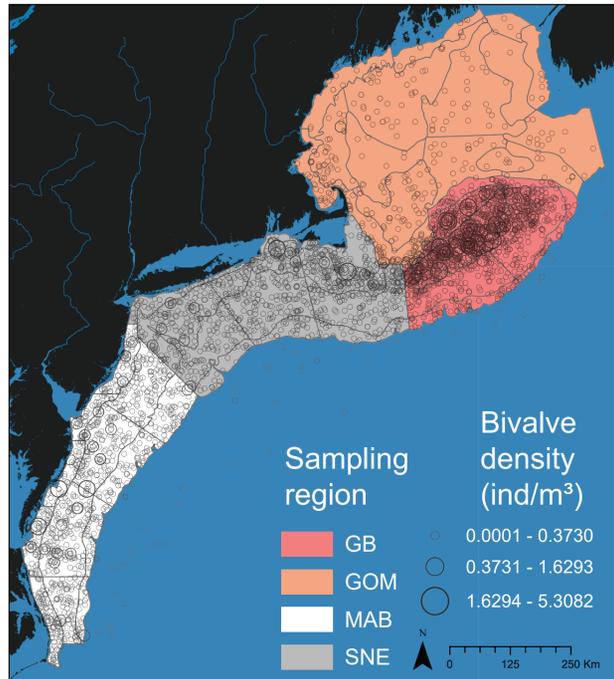# Examining long-term patterns in Atlantic sea scallop (*Placopecten magellanicus*) early life history dynamics with a novel Bivalve Larval Imaging System (BLIS)

Andrew D. Corso[1], Liuzhi Zhao[2], Scott M. Gallager[3], Siqi Li[2], Harvey J. Walsh[4], and Changsheng Chen[2]

NOAA NEFSC plankton archive

Sampling region: GB, GOM, MAB, SNE

Bivalve density (ind/m³): 0.0001 - 0.3730; 0.3731 - 1.6293; 1.6294 - 5.3082
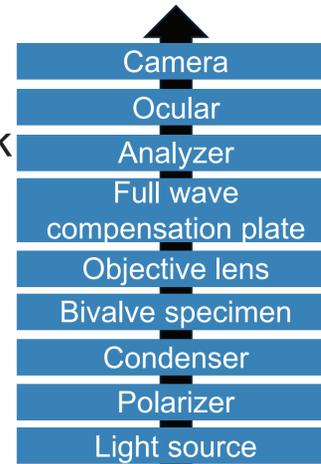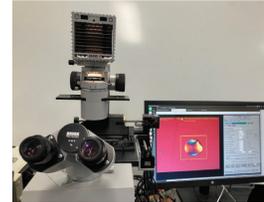
- Marine Resources Monitoring, Assessment, and Prediction
  ◦ MARMAP: 1977–1987
- Ecosystem Monitoring
  ◦ EcoMon: 1992–present
- 4 cruises/year
- 5,404 larval bivalve jars
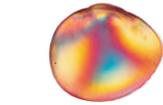- Bongo nets
  ◦ 60-cm 333 μm
  ◦ 20-cm 333 μm

How to identify 43,000+ larval bivalves?

- Polarized light microscopy
  ◦ Unique signature in aragonitic crystals
- Deep learning convolutional neural network
- Trained on 56 species

Camera
Ocular
Analyzer
Full wave compensation plate
Objective lens
Bivalve specimen
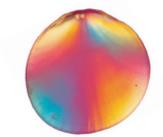Condenser
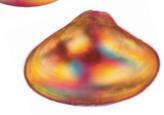Polarizer
Light source

Preliminary results

350 μm

- 14 years of usable ethanol samples
  ◦ Formalin samples not intact
- All stations in Oct–Nov contain sea scallops
  ◦ Make-up 6–92% of larval bivalves
  ◦ 250–290 μm shell height
- Five other species present
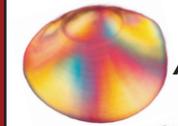
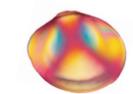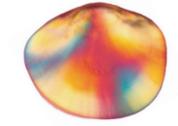*Arctica islandica*
Lunarca ovalis
Argopecten irradians
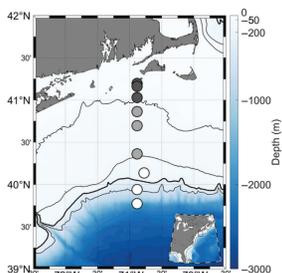*Geukensia demissa*
Spisula solidissima

Applications – simulate spring spawning

- Individual-Based Model
  ◦ Scallop-IBM
- Northeast Coastal Ocean Forecast System (NECOFS)
  ◦ Global-regional nested Finite Volume Community Ocean Model (FVCOM)
- Parameterization follows Munroe et al. 2018
- Simulation for 2017–2023
  ◦ Initiates on March 20
- Settlement starts at 35 days, peaks at 45 d post-spawn

New York Bight Area
Elephant Trunk Area

2017
2020
2017-2023
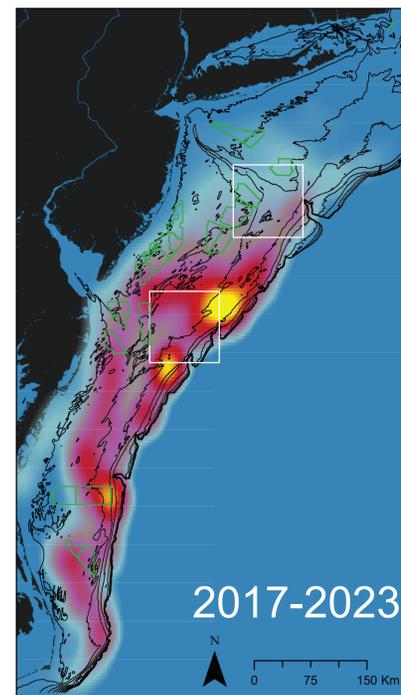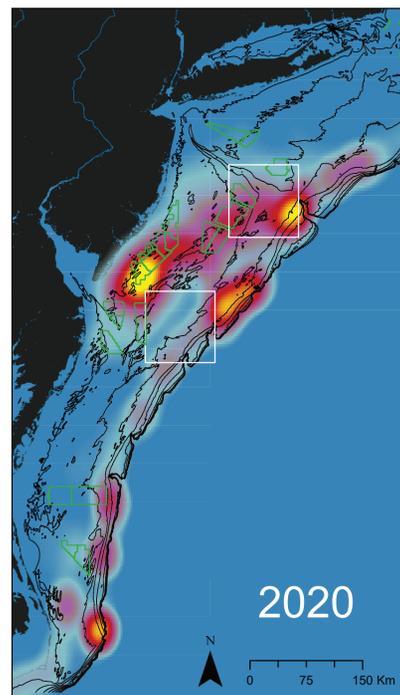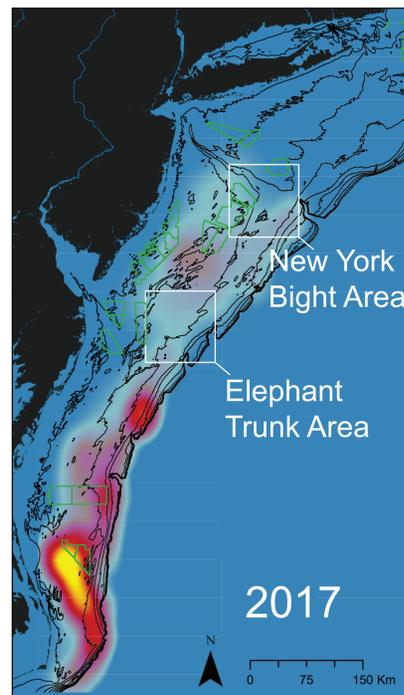
Next steps

- Process remaining NOAA EcoMon cruises
- Northeast U.S. Shelf (NES) Long-Term Ecological Research (LTER) project samples
  ◦ 60-cm 150 μm mesh
- Validate spawning simulations with electronic submersible mining pump
  ◦ Discrete sampling depths

NOAA FISHERIES
University of Massachusetts Dartmouth SMAST
Coastal Ocean Vision

[1]Coonamessett Farm Foundation, East Falmouth, MA, USA; [2]School for Marine Science and Technology, University of Massachusetts Dartmouth, New Bedford, MA, USA; [3]Coastal Ocean Vision, North Falmouth, MA, USA; [4]NOAA, NMFS, Northeast Fisheries Science Center, Narragansett, RI, USA

acorso@cfarm.org