



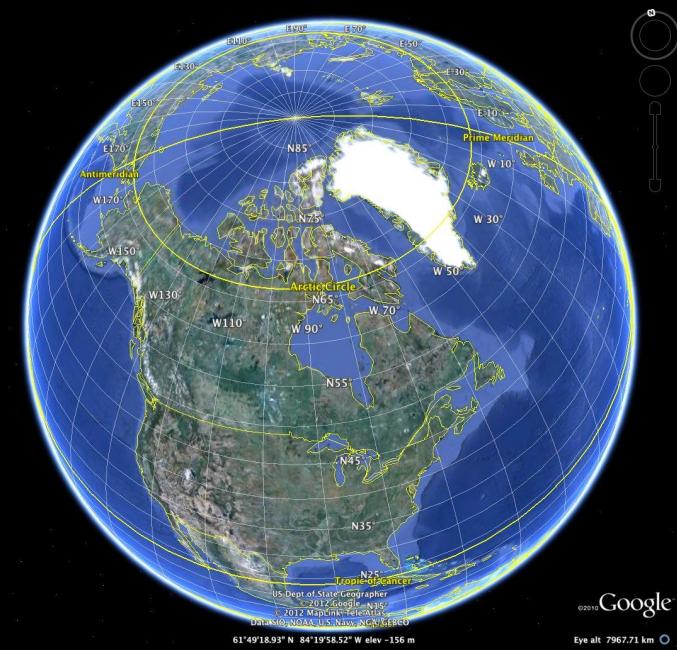
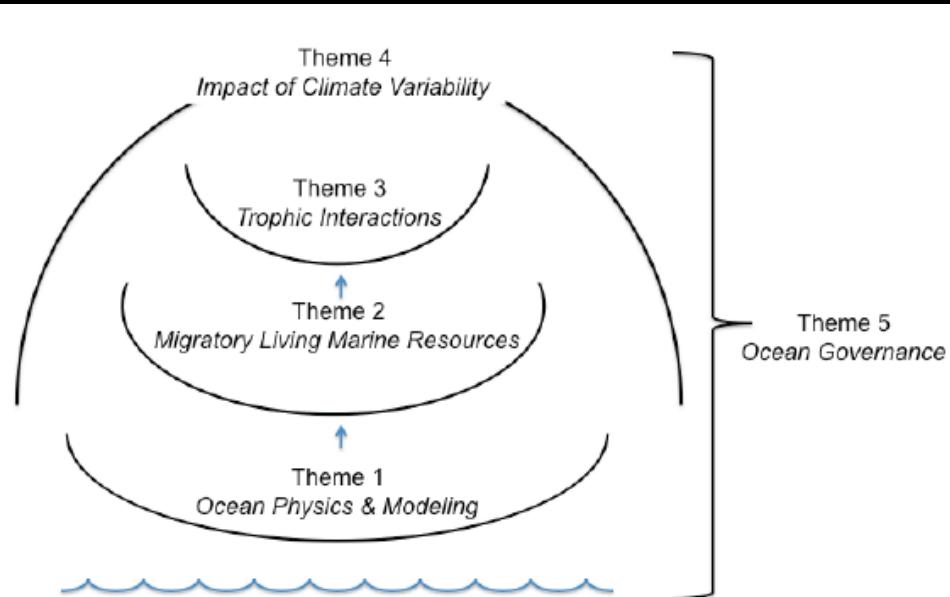
The Arctic Ocean Tracking Network: Movement and behaviour of an important commercial fish species, Greenland halibut and by- catch species, Greenland shark and Arctic skate in Cumberland Sound.

Nigel E. Hussey, Iva Peklova, Kevin J. Hedges,
Svein Vagle, Jeannette Bedard, Margaret Treble and
Aaron T. Fisk



Overall Arctic OTN objective:

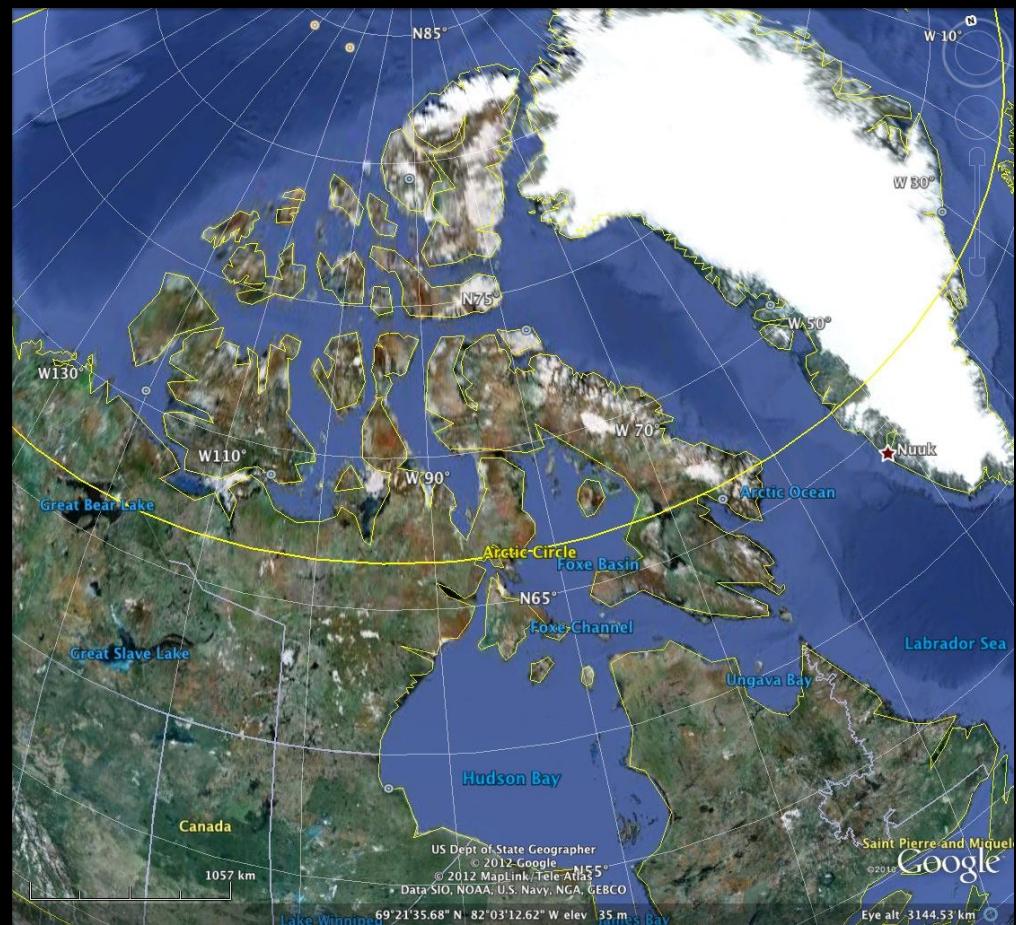
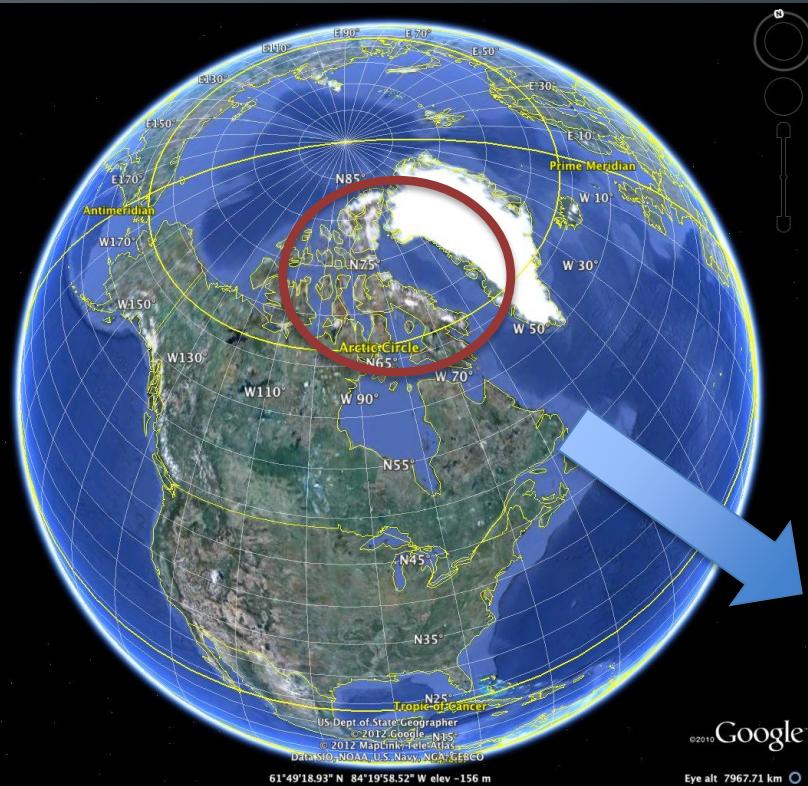
A long term integrative research program which makes use of the latest acoustic and satellite tracking technologies to understand multi-species movements in both a developing and changing ecosystem.



Ocean Tracking Network

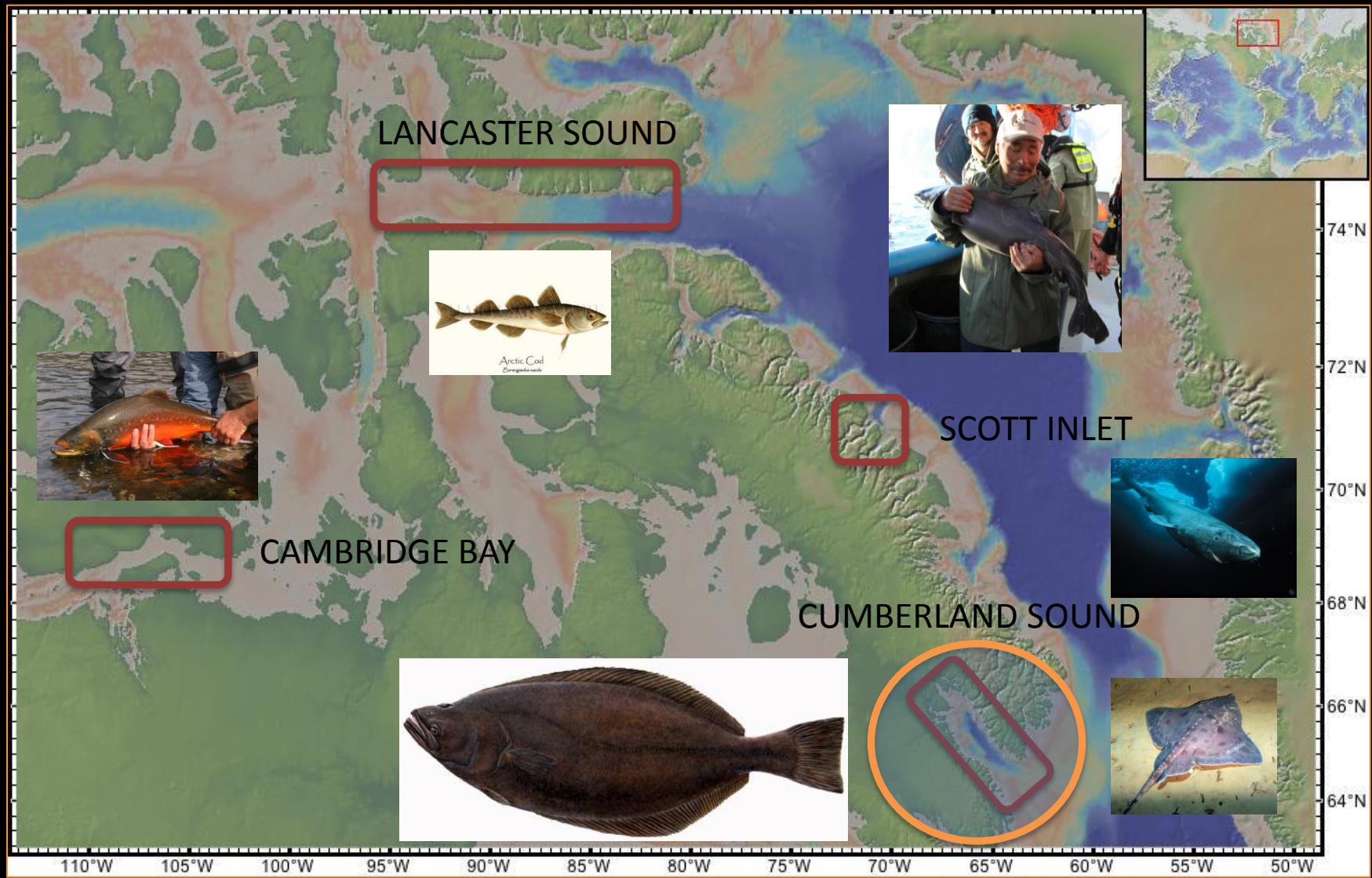


Ocean Tracking Network





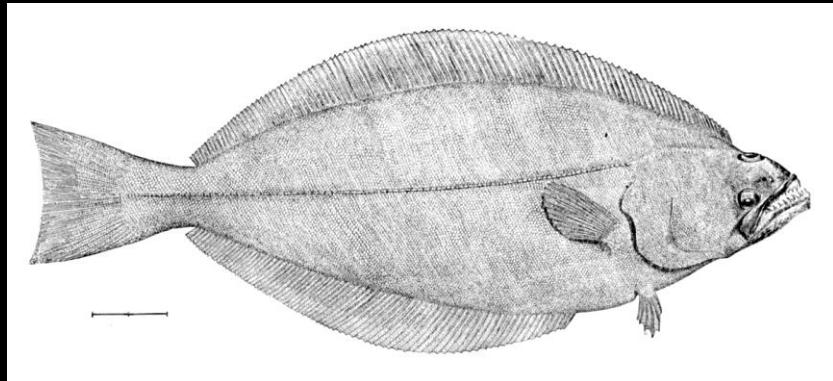
PROJECT LOCATIONS





Target species: FISH AND ELASMOBRANCH

Commercial value / Potential for Developing Fisheries

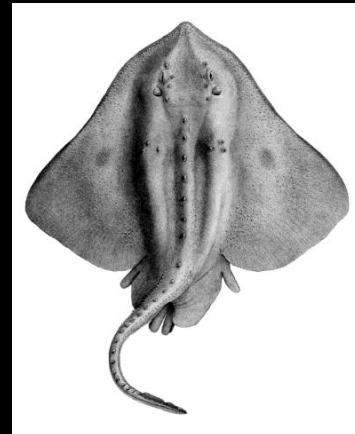


Greenland halibut (*Reinhardtius hippoglossoides*)

Principal by-catch species



Greenland shark (*Somniosus microcephalus*)



Arctic skate (*Amblyraja hyperborea*)



Cumberland Sound Fisheries

Traditional **WINTER** fishery



Developing **SUMMER** fishery





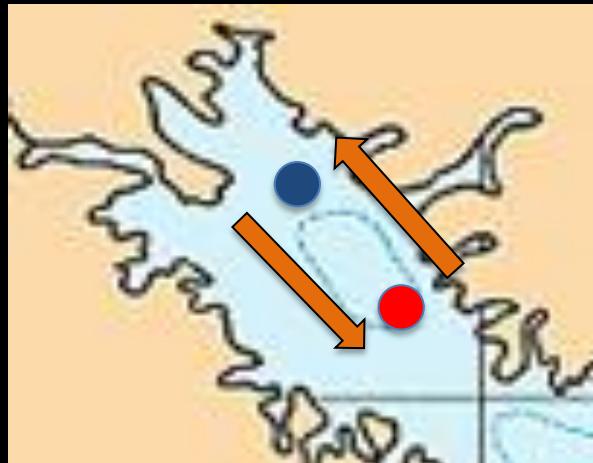
Questions for effective fisheries management:

Stock assessment – sustainable quotas

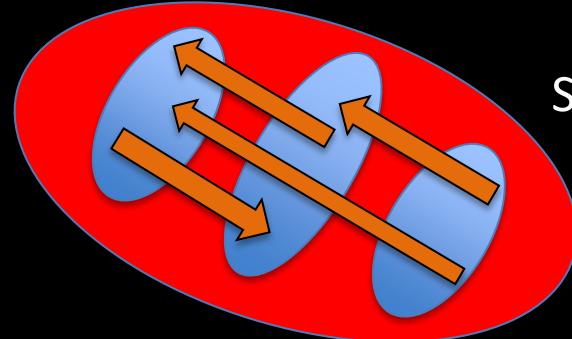
(i) Population size

(ii) Stock structure (sex /size composition/breeding population)

(iii) Movement (between fishing grounds)

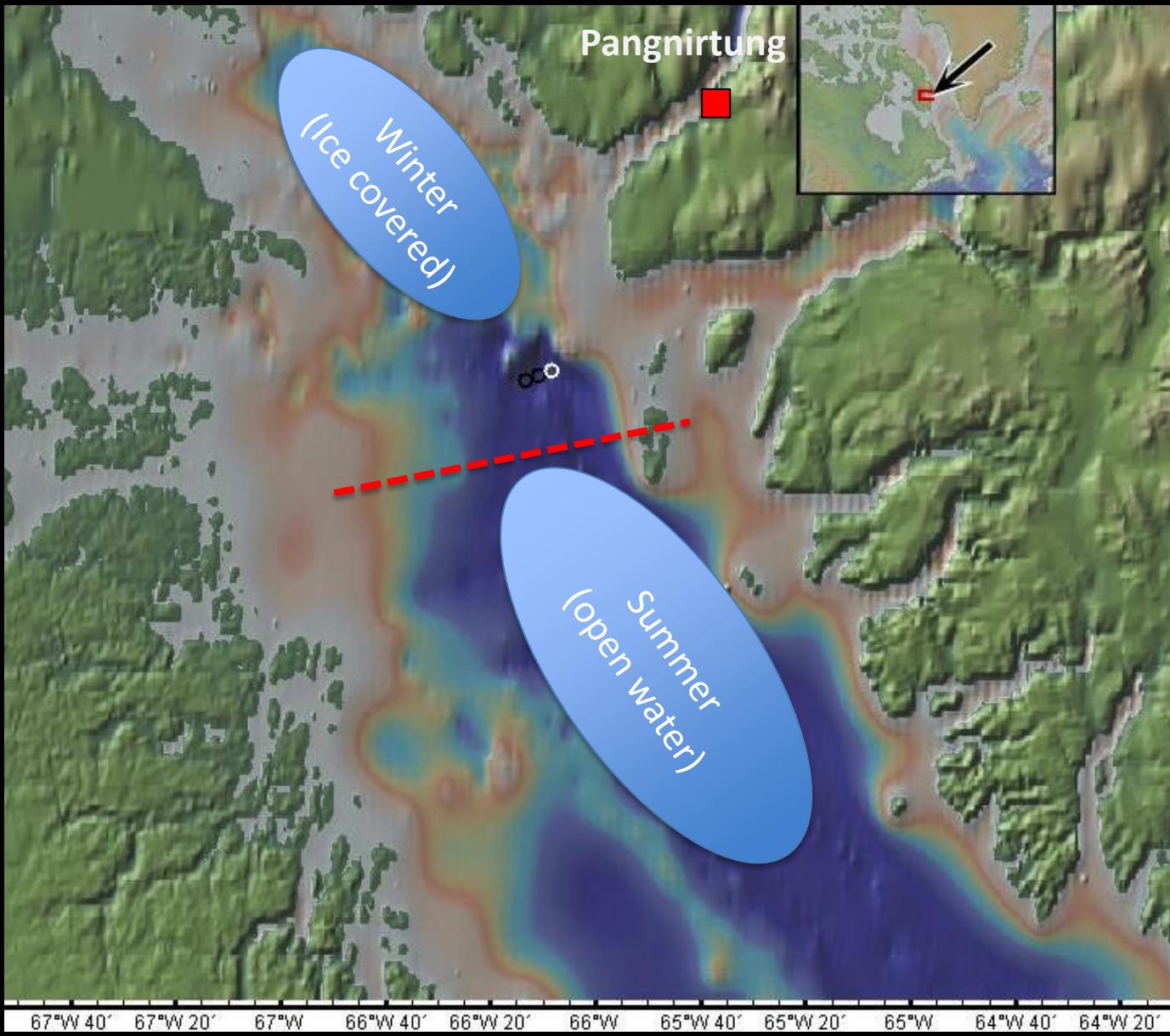


(iv) Movement within summer fishing grounds



Sub-structure

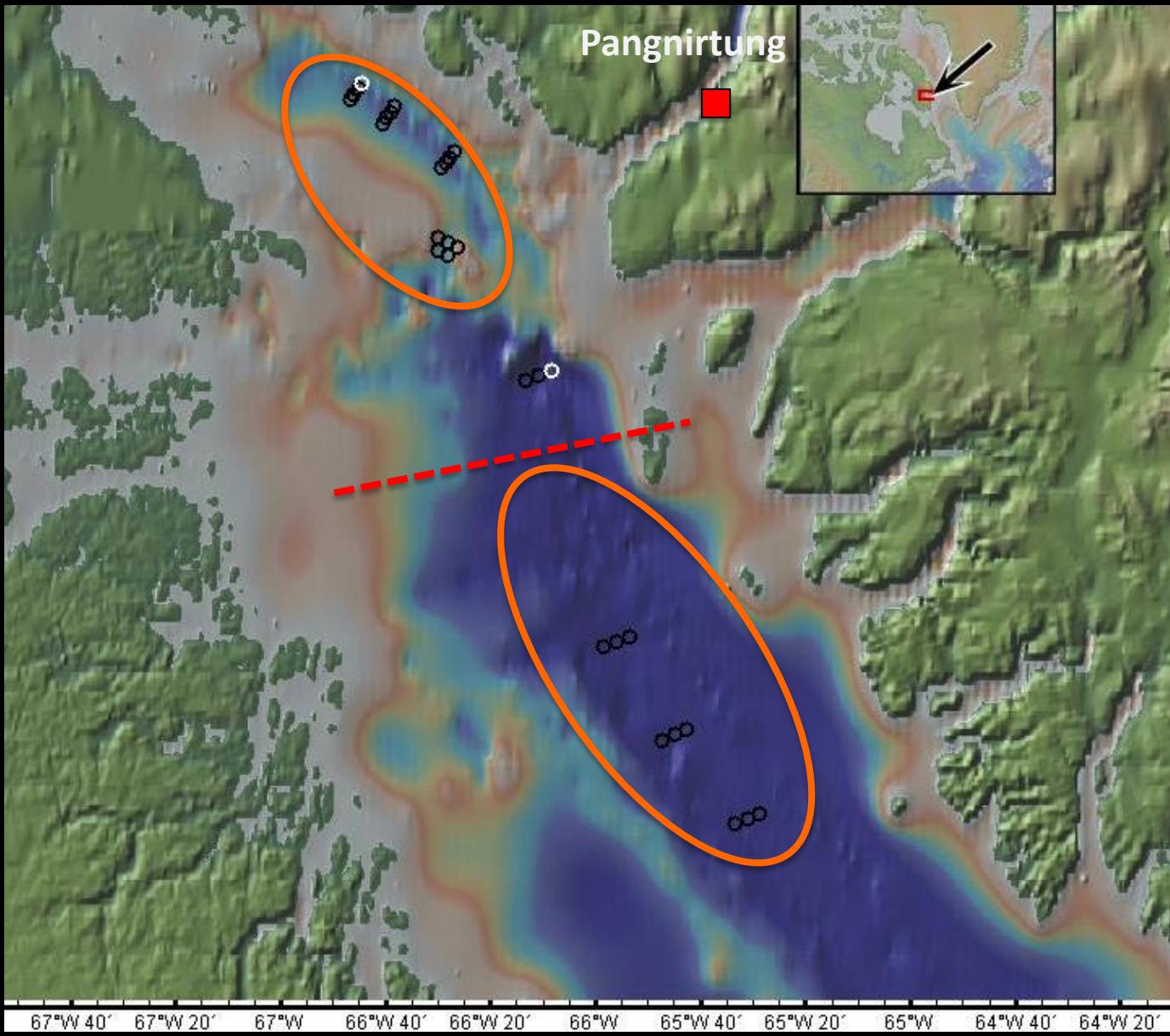
Depth stratified survey





Deploying the ACOUSTIC ARRAY







ACOUSTIC TAGGING Greenland halibut





ACOUSTIC TAGGING Greenland shark

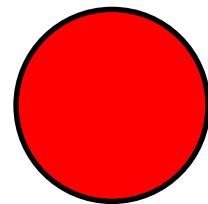




ACOUSTIC TAGGING Arctic skate



TURBOT tagged in summer – open water SUMMER fishing grounds August 2010/2011



Total turbot tagged: 182
Total turbot detected: 134

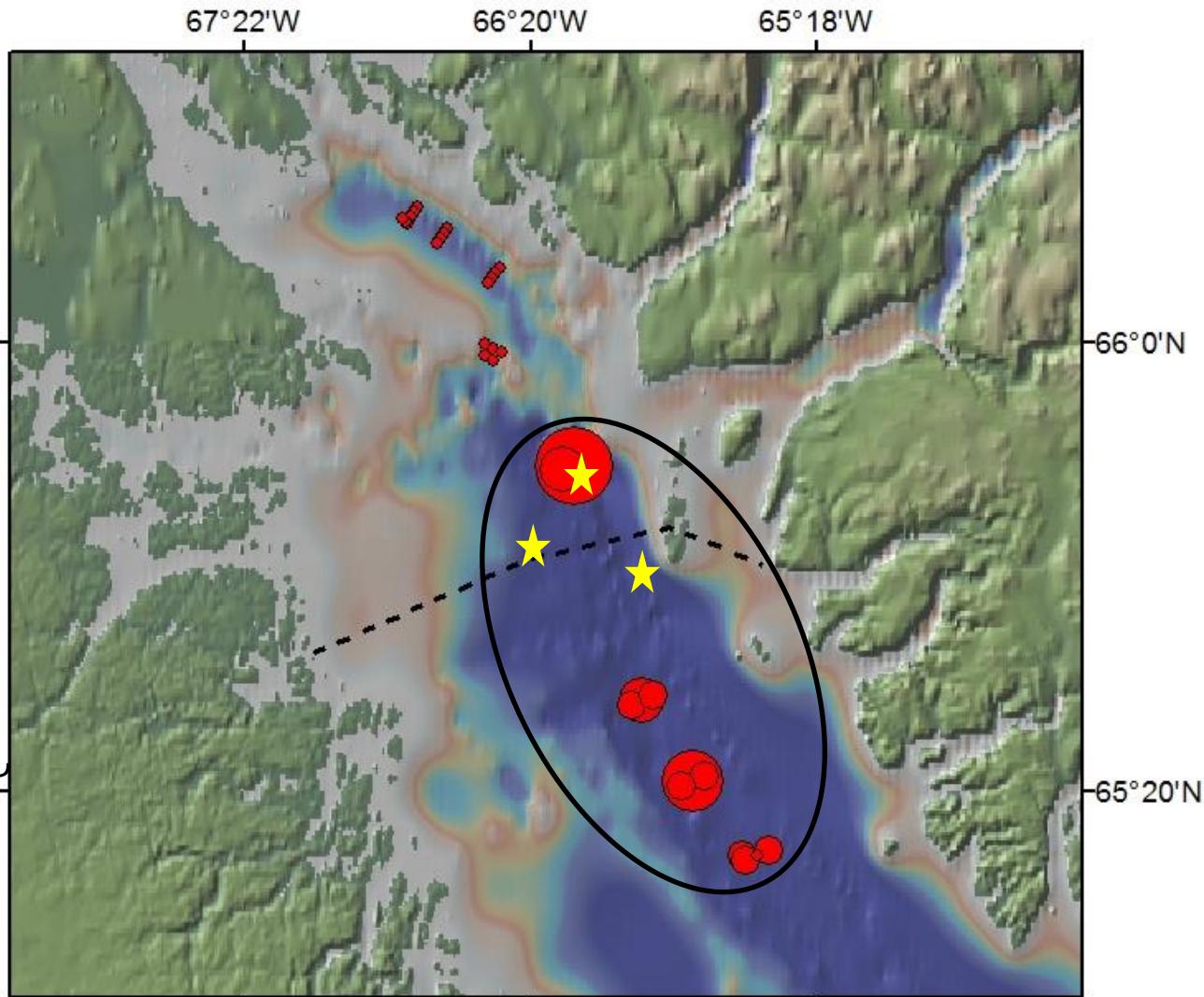
◀▶▷ 2011

TURBOT – SUMMER TAGGED

August 2011

- | Value Range | Count |
|-------------|-------|
| 0 - 20 | 1 |
| 21 - 74 | 1 |
| 75 - 168 | 1 |
| 169 - 459 | 1 |
| 460 - 973 | 1 |

----- Management Boundary



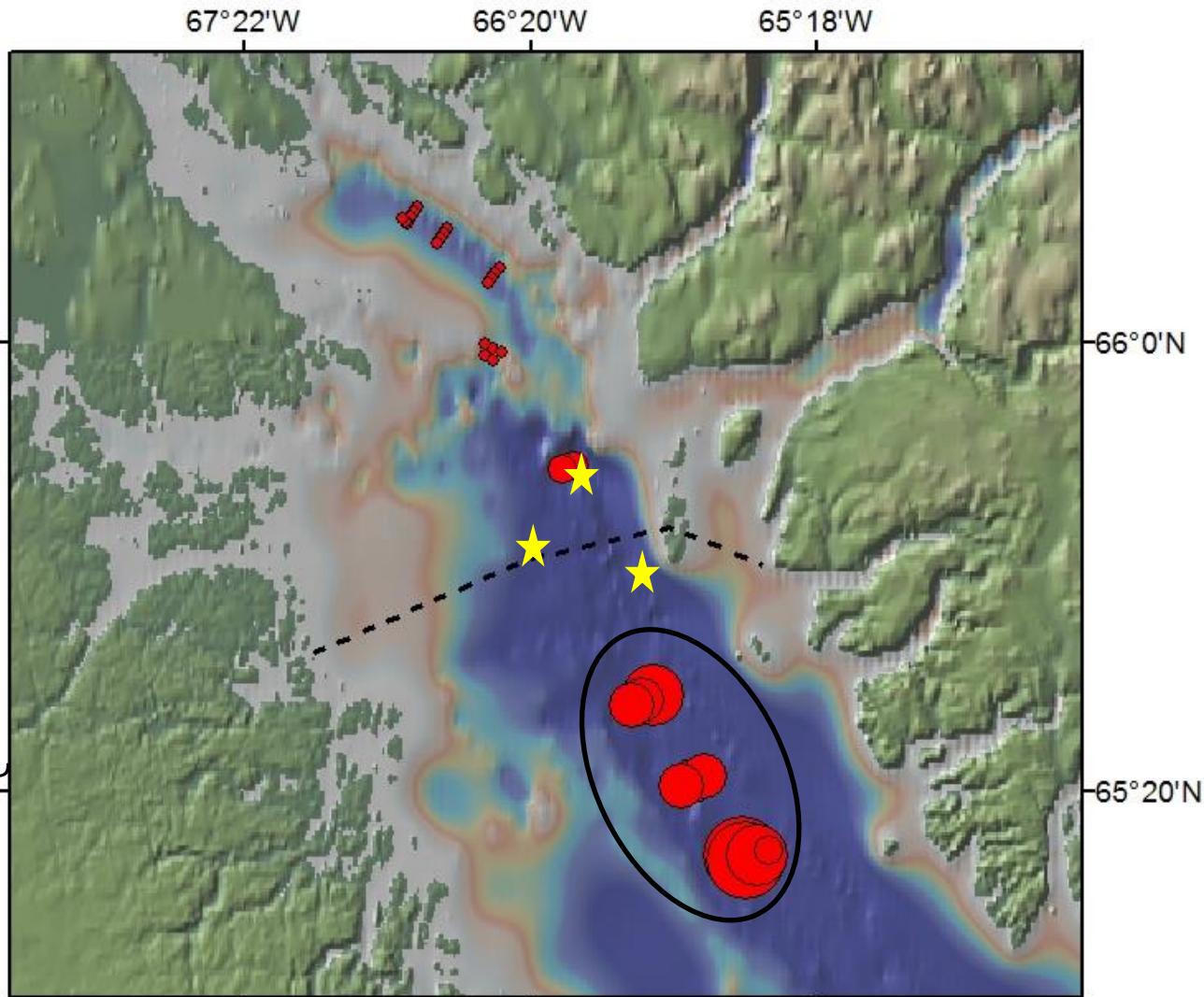
◀▷↳▫◀σ ◀▫▷Γ◀◀
✗□✗ 2011

TURBOT – SUMMER TAGGED

September 2011

- 0 - 25
 - 26 - 223
 - 224 - 435
 - 436 - 823
 - 824 - 1725

----- Management Boundary

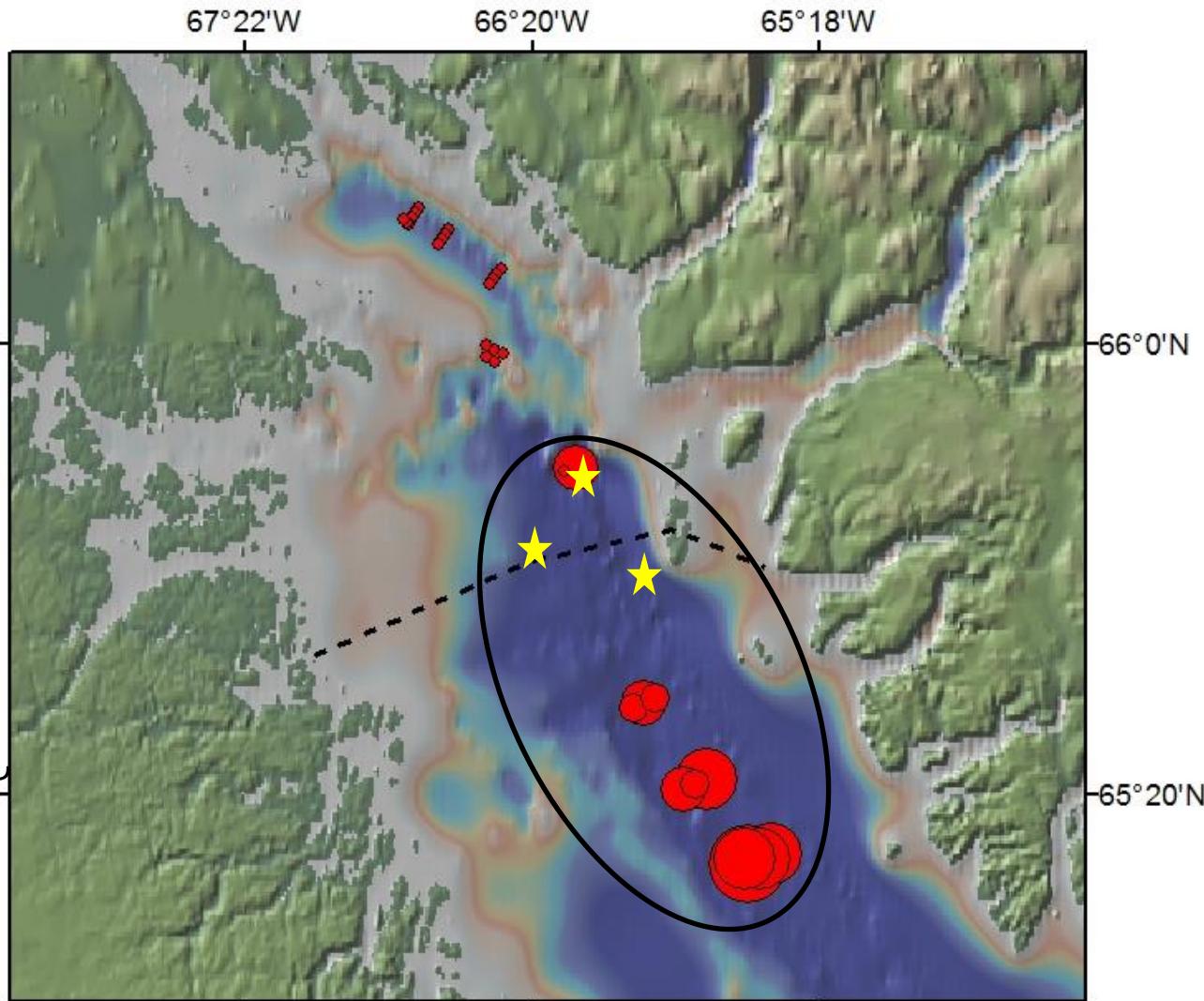


TURBOT – SUMMER TAGGED

October 2011

- 0 - 12
 - 13 - 216
 - 217 - 413
 - 414 - 557
 - 558 - 797

----- Management Boundary

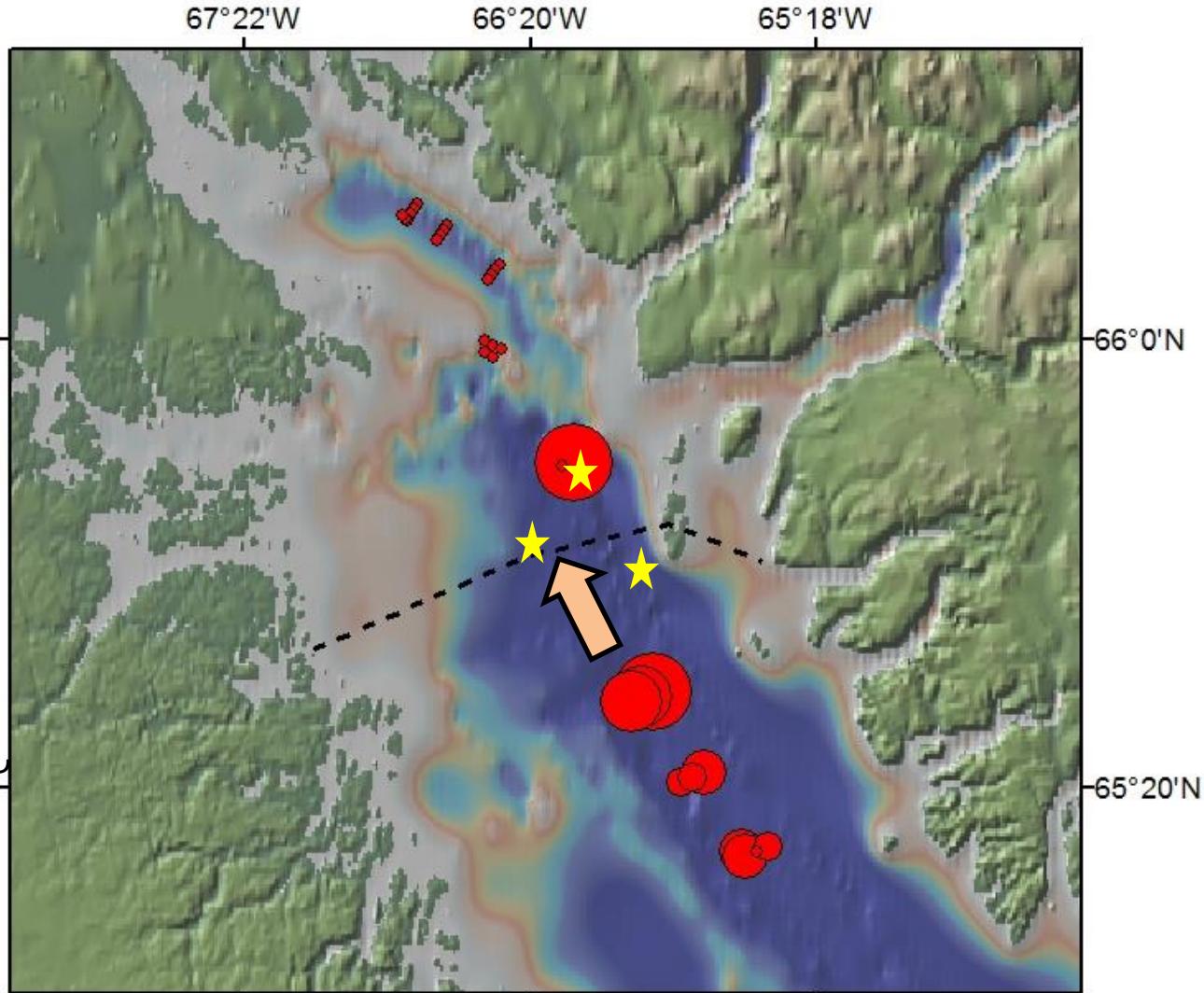


TURBOT – SUMMER TAGGED

November 2011

- 0 - 25
 - 26 - 233
 - 234 - 558
 - 559 - 903
 - 904 - 2988

----- Management Boundary

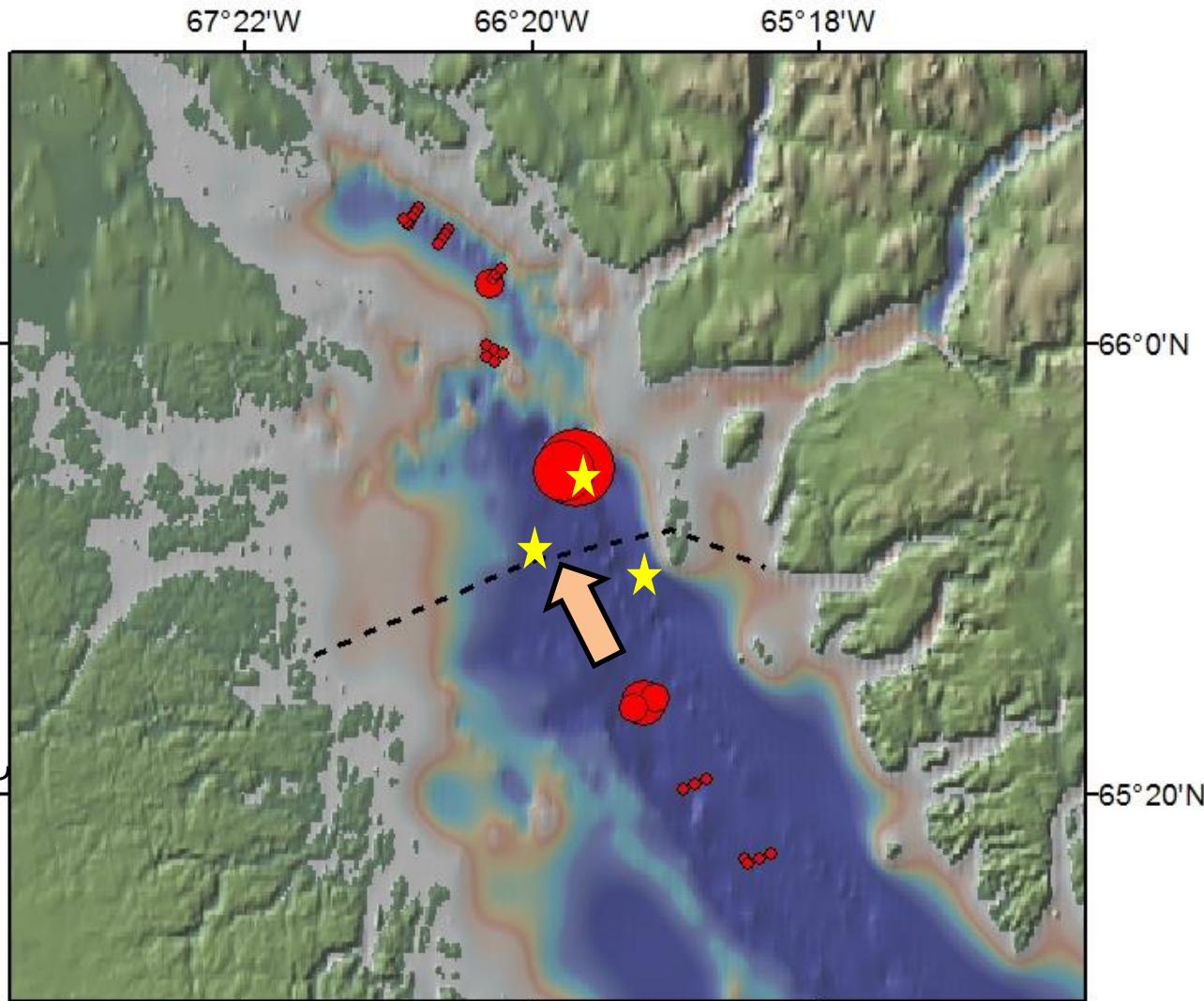


TURBOT – SUMMER TAGGED

December 2011

- 0 - 149
 - 150 - 693
 - 694 - 1044
 - 1045 - 2140
 - 2141 - 6922

----- Management Boundary



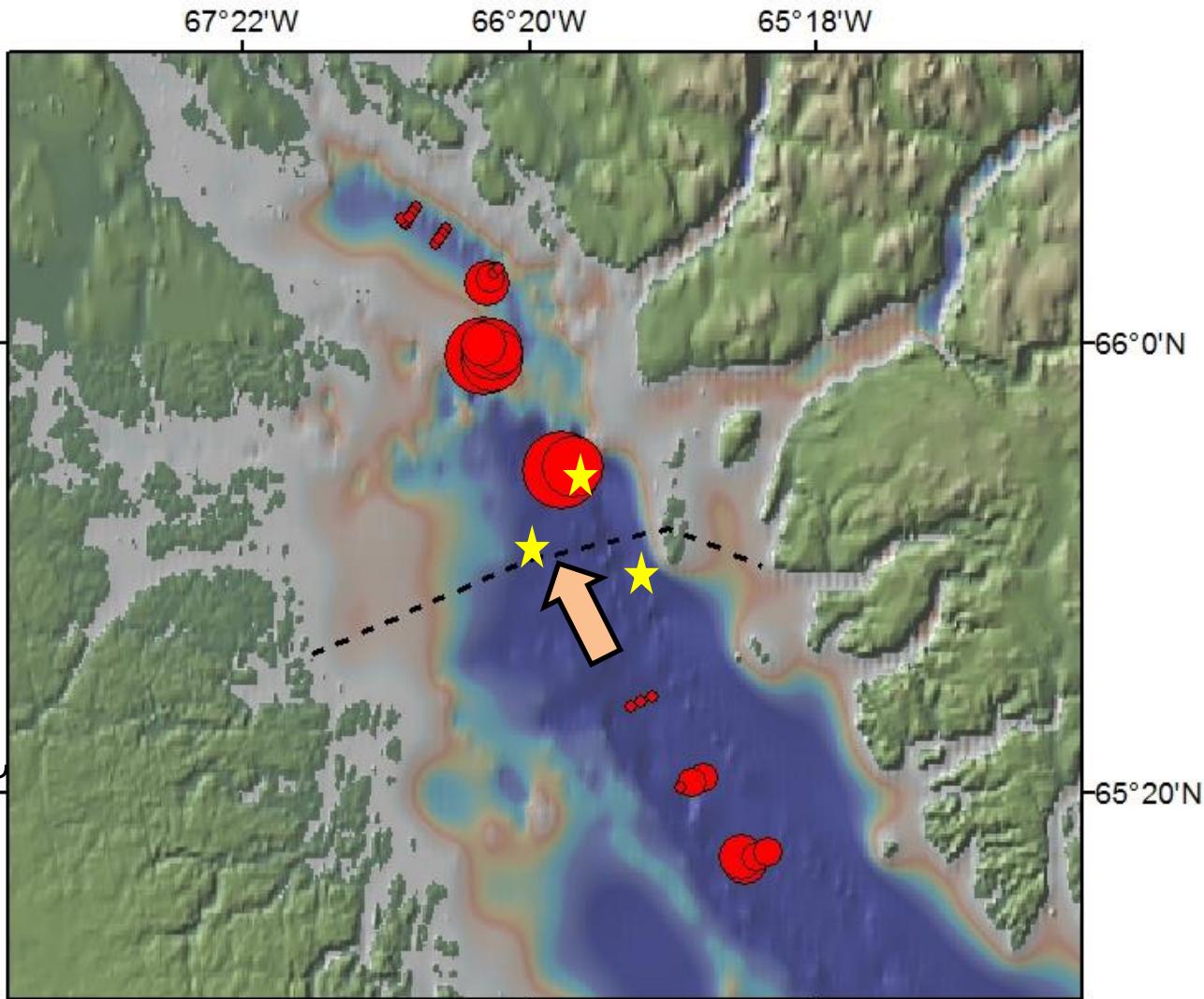
TURBOT – SUMMER TAGGED

January 2012

- 0 - 26
 - 27 - 89
 - 90 - 388
 - 389 - 835
 - 836 - 1459

----- Management Boundary

◀▷ርርብ ማስኅበር የርርብና ሂሳብ

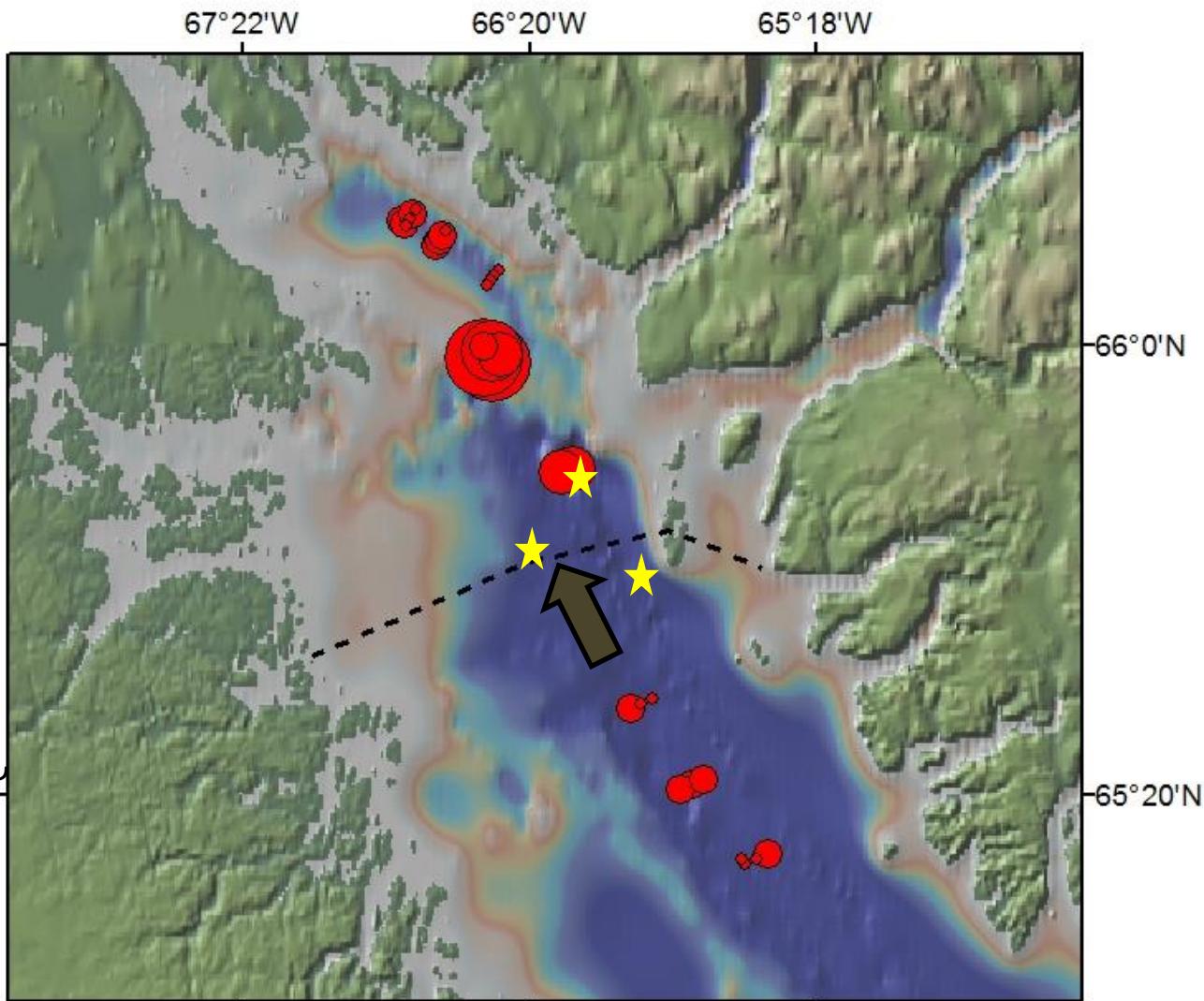


TURBOT – SUMMER TAGGED

February 2012

- 0 - 29
 - 30 - 168
 - 169 - 961
 - 962 - 1507
 - 1508 - 4758

----- Management Boundary
◀▷ርርስናንጻር የርርሃሽናንጻር
 Tagging location



◀▶↳▫σ ◀▫▷Γ<<
↳▫Y 2012

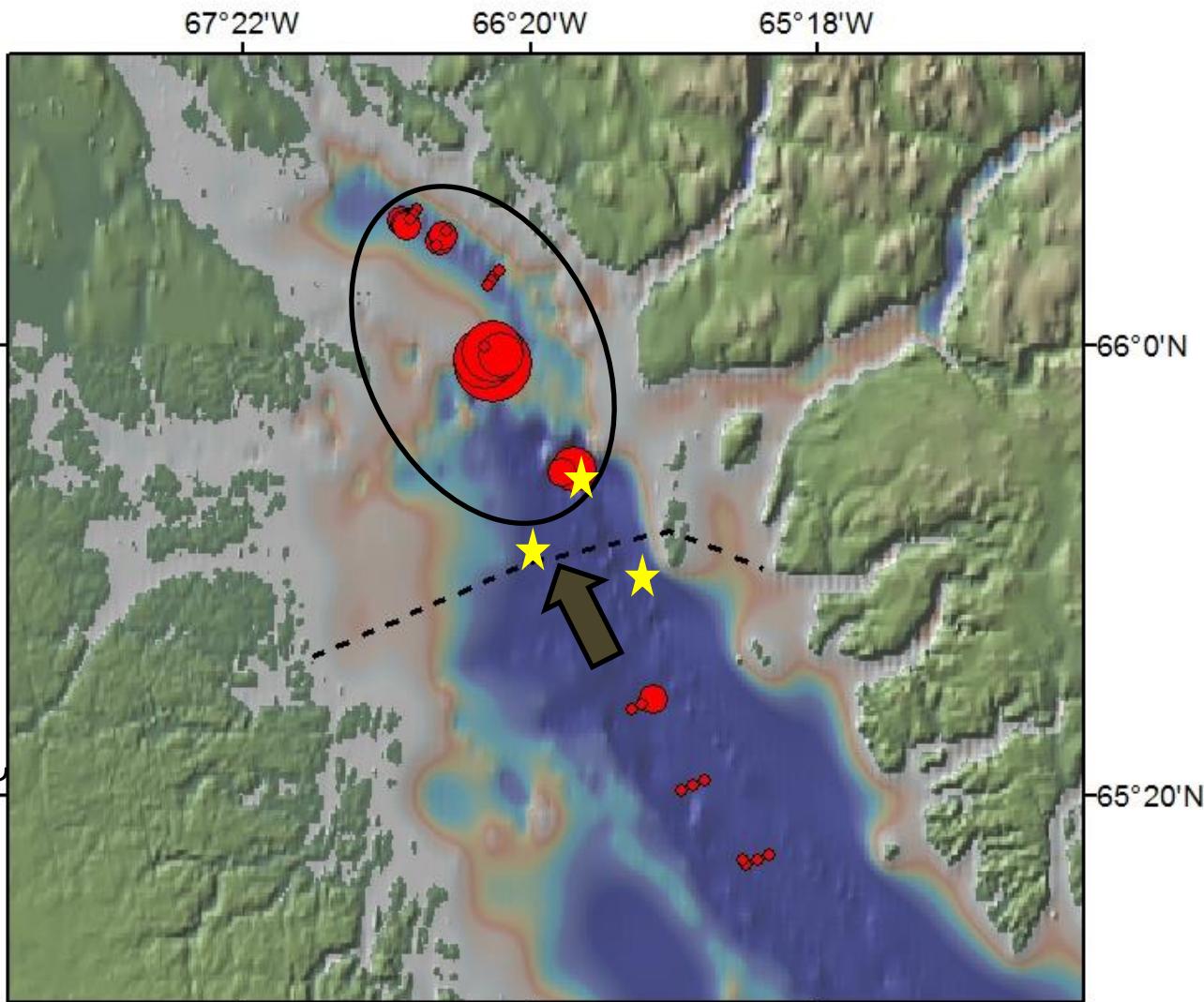
TURBOT – SUMMER TAGGED

March 2012

- 0 - 94
 - 95 - 366
 - 367 - 667
 - 668 - 2051
 - 2052 - 5437

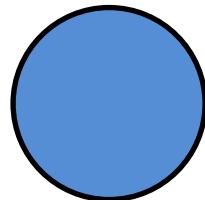
----- Management Boundary

Tagging location



▷▷▷▷▷
▷▷▷▷▷

**TURBOT tagged in winter through ice
WINTER fishing grounds
March 2012**

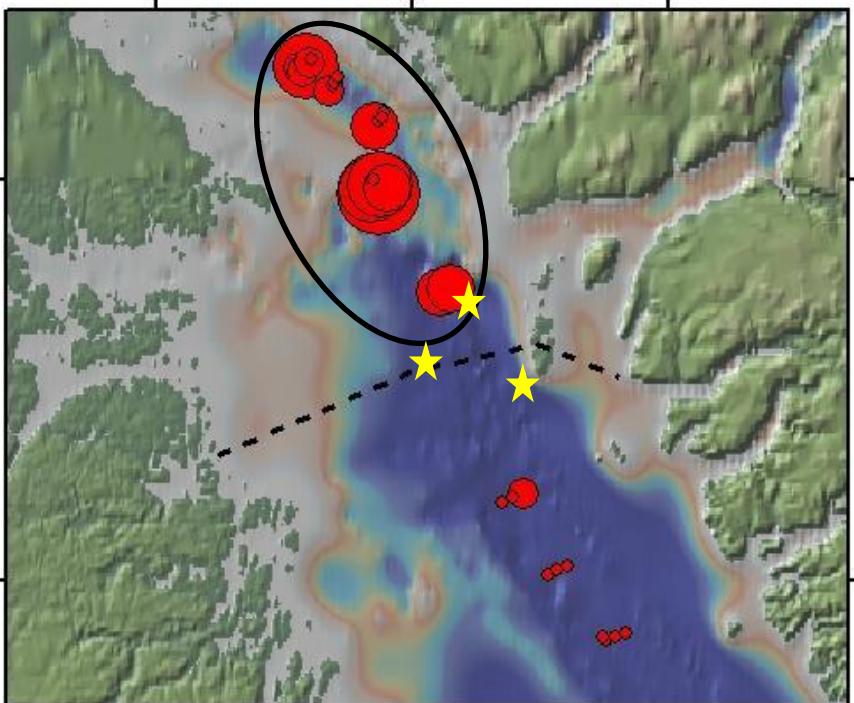


Total turbot tagged: 43
Total turbot detected: 33

67°22'W

66°20'W

65°18'W



★ Tagging location

TURBOT – SUMMER TAGGED

April 2012

- 0 - 103
- 104 - 266
- 267 - 690
- 691 - 1172
- 1173 - 3521

Management Boundary

TURBOT – WINTER TAGGED

April 2012

▷▷▷▷▷◁◁◁◁◁

△△△△△

0 - 3

4 - 25

26 - 292

293 - 613

614 - 5466

◁◁◁◁◁△△△△△

Management Boundary

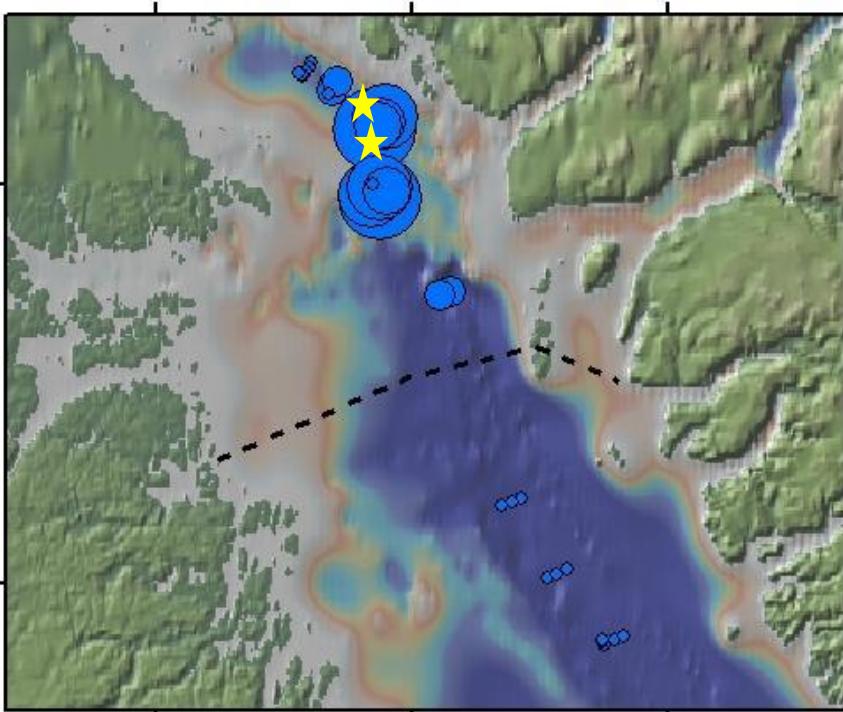
67°22'W

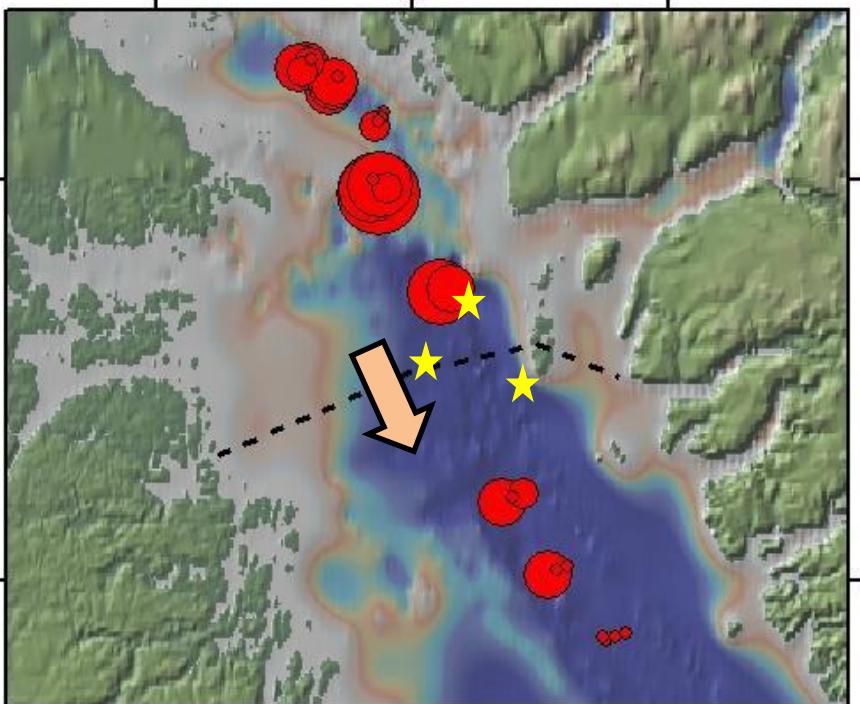
66°20'W

65°18'W

66°0'N

65°20'N





Tagging location

TURBOT – SUMMER TAGGED

May 2012 ◀▶◀▲

- 0 - 21 LΔ
 - 22 - 119
 - 120 - 231
 - 232 - 1236
 - 1237 - 4341

Management Boundary

TURBOT – WINTER TAGGED

May 2012

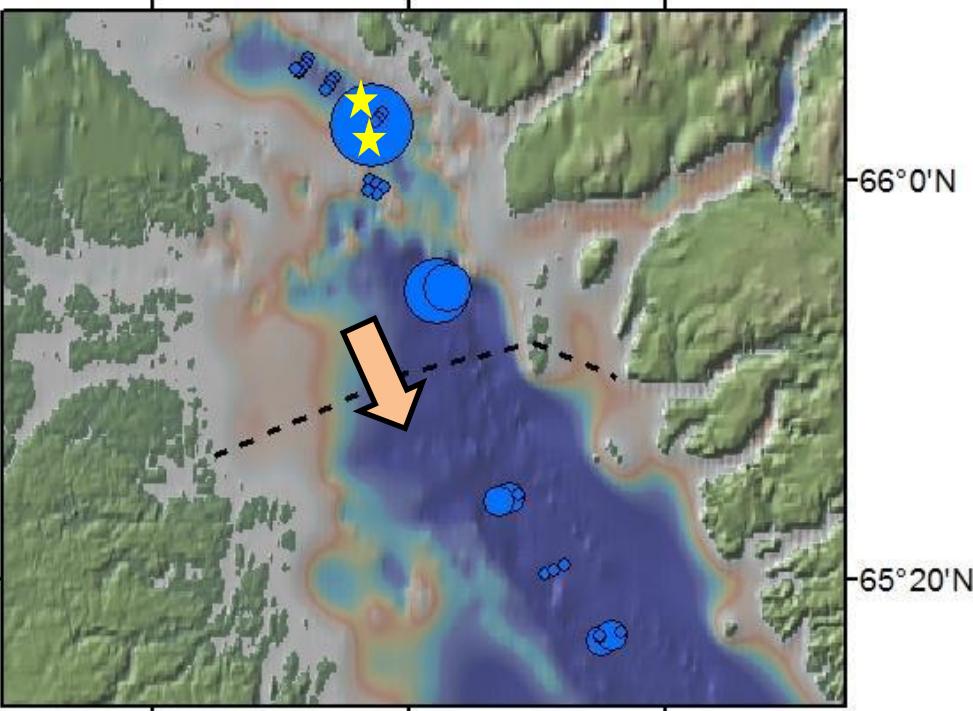
- 0 - 1
 - 2 - 5
 - 6 - 55
 - 56 - 149

150 - 1114
◀▷ርርብስናንጻር የርርብናንጻር
- - - Management Boundary

67°22'W

66°20'W

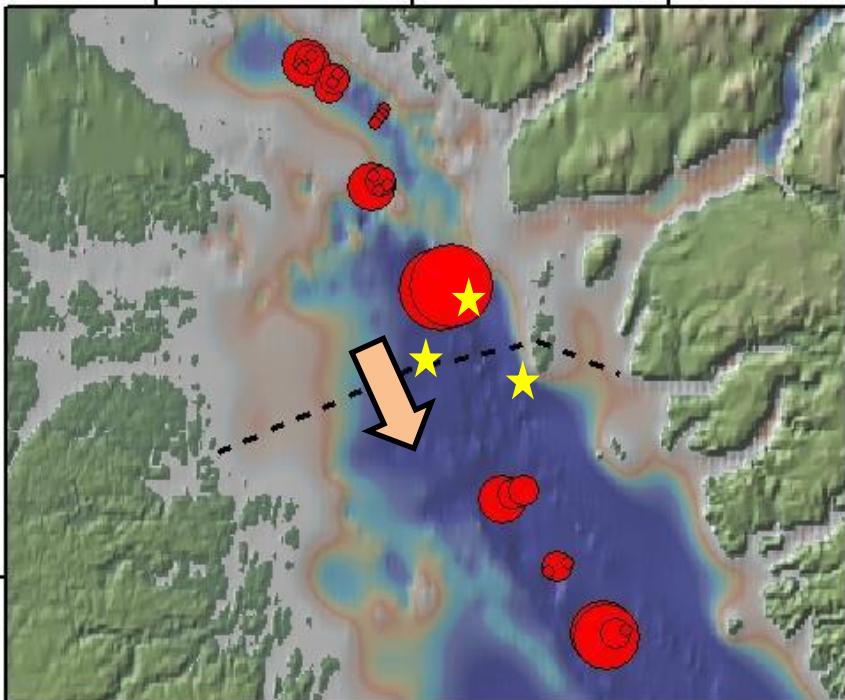
65°18'W



67°22'W

66°20'W

65°18'W



★ Tagging location

TURBOT – SUMMER TAGGED

June 2012

- 0 - 69
- 70 - 157
- 158 - 466
- 467 - 905
- 906 - 2053

Management Boundary

TURBOT – WINTER TAGGED

June 2012

- ▷ P▷ J^c ▲^c C▷ Γ<<
- ↓ σ 2012
- Management Boundary

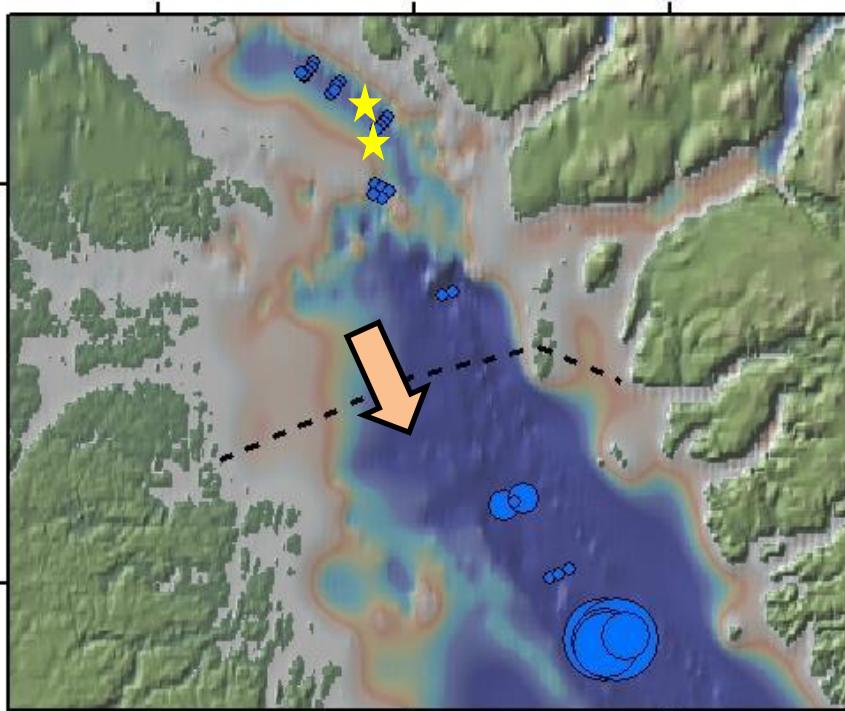
67°22'W

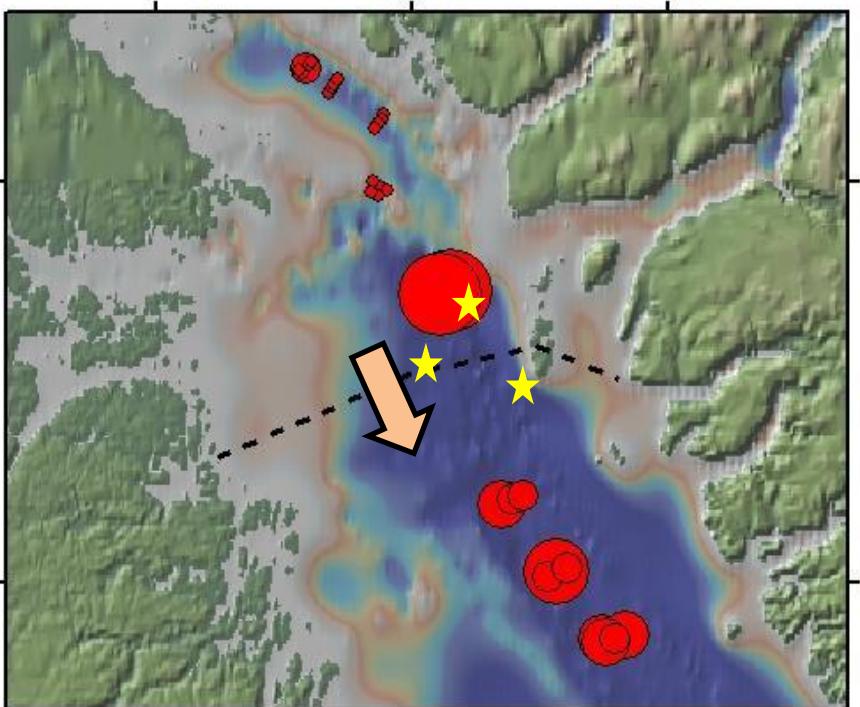
66°20'W

65°18'W

66°0'N

65°20'N





Tagging location

TURBOT – SUMMER TAGGED
July 2012 <1>Ն՞ | Հ <1>

- 0 - 21 ↗△ 2012
 - 22 - 106
 - 107 - 181
 - 182 - 350
 - 351 - 1561

Management Boundary

TURBOT – WINTER TAGGED

July 2012

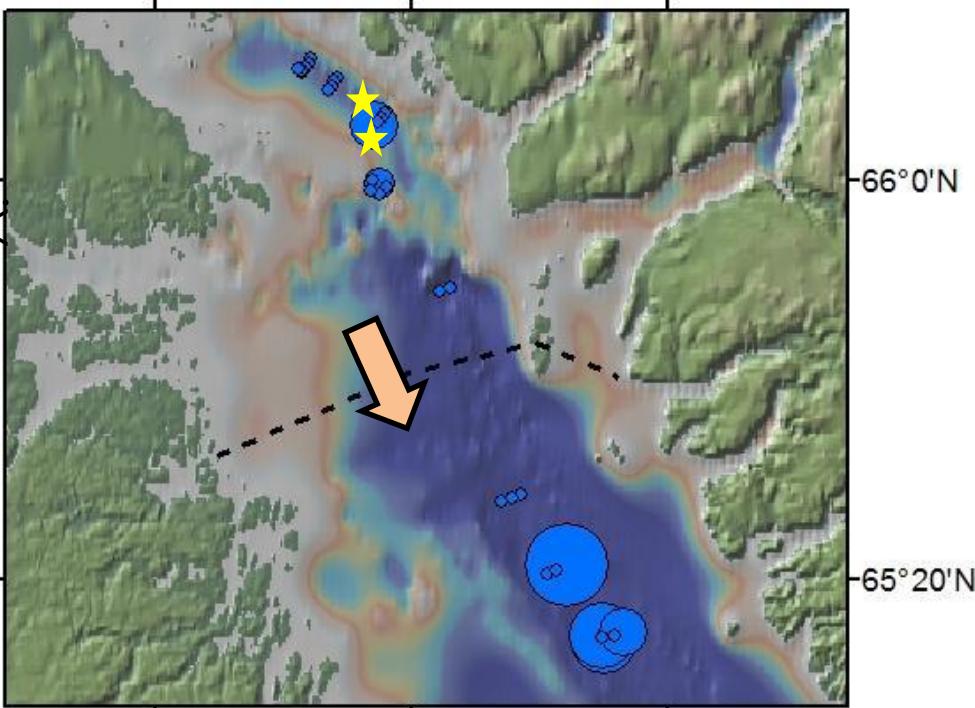
- 0 - 1
 - 2 - 3
 - 4 - 6
 - 7 - 34
 - 35 - 50

Management Boundary

67°22'W

66°20'W

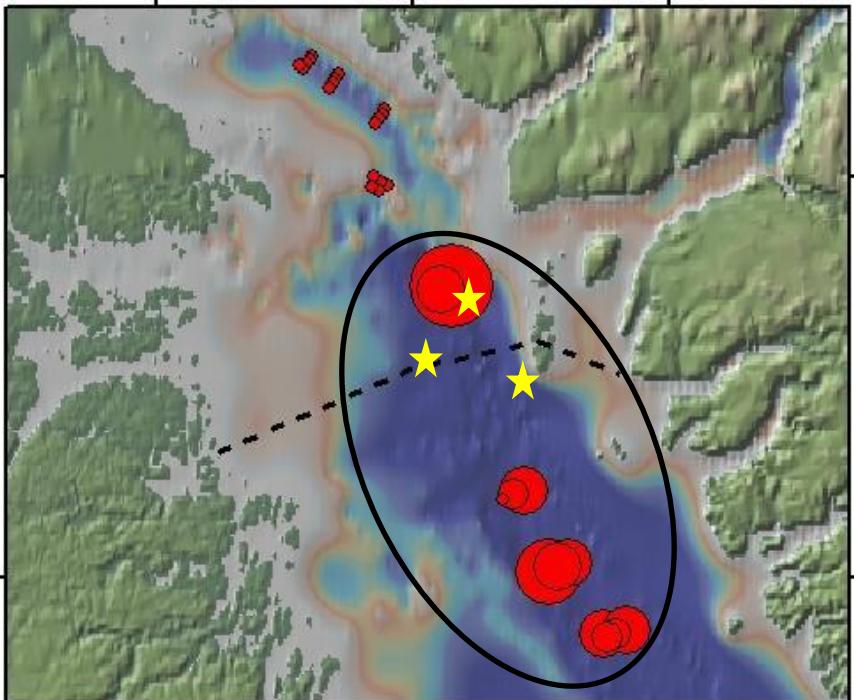
65°18'W



67°22'W

66°20'W

65°18'W



TURBOT – WINTER TAGGED

August 2012

• 0

● 1 - 52

● 53 - 73

● 74 - 106

● 107 - 321

— Management Boundary

★ Tagging location

TURBOT – SUMMER TAGGED

August 2012

• 0 - 43 2012

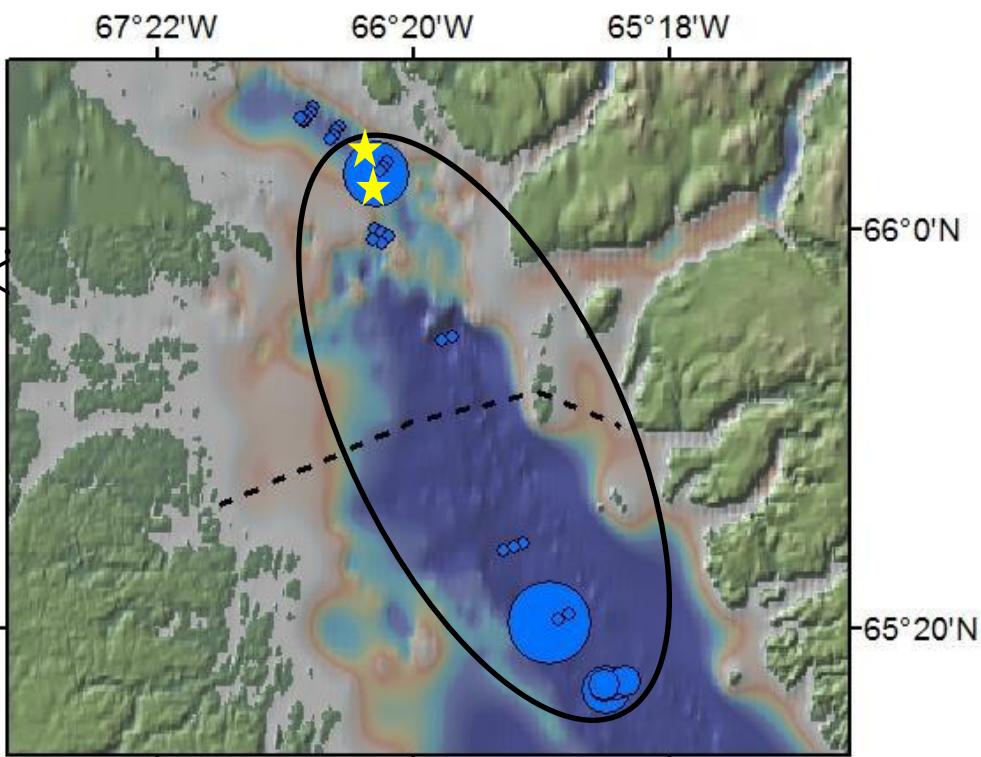
● 44 - 227

● 228 - 410

● 411 - 703

● 704 - 1213

— Management Boundary

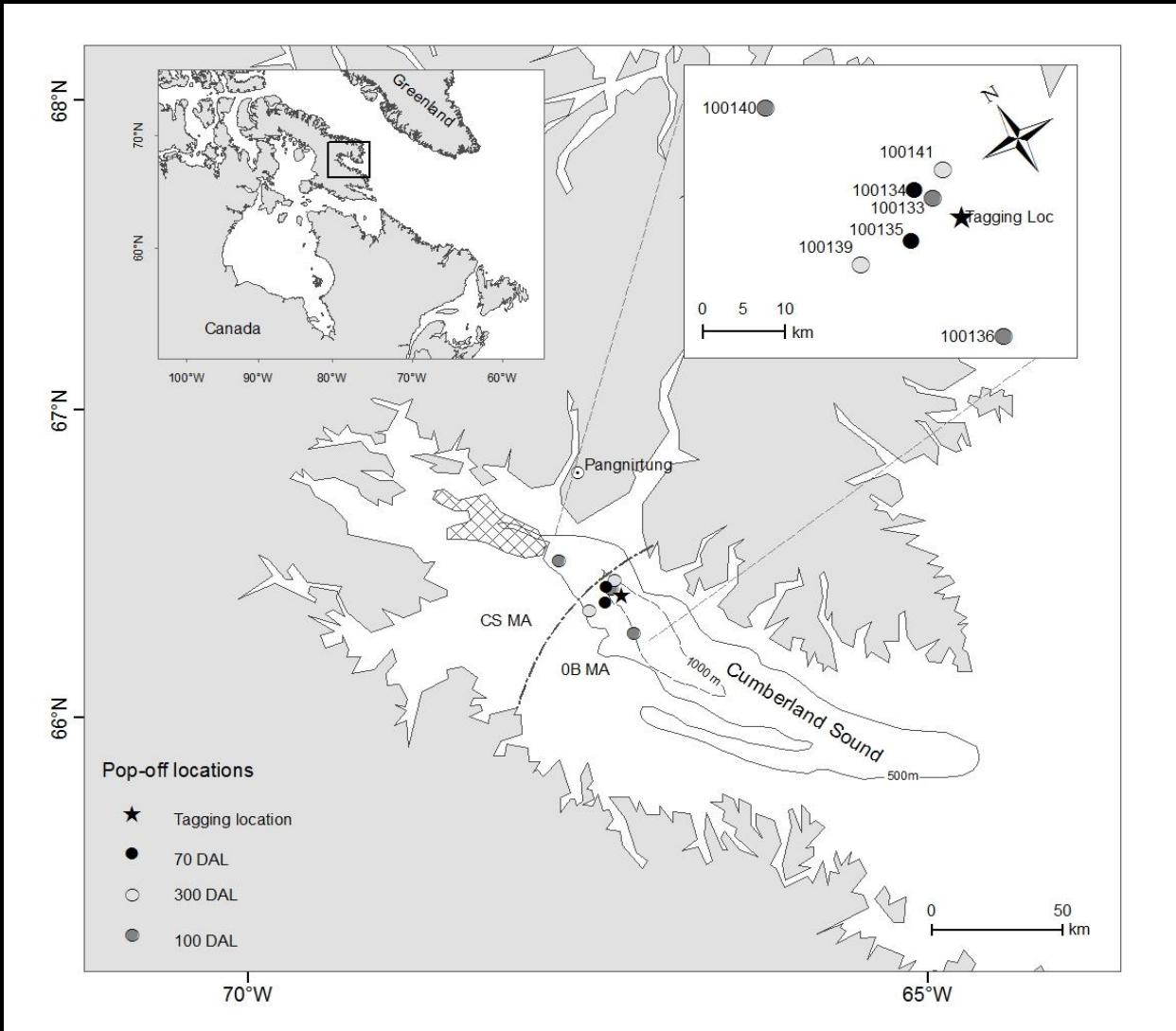




SATELLITE TAGGING: Greenland halibut

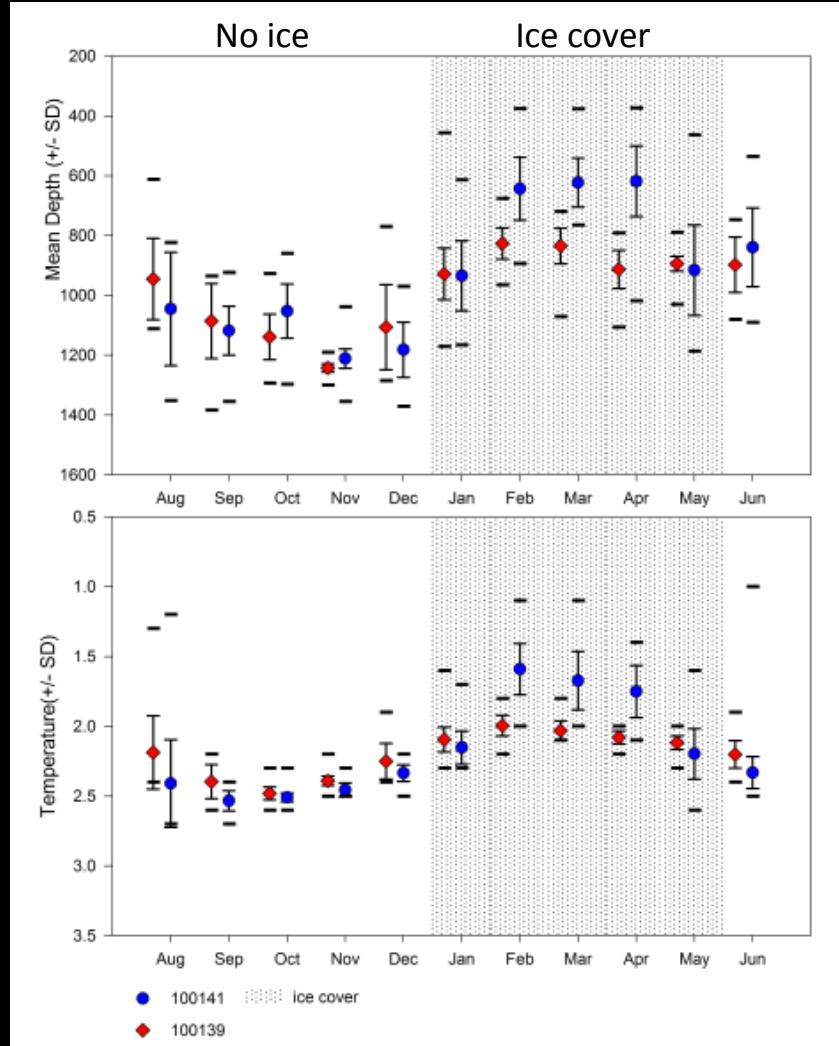
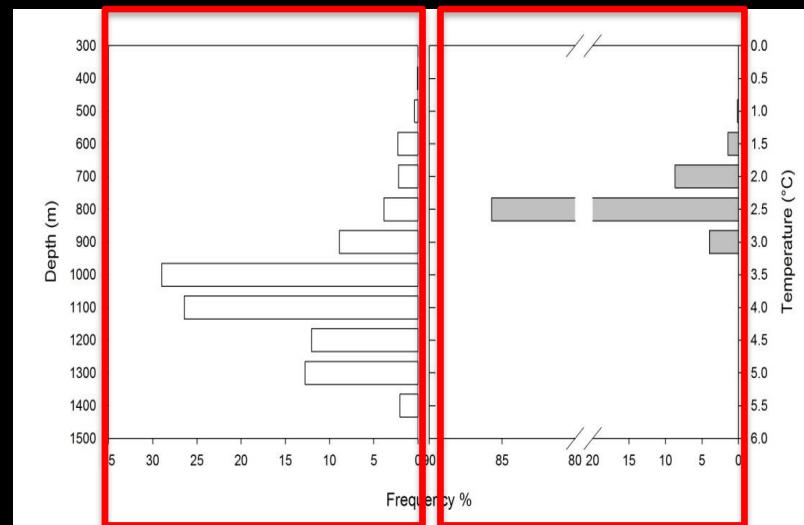


- 12 tags deployed
9 transmitted
- 40, 70, 100 and 300 days



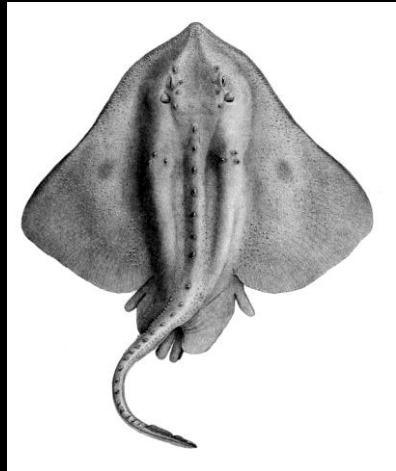


SATELLITE TAGGING: Greenland halibut

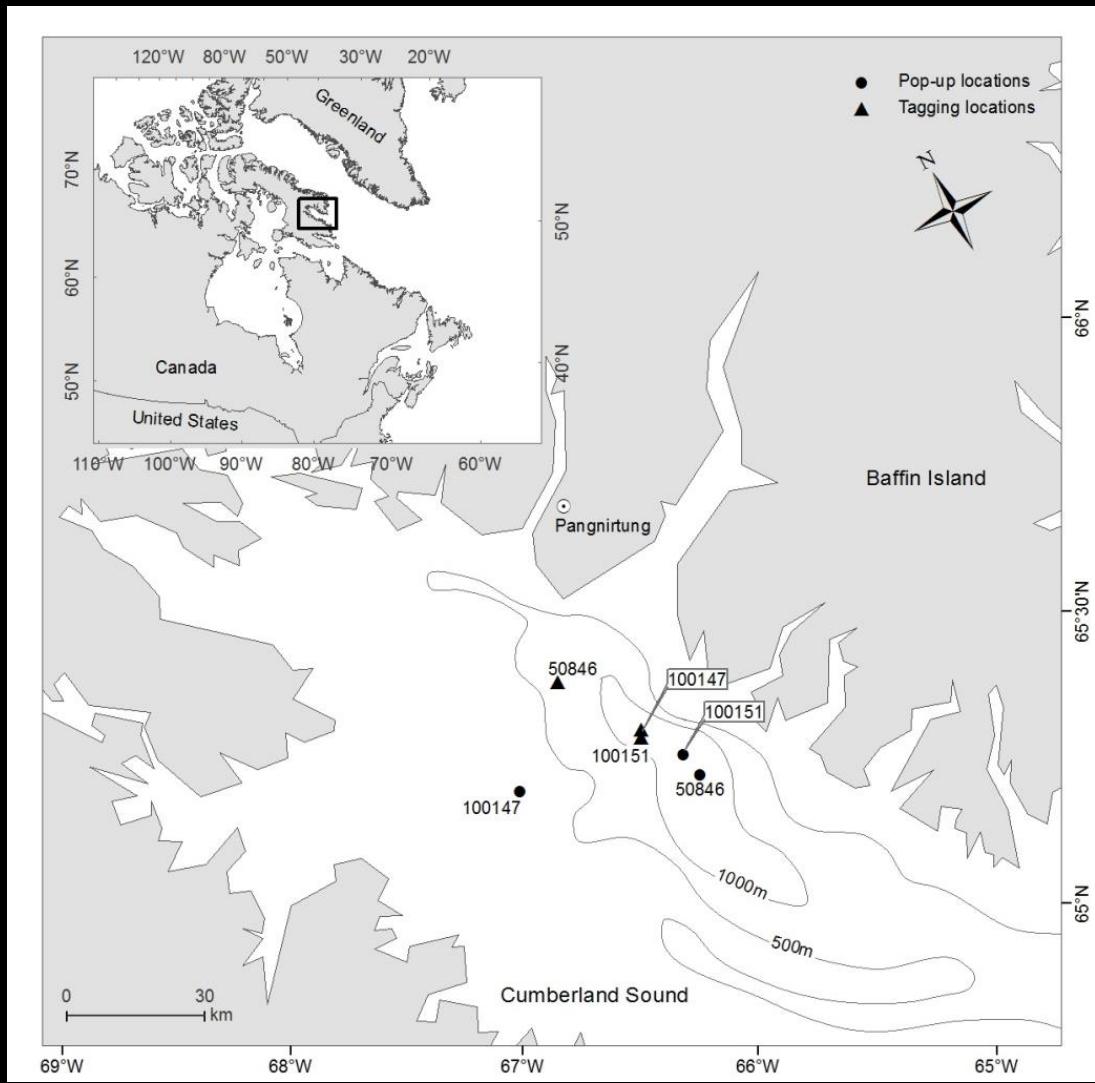




SATELLITE TAGGING: Arctic skate

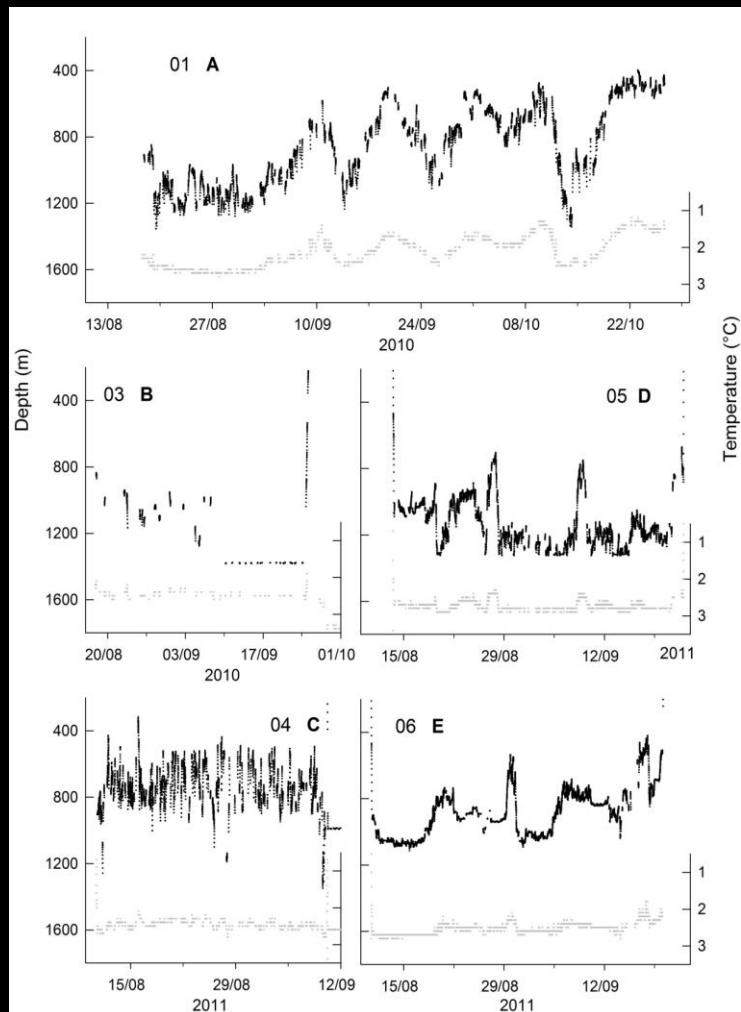
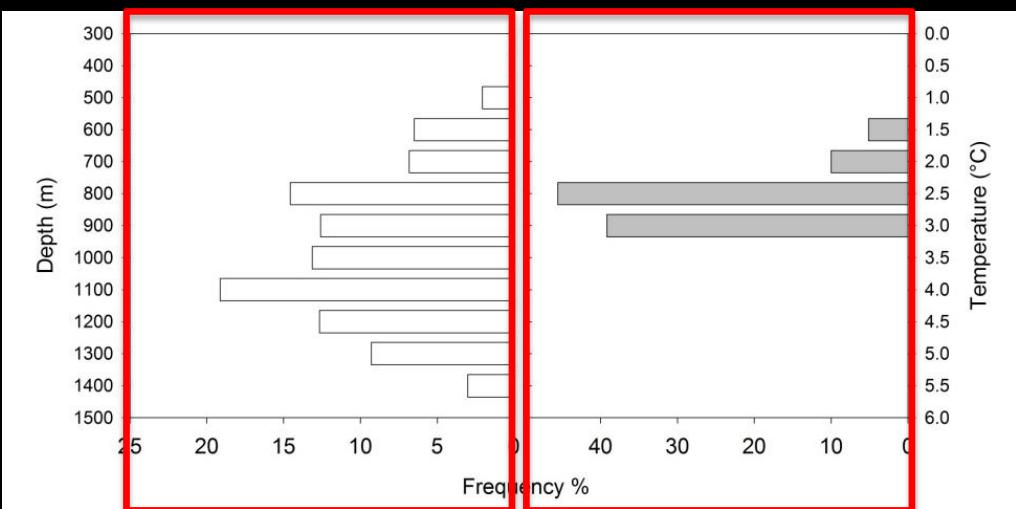
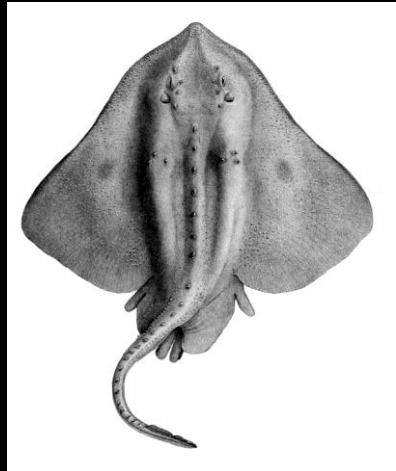


- 9 tags deployed
7 transmitted
- 40, 70, 100 days





SATELITE TAGGING: Arctic skate

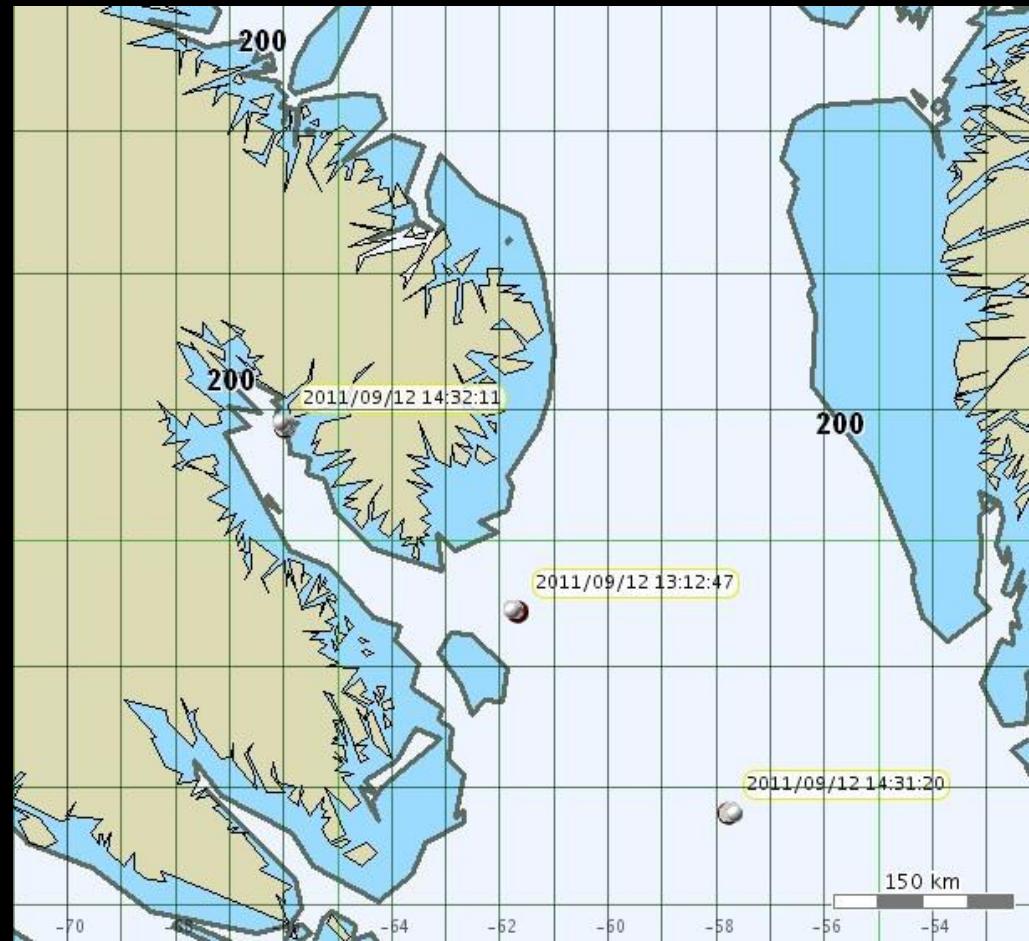




SATELLITE TELEMETRY: Greenland shark

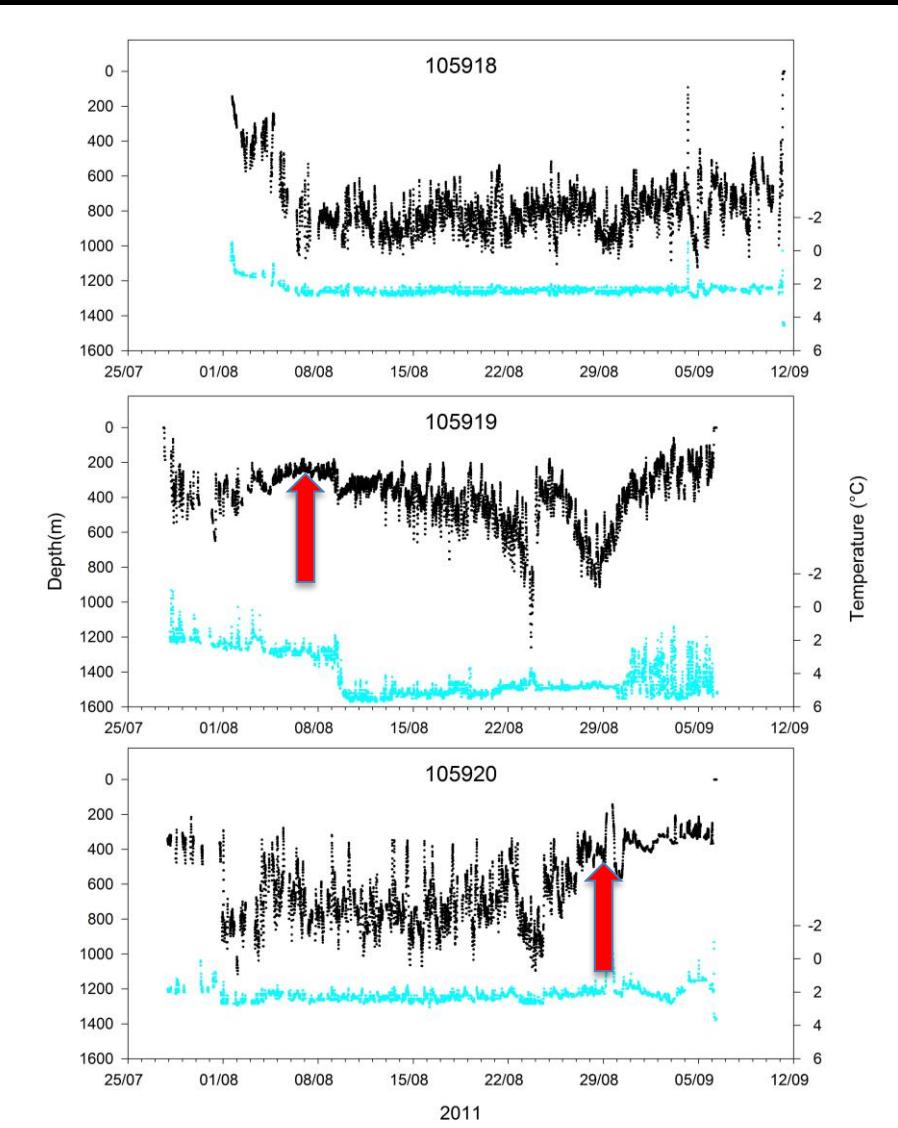


- 3 tags deployed
3 transmitted
- 42 days





SATELLITE TELEMETRY: Greenland shark



2011