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Evolving strategies for AIS response: Lessons learned from 10 years of research in Newfoundland, Canada

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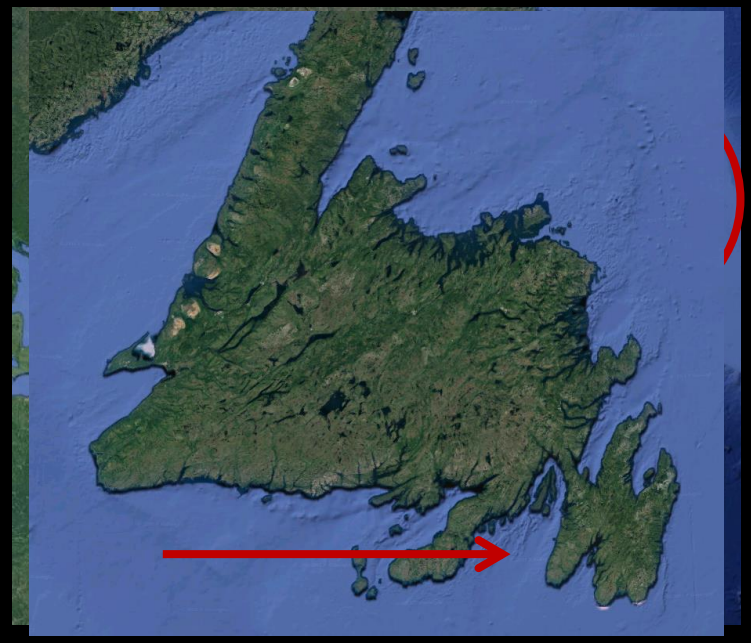
ICAIS 2017

Fort Lauderdale, Florida: Oct 23 2017

Aquatic Invasive Species in Newfoundland

- A large province, with low population (~ 500 000 people)
- Fisheries and Oceans Canada (DFO) Newfoundland AIS Monitoring and Research program began in 2006
- Subarctic ecosystem (-1 °C to 16 °C)
- Placentia Bay has high amounts of boat traffic and is one of largest ballast water discharge sites in Canada



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Aquatic Invasive Species in Newfoundland

European Green Crab (2007)

Vase Tunicate (2012)

Violet Tunicate (2007)

Golden Star Tunicate (1940s; 2000s)

Coffin Box Bryozoan (~2002)

Oyster Thief (2012)

Japanese Skeleton Shrimp (2010)

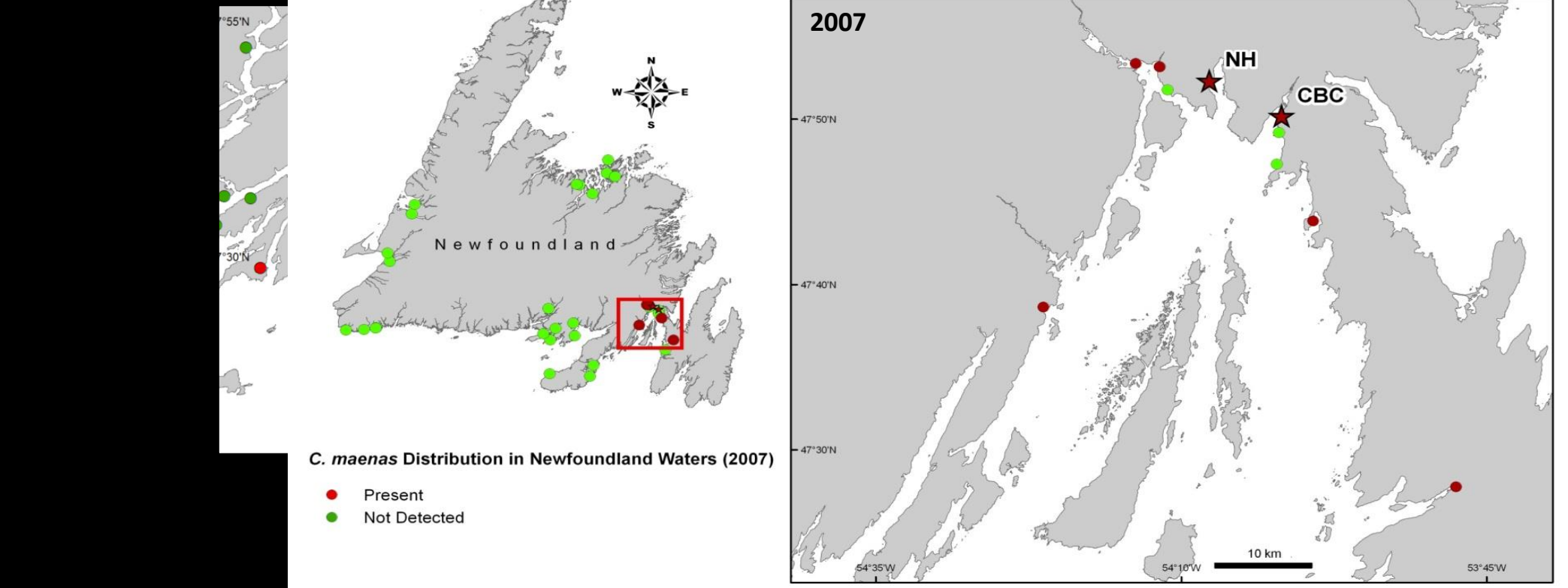
DFO NL AIS Program

2006 - present

1. **Communication and Education**
2. **Monitoring and Surveys**
3. **Research**
4. **Response**

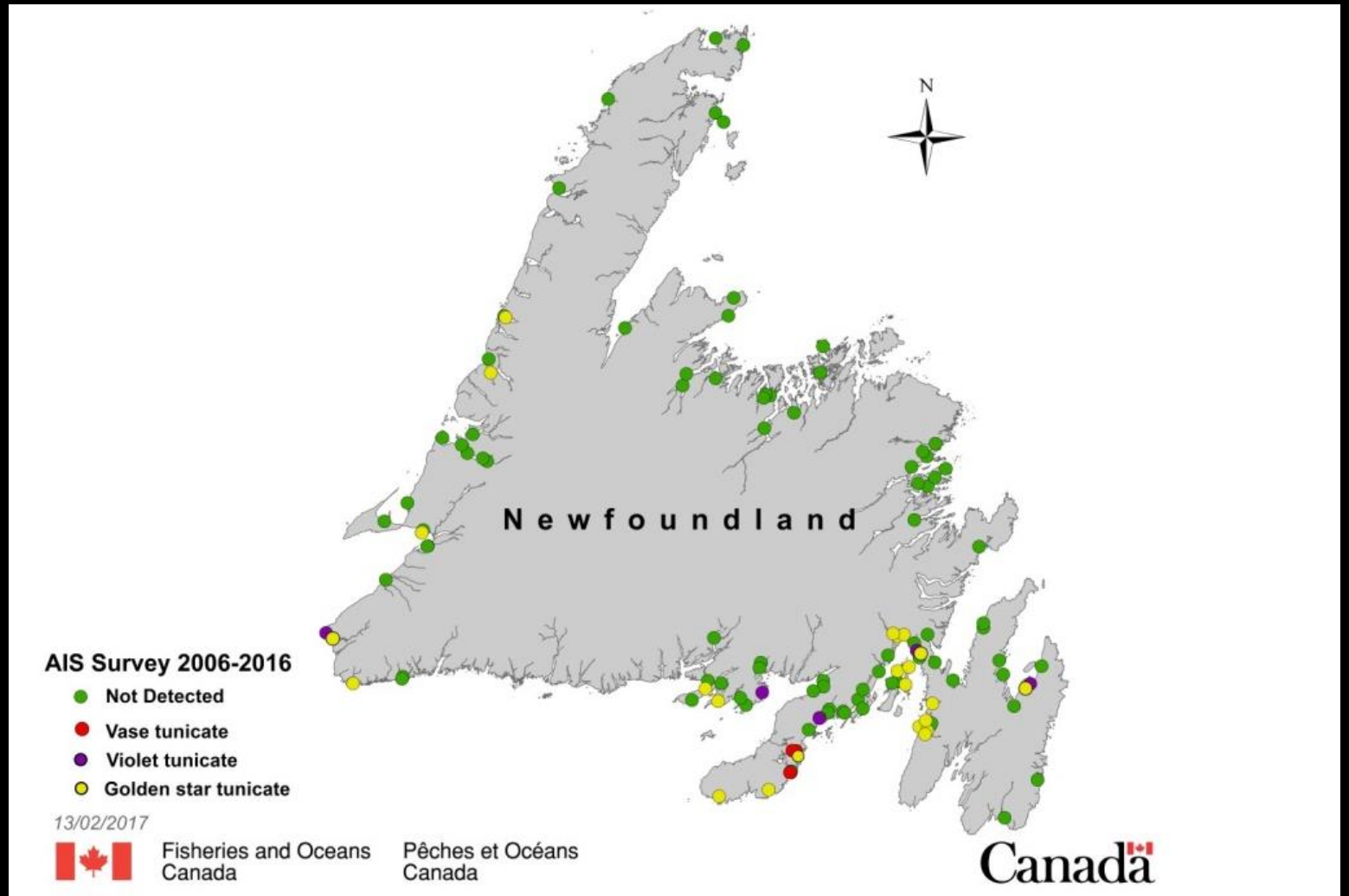
2. Monitoring and Surveys

- Green crab (*Carcinus maenas*)



2. Monitoring and Surveys

- Tunicates



3. Research

- Species
- Population
- Ecosystem
- Vector

- **Population dynamics of non-indigenous colonial ascidian tunicate (Ma 2012, MSc Thesis)**

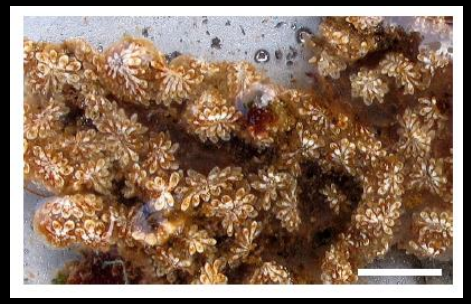
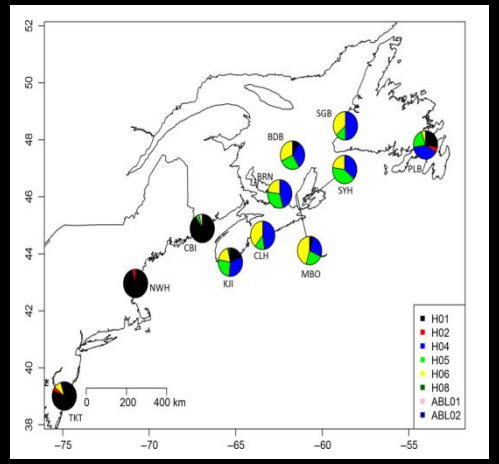


Photo credits: Kevin Ma

- **Genomewide divergence between independent invasions of green crab in NW Atlantic (Jeffery et al. 2017)**



- **Linking eelgrass declines and impacts on associated fish communities to green crab invasion (Matheson et al. 2016)**

3. Research

- Species
- Population
- Ecosystem
- **Vector**

- **Performance of biocide and non-biocide coatings to prevent biofouling of invasive species (Bungay, A - MSc candidate)**

July 2016

March 2017

4. Response

- Rapid Response Plan
  - Communication
  - Detection (early) and demarcation
  - Containment and risk assessment
  - Mitigation implementation
  - Evaluation

Management of Biological Invasions (2016) Volume 7, Issue 1: 87–100
DOI: http://dx.doi.org/10.3391/mbi.2016.7.1.11

Open Access

Proceedings of the 5th International Invasive Sea Squirt Conference (October 29–31, 2014, Woods Hole, USA)

Management in Practice

The development of a rapid response plan to control the spread of the solitary invasive tunicate, *Ciona intestinalis* (Linnaeus, 1767), in Newfoundland and Labrador, Canada

Cynthia H. McKenzie[1]*, Kyle Matheson[1], Vanessa Reid[2], Terri Wells[1], Derek Mouland[3], Darrell Green[4], Brooks Pilgrim[5] and Geoff Perry[6]

- Management
  - Mitigation
  - Control and Prevention

Tunicates

Green crab

4. Response – Mitigation (removal)

– Vase tunicate (*Ciona intestinalis*); 2013

4. Response – Control the vector

– Vase tunicate (*Ciona intestinalis*); 2017





4. Response - Mitigation

- Green crab: Can trapping control abundances? (2014-2016)

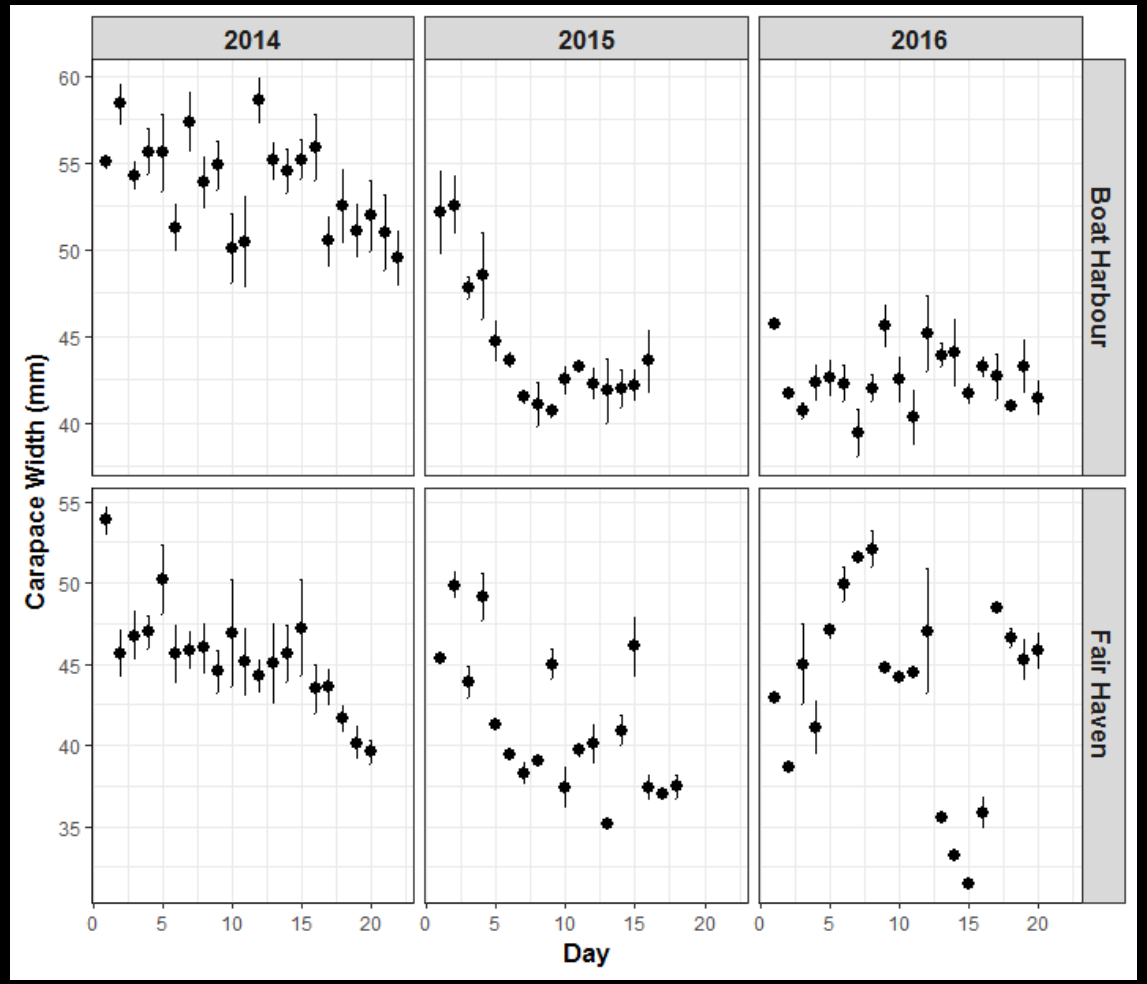
4. Response - Mitigation

- Green crab: Can trapping control abundances?

- Boat Hr - 3300 kg
- Fair Haven -7600 kg

- Total catch and crab size decreased, but requires continuous trapping

- Size and openness of fishing area key to success



Lessons learned

- **Monitoring is key; the first step to early detection**
- **Strong partnerships; collaboration with numerous agencies and manpower is required**
- **Management vs eradication**
- **Focus on the vector!** → **Follow best management practices**

Partnerships:

- Fish harvesters
- Ocean Sciences Field Services Unit
- Memorial University / Marine Institute
- FFAW
- DFLR
- NAIA
- ACAP
- Harbour Authorities
- DFO (Small Craft Harbours, Oceans, FPP, FAM, Policy & Communications)
- Parks Canada
- Qalipu/Miawpukek River First Nations
- Aquaculture groups
- Universities across Canada and USA
- Avalon Ocean Products
- Hebron
- Louis MacDonald
- Vale Limited