Temporal aspects of habitat utilization and interspecies competition: defining the ecological impacts of spiny dogfish in structuring the ecosystem dynamics of southern New England

CFRF COMMERCIAL FISHERIES RESEARCH FOUNDATION

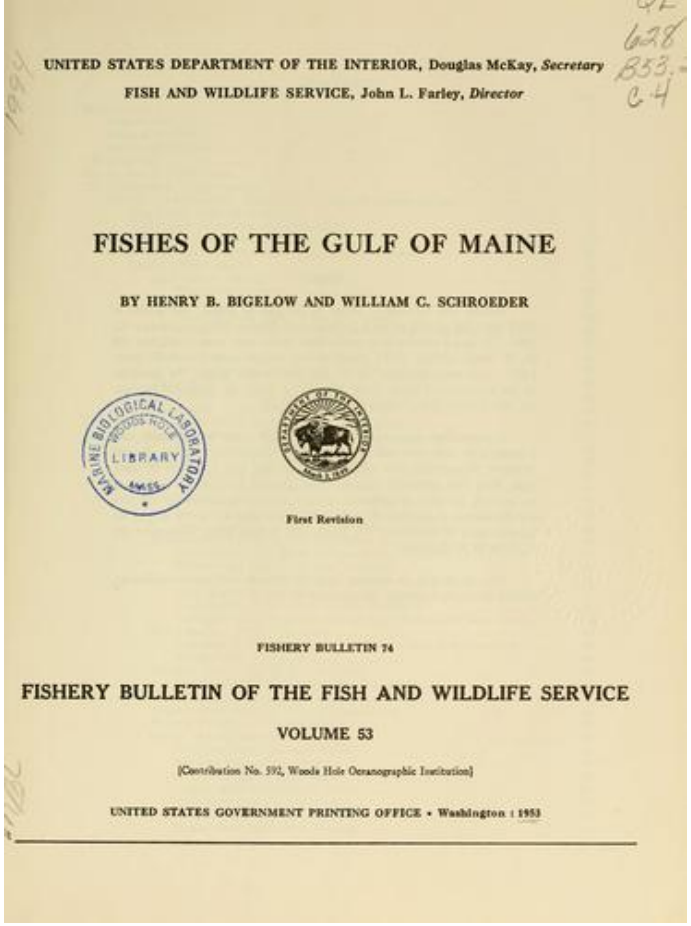
UNE UNIVERSITY OF NEW ENGLAND

I

THE DOG-FISH PLAGUE IN CANADA.

By Professor Edward E. Prince, Commissioner and General Inspector of Fisheries for Canada.

'wolves of the sea'



UNITED STATES DEPARTMENT OF THE INTERIOR, Douglas McKay, *Secretary*
FISH AND WILDLIFE SERVICE, John L. Farley, *Director*

FISHES OF THE GULF OF MAINE

BY HENRY B. BIGELOW AND WILLIAM C. SCHROEDER

First Revision

FISHERY BULLETIN 74

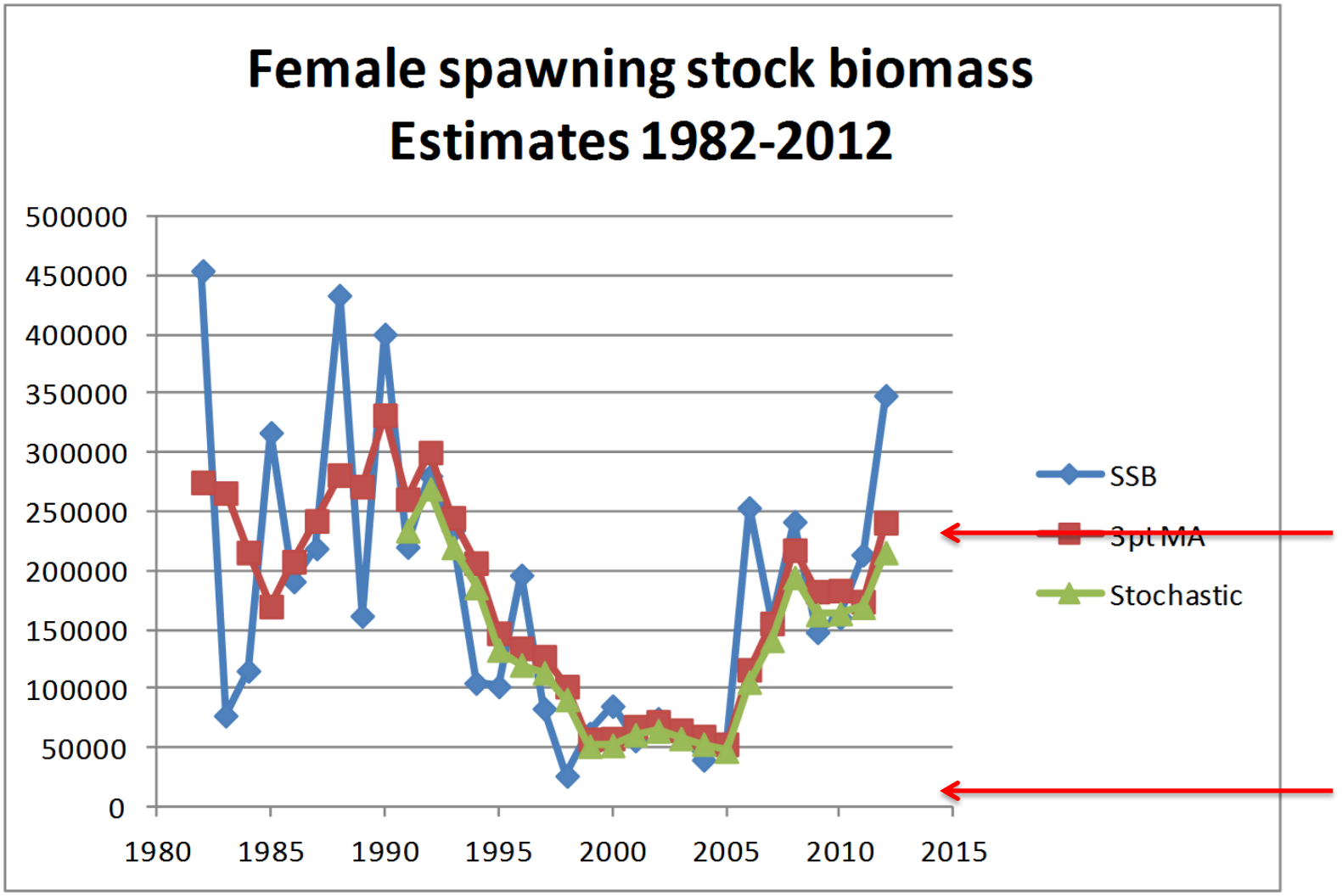
FISHERY BULLETIN OF THE FISH AND WILDLIFE SERVICE

VOLUME 53

[Contribution No. 592, Woods Hole Oceanographic Institution]

UNITED STATES GOVERNMENT PRINTING OFFICE • Washington : 1953

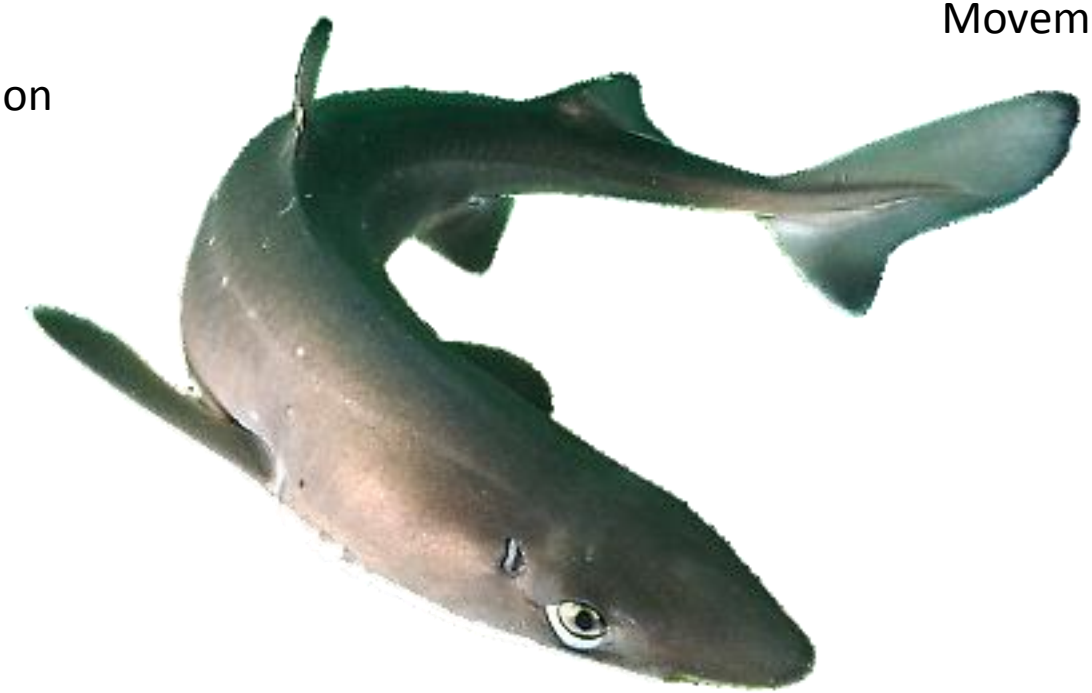
"Voracious almost beyond belief, the dogfish entirely deserves its bad reputation".



Jim Armstrong MAFMC

Movement

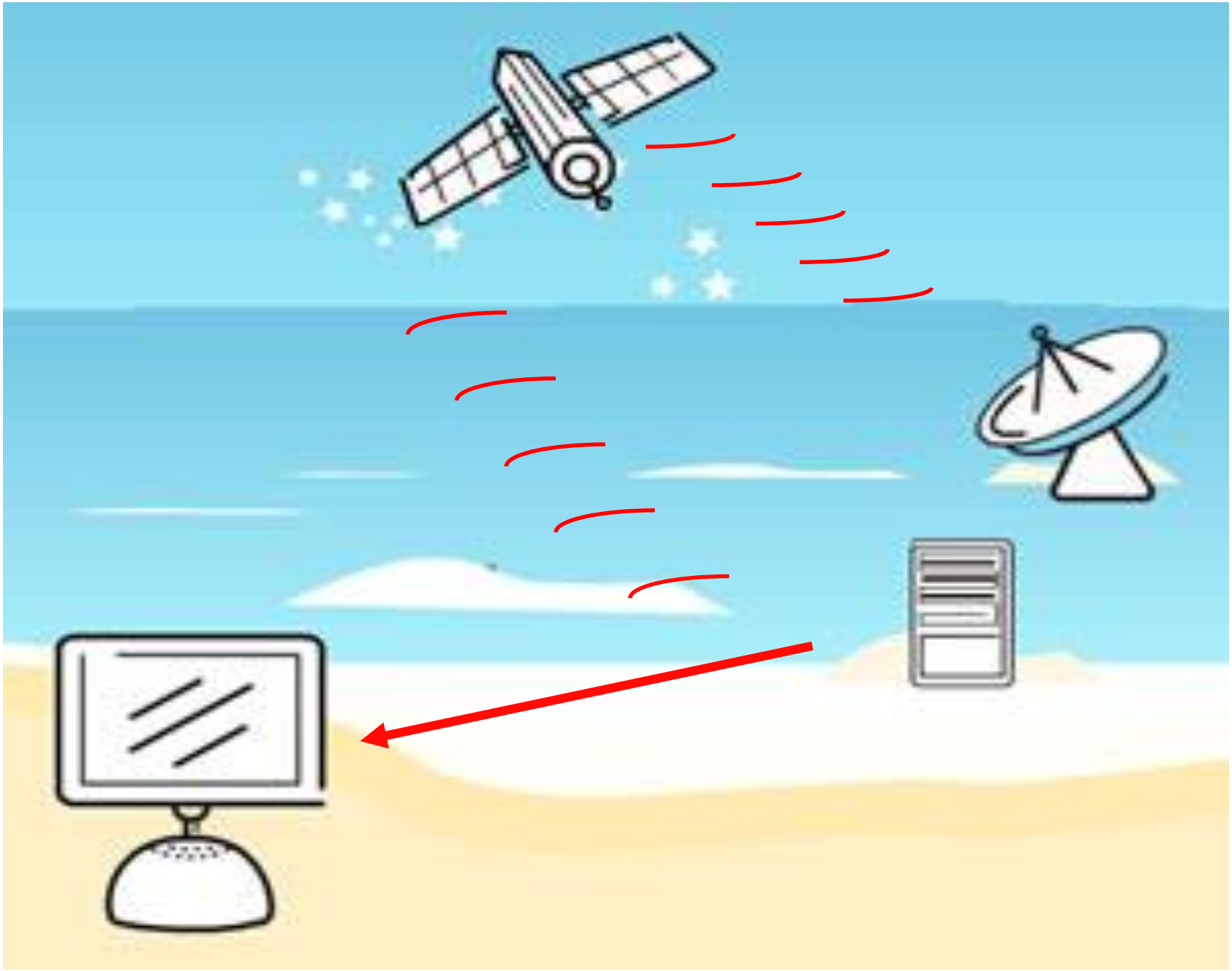
Reproduction

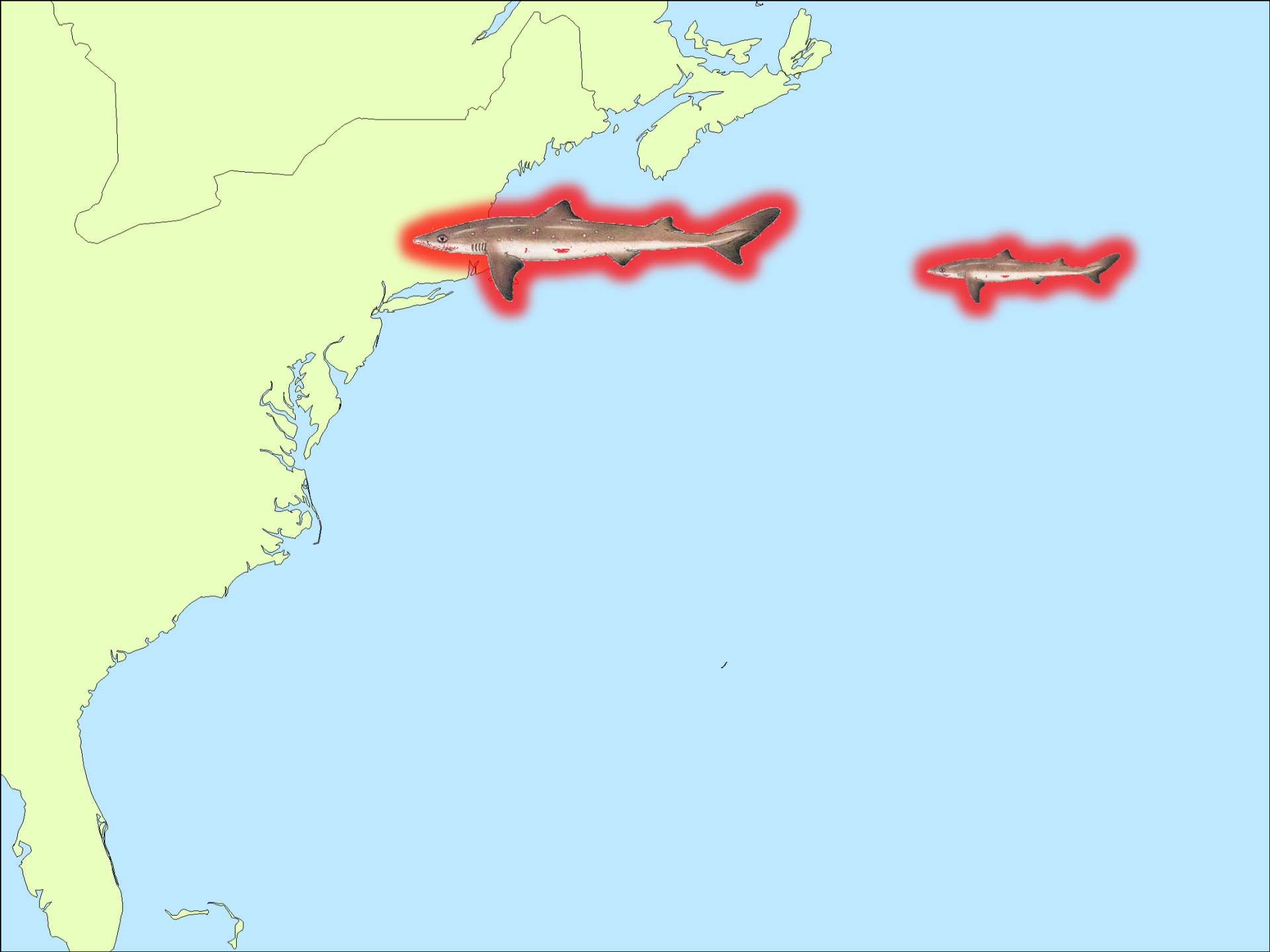


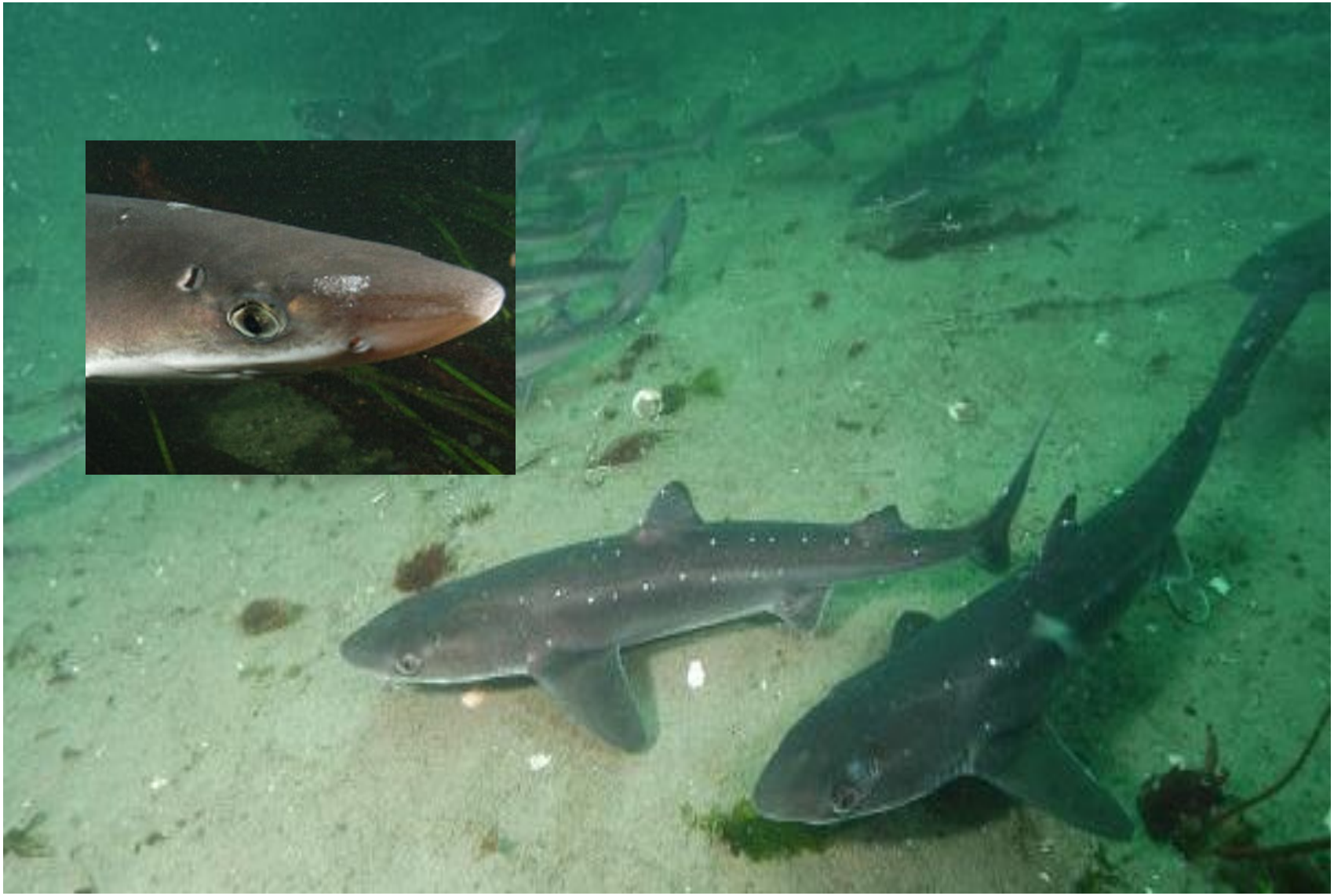
Ecology

Essential Habitat

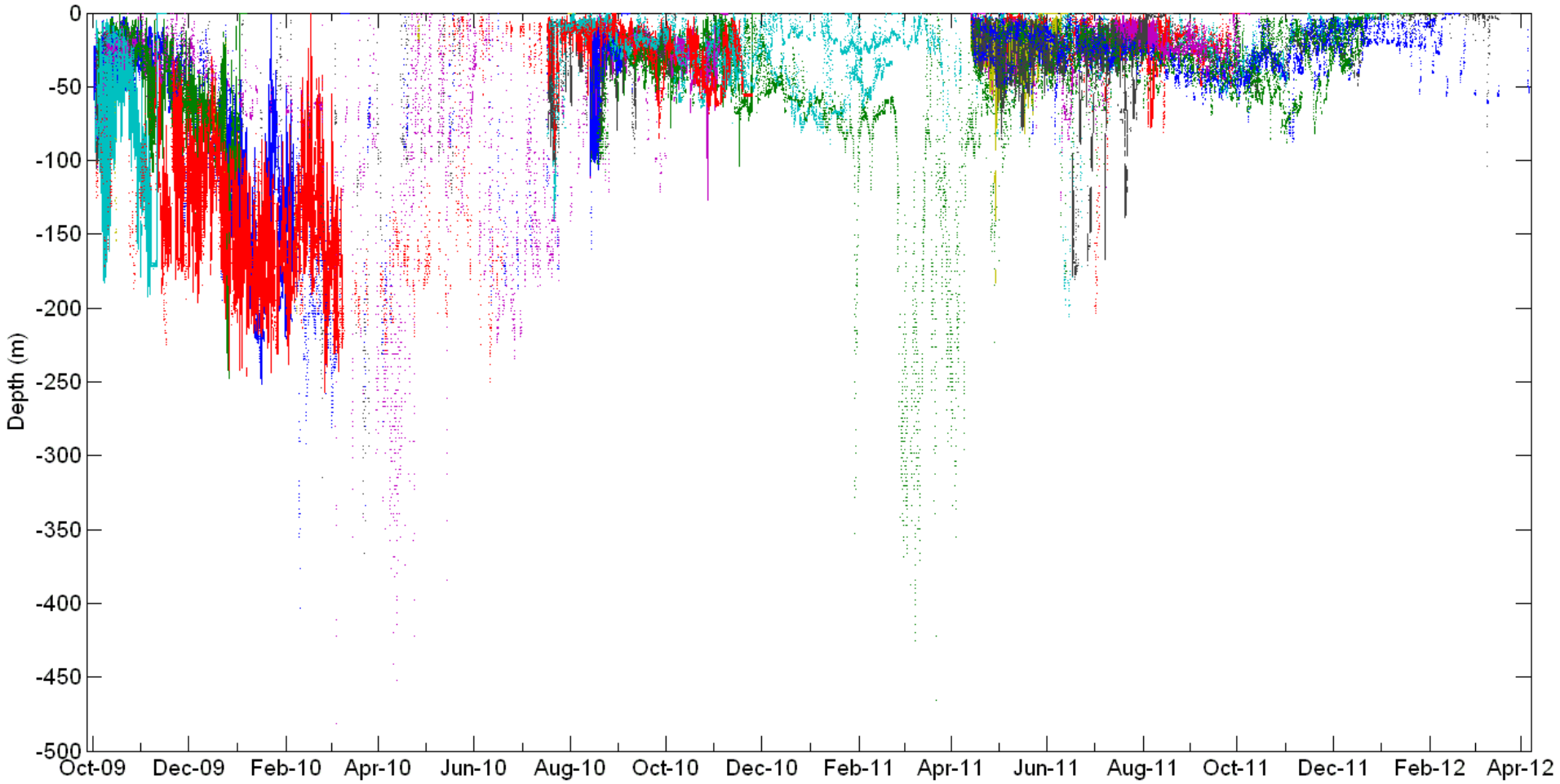

UNE DOGFISH
RESEARCH
RYOBI



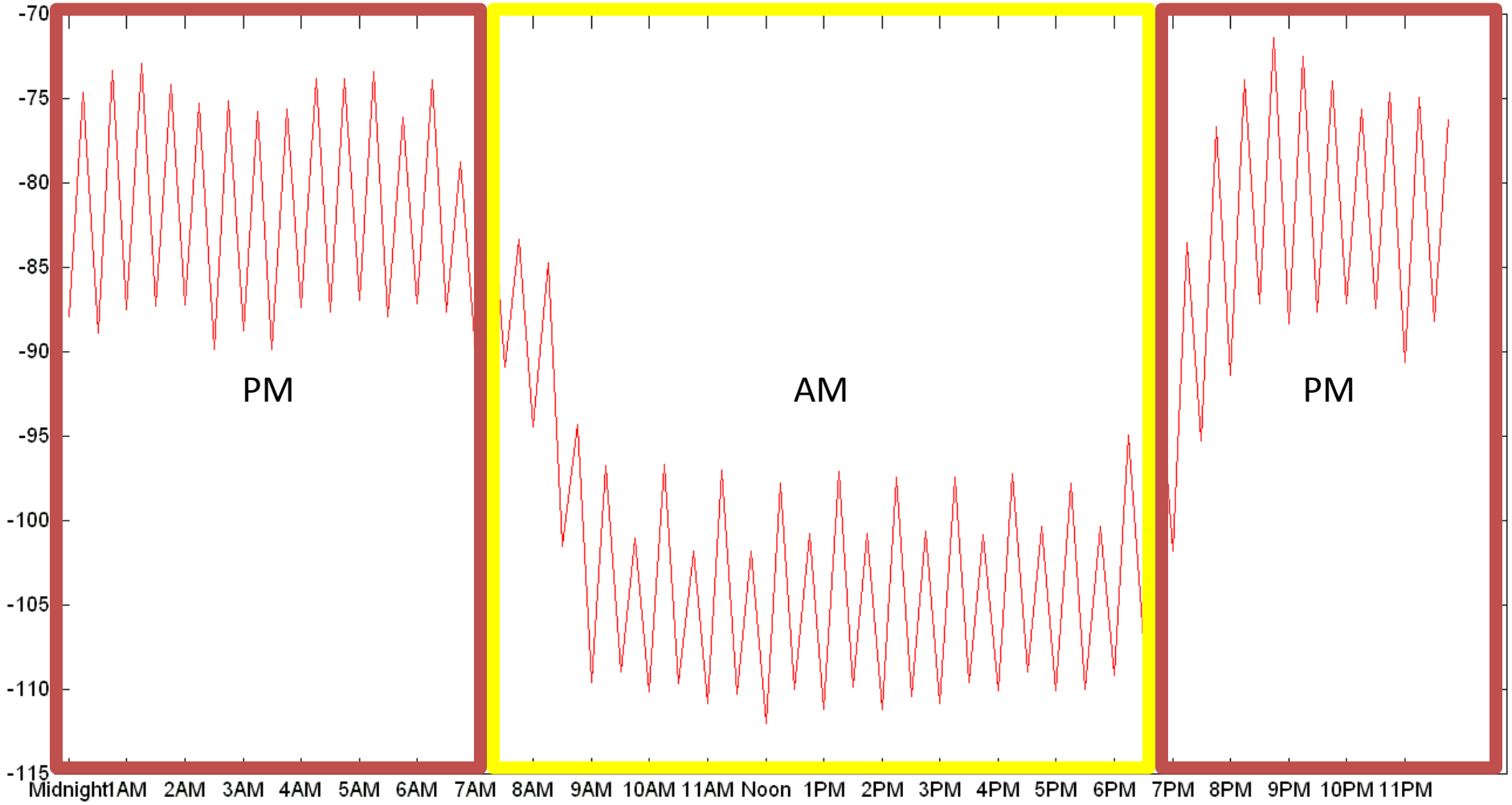




Vertical Movement (Depth)



Diel Movement



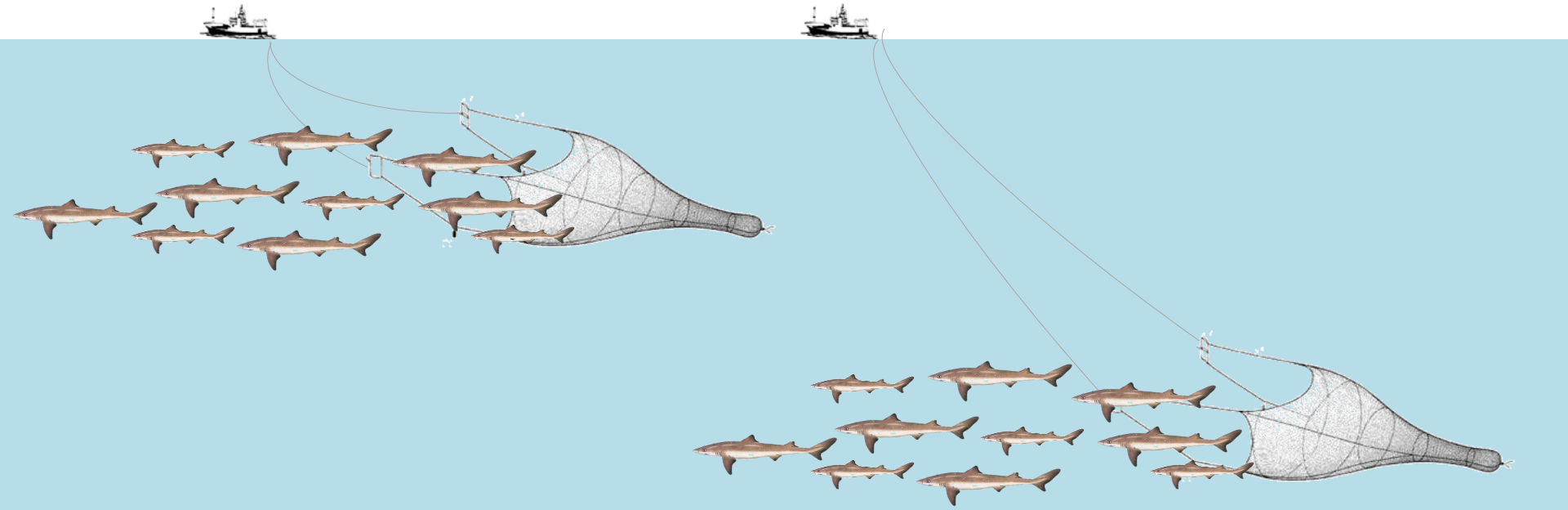
CFRF COMMERCIAL FISHERIES RESEARCH FOUNDATION

Directed Collaborative and Cooperative Research Opportunity – Subject area: Spiny Dogfish, *Squalus acanthias*

Hypothesis 1: Based on satellite tag data and anecdotal evidence from fisherman, we aimed to test whether an active vertical movement pattern exhibited by spiny dogfish prevents this species from being effectively captured by NEFSC otter trawl surveys.

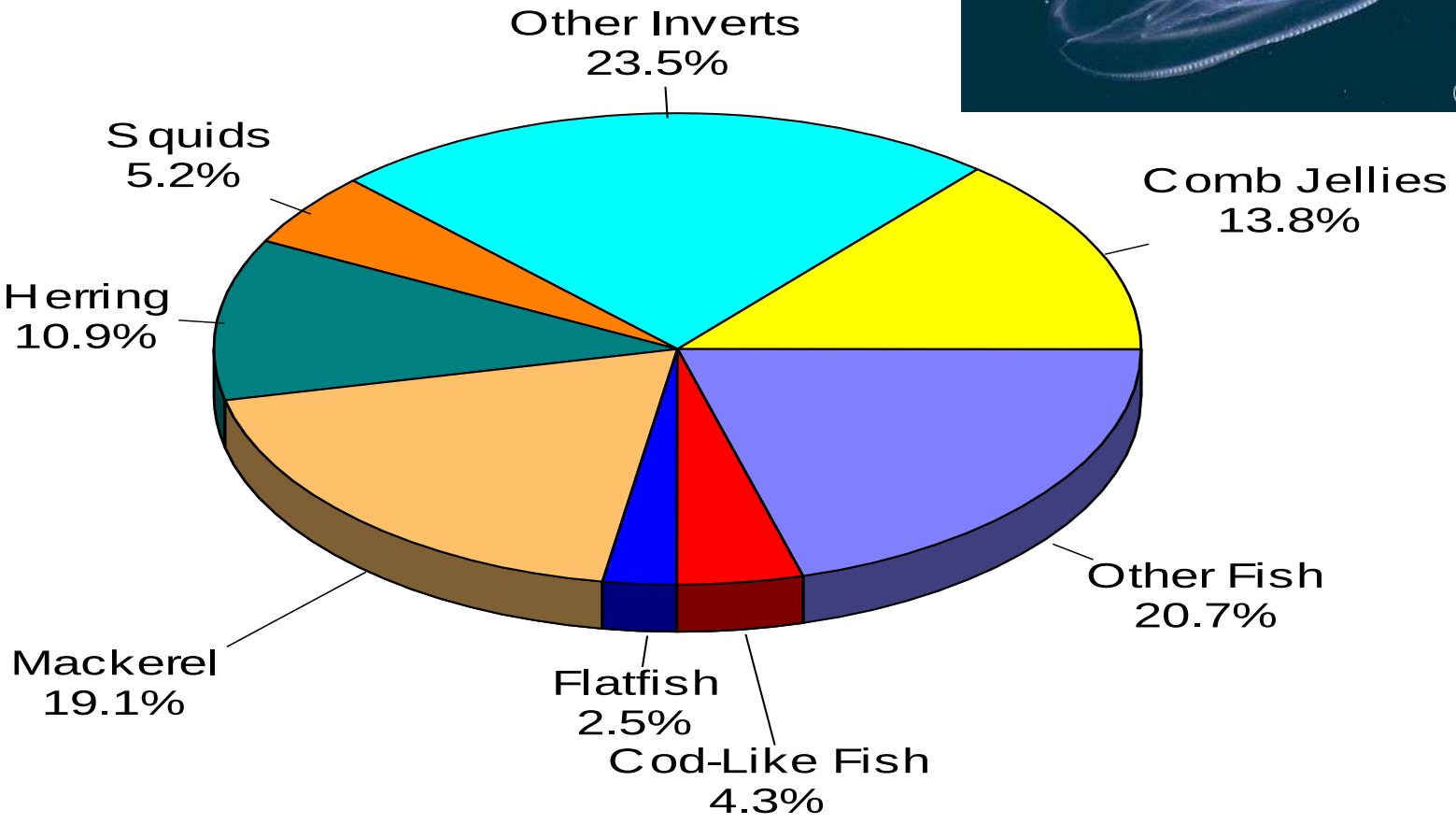
Hypothesis 2: Dogfish do not migrate south, out of southern New England waters, during the winter.

Hypothesis 1 and 2: Monthly bottom and mid water surveys occured in tandem (side by side). This will allow for temporal and spatial comparisons to be made between the abundance of spiny dogfish captured on the benthos to those captured in mid water.



Dogfish Food Habits, SPRING SURVEY

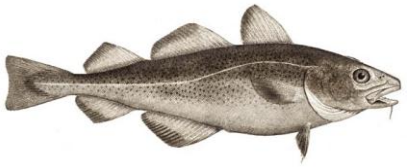
A starting point for ecosystem implications



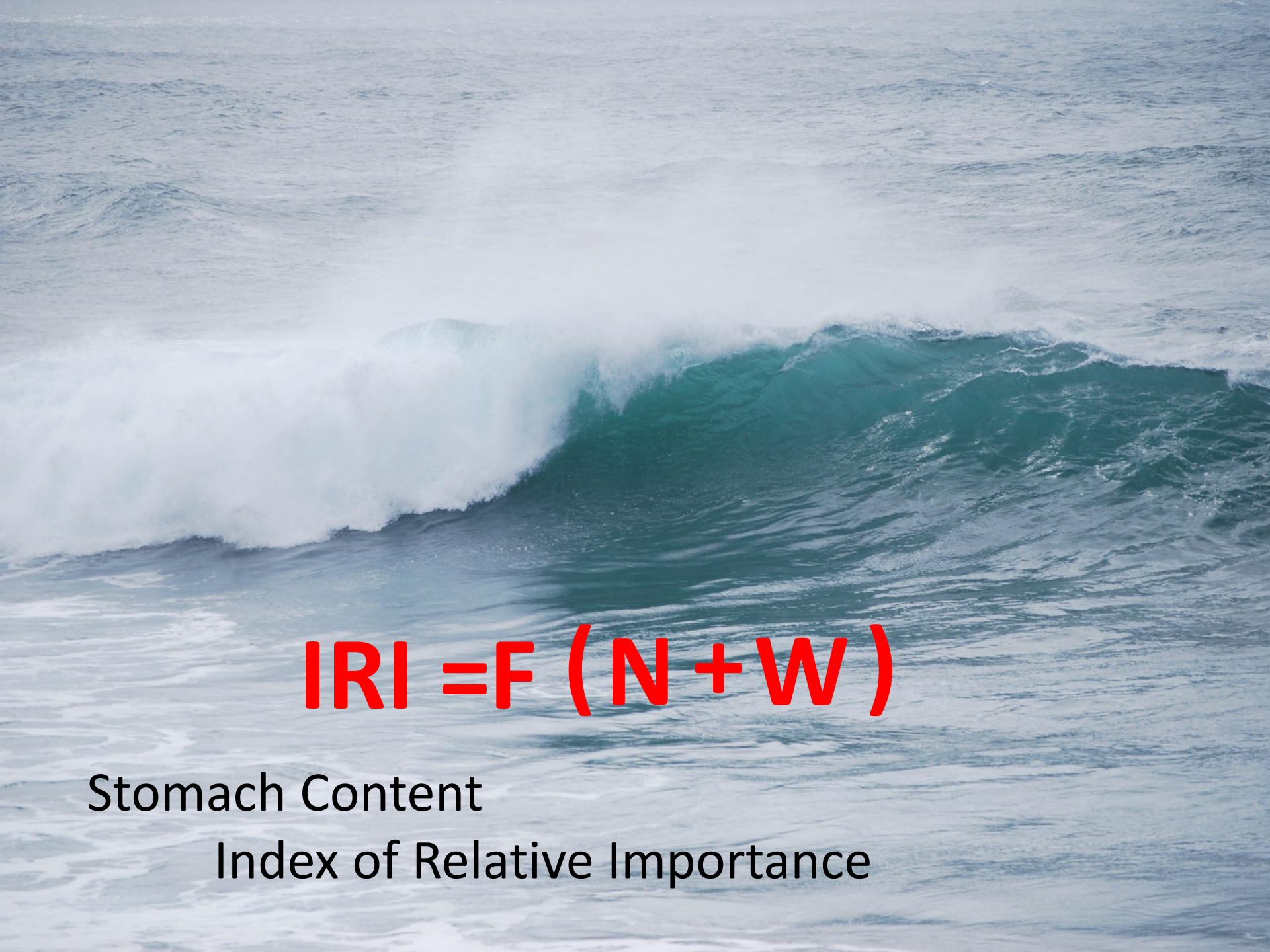
Based on 40,000 stomachs examined (fall + spring)

Courtesy of Paul Rago, NMFS

Hypothesis 3: If hypotheses 1 and 2 were true, then a year round dogfish population would impact ecosystem dynamics within this region.



Conducting stable isotope and stomach content analysis order to test for direct and indirect competition and the impacts of these interactions on other commercially important species.



$$IRI = F(N + W)$$

Stomach Content

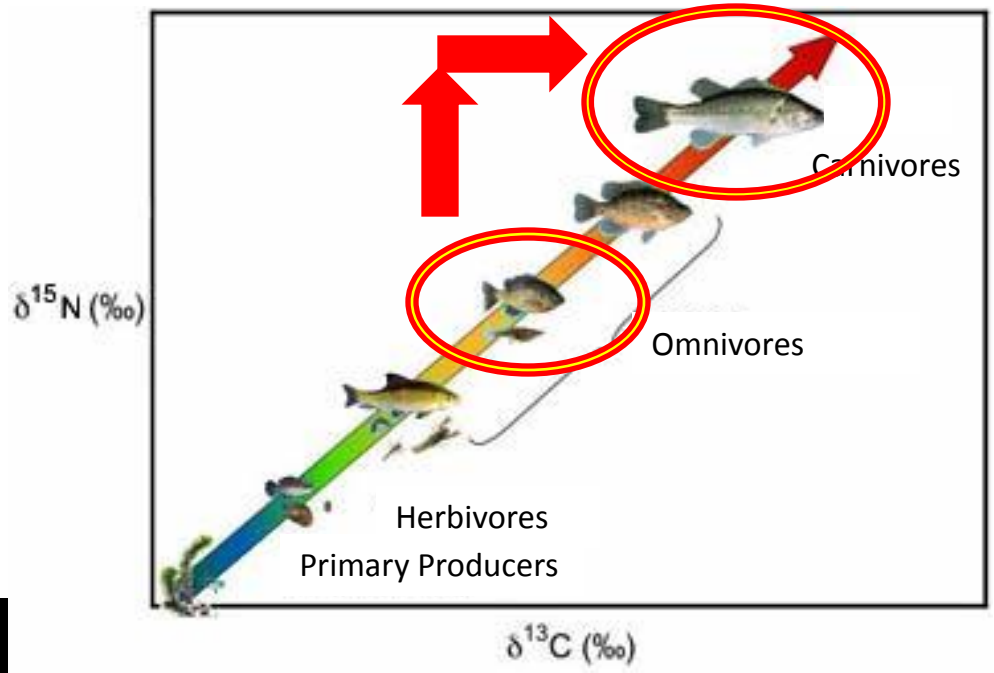
Index of Relative Importance

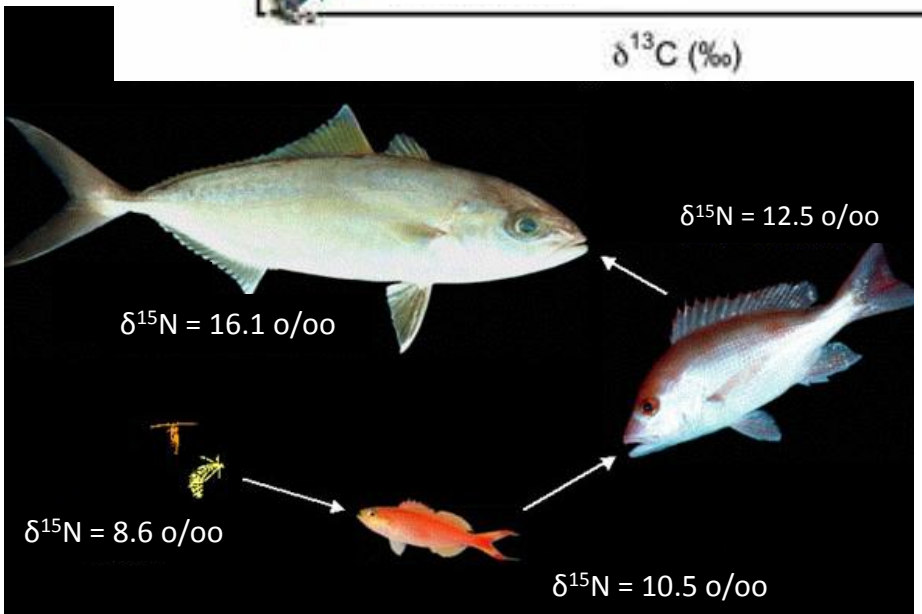
Stable Isotope Analysis

Long-term

Liver and muscle

$\delta^{13}C$ and $\delta^{15}N$





Hypothesis 1: Based on satellite tag data and anecdotal evidence from fisherman, we aimed to test whether an active vertical movement pattern exhibited by spiny dogfish prevents this species from being effectively captured by NEFSC otter trawl surveys.

Hypothesis 2: Dogfish do not migrate south, out of southern New England waters, during the winter.

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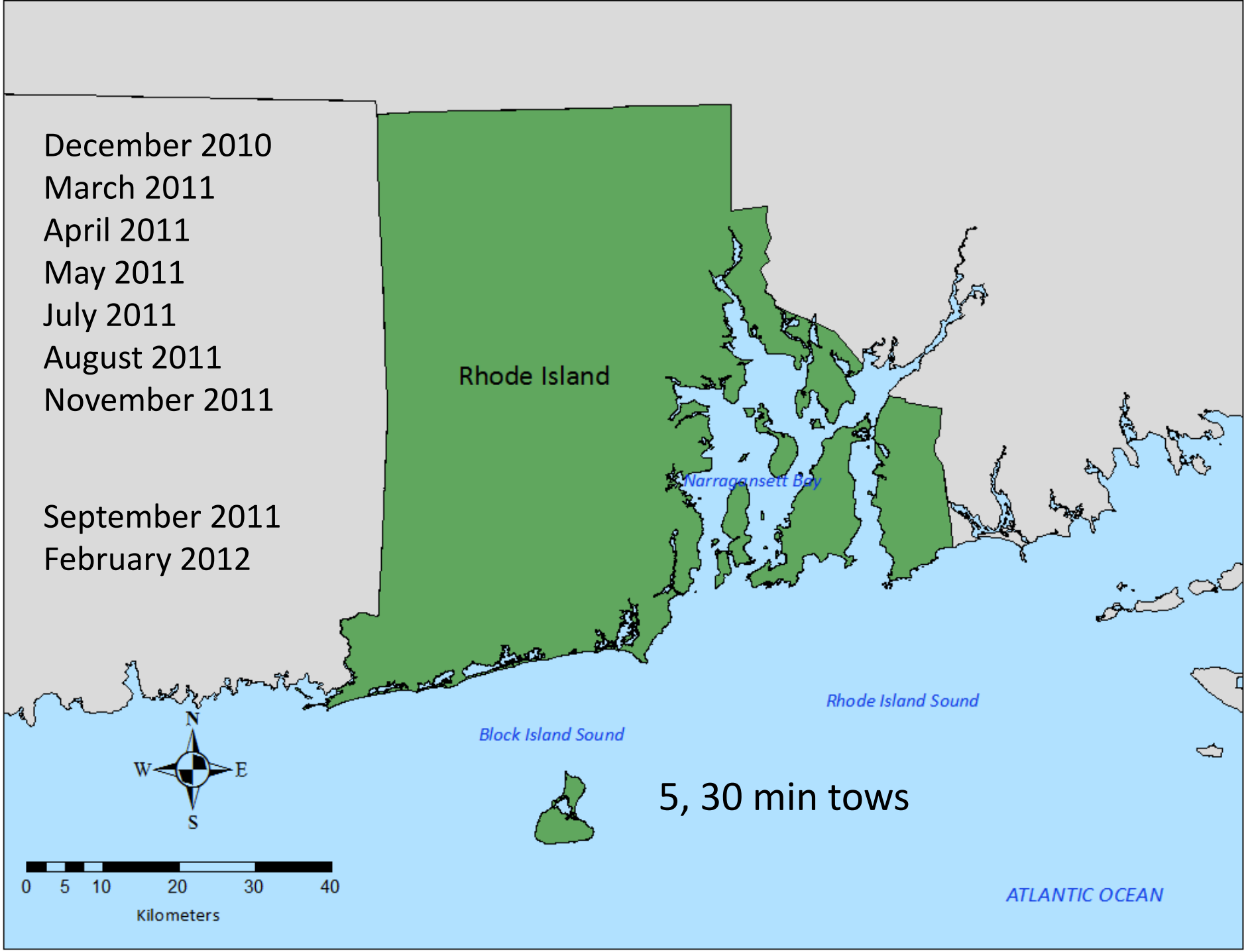
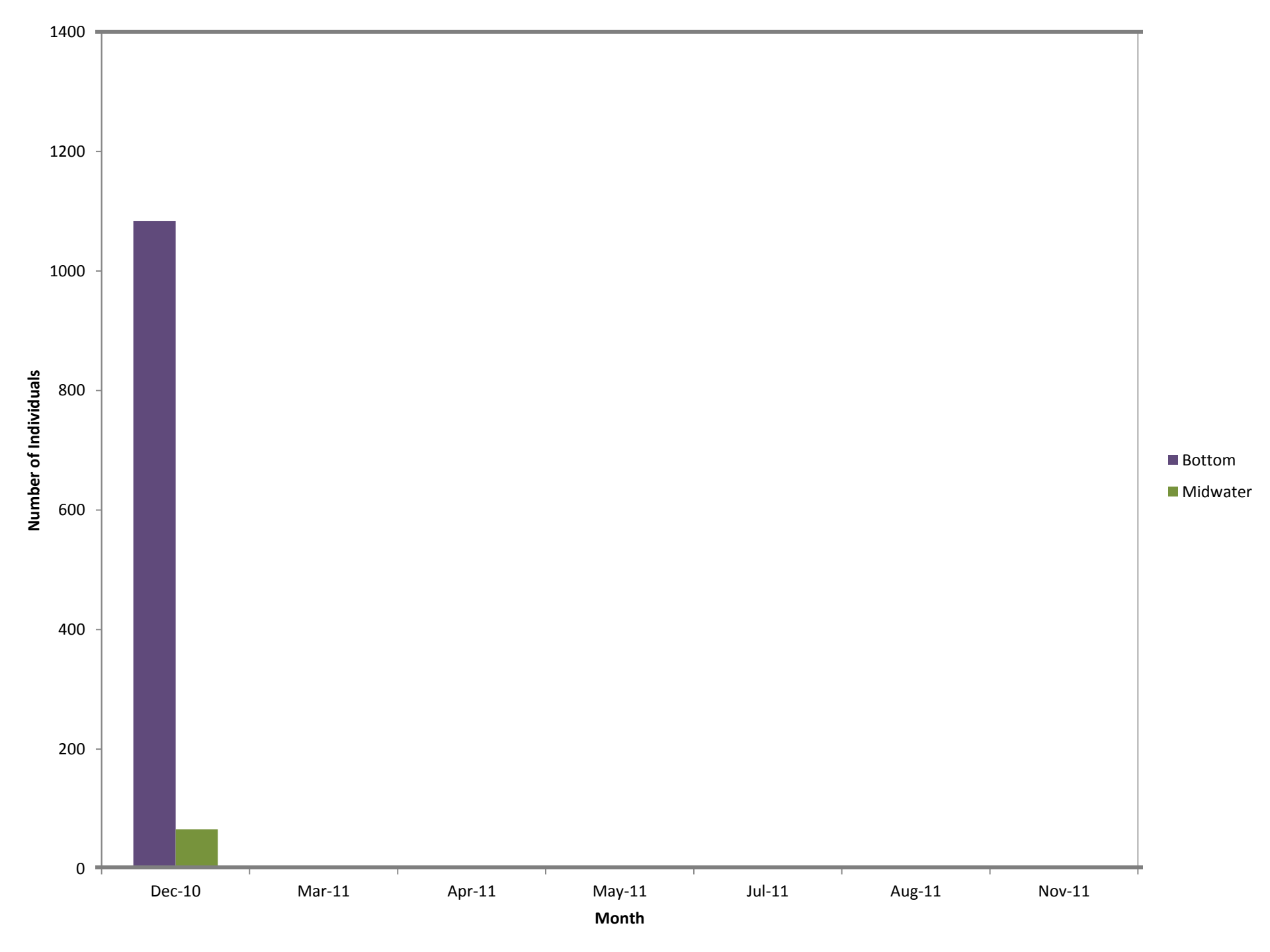

December 2010
March 2011
April 2011
May 2011
July 2011
August 2011
November 2011
September 2011
February 2012
Rhode Island
Narragansett Bay
Rhode Island Sound
Block Island Sound
ATLANTIC OCEAN
N
W
E
S
0 5 10 20 30 40
Kilometers
5, 30 min tows


ELIZABETH HELEN
659112

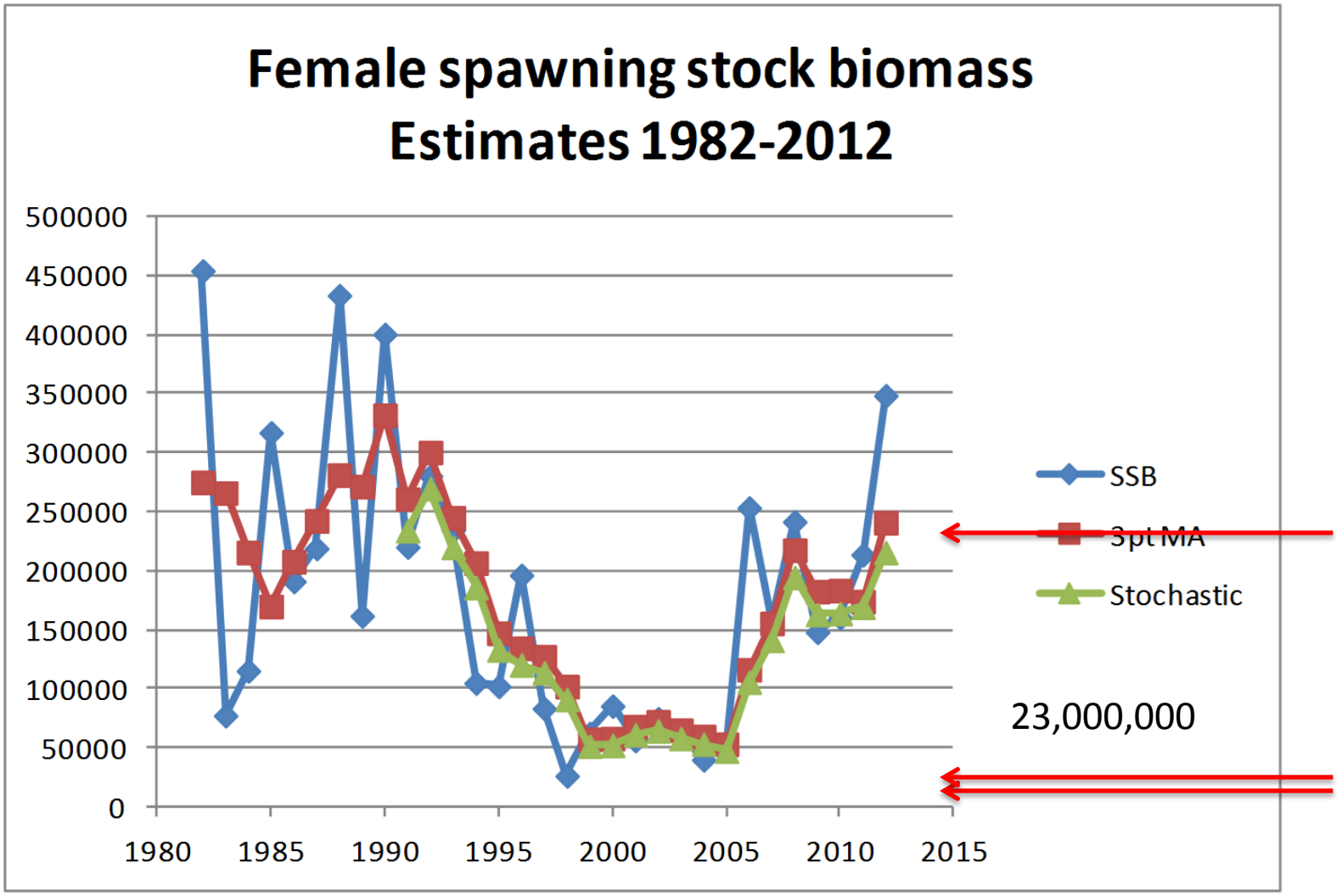

RI 9130 U
PROUD MARY

Hypothesis 1: Based on satellite tag data and anecdotal evidence from fisherman, we aimed to test whether an active vertical movement pattern exhibited by spiny dogfish prevents this species from being effectively captured by NEFSC otter trawl surveys


1400
1200
1000
800
600
400
200
0
Number of Individuals
Dec-10
Mar-11
Apr-11
May-11
Jul-11
Aug-11
Nov-11
Month
Bottom
Midwater

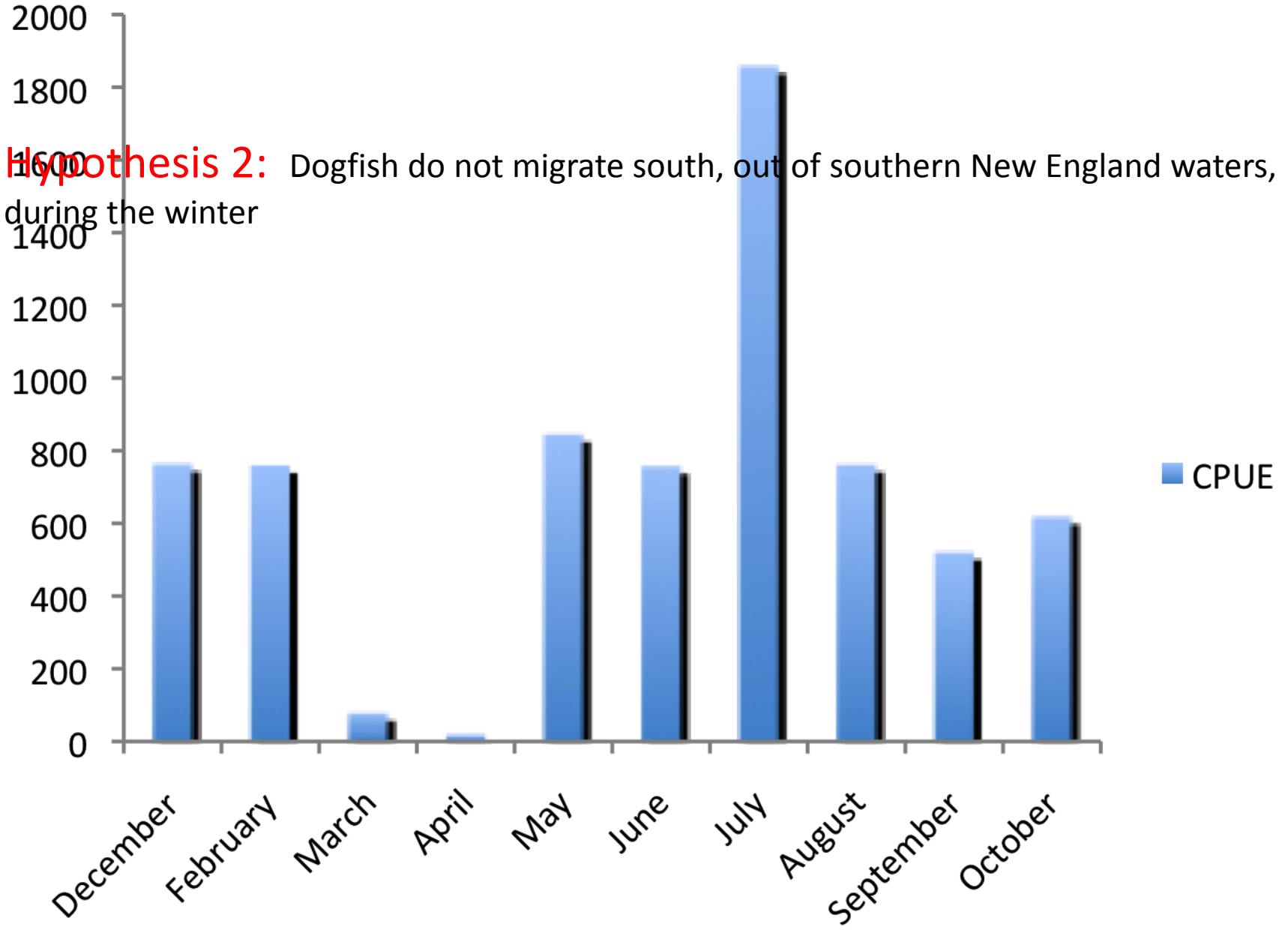
Improvements?

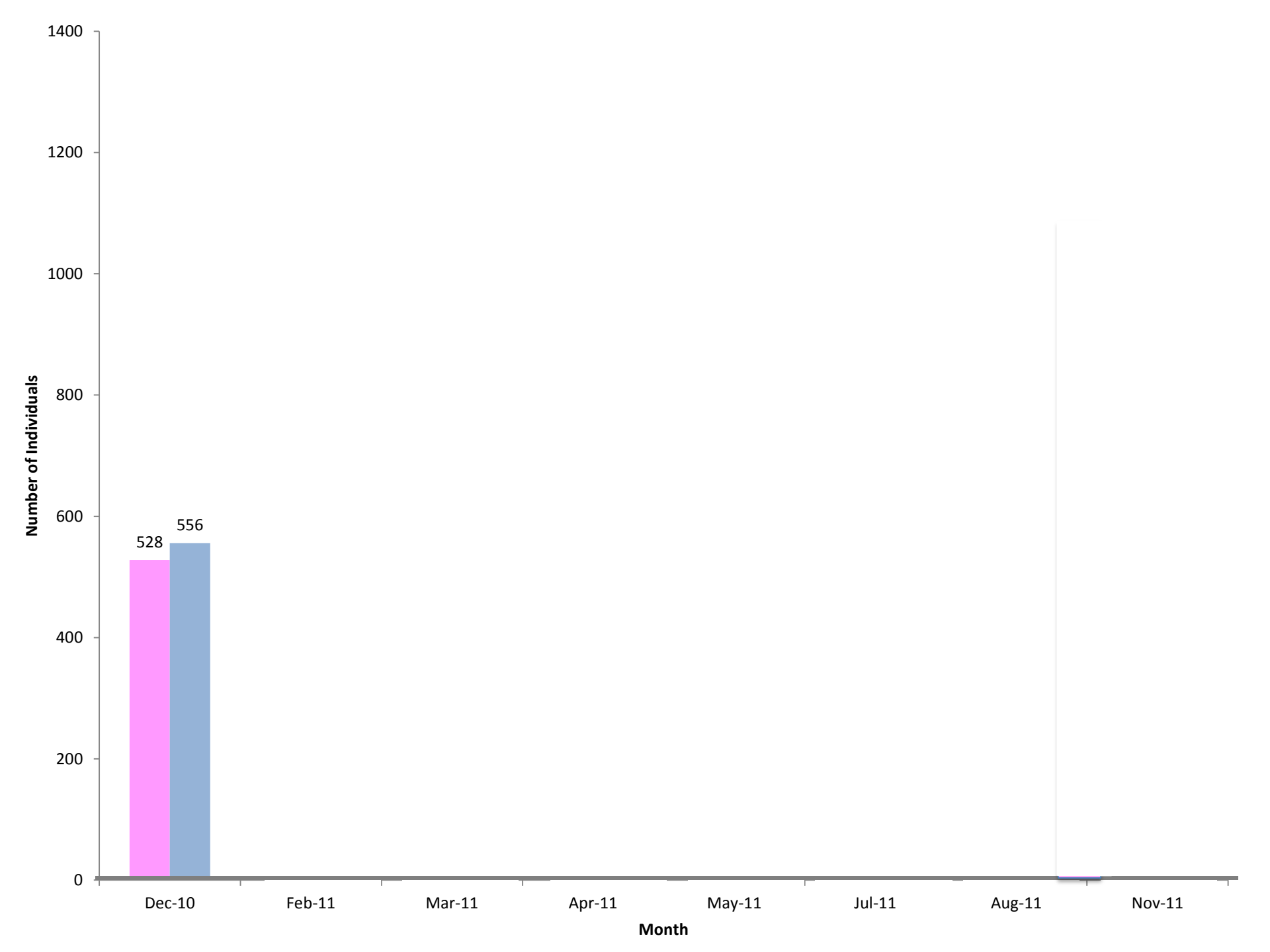
- Learning process for everyone
- 7 months sampled
- Only conducted during the daylight hours

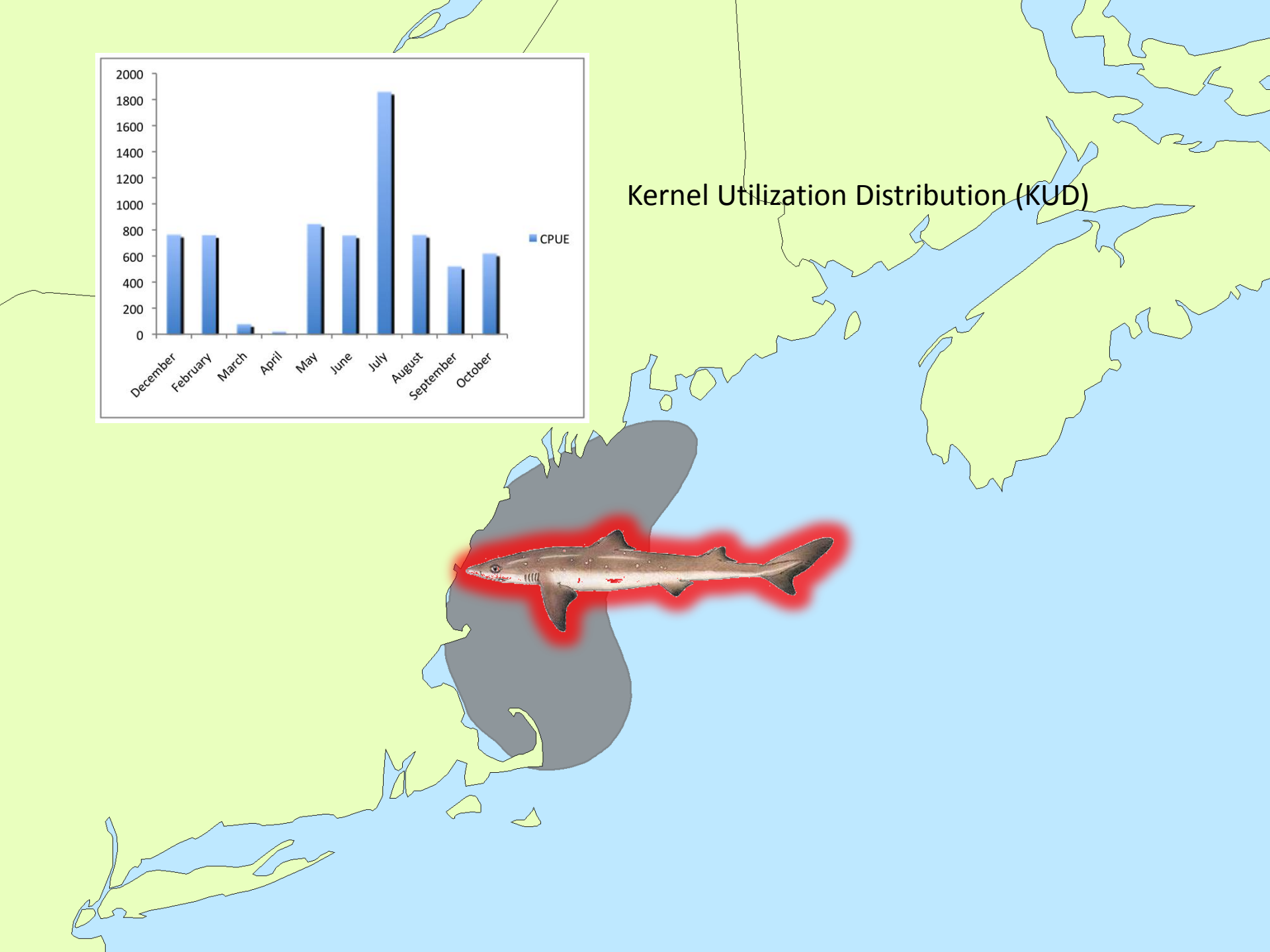


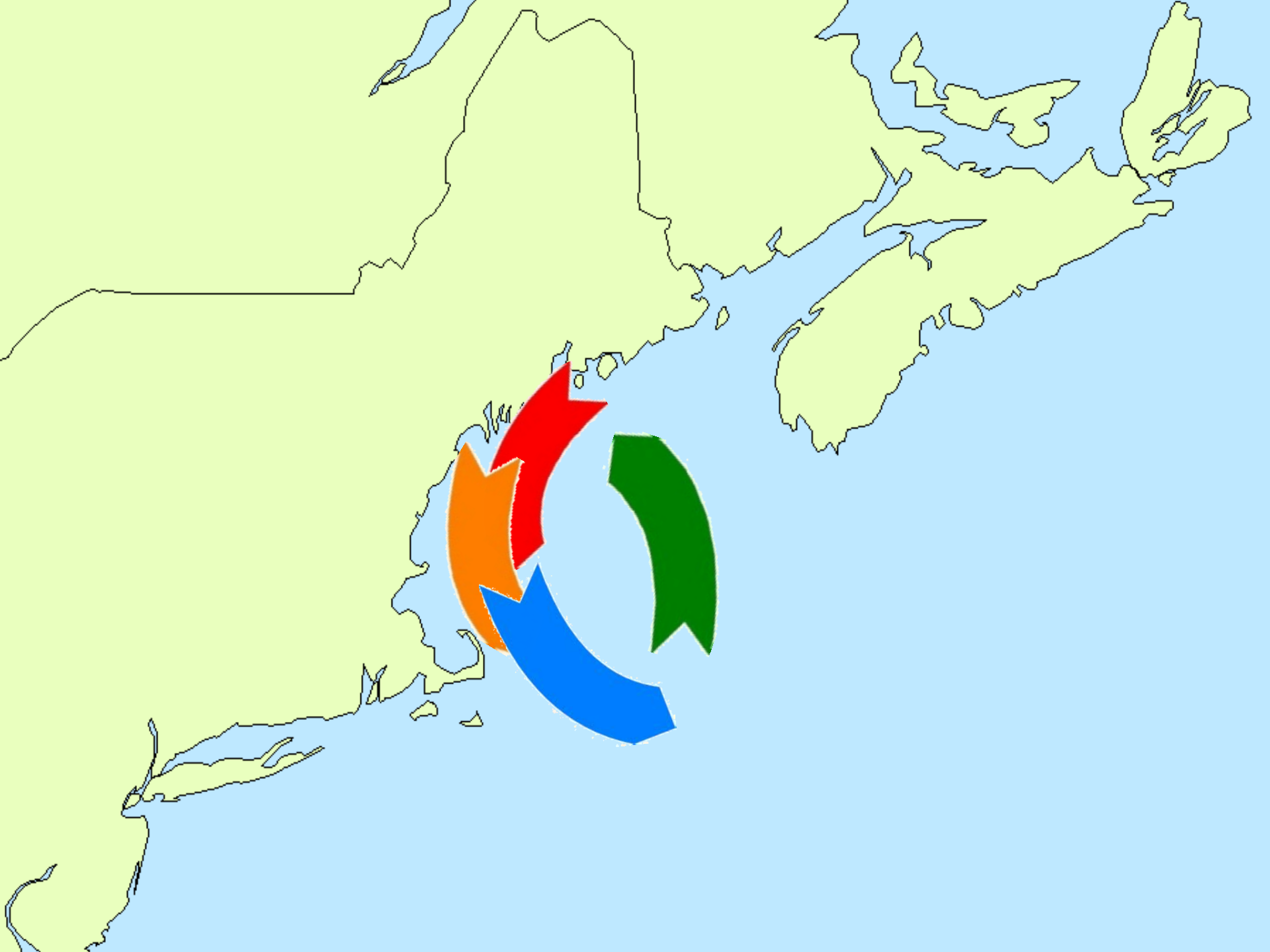
Jim Armstrong MAFMC

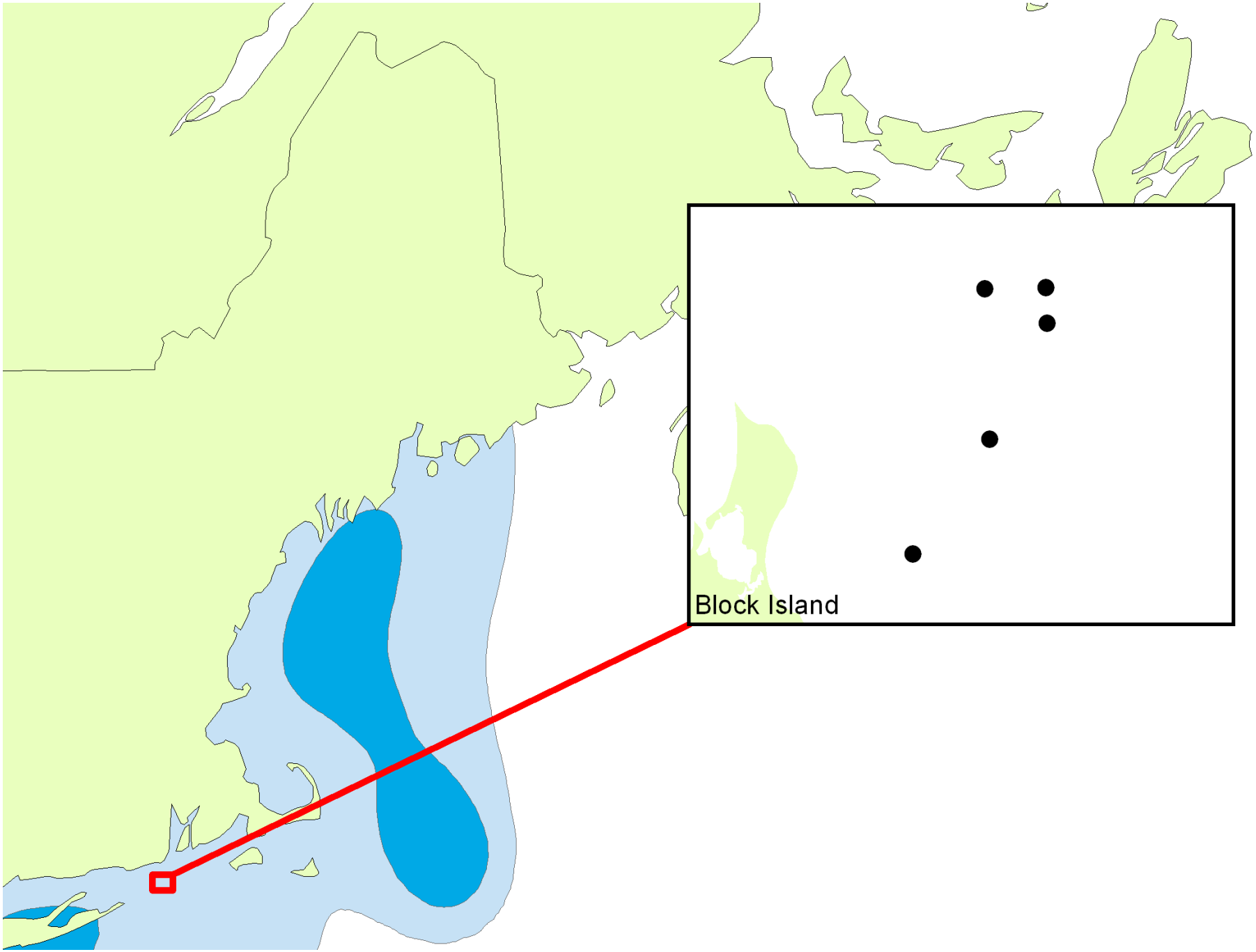
Hypothesis 2: Dogfish do not migrate south, out of southern New England waters, during the winter

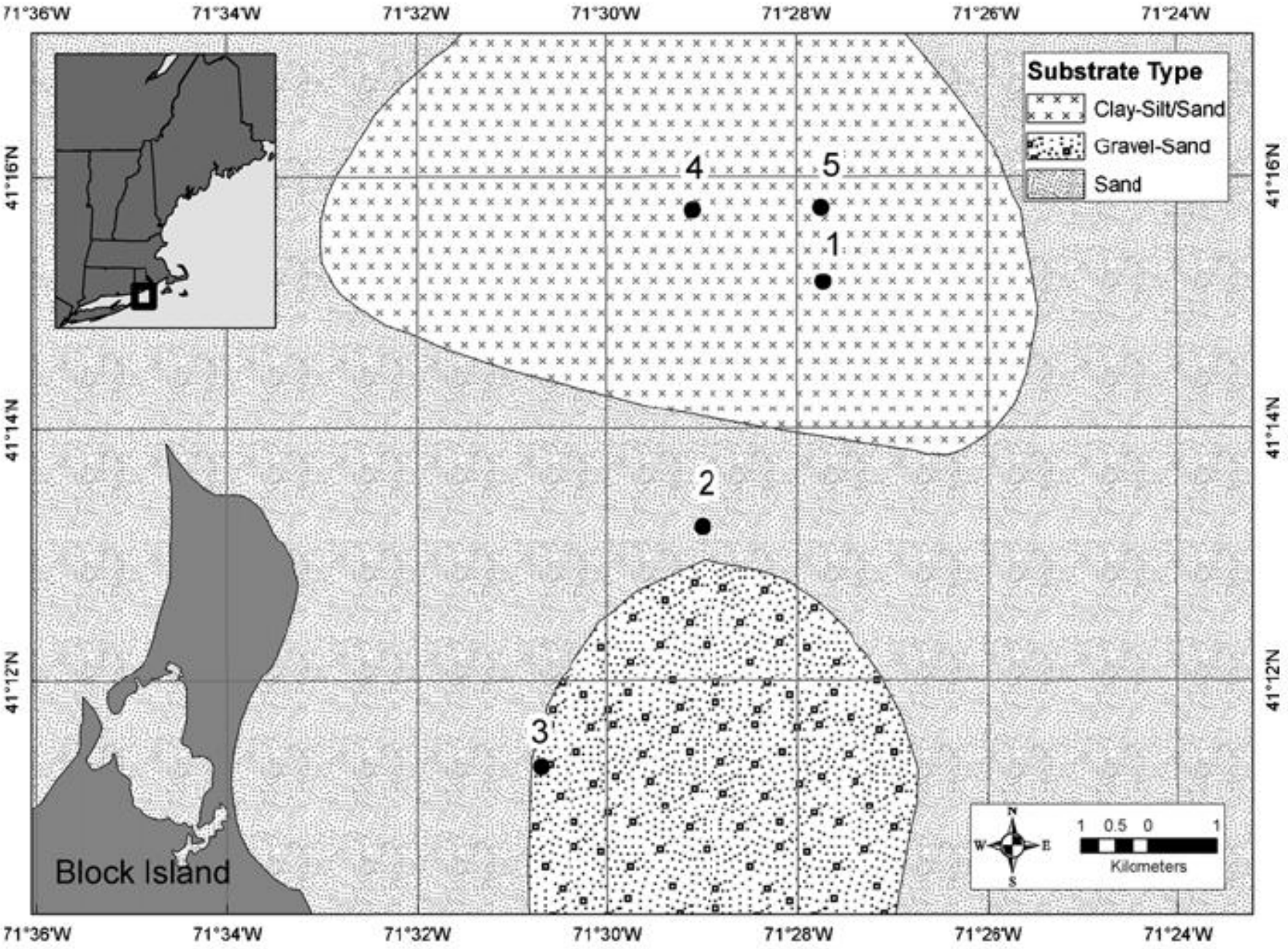


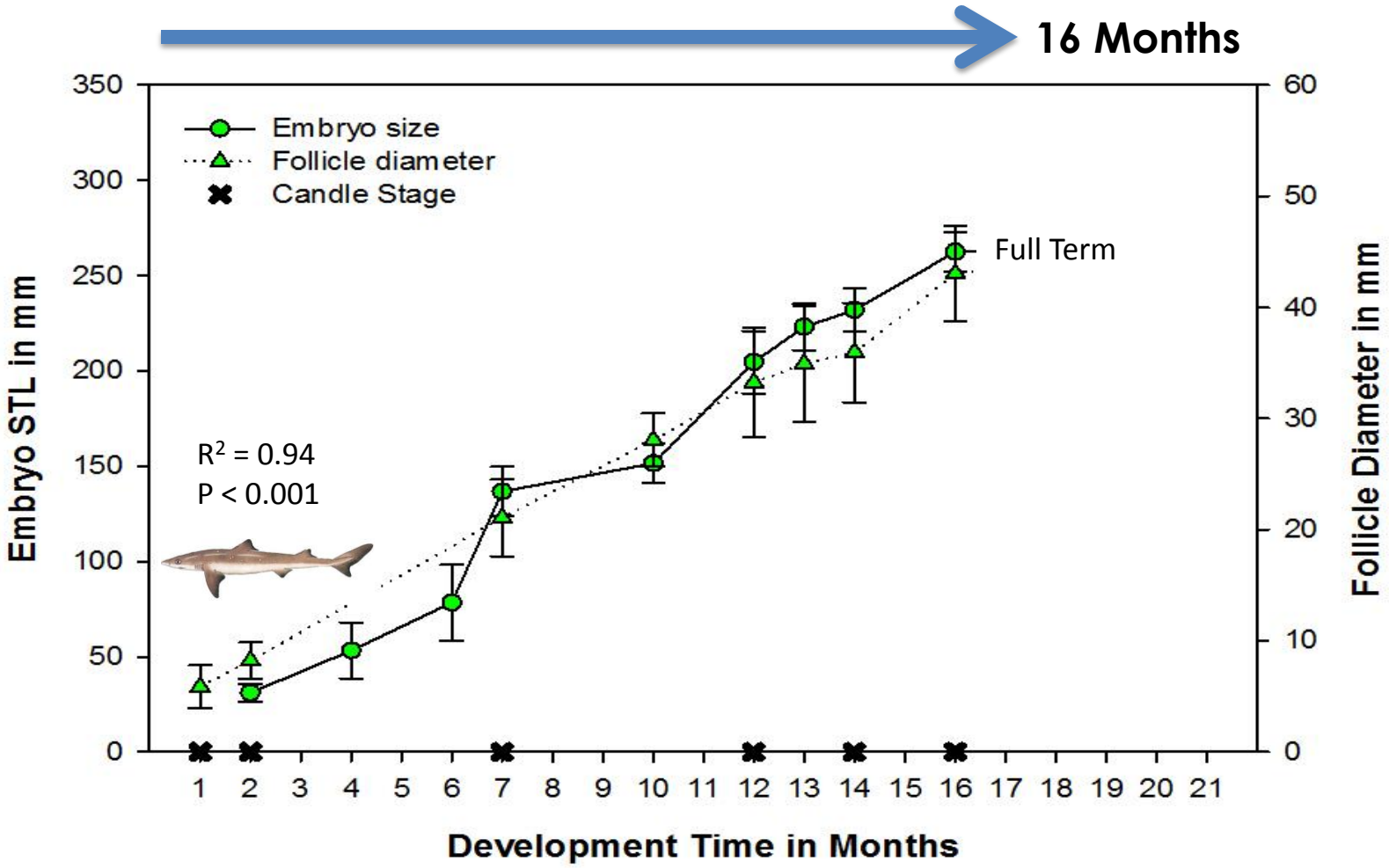

1400
1200
1000
800
600
400
200
0
Number of Individuals
528
556
Dec-10
Feb-11
Mar-11
Apr-11
May-11
Jul-11
Aug-11
Nov-11
Month


2000
1800
1600
1400
1200
1000
800
600
400
200
0
CPUE
December
February
March
April
May
June
July
August
September
October
Kernel Utilization Distribution (KUD)

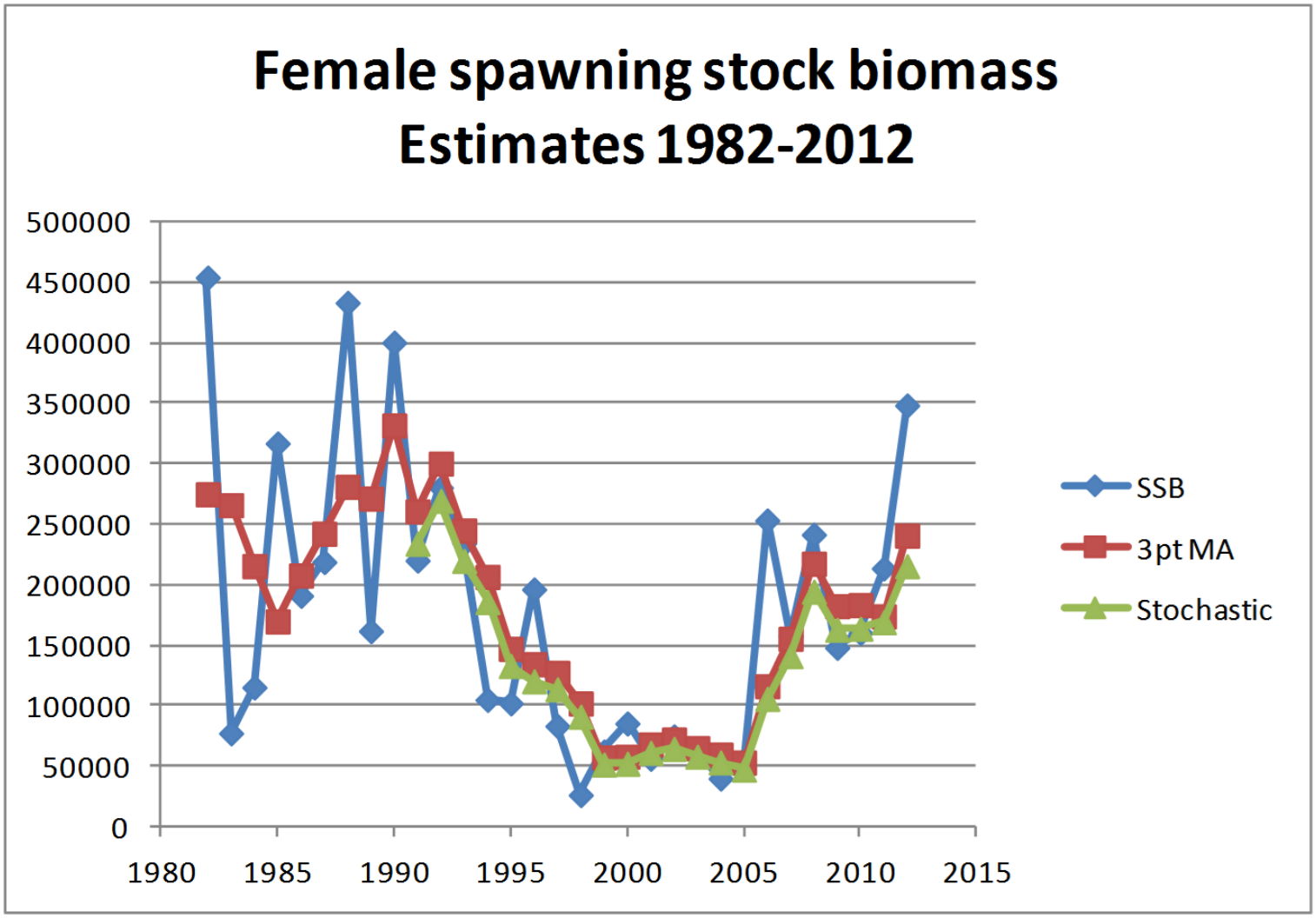



Block Island


71°36'W
71°34'W
71°32'W
71°30'W
71°28'W
71°26'W
71°24'W
41°16'N
41°14'N
41°12'N
Substrate Type
Clay-Silt/Sand
Gravel-Sand
Sand
1
2
3
4
5
Block Island
N
W
E
S
1 0.5 0 1
Kilometers



6-8 months shorter than the literature suggests

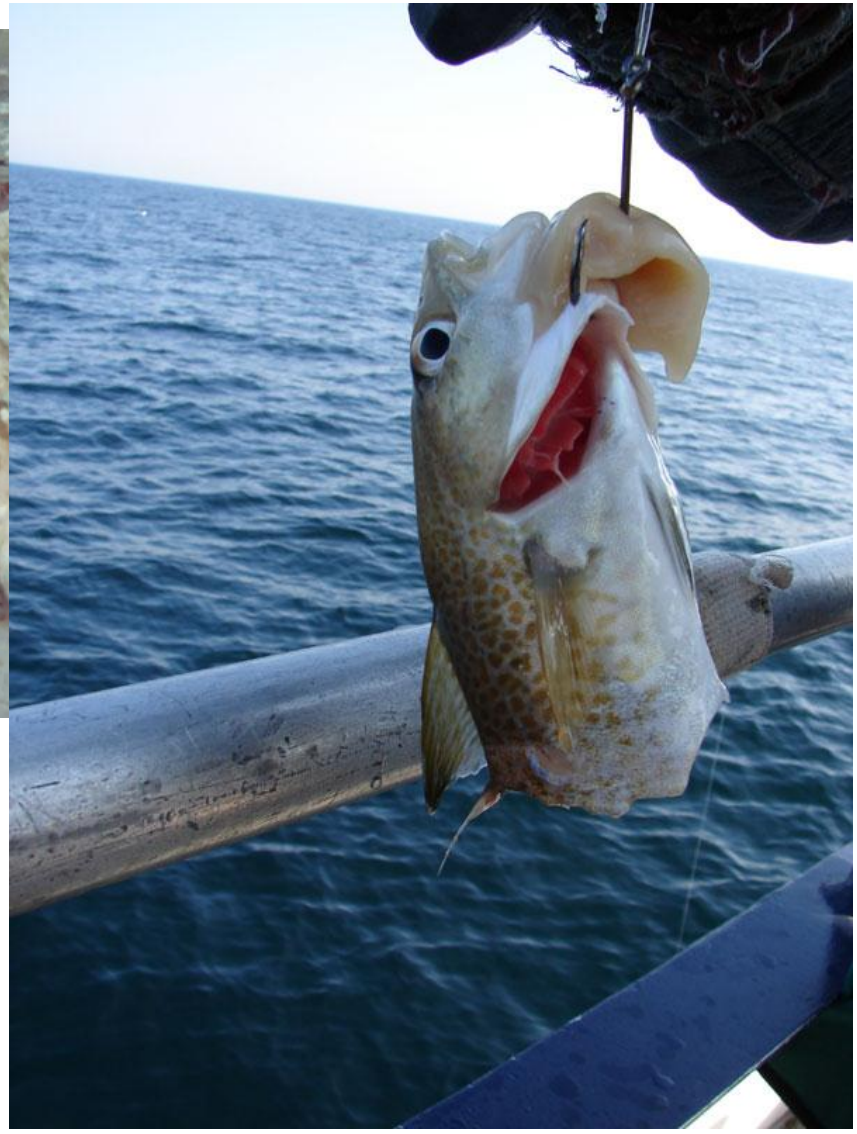


Jim Armstrong MAFMC

Hypothesis 3: If hypotheses 1 and 2 are true, then a year round dogfish population would impact ecosystem dynamics within this region

Link and Garrison

Dominant Piscivore outcompetes other species

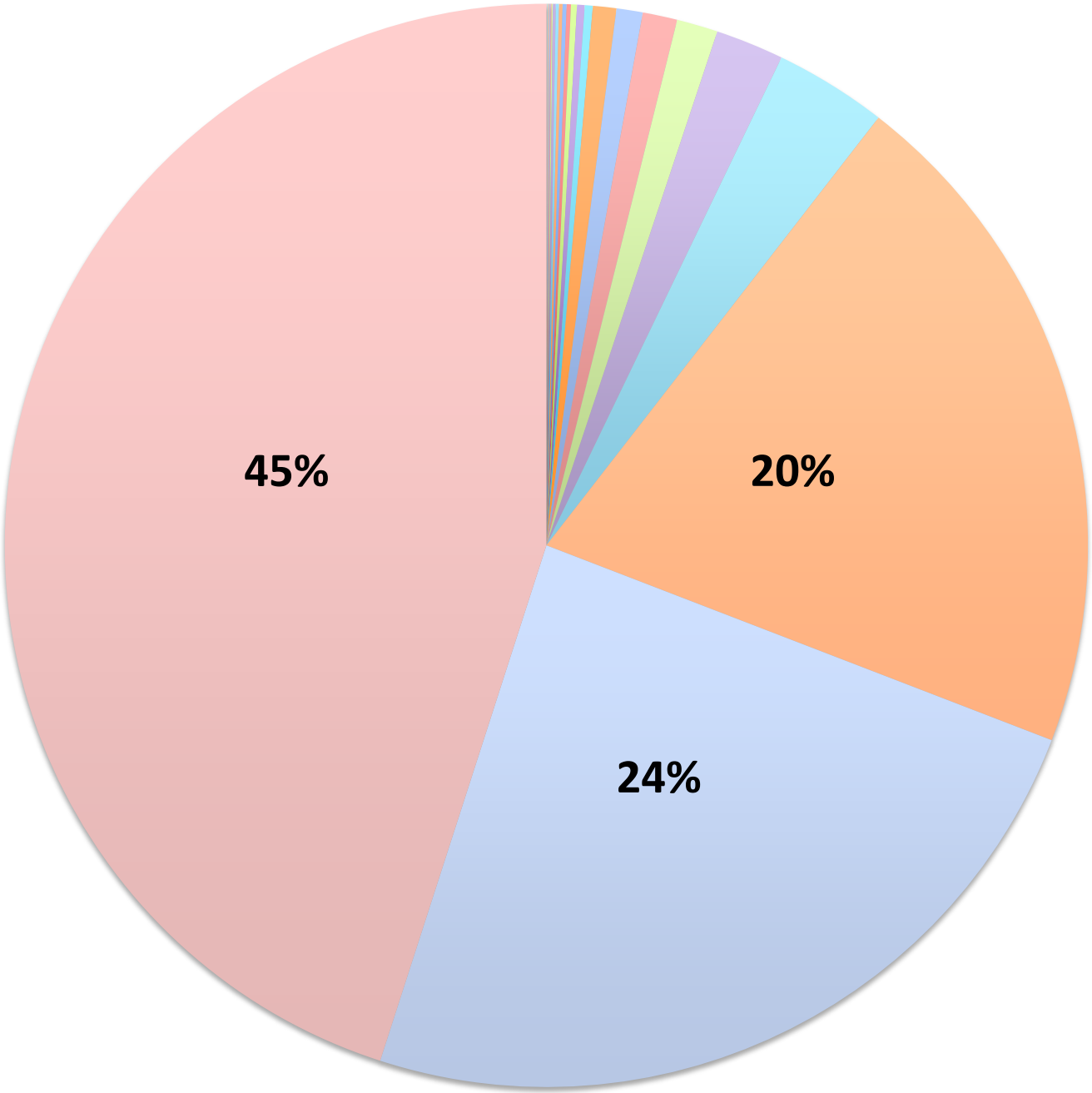



Scout Pro
ON/ZERO
PRINT
Unit

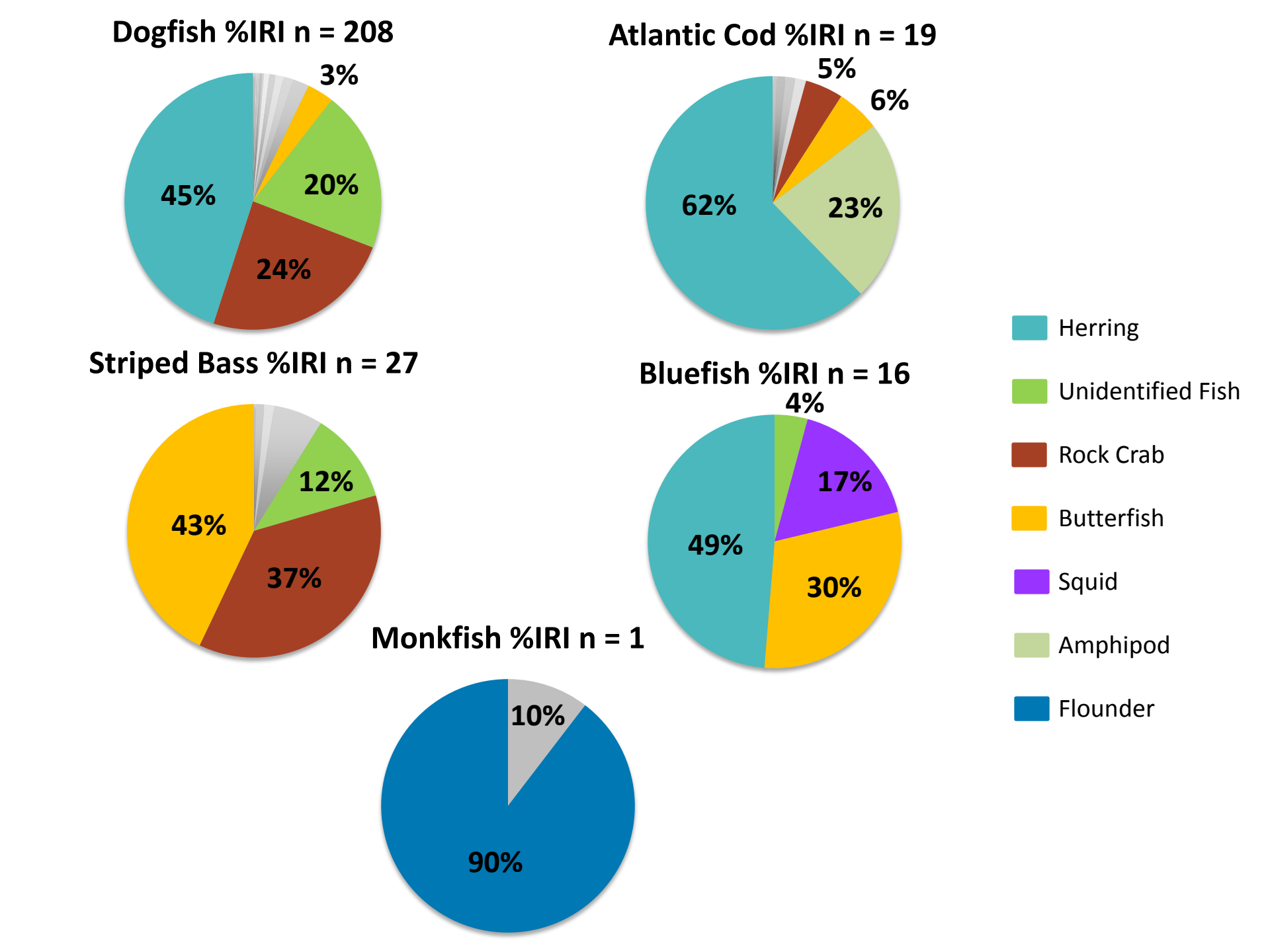

117B
Lab Prep
Storage

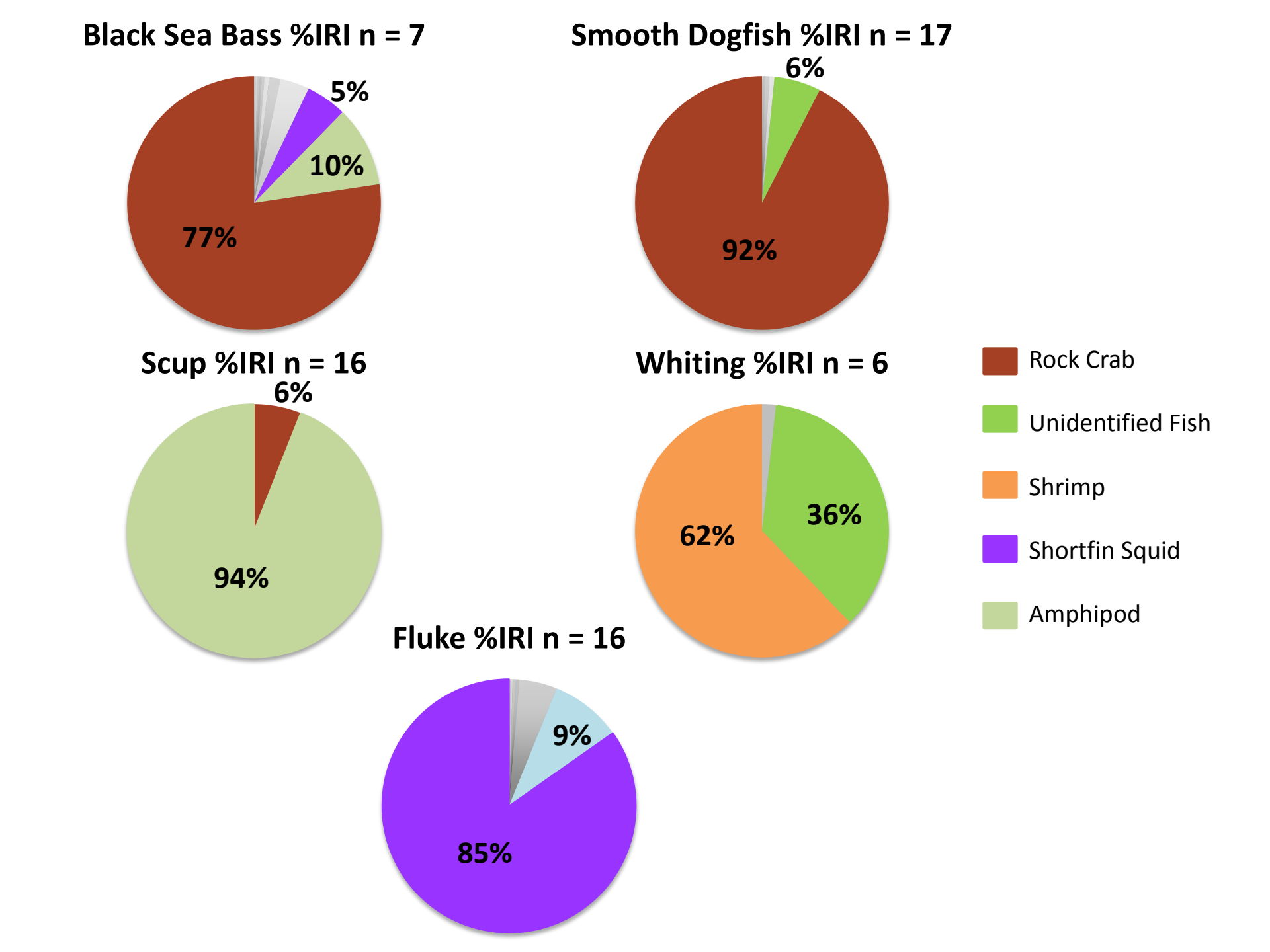

INCHES
LABORATORY APPARATUS, FURNITURE
SCIENTIFIC INSTRUMENTS & CHEMICALS
VWR Scientific Products
SAF
RI
46

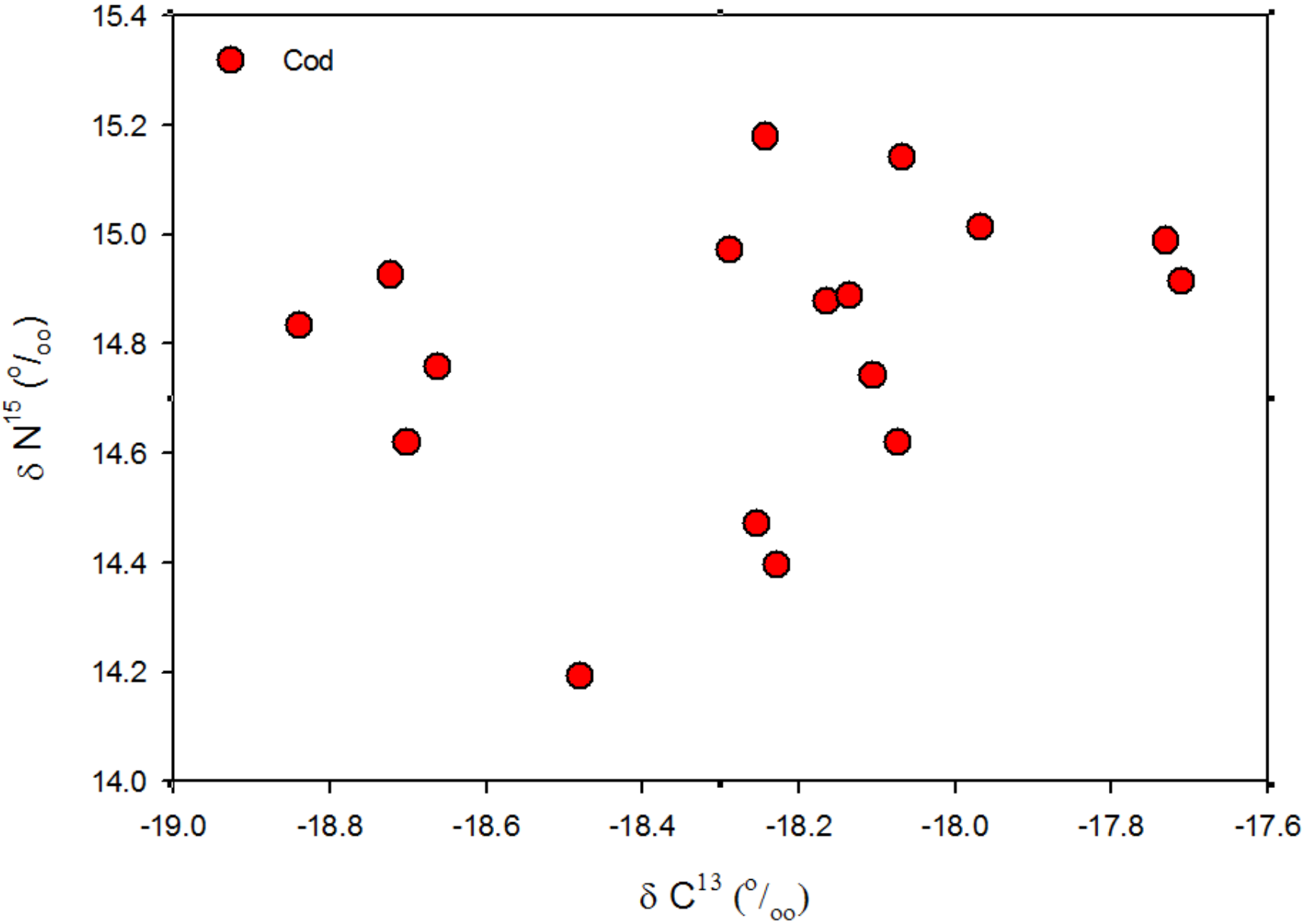
Dogfish %IRI n = 208

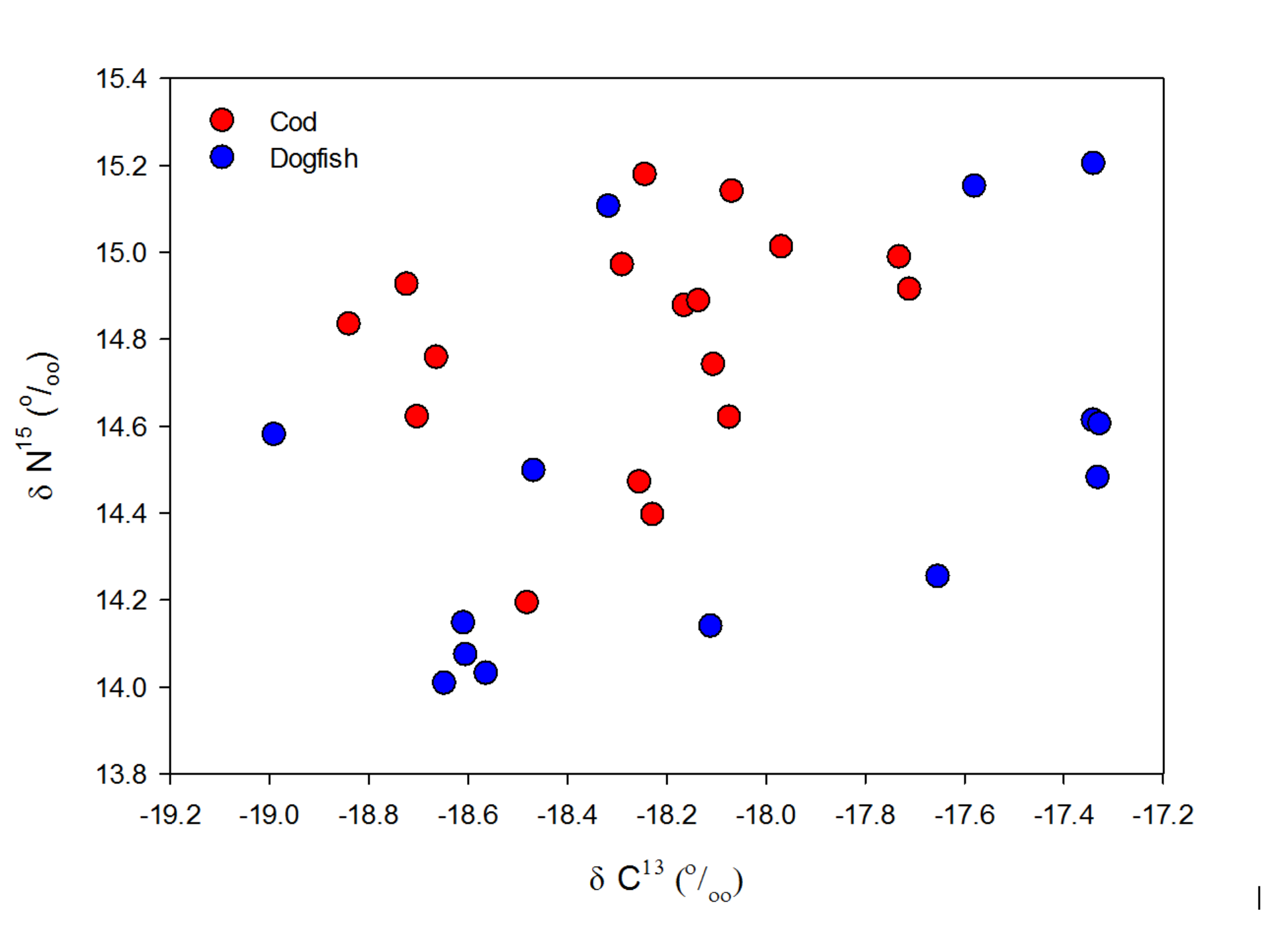


- Longfin Squid
- Jellyfish
- Bones
- Shortfin Squid
- Green Crab
- Sea Robin
- Clam
- Baby Dogfish
- Anaskid Worm
- Amphipod
- Blueback Herring
- Unknown
- Bird
- Mackerel
- Squid
- Whiting
- Summer Flounder
- American Eel
- Crab
- Skate
- Gadiforme
- Cod Intestines
- Butterfish
- Teleost
- Rock Crab

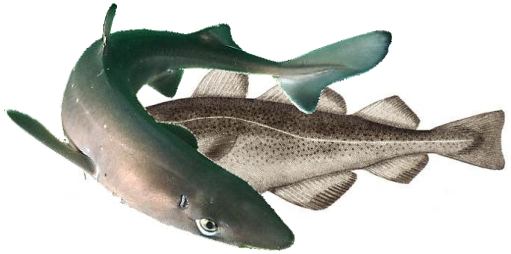

Dogfish %IRI n = 208
3%
45%
20%
24%
Atlantic Cod %IRI n = 19
5%
6%
62%
23%
Striped Bass %IRI n = 27
12%
43%
37%
Bluefish %IRI n = 16
4%
17%
49%
30%
Monkfish %IRI n = 1
10%
90%
Herring
Unidentified Fish
Rock Crab
Butterfish
Squid
Amphipod
Flounder


Black Sea Bass %IRI n = 7
5%
10%
77%
Smooth Dogfish %IRI n = 17
6%
92%
Scup %IRI n = 16
6%
94%
Whiting %IRI n = 6
36%
62%
Fluke %IRI n = 16
9%
85%
Rock Crab
Unidentified Fish
Shrimp
Shortfin Squid
Amphipod


Cod
15.4
15.2
15.0
14.8
14.6
14.4
14.2
14.0
δ N15 (°/oo)
-19.0
-18.8
-18.6
-18.4
-18.2
-18.0
-17.8
-17.6
δ C13 (°/oo)


Cod
Dogfish
15.4
15.2
15.0
14.8
14.6
14.4
14.2
14.0
13.8
δ N15 (o/oo)
-19.2
-19.0
-18.8
-18.6
-18.4
-18.2
-18.0
-17.8
-17.6
-17.4
-17.2
δ C13 (o/oo)

δN^{15}



Species	Sample Size	δC^{13} (‰)	δN^{15} (‰)
Cod	17	-18.1 (0.3)	14.5 (0.3)
Dogfish	14	-18.3 (0.6)	14.8 (0.4)

δC^{13}

Where are we now

- Developing an ecopath model

  Data already entered into model :

  habitat area, biomass in the habitat area, production/biomass, consumption/biomass values, landings, discards and catch rates

  Still being entered – diet composition

- 300 SIA samples are being analyzed
- Depth, fishing location and/or water temperature significantly affects catches of spiny dogfish

Questions..