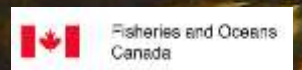


# Using archival and acoustic telemetry to investigate the marine behavior of Atlantic salmon in Newfoundland and Labrador

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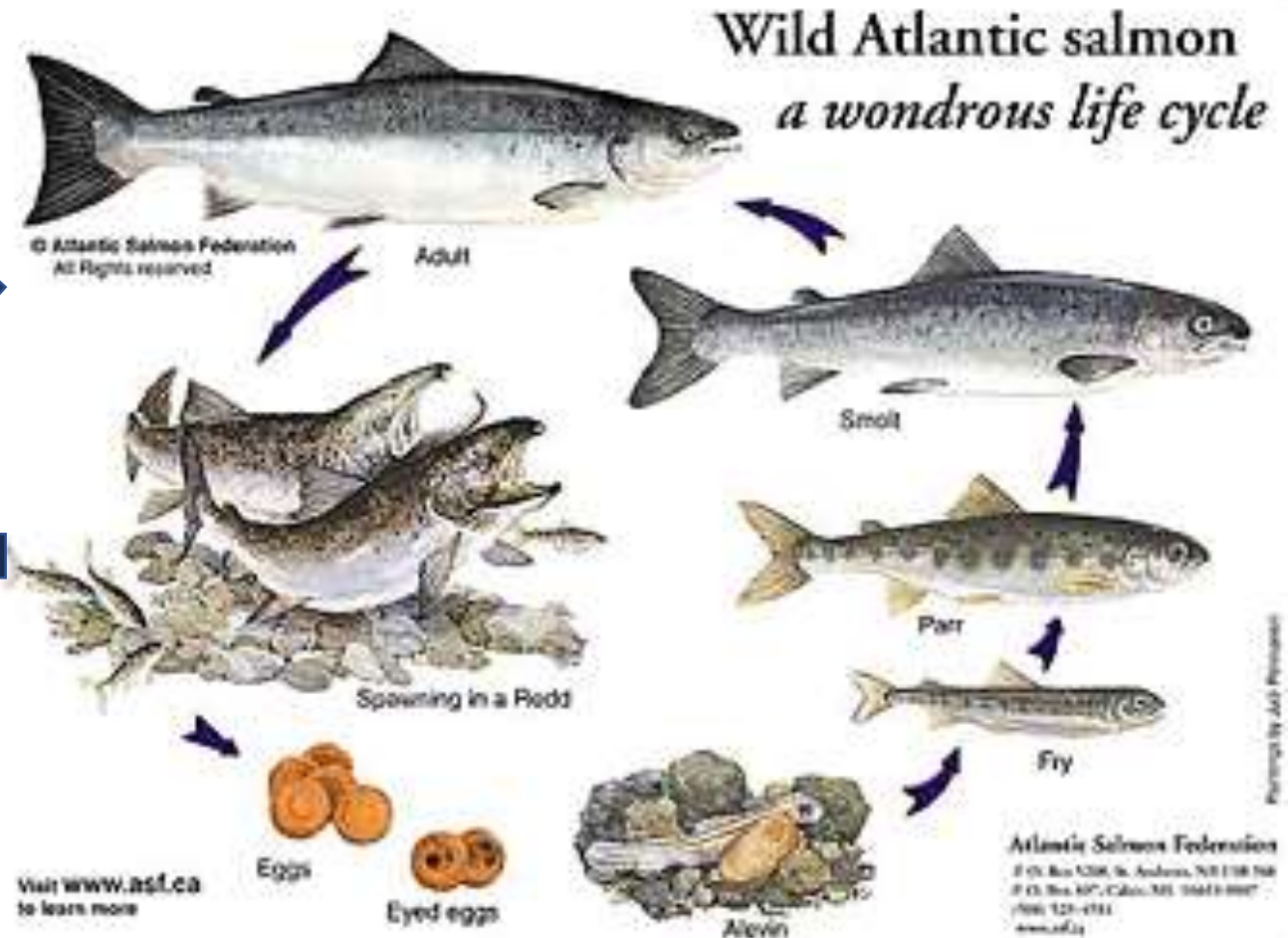




# Atlantic salmon life cycle



Kelt



**Telemetry:** Remote monitoring of behavioural, physiological or environmental information of individuals by the use of electronic 'tags'

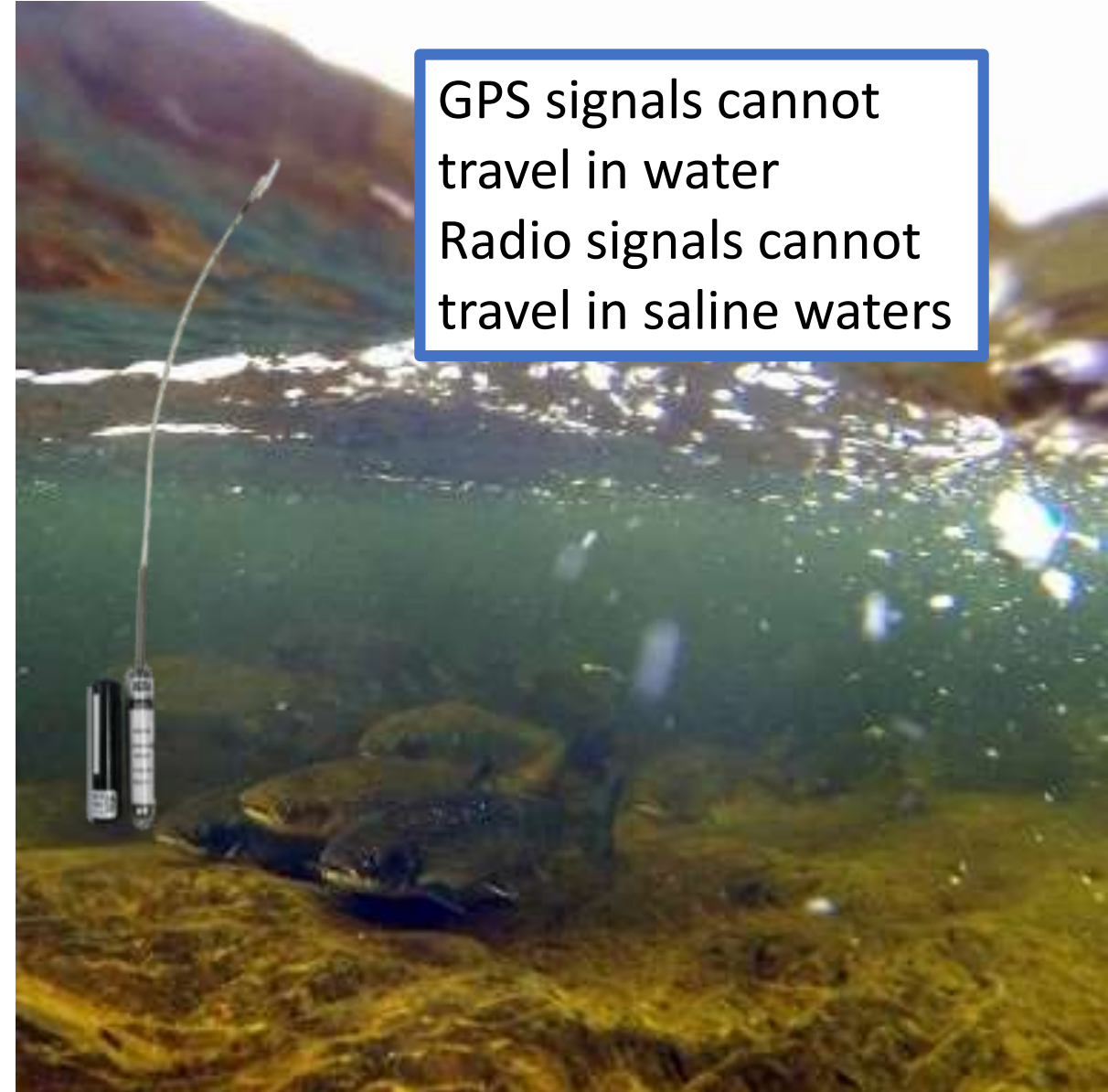
- Observe movements and behavior of individual fish

**Today:** Using acoustic and archival telemetry to investigate marine movements of NL Atlantic salmon



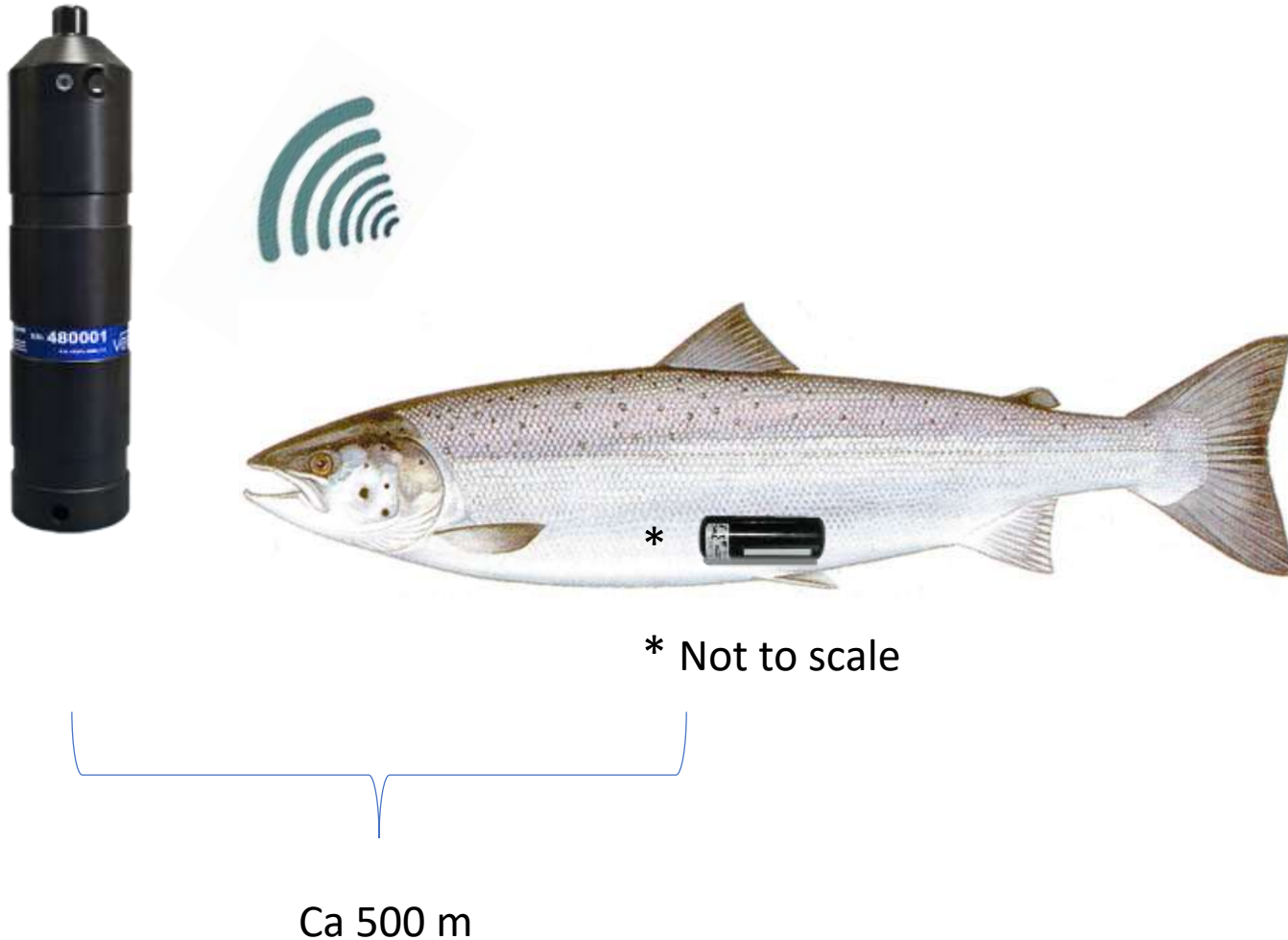
## Two main types of fish telemetry in marine waters:

- Acoustic telemetry
  - Information transmitted to receivers using ultrasonic sound signals
  - Less detail
- Archival telemetry
  - Information logged onboard tag which needs to be retrieved to access data
  - Highly detailed



GPS signals cannot travel in water  
Radio signals cannot travel in saline waters

# Acoustic telemetry:



## Information transmitted via ultrasonic sound signals to underwater receivers

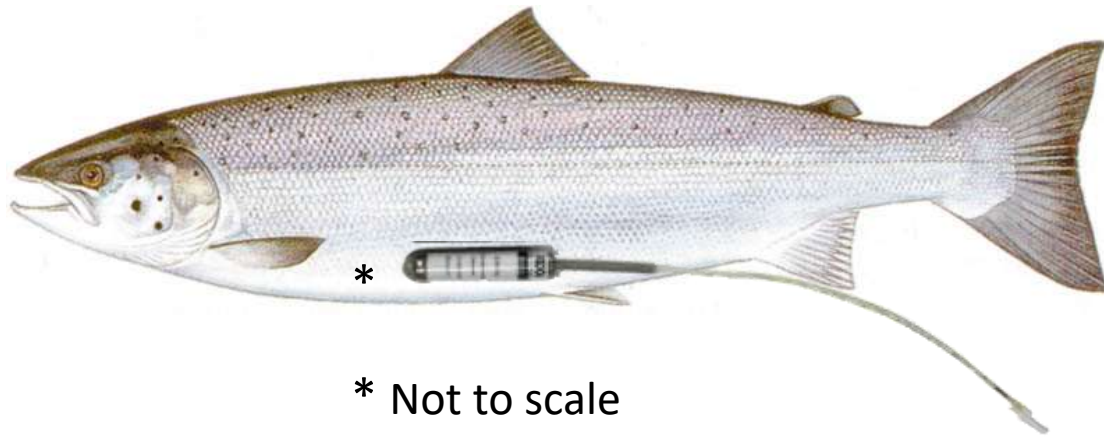
- Fish location
- sensor data (temp, depth)

Only information available when fish are found in the detection range (c. 500 m)

- Usually limited to nearshore areas



# Archival telemetry:



## Information stored onboard tag:

- Water temperature
  - Fish temperature
  - Fish depth
  - (Geographic location)
- 
- Highly detailed information independent of fish location
  - Only information from those fish whose tags are retrieved

## Tag deployment

### Electronic tags fitted externally or internally to fish

#### Internal tags:

- Fish anaesthetized
- Tag inserted into the peritoneal cavity
- Incision closed with sutures
- Ca 2-3 minutes
- Fish monitored until recovered and immediately released



Nurturing the salmon back from anaesthesia after surgery



Tags inserted into body cavity of anaesthetized fish, incision closed with 2-3 sutures



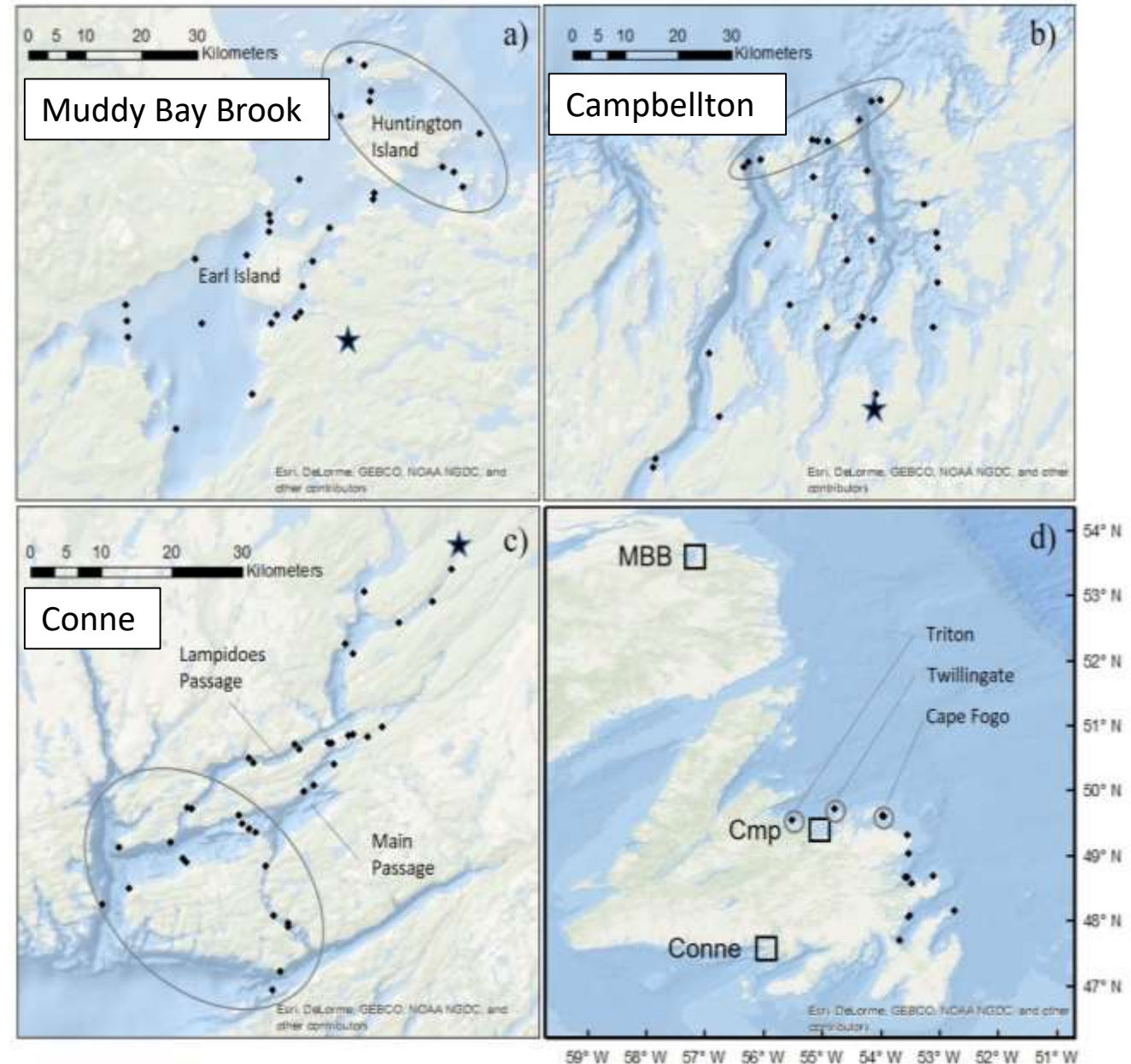
# Acoustic telemetry

## Nearshore migratory behaviour – acoustic telemetry

Three study populations:

- Muddy Bay Brook (2015)
- Campbellton River (2014)
- Conne River (DFO – 2007)

\* Additional receivers along the NE NL coast (DFO cod monitoring program)



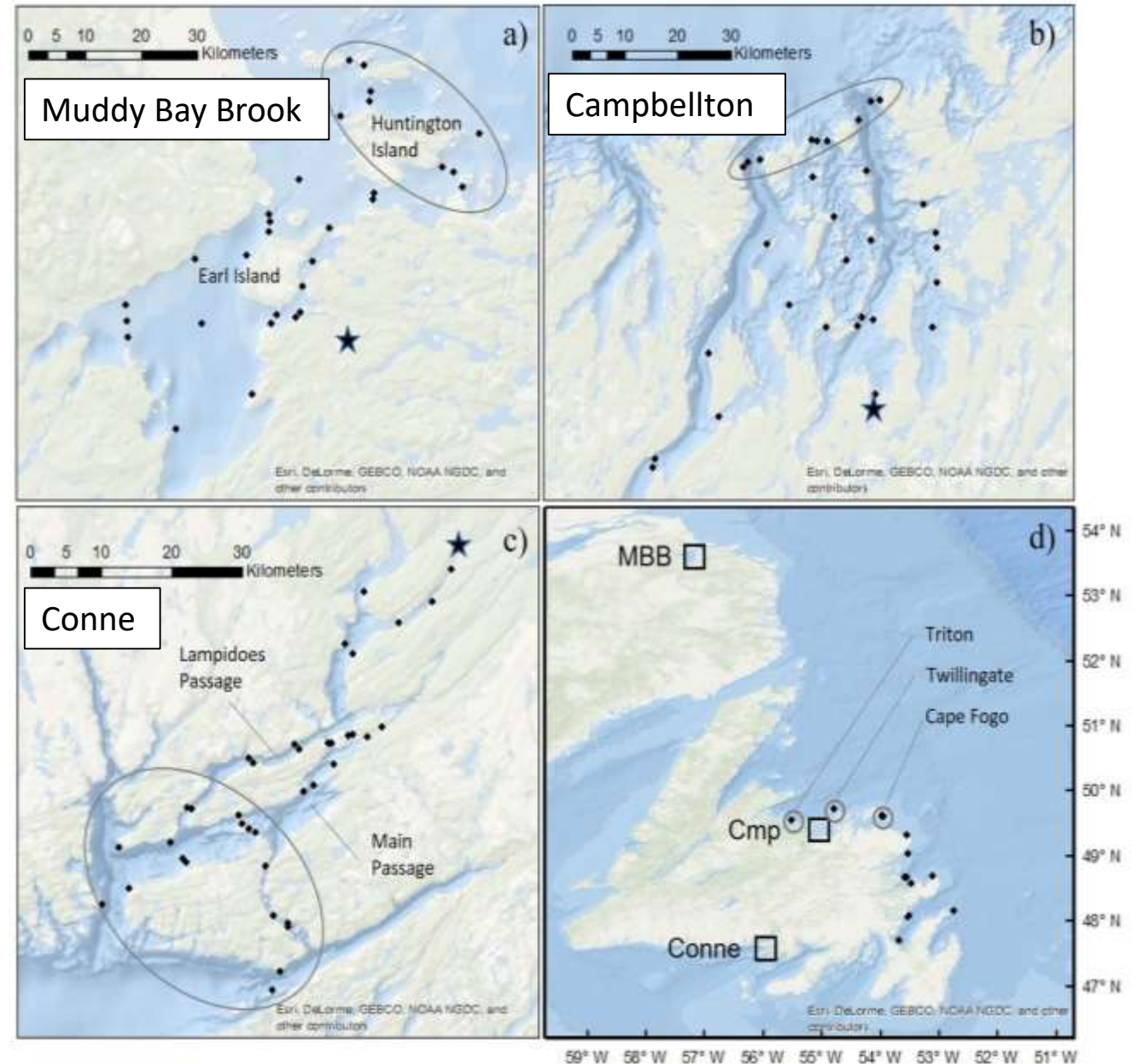


# Findings

## Smolt nearshore survival:

- MBB 56 %
- Cmp 92 %
- Conne 53 %
- kelts (85 -90%)

Nearshore area not a critical phase for survival in the systems investigated

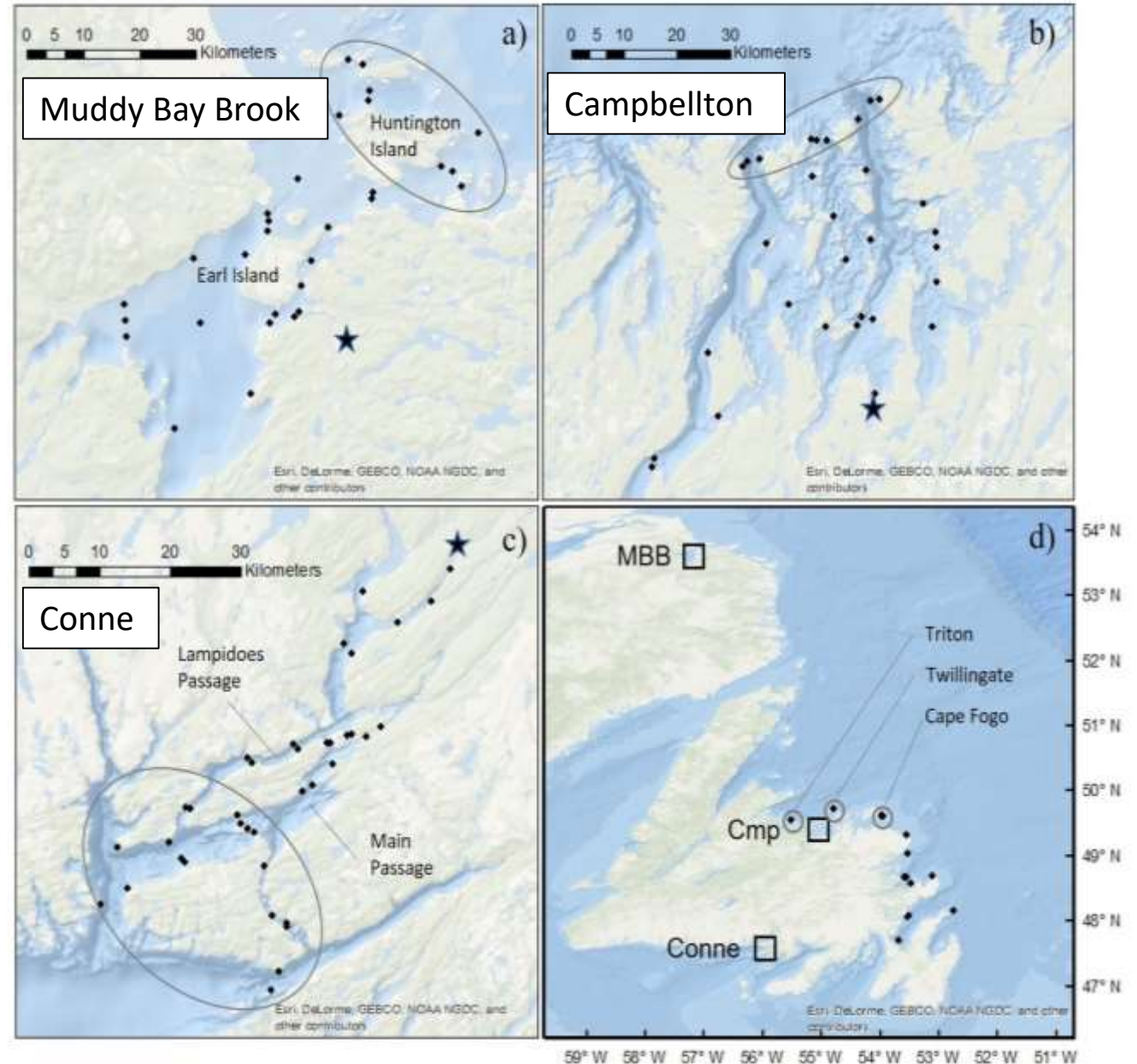


# Findings

## Prolonged residency in the fjord/bay:

- Conne smolt : c. 30 days
- Conne kelt: c. 25 days
- Cmp smolt: c. 30 days

Presumably low predation pressure and sufficient feeding conditions

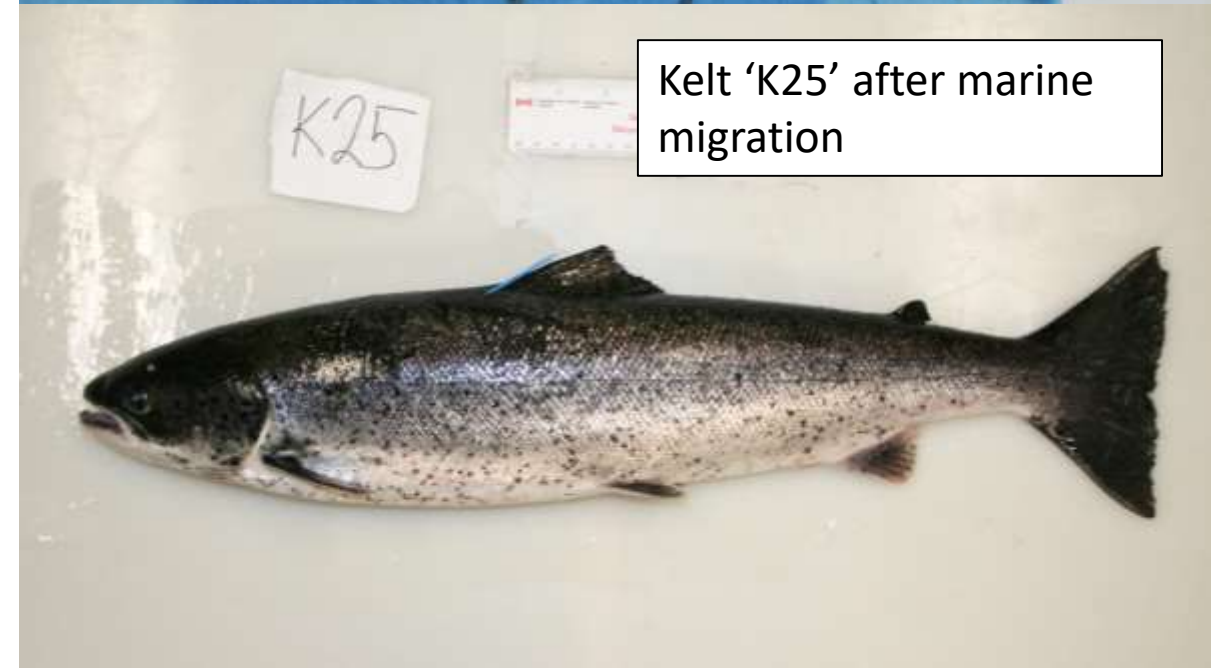


## Findings

### Kelts returning as repeat spawners:

- Campbellton:
  - 16 kelts (33 % of tagged fish)
- Conne River
  - 5 kelts (16 % of tagged fish)

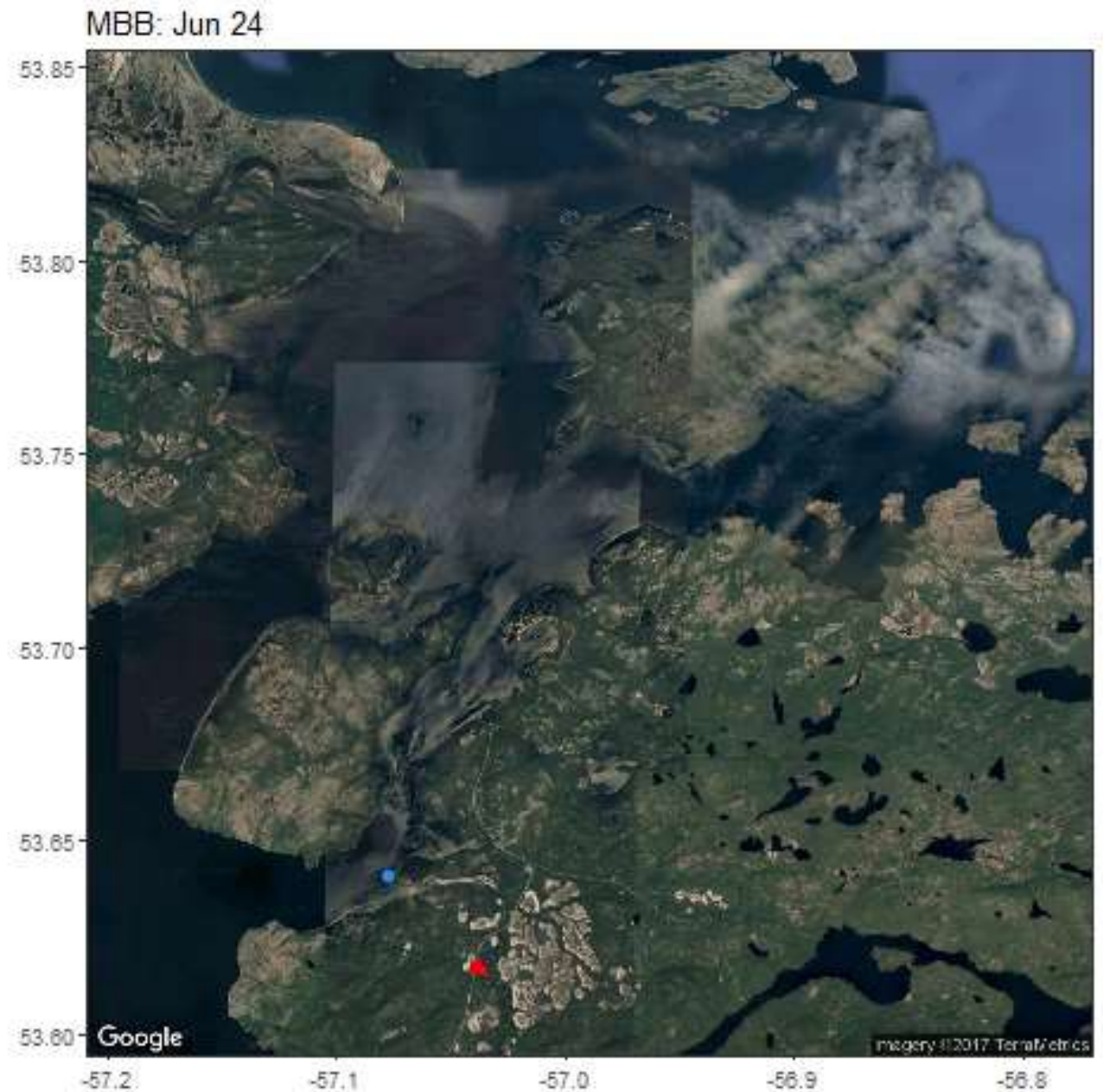
Ca 2 months spent at sea  
between spawning events



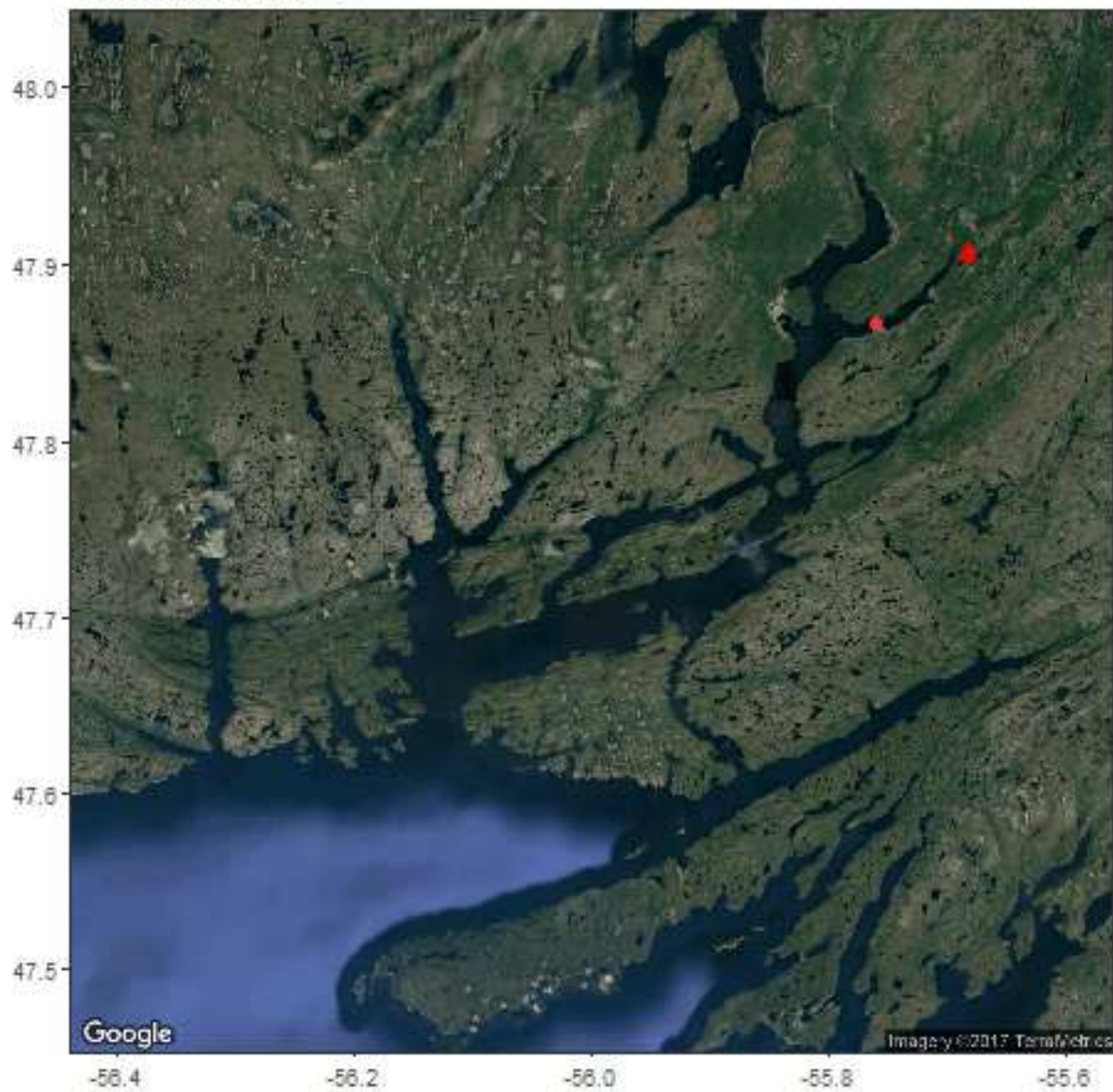


## Muddy Bay Brook smolt:

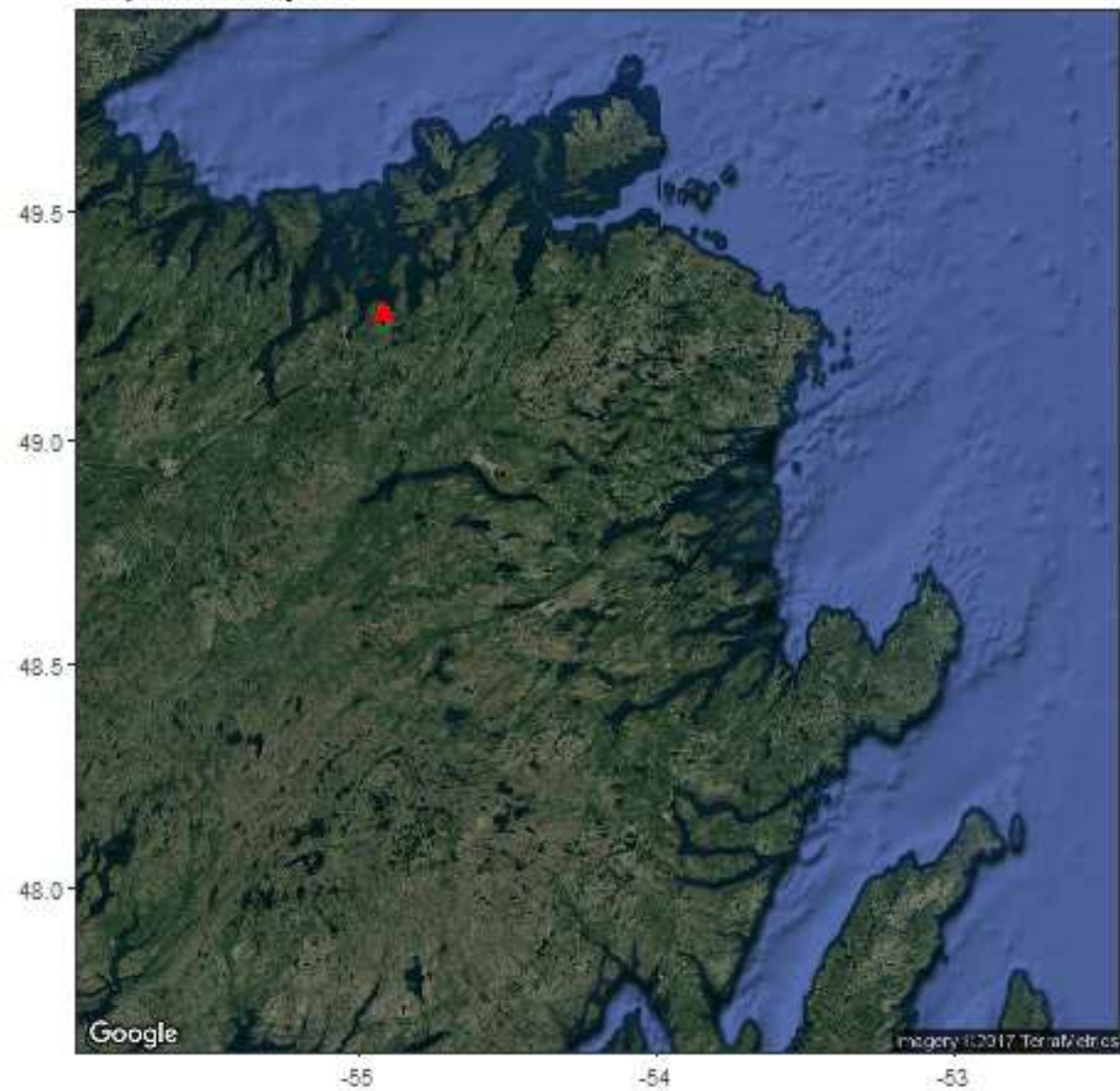
- Left the array after c. 4 days
- Fast movements with some temporary reversal in direction, likely as a result of changes in tidal phase



Conne River: Apr 23



Cmp River: May 26



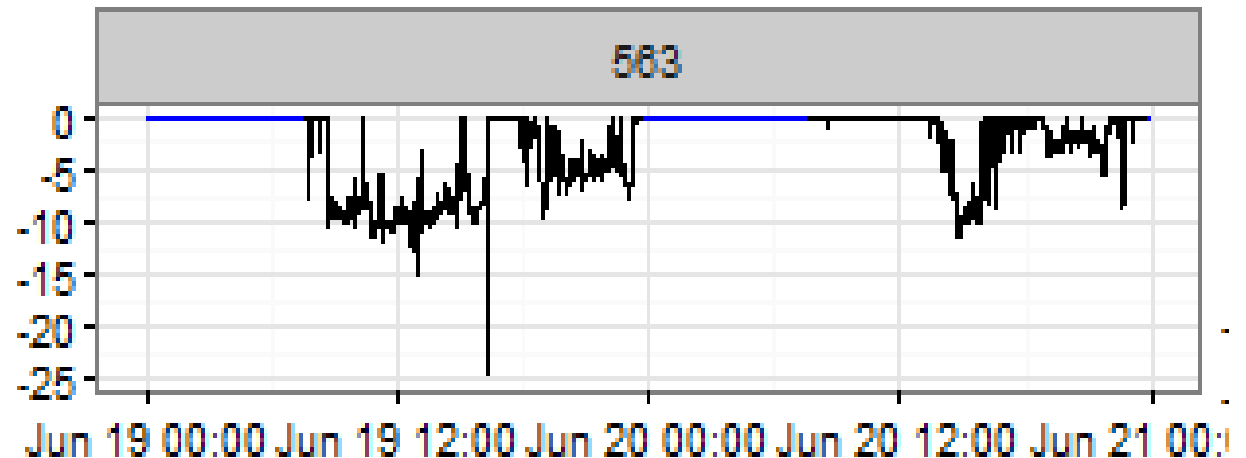


# Combining acoustic with archival telemetry:

- Kelts from Campbellton 'double-tagged' with both acoustic & archival tags
- Data on location as well as detailed history on depth and temperature during the entire two month long migration



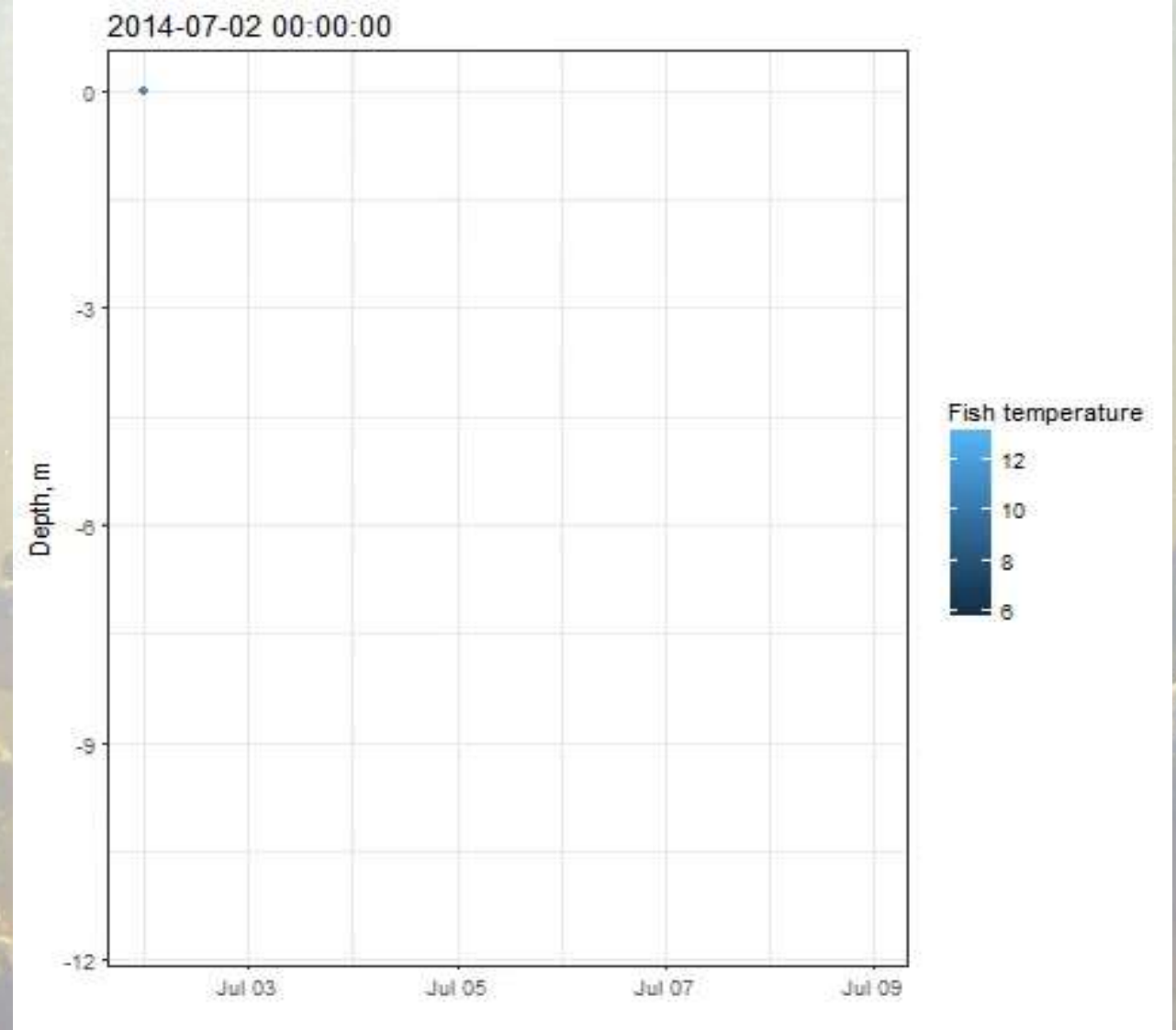
"A day in the life of a migrating Atlantic salmon kelt"





## A week of depth and temperature data of salmon '563'

- Frequent diving during daytime
- Mainly at surface at night
- Fish temperature generally stable around 10 degrees on average despite variable ocean temperatures



# Summary:

## **Telemetry revealed:**

- Moderately high to very high smolt survival in the nearshore environments of the three systems investigated
  - High kelt survival
- Prolonged residency in the nearshore environment in two populations
  - Sufficient feeding opportunities, low predation
- Two different kelt migratory patterns
  - Stayed close to shore the whole time
  - Long distance migrations up to 300 km from the natal river
  - Frequent diving associated with daylight and stable temperatures





An underwater photograph showing several fish swimming near a rocky bottom. The water is clear with some light refraction visible on the right side. A semi-transparent speech bubble is overlaid on the right side of the image.

**Questions?**