Acoustic measures of fish distribution, abundance, movement and habitat in Manitoba lakes

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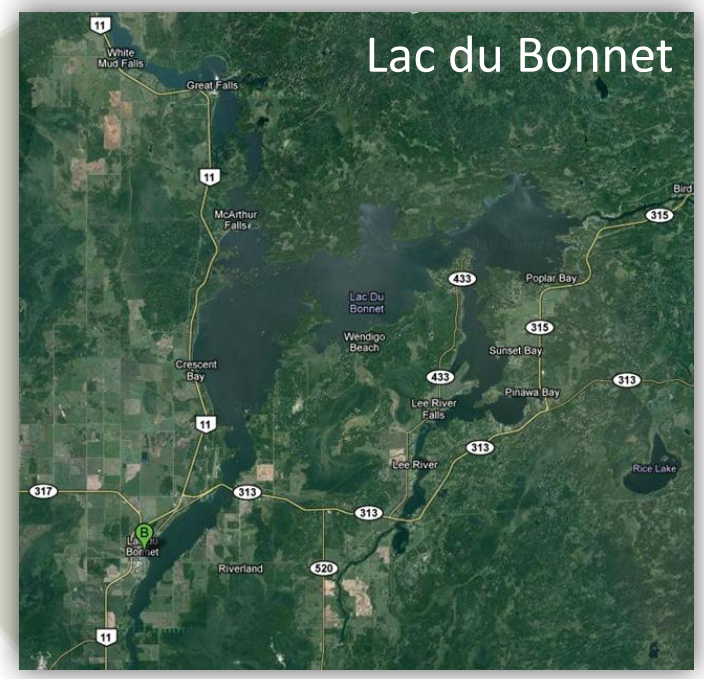
Objectives

- To determine distribution (summer), abundance and size of species in pelagic zones
- To examine seasonal thermal habitat use
- To map habitat, bathymetry and bottom type at high resolution
- To describe summer diel movement patterns of key species (Walleye)

Study Site:


Vidir
Ledwyn
Riverton
Bissett
Caribou Landing
Arborg
68
8
Valhalla
Arnes
O'Hanly
Little Black River
Spruce Sands
Victoria Beach
Camp Morton
Hillside Beach
Traverse Bay
Fraserwood
Fort Alexander
Gimli
9
Grand Beach
Powerview
Sandy Hook
Grand Marais
St-Georges
Komarno
Winnipeg Beach
11
Dunnottar
304
Great Falls
Stead
Matlock
Bird River
8
Teulon
Lac Du Bonnet
Poplar Bay
59
Scanterbury
Gull Lake
Pinawa Bay
Pointe du Bois
Petersfield
317
317
11
8
59
Lac du Bonnet
Selkirk
Pinawa
Stonewall
East Selkirk
Nutimik Lake
11
Stony Mountain
Lockport
12
Seven Sisters Falls
Garson
Tyndall
Seddons Corner
Saint Andrews
Beausejour
44
River Hills
West Saint Paul
Cooks Creek
White Lake
East Saint Paul
Hazelridge
Whitemouth
101
Oakbank
44
Winnipeg
Anola
Vivian
85
Elma
Rennie
135
206
75


Manigotagan Lake
Caribou Landing
Happy Lake


Lac du Bonnet
11
White Mud Falls
Great Falls
11
McArthur Falls
Bird
315
Poplar Bay
433
Lac Du Bonnet
Wendigo Beach
315
Sunset Bay
Crescent Bay
433
313
Pinawa Bay
Lee River Falls
11
313
Lee River
Rice Lake
317
313
313
Riverland
520
11

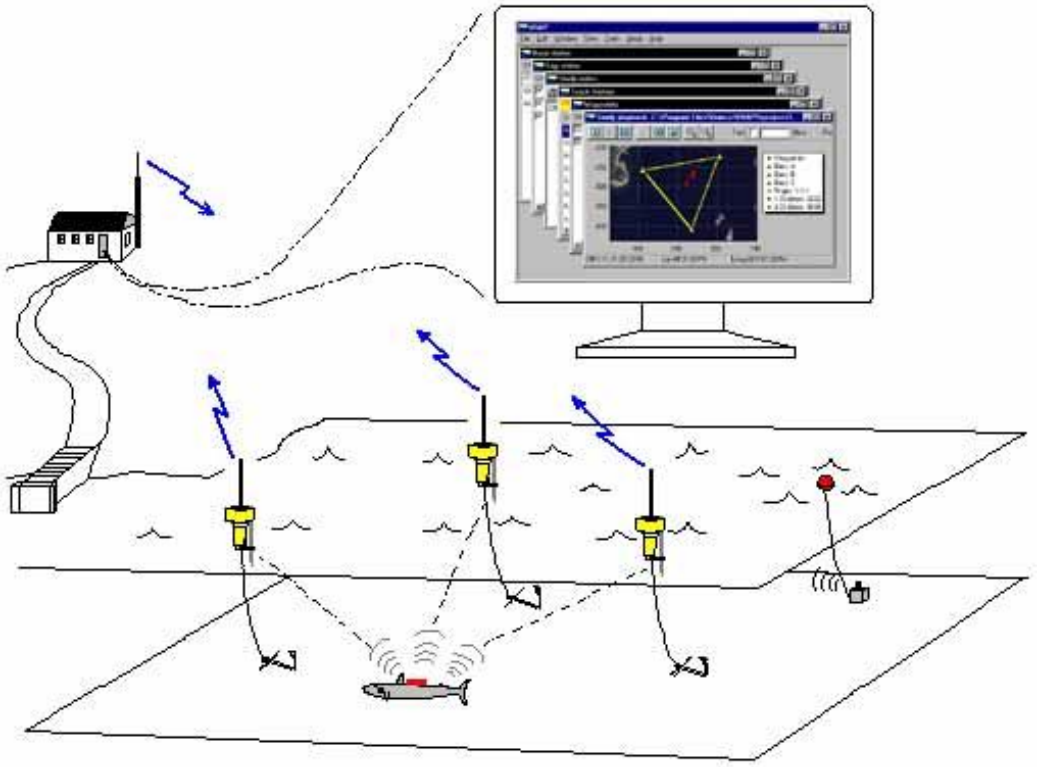
Methods

- Acoustic survey
  - Multifrequency split beam
  - Bathymetry, bottom typing echo, macrophytes, fish density, fish size (TS), fish species
  - Boat avoidance
  - Underwater camera / ROV

BioSonics DTX scientific echosounder: 12V, GPS integrated, 3 frequency (1000, 420, 200 kHz)

Methods

- Temperature profiling
  - fixed mooring
- VRAP 3D telemetry tracking



Problems-Solutions

- Boat avoidance
  - use quiet by design boat
  - experiments to quantify avoidance and acoustic properties
- Species ID and TS
  - experiments and multi-frequency analyses

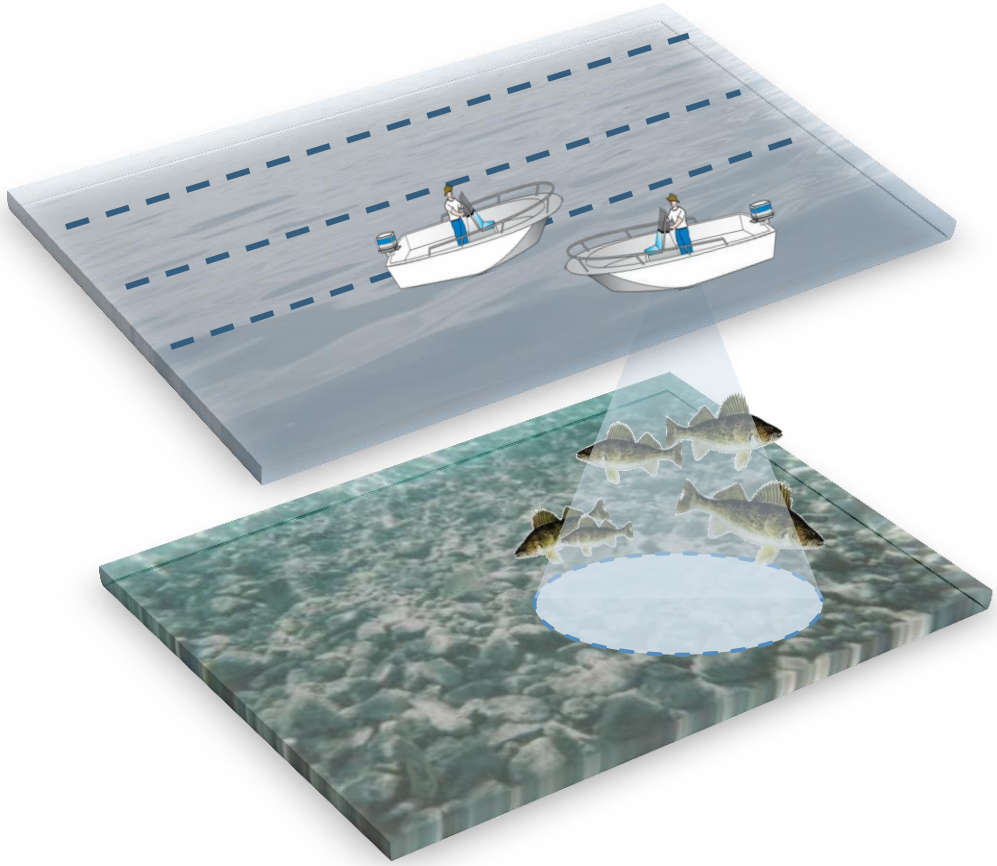
Problems-Solutions: Boat avoidance

- To reduce avoidance, use quiet by design boat :
  - Whaler cored hull
  - 4 stroke motor (small)
  - Storage battery power

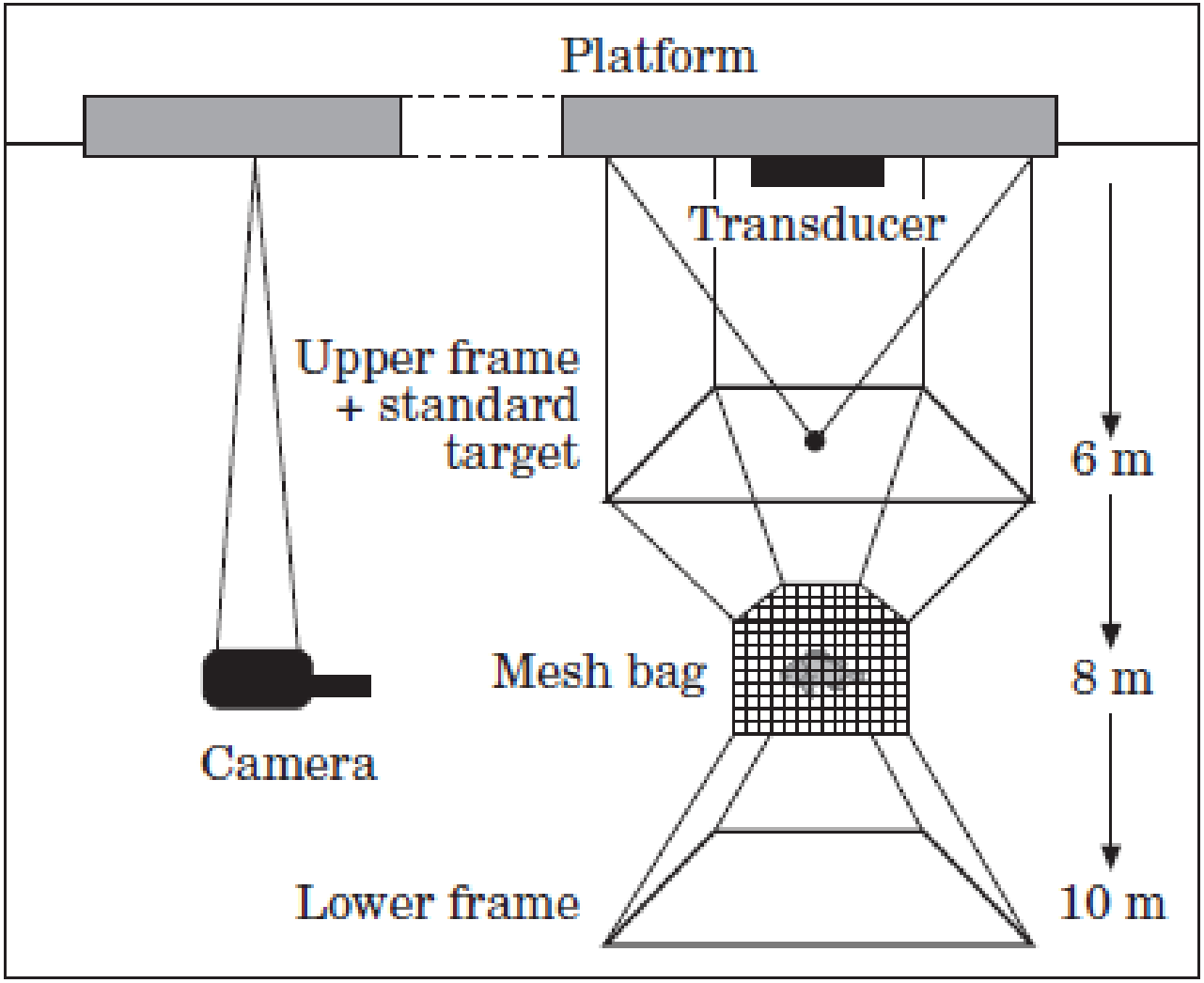
Problems-Solutions: Boat avoidance

1. **Using 2 boats** – one stationary with acoustic equipment, one running transects

2. **Using telemetry** – tagged fish in VRAP system as boat passes

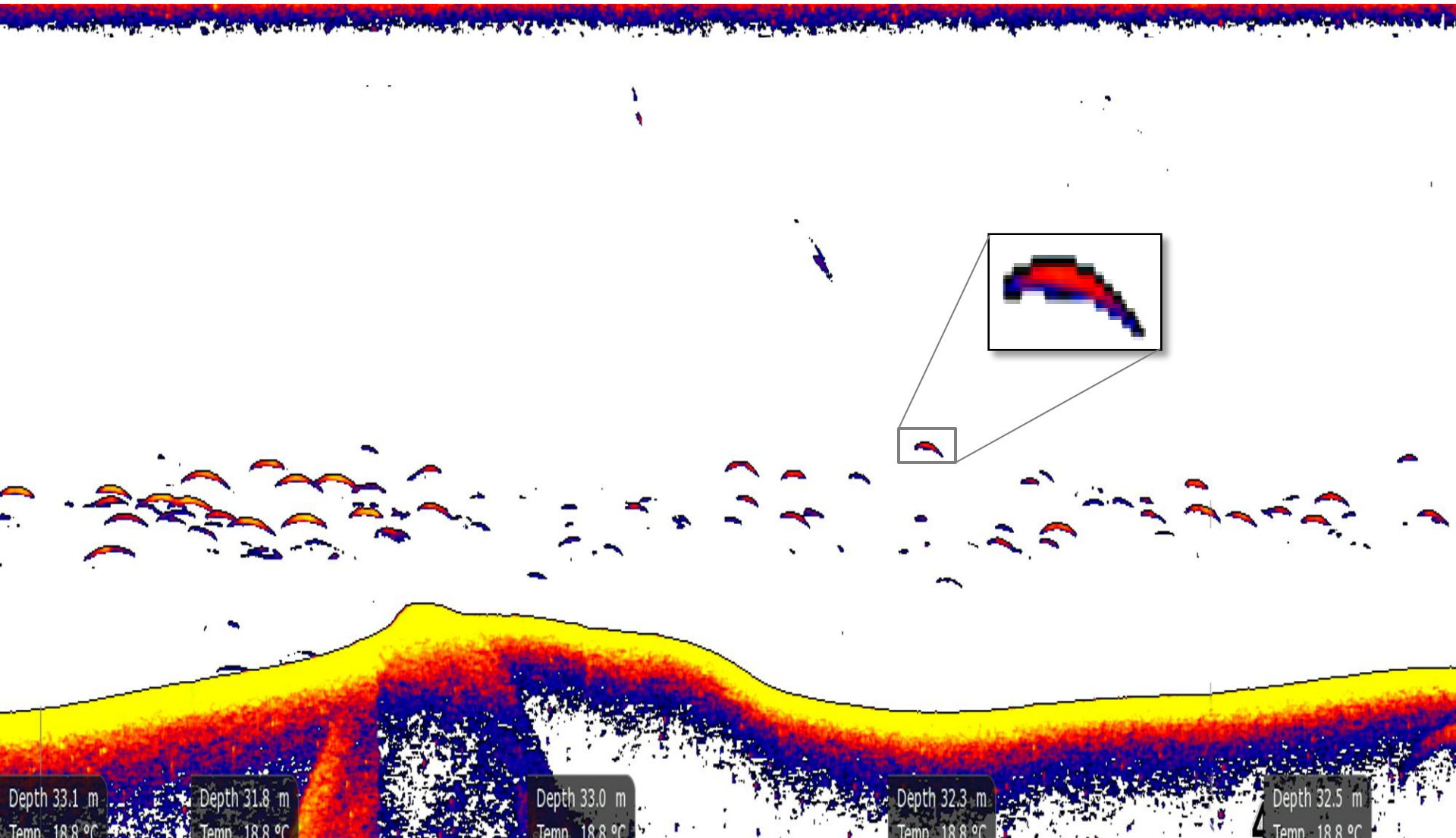


Problems-Solutions: TS Experiments

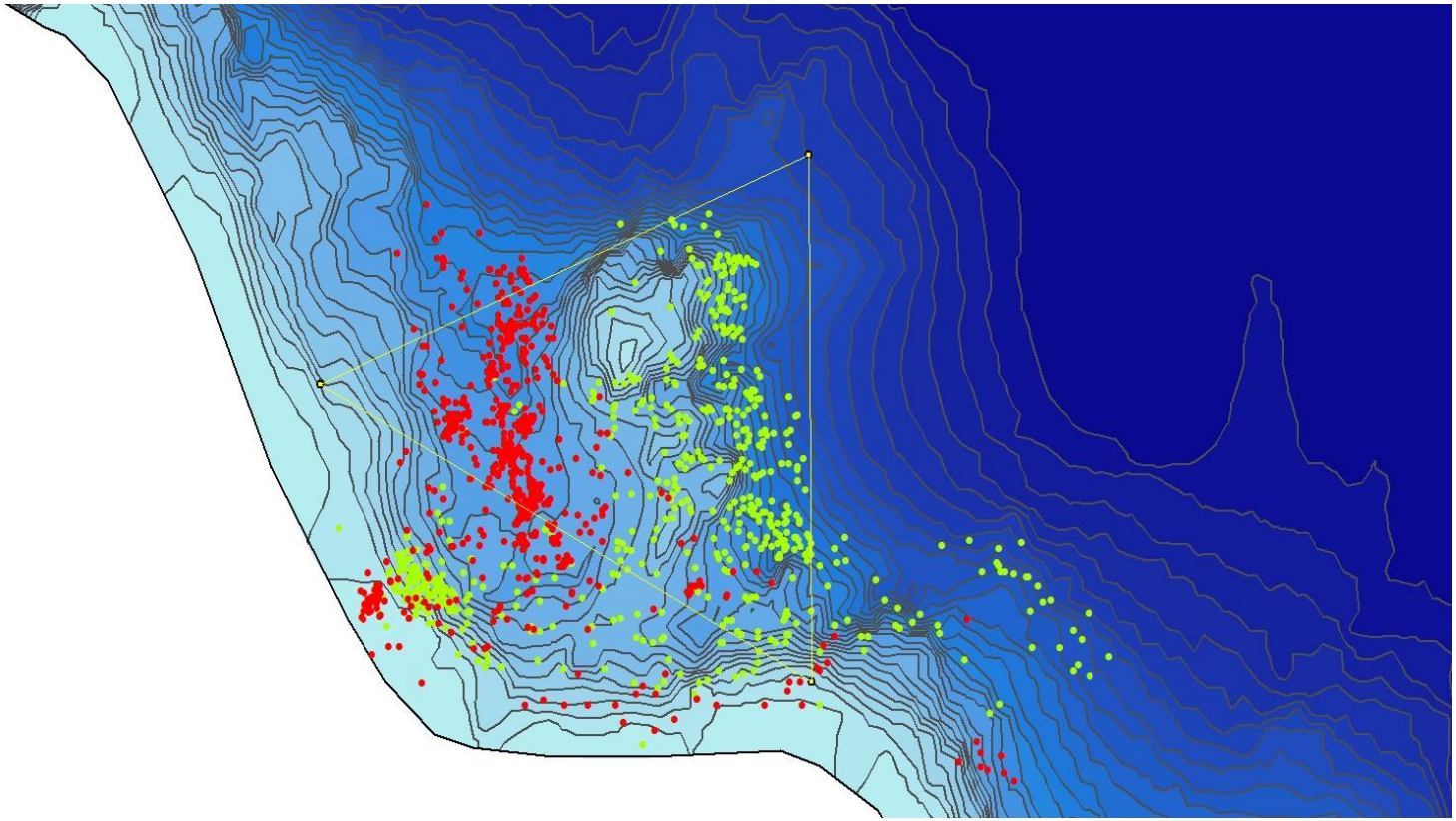


(Gauthier, S. and Rose, G.A. 2001)

Cold Spring Pond Aug. 2010–200 kHz Lowrance sounder



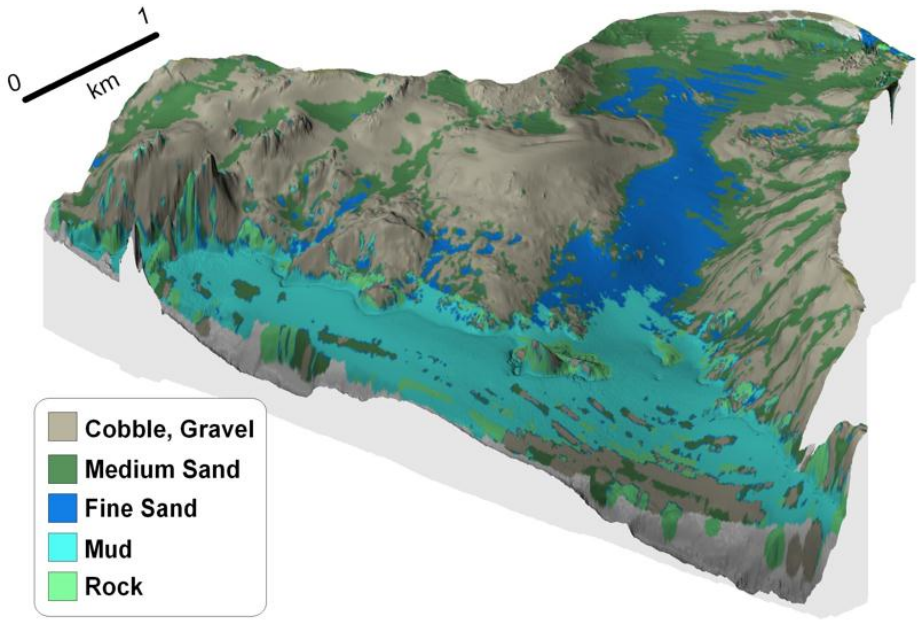
VRAP tracking



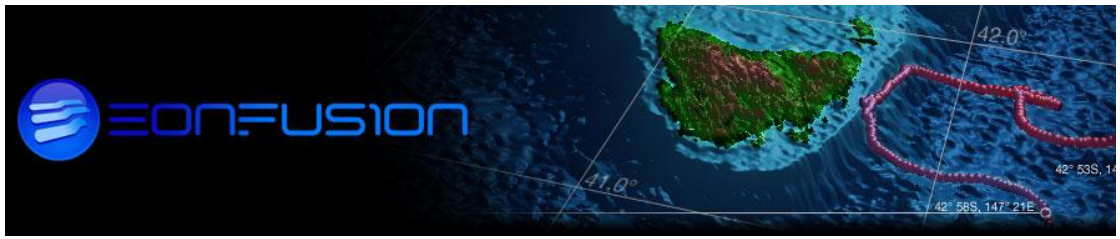
Juvenile cod movements over a month

Smith Sound, Newfoundland

Data Processing

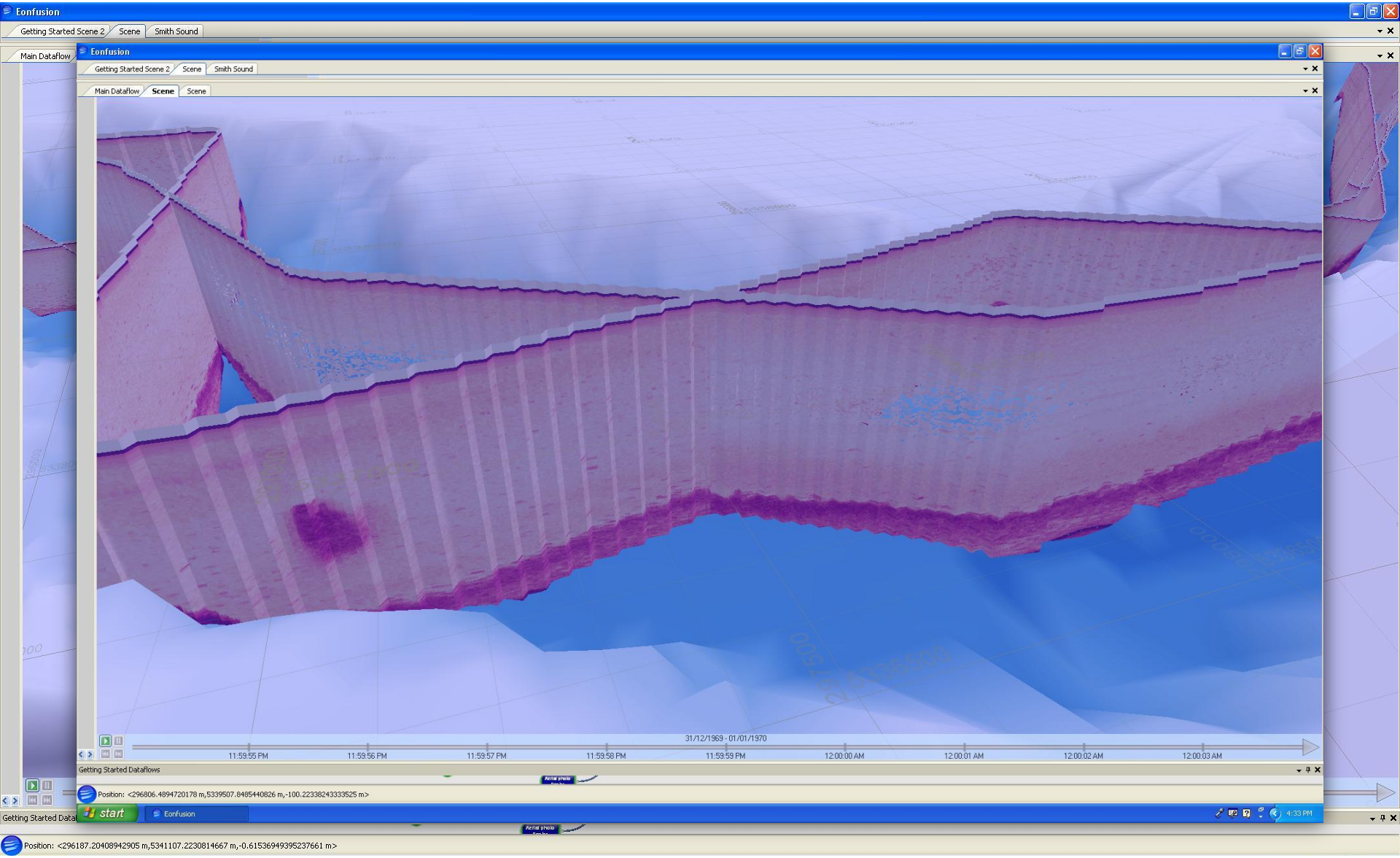


- EchoView
- QTC
- ArcGIS
- Eonfusion



Spatial Analysis

- Geostatistics for fish distribution and abundance
  - Compare with independent geocorrelates (eg. Temp, depth, slope)
- Spatial interpolates for habitat
  - Qualitative factors
- Describe relationships using:
  - Regression, General Additive Models, Geographic Weighted Regression, Regression Trees



Smith Sound, Newfoundland

In Summary:

- Acoustic surveys will allow us to:
  - Estimate fish stock abundances
  - Map bathymetry, bottom type and habitat
  - Track fish habitat usage and movement

Make connections between fish and habitat at high resolutions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Thank you!