the BRD

- Deployment in Murray Harbour
  - 4 sites
  - Pairs (1 modified, 1 regular)
- Original nets caught more GC than modified nets
  - However, modified nets caught proportionally less bycatch



# BRD Evaluation

- Implications
  - Reduction in bycatch is consistent with the goals of modern fishery management strategies
    - Protection of diversity
    - Interaction between caught and uncaught species
  - Reduction of economically and ecologically important species
  - A fully reversible net is ideal for eel fishermen, who are the current licence holders in green crab fishery
    - Easing the financial burden
  - Further work is needed to improve the catchability of green crab
    - Compare to baited traps
    - Study molting rates

# Conclusions

- Urgent need to control populations
  - Novel techniques
  - Cost-effective
- Minimize the species' impact on newly invaded ecosystems
- Further research
  - Ecosystem rehabilitation
  - Thresholds of impacts and ecosystem tolerances
  - Holistic approaches to invasive management

# Acknowledgements

- Supervisors (Pedro Quijon, Sophie St-Hilaire)
- University of Padua – Chioggia Hydrobiology Lab
- The Quijon Lab Group and Field Assistants



# Questions?

