

Fisheries science to inform management

How it works & how to get involved



Jim Gartland

Virginia Institute of Marine Science

February 25, 2023

Presentation Outline

- 1. Where do fisheries data come from?**
- 2. How exactly are fisheries data collected?**
- 3. How do we handle/analyze these data?**
- 4. How are the data used?**
- 5. Where are we headed?**
- 6. How can you get involved?**

Types of fisheries science

- Fisheries-dependent (observers, VTR)
- Fisheries-independent surveys
- Age & growth
- Reproductive studies
- Trophic interactions
- Habitat ecology
- Fisheries oceanography
- Management strategy eval. (simulations)
- Economic analyses
- Dozens & dozens more...



Fisheries-independent monitoring surveys

Objective

Measure trends in relative abundance, distribution, population structure, & life history for stock assessments & management

Approach

- Identify target species (one, some, many) & area
- Based on above, choose the right fishing gear (KEY POINT!!!)
- Design, sample (go fishing), & collect data consistently over time

For best results...

Blend industry's observations & ability to fish with our scientific abilities (aka. cooperative research)

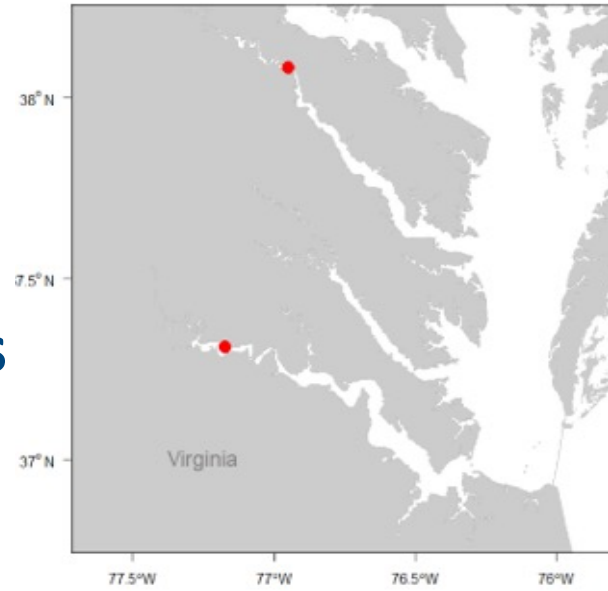
Striped Bass Monitoring Program

Design

- Weekly, Feb – May since 1988
- Gill nets; 3" – 10" mesh, 24 h soak
- Industry: net design & sample locations
- VMRC funded

Data Collection

- Count (abundance trends)
- Length, weight, sex, maturity, age
- Myco presence & severity
- Data to ASMFC



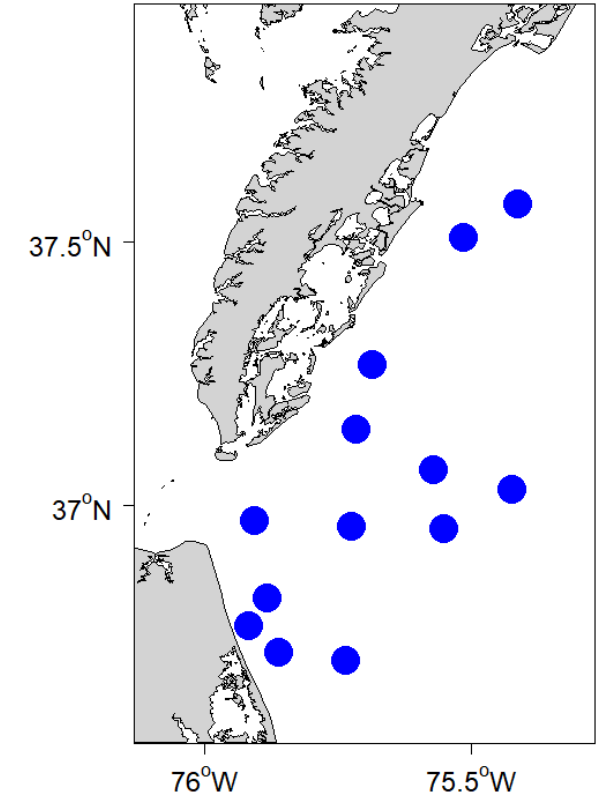
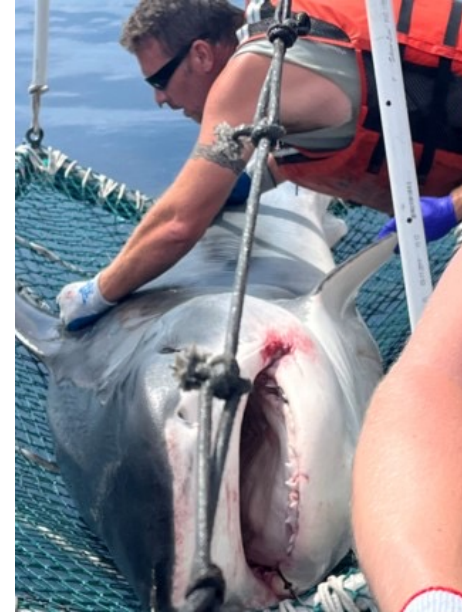
Virginia Shark Monitoring Program

Design

- Monthly, Jun – Sept since 1974
- Bottom longline; 100 hooks, 4 h soak
- Industry BLL & sample locations
- NOAA/ASMFC funded

Data Collection (16 spp)

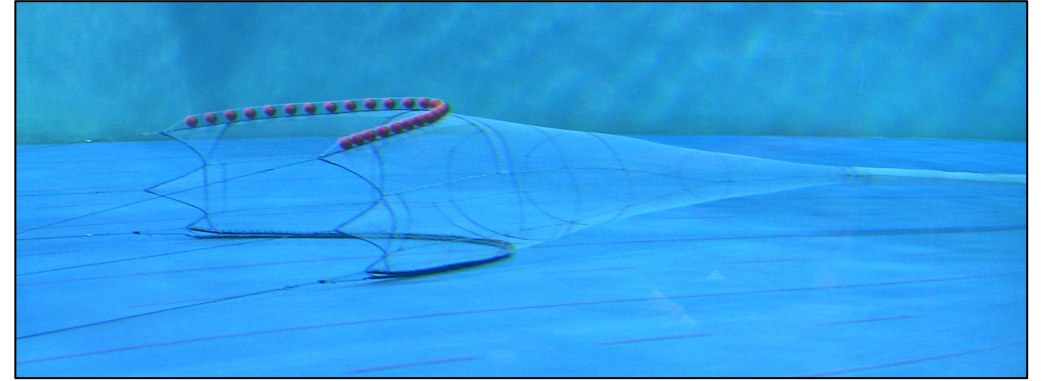
- Count (abundance trends)
- Length, weight, sex
- All sharks tagged & released
- Data to ASMFC & SEDAR



ChesMMAP Trawl Survey

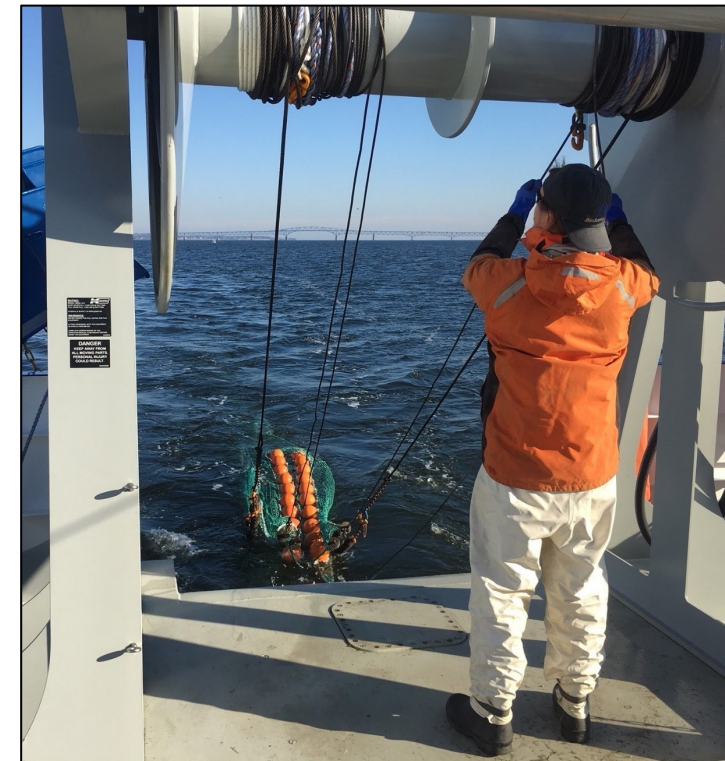
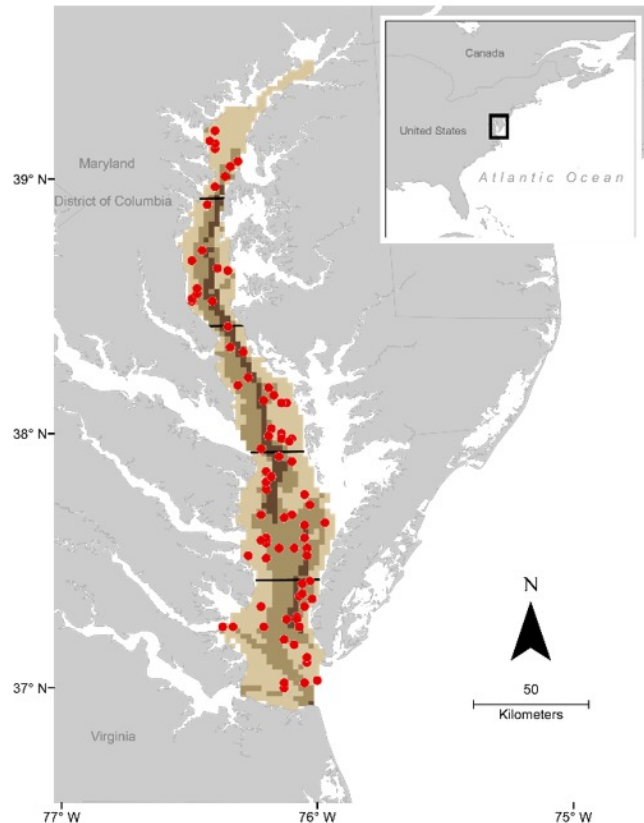
Design

- Mar, Jun, Sep, Nov since 2002
- 200 x 12cm, 3-bridle 4-seam btm trawl
- Industry & VIMS designed trawl
- VMRC funded



Data Collection (~100 spp)

- Count & weight (abundance)
- Length, sex, maturity, age, diet
- 240 tows/year
- Data to VMRC, ASMFC, NOAA



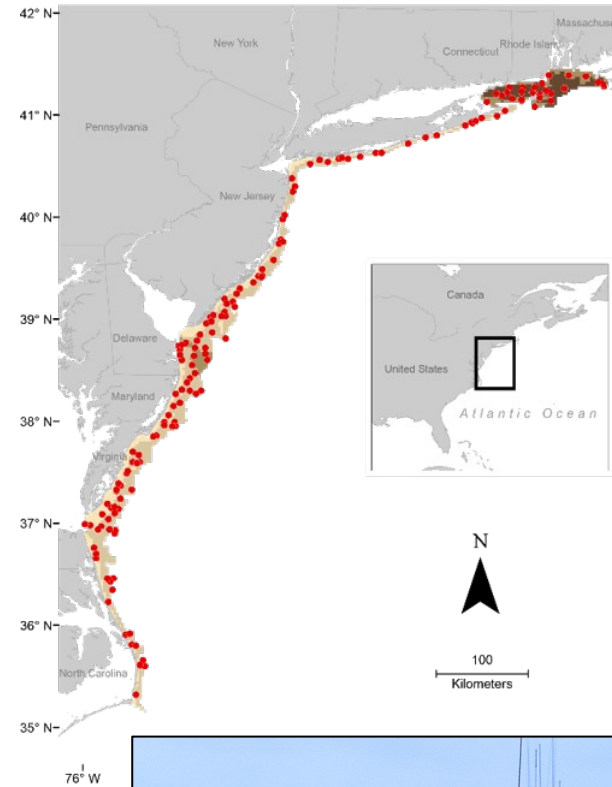
NEAMAP Trawl Survey

Design

- Spring & Fall since 2007
- 400 x 12cm, 3-bridle 4-seam btm trawl
- Industry designed trawl, industry boat
- ASMFC & NOAA funded

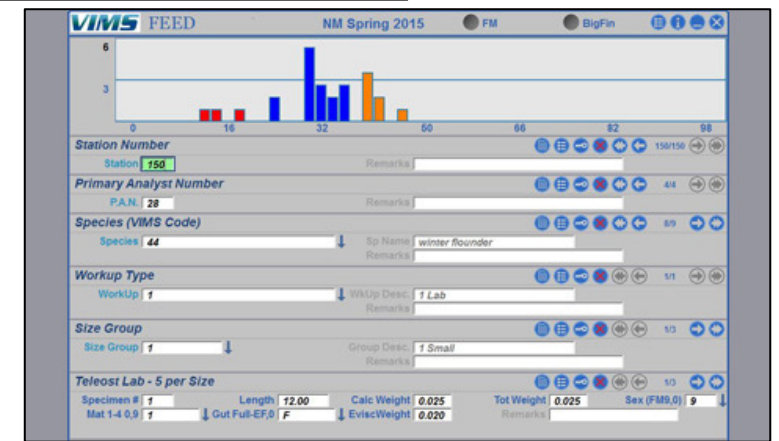
Data Collection (~180 spp)

- Count & weight (abundance)
- Length, sex, maturity, age, diet
- 300 tows/year
- Data to VMRC, ASMFC, NOAA



Catch Processing – How it works...

1. Fishermen set gear & make tow
2. Scientists record location, gear, weather, & water quality
3. Fishermen haul back & dump catch
4. Scientists sort catch by species & size groups
5. Fishermen run boat to the next station
6. Scientists record aggregate weight & individual length (provides count) for each species



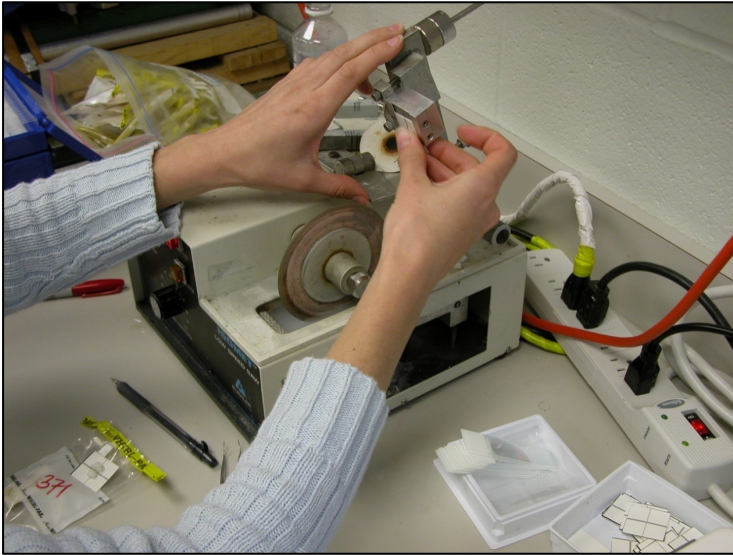
Onboard Laboratory – How it works...

- Temporary conversion of fish hold to laboratory
- 5 fish per species per tow
- Length, weight, sex, maturity
- Stomach removed & preserved for diet analysis
- Otoliths, scales, vertebrae, etc removed & stored for ageing
- 158,661 fish processed to date



Shore-Based Laboratory – How it works...

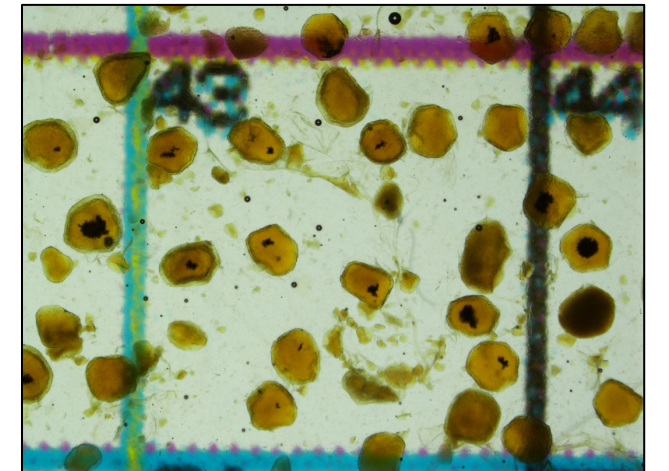
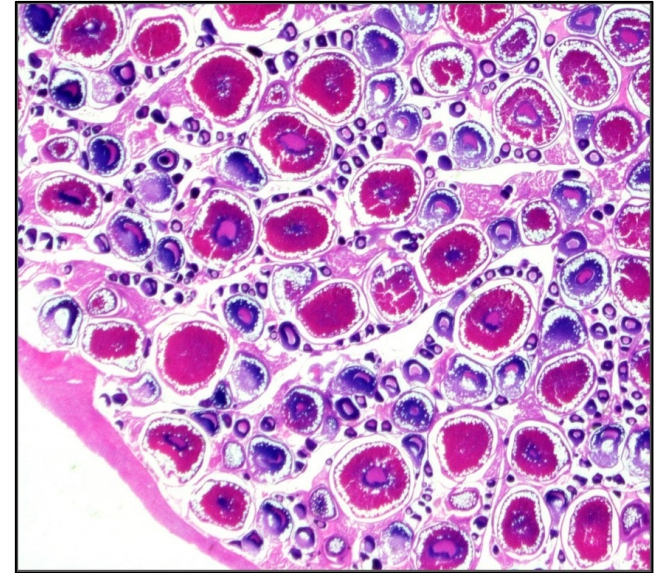
Age



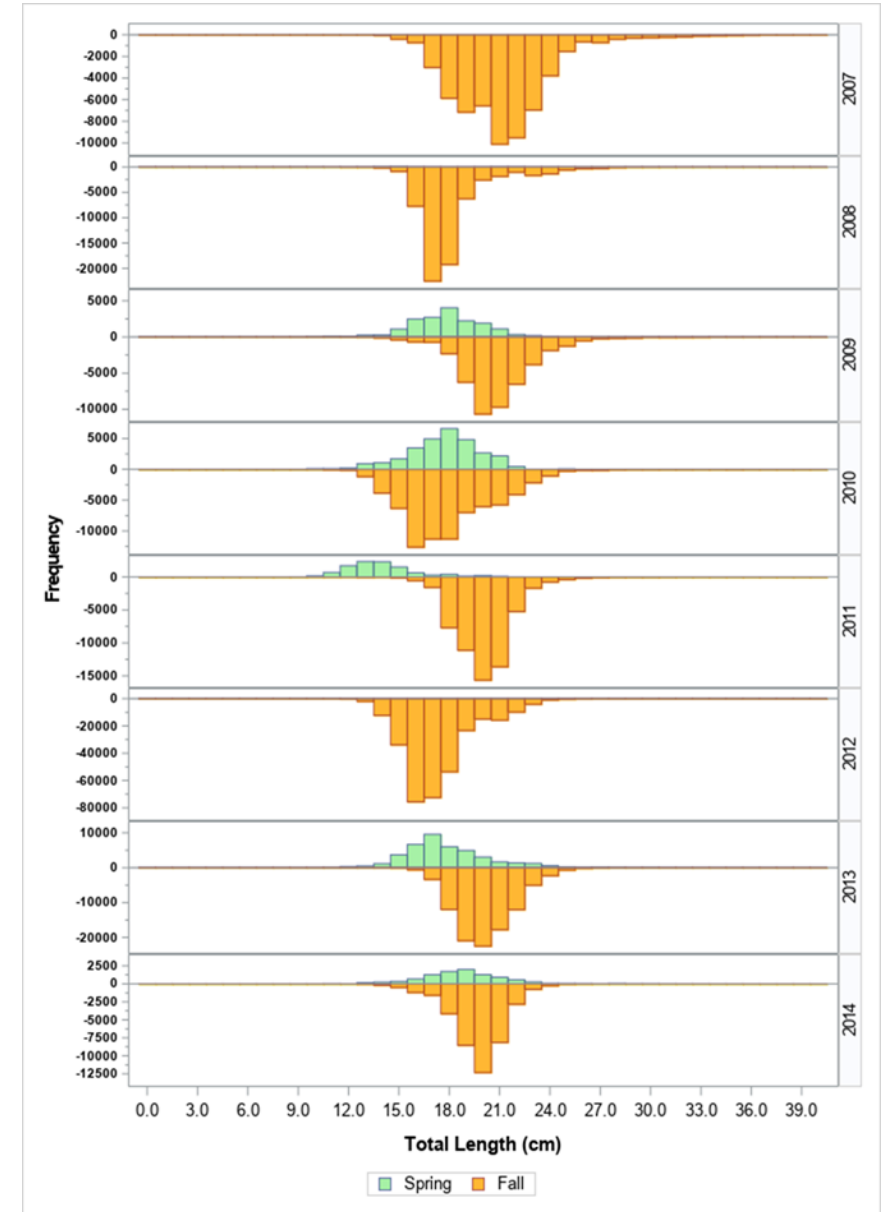
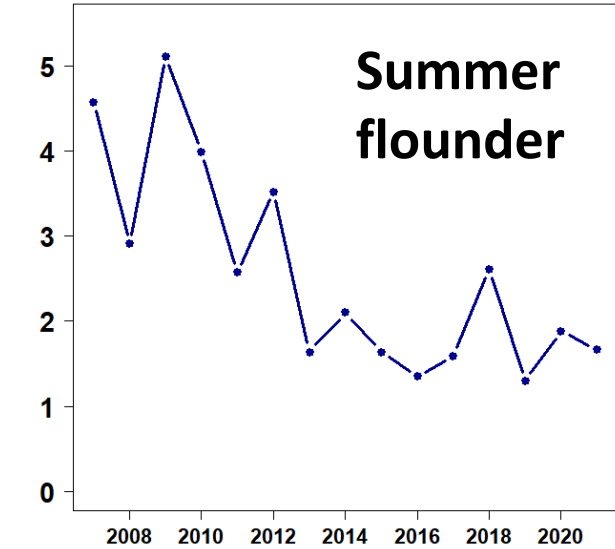
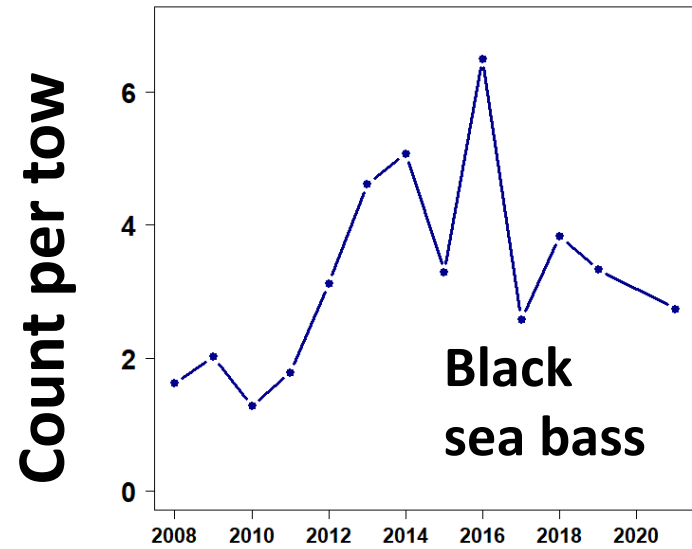
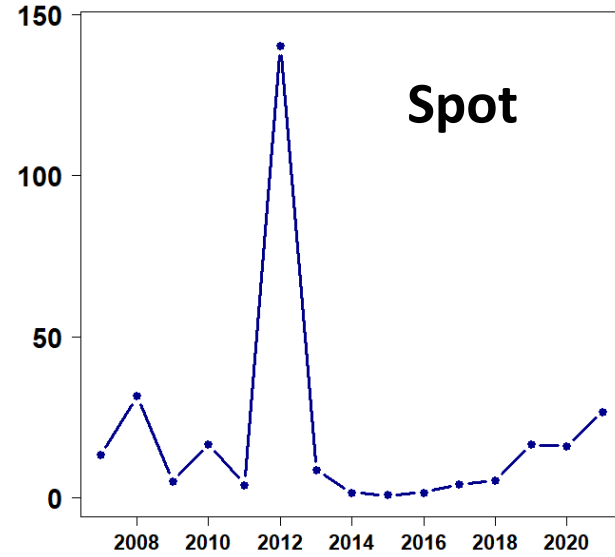
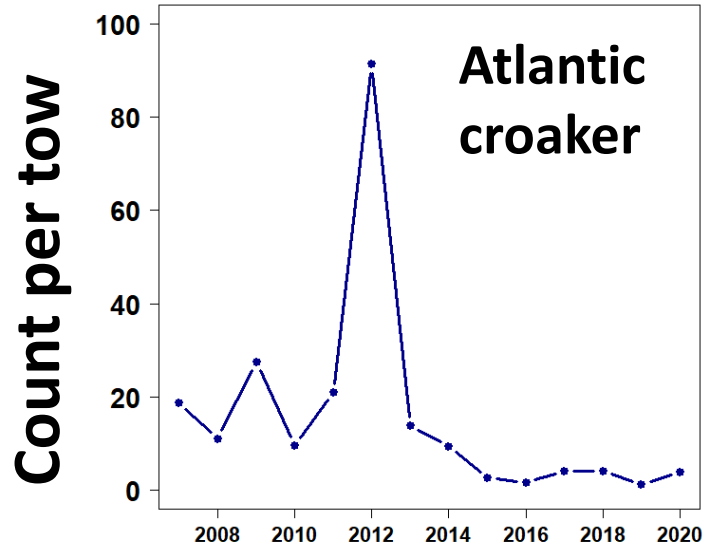
Diet



Reproduction



Analyzing the Data – Catch & Length



Calculating index trends (*Math Time!*)

1. Design Survey

(a) 1/6	(c)
(b) 1/3	1/2



2. Catch Fish

(a) <u>Catch</u> 36	(c) <u>Catch</u> 154
(b) <u>Catch</u> 12 2 Ave: 7	201 74 Ave: 143

3. Math

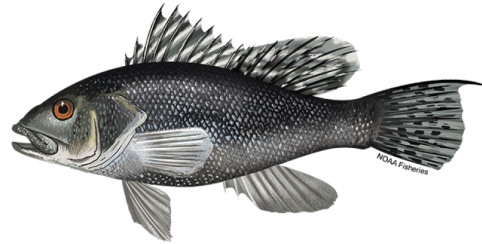
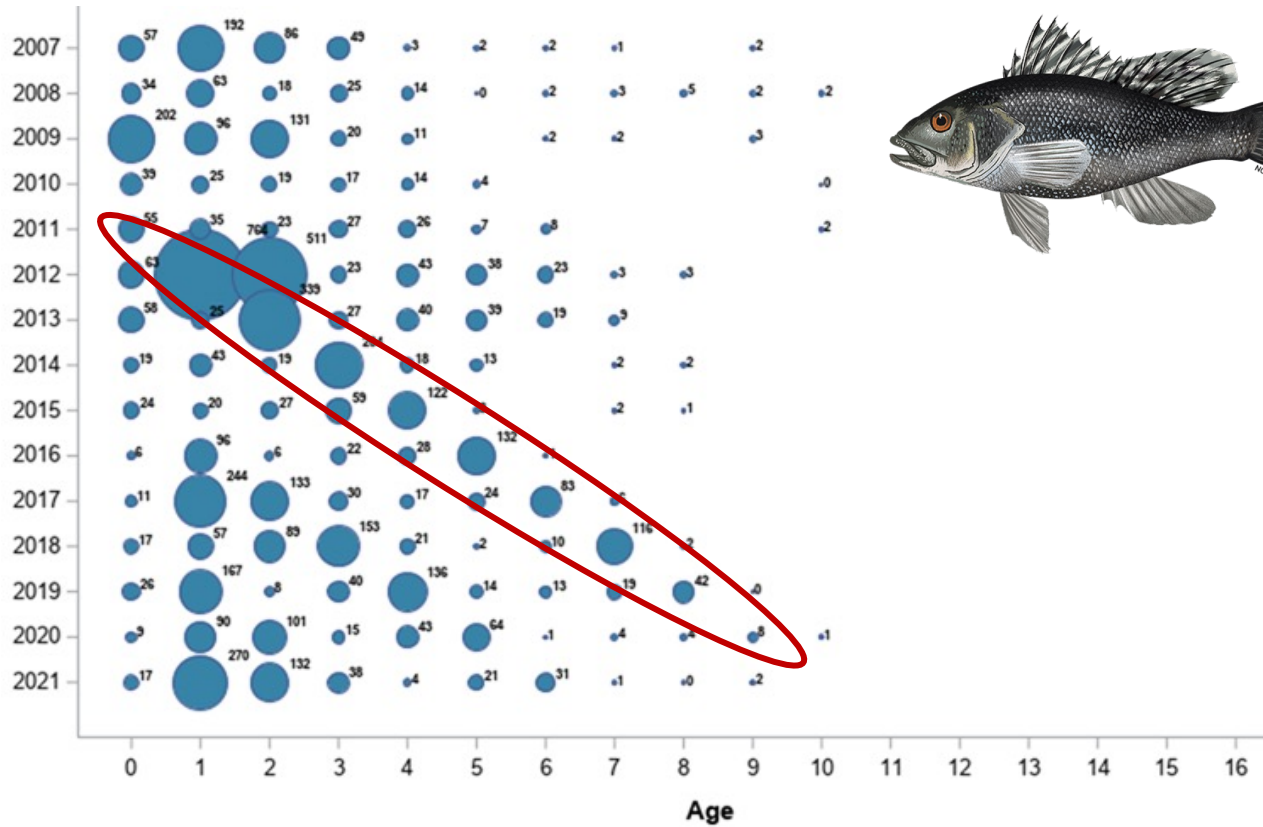
$$(a) \quad (b) \quad (c)$$
$$(1/6 * 36) + (1/3 * 7) + (1/2 * 143)$$

4. Answer

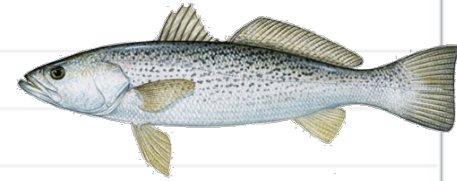
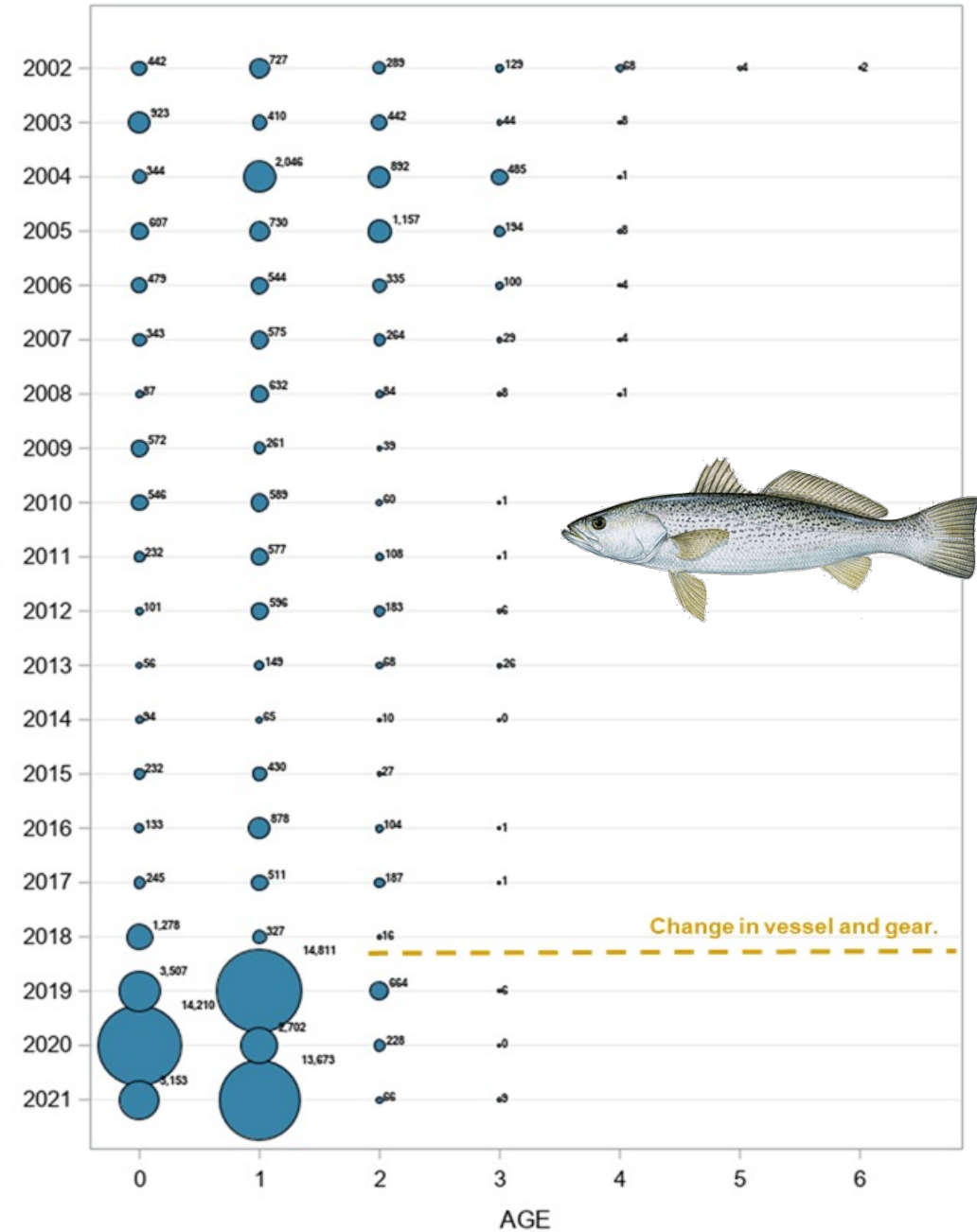
79.8 FISH PER TOW

Fish Age Data

Track Strong Year-Classes

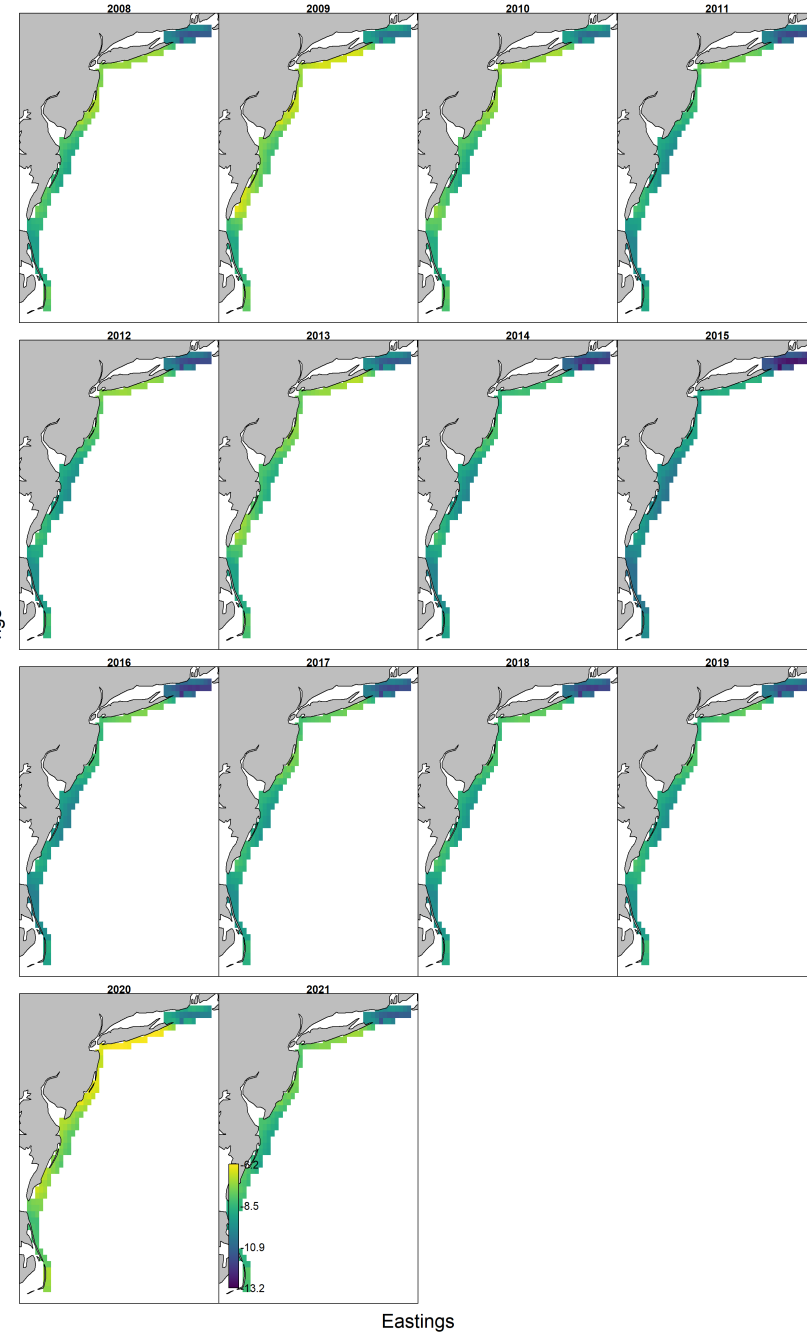
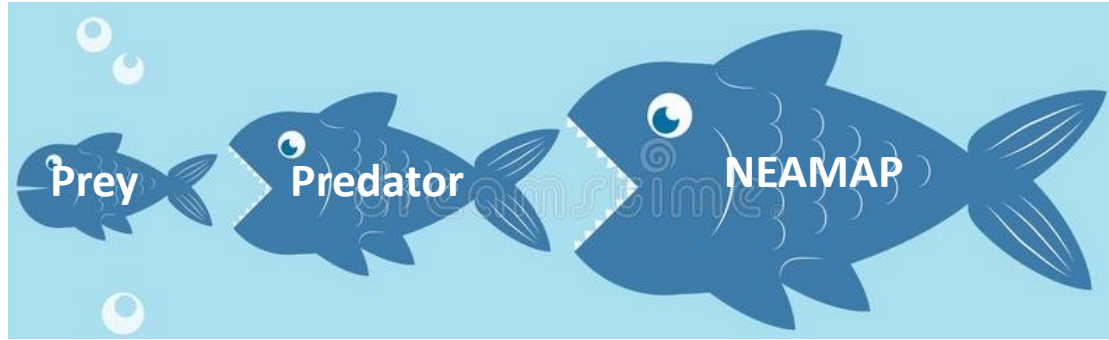


Uncover Problems



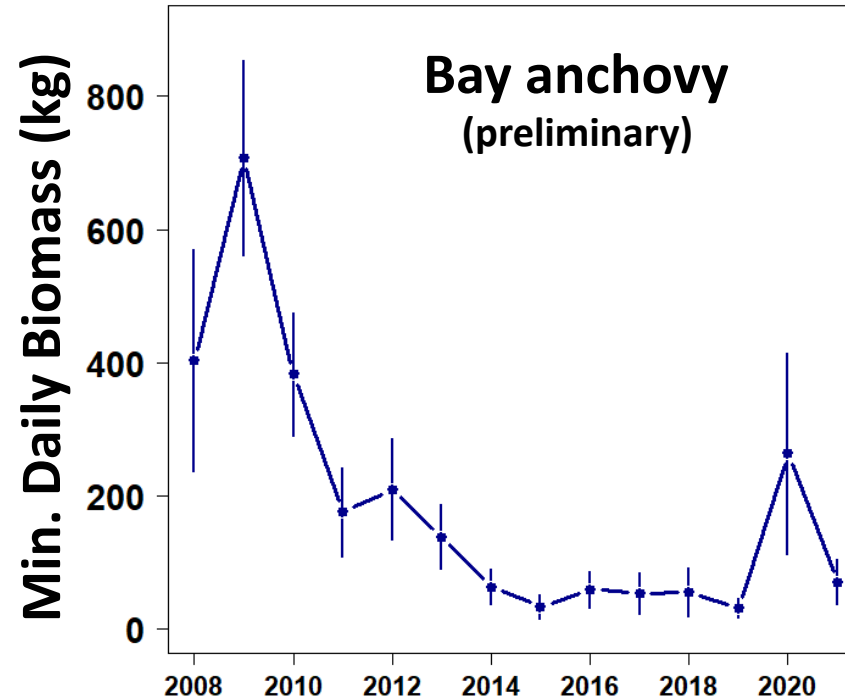
Fish Diets

Predator diets to quantify prey abundance



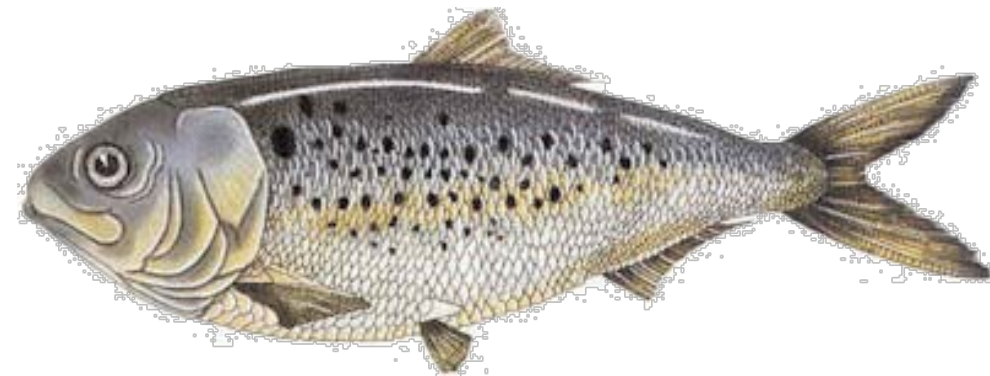
Combine

- Diet
- Water temp
- Catch
- Time
- Area



Fish Reproduction

	Annual Fecundity		
Age	Lewis et al. 1987	VIMS	Percent Change
1	3,770	27,350	+ 625%
2	37,765	270,490	+ 616%
3	98,782	771,287	+ 681%
4	137,741	1,044,859	+ 659%
5	173,022	1,132,786	+ 555%
6+	180,394	1,271,904	+ 605%



Stock Assessments

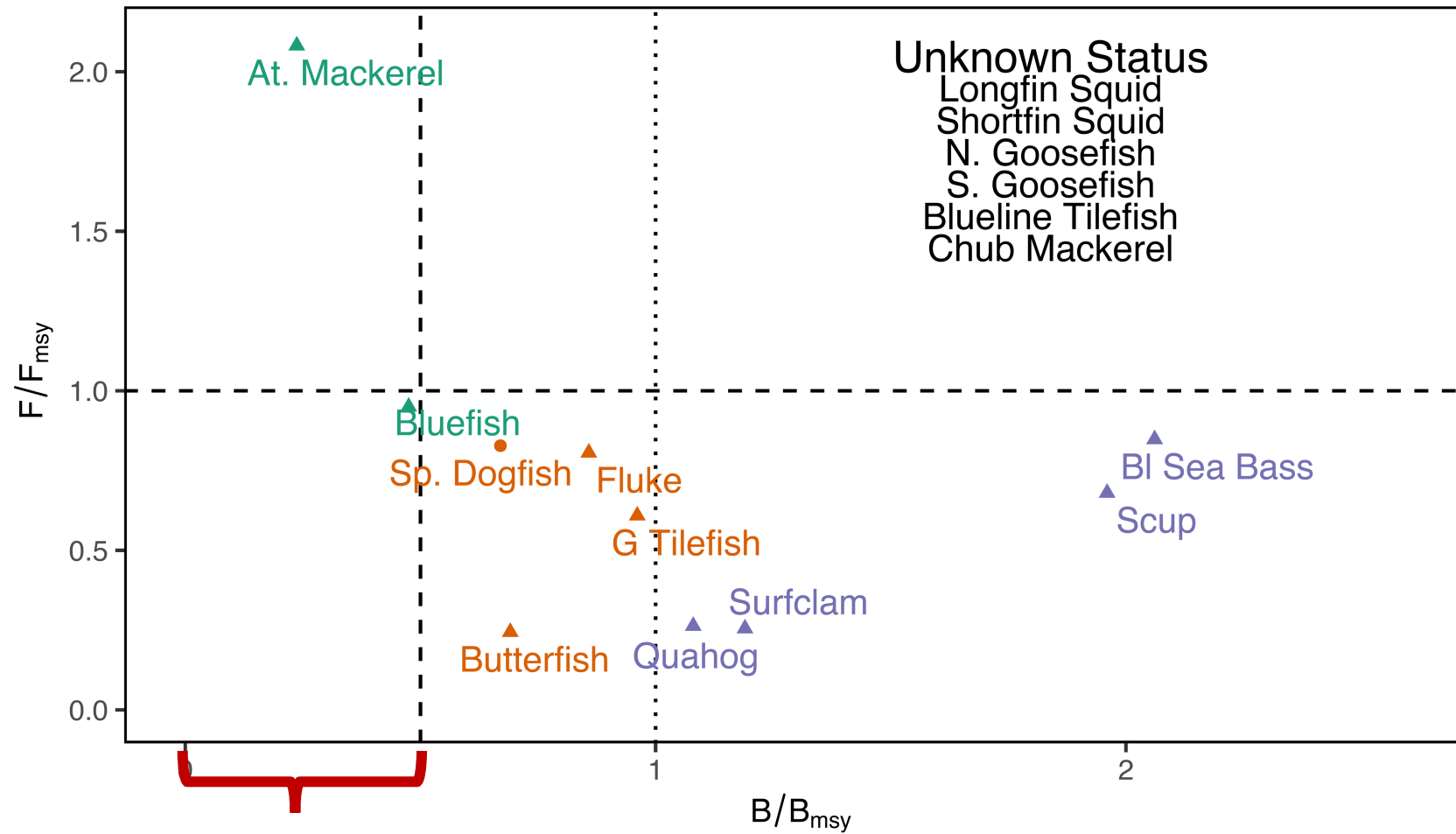


Longline

- Atl. sharpnose
- Blacktip
- Dusky
- Sandbar
- Sm hammerhead (ongoing)

Species	NM (29)	CM (10)	SB (1)
Atl. croaker	*	*	
Atl. menhaden	*	*	
Black drum	*		
Black sea bass	*	*	
Bluefish	*	*	
Longfin squid	*		
River herr.	*		
Shortfin squid	*		
Spot	*	*	
Striped bass		*	*
Sum. flounder	*	*	
Weakfish	*	*	

Stock Status



Overfished

Biomass too low

Overfishing

Rate of harvest is too high

Surveys “Influence” (some examples)

- 1. Contributed to VA shrimp (NM/CM)**
- 2. Loosened summer flounder regs. (NM)**
- 3. Doc. coastal shark improvements (LL)**
- 4. Corrected menhaden fecundity (NM/CM)**
- 5. Highlighted declines in the bay (CM)**
- 6. At times, put fishermen on fish (VHF)**

Where are we headed?

Midwater Trawl Surveys

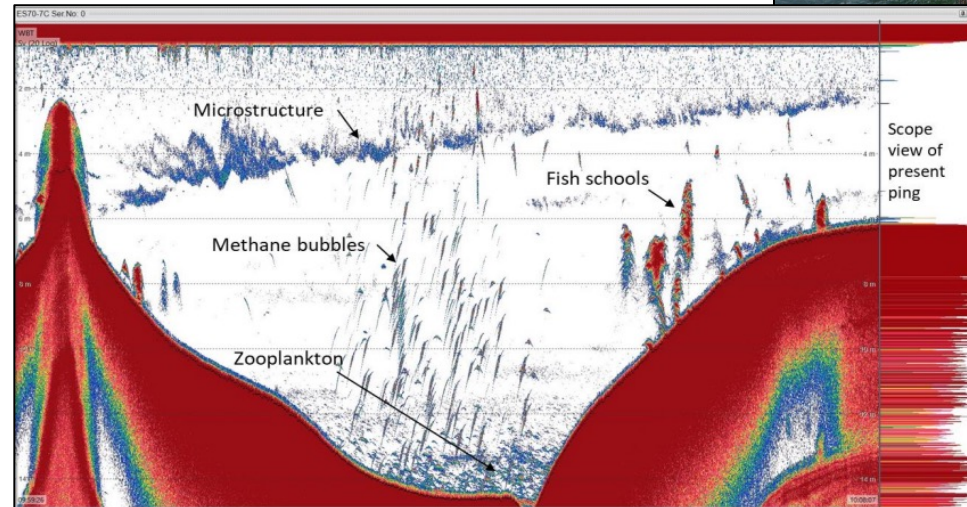
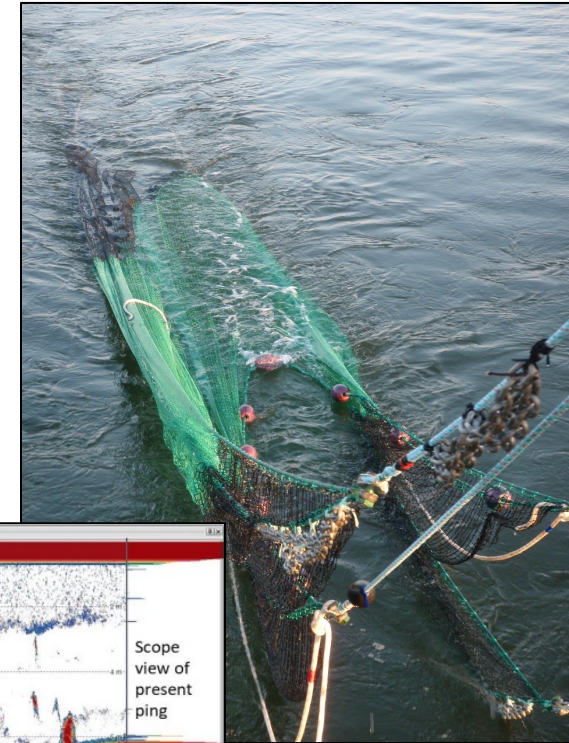
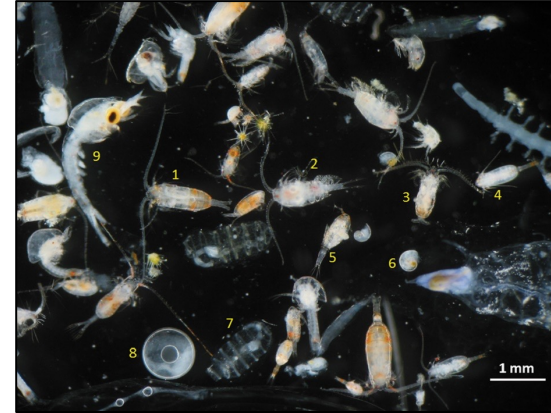
Quantify the pelagic ecosystem

Plankton Surveys

Understand base of food webs

Acoustic Surveys

For those hard to reach places...



How can you get involved?

VIMS NEAMAP

Survey Demos!

jgartlan@vims.edu

804-684-7546



NOAA Northeast Fisheries Science Center
Cooperative Research

Google that

Join emailing list &
get involved!!!



Thank you

