Update on Scallop Meat Quality in Closed Area II

RSA research - Seasonal Bycatch Survey

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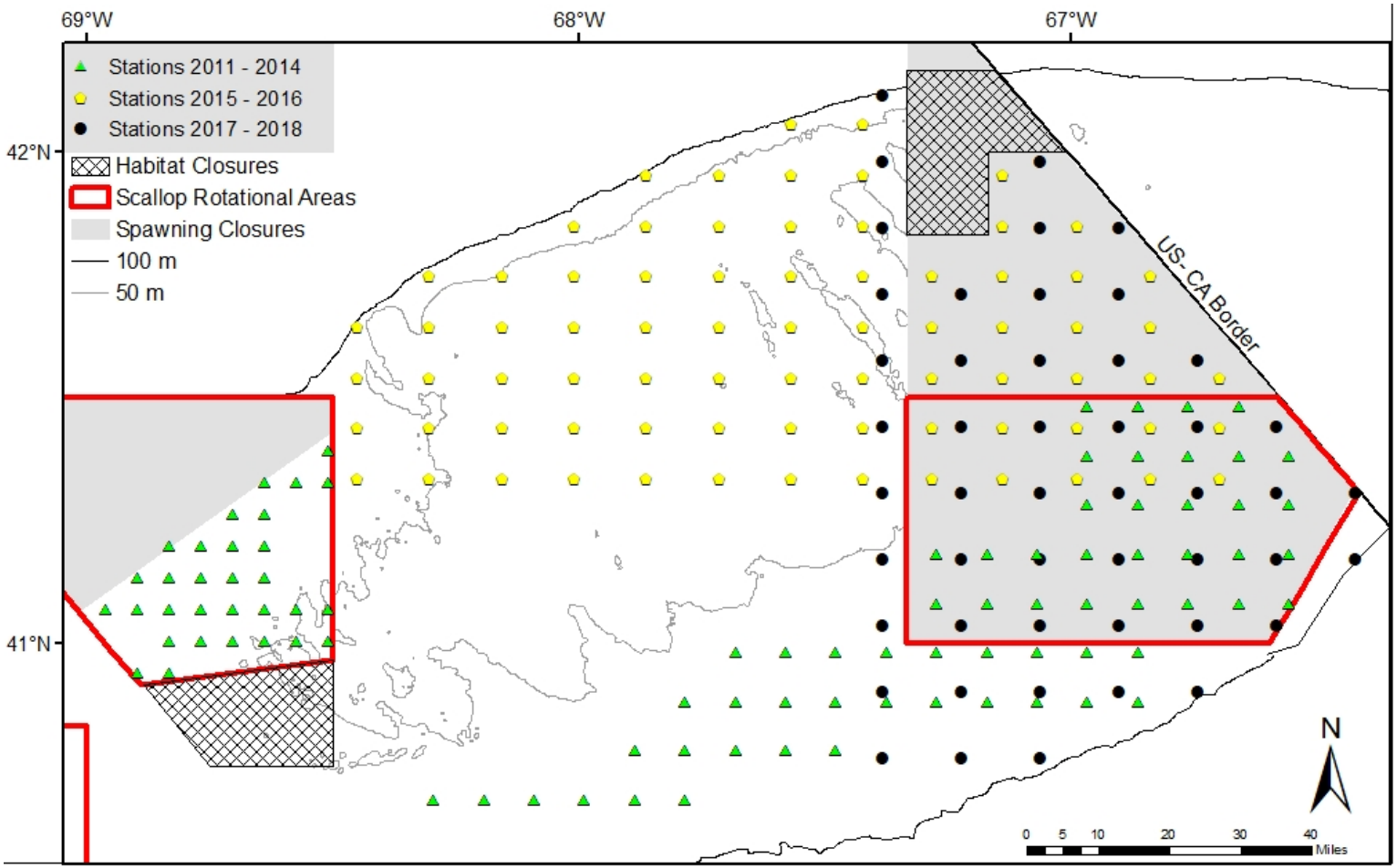


- The survey uses a fixed grid design
- From May 2011 – March 2014, the survey was conducted every four to six weeks in the scallop access areas of CAI and CAII and along the southern flank
- The survey was moved onto northern Georges Bank beginning in August 2015
- Since August 2017 the survey has been conducted in the eastern portion of GB

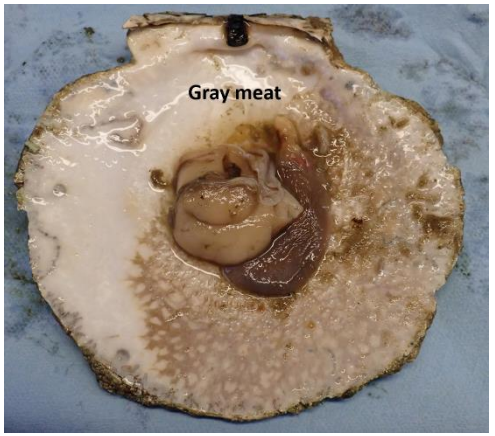
Methods

30 minute tows
4.8 knots
Control vs. Experimental

Depth
Bottom temperature
Location coordinates
Month, day, and time

All catch is analyzed on board

Shell height
Meat/gonad weight
Sex
Reproductive stage
Diseases/quality of the meat



Molecular and histological analyses of disease

Total numbers of scallops assessed during each survey month.

CAI and CAII

Survey Year	Survey Month	Number of scallops sampled
2013	September	396
	October	380
	December	364
2014	January	363
	March	399

363 – 873
scallops per trip

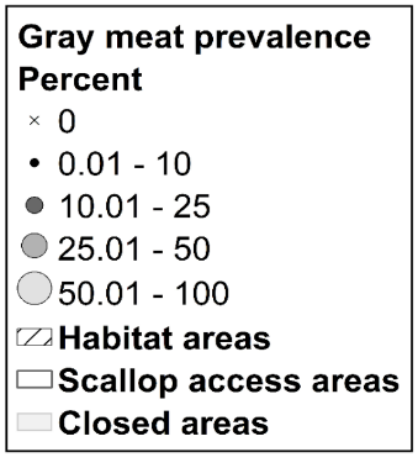
Northern portion of Georges Bank

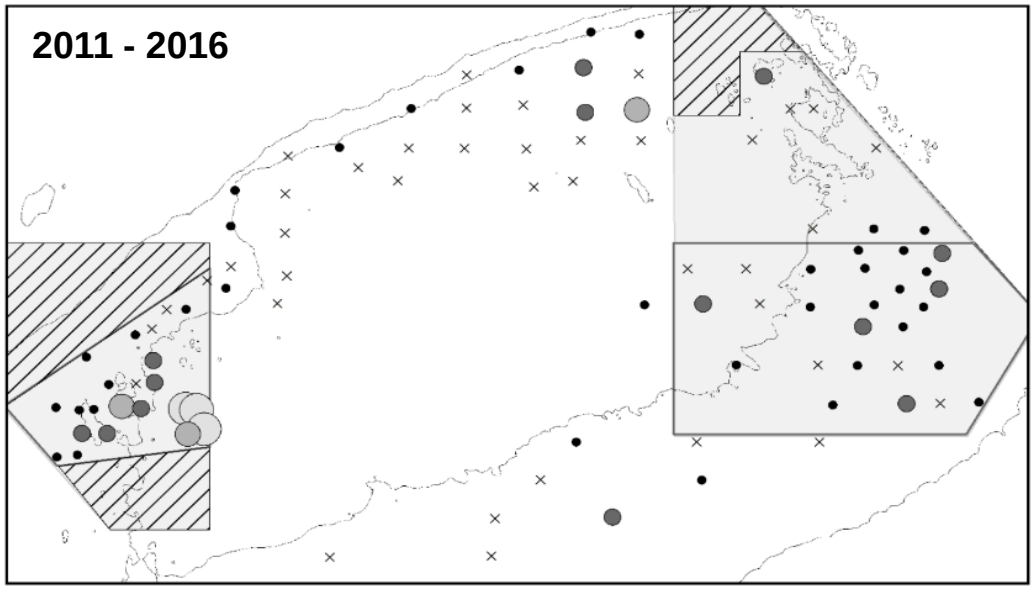
Survey Year	Survey Month	Number of scallops sampled
2015	August	411
	September	558
	October	557
	November	605
2016	January	563
	March	654
	May	641
	June	527
	July	530
	October	517
	November	385
2017	January	483
	March	520
	May	628
	June	502

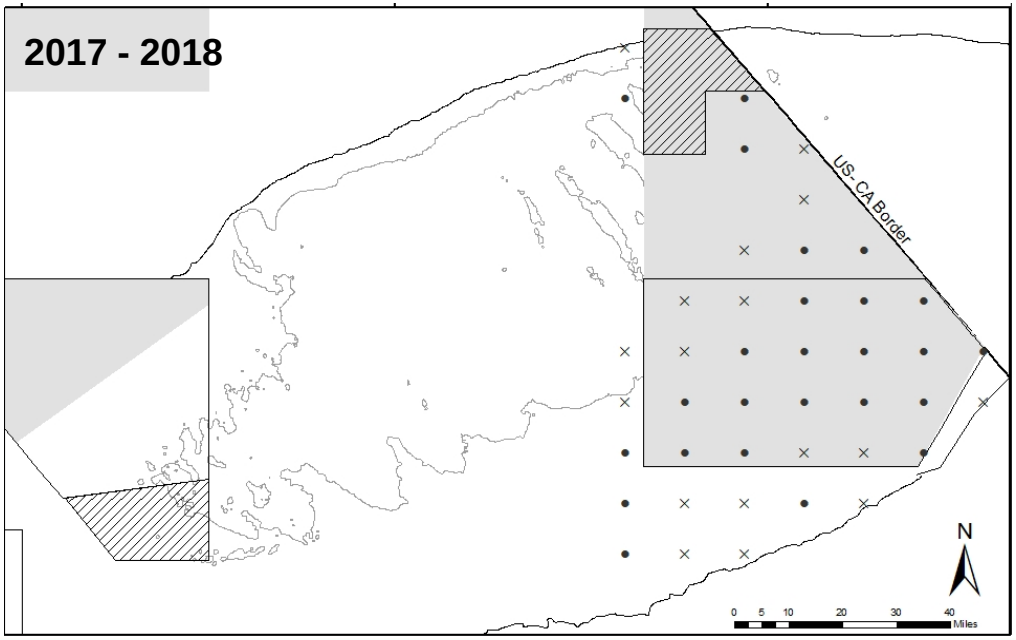
Eastern portion of Georges Bank

Survey Year	Survey Month	Number of scallops sampled
2017	August	873
	September	782
	October	777
	December	754
2018	January	755
	February	840
	April	745
	June	864
	August	828
	September	776
	October	558
	December	776
2019	January	847
	February	751
	April	853
	June	845

Gray meat prevalence 2011-2016 and 2017-2018

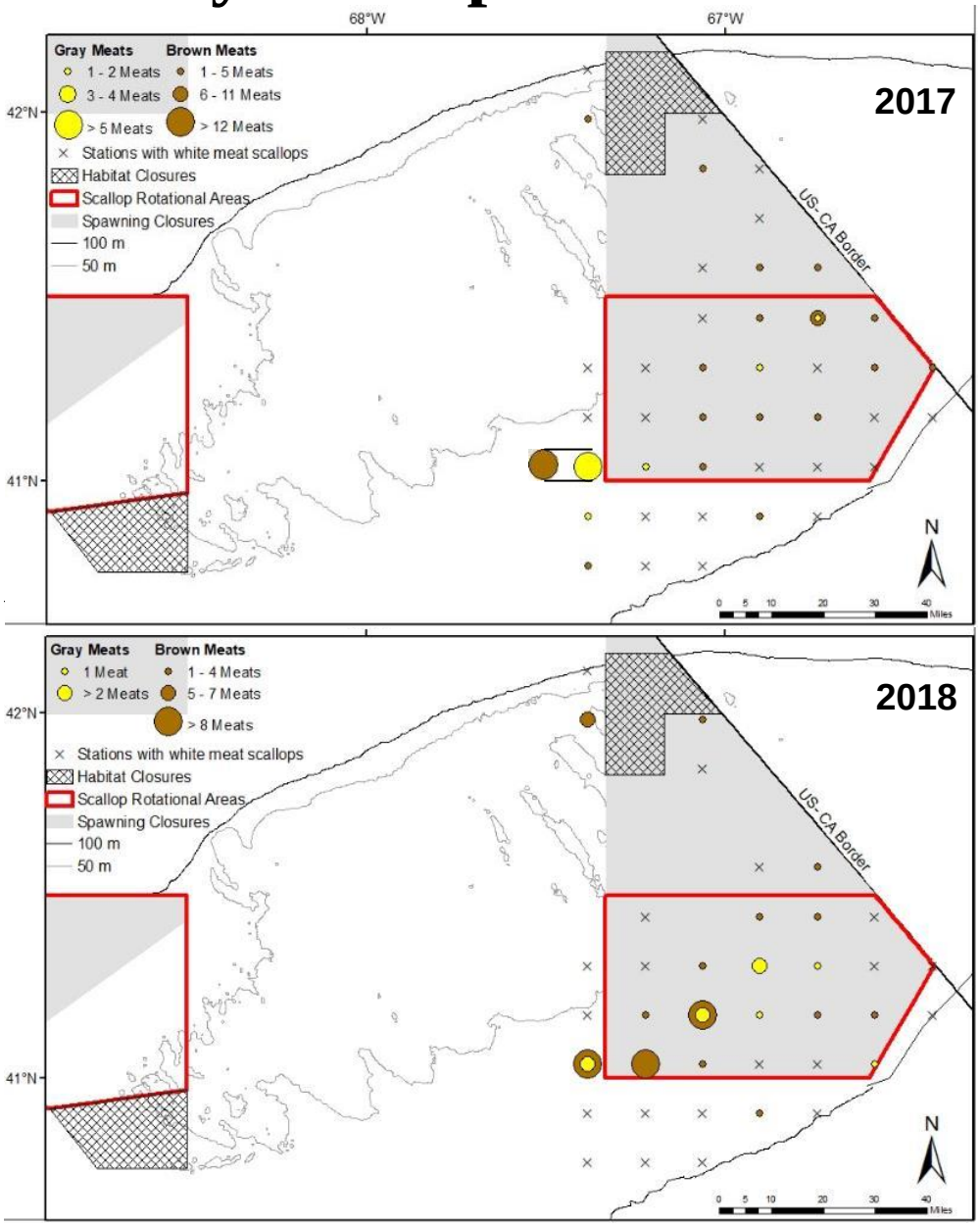






- 133/12,629 scallops = **1.05%**
- low prevalence across CAII – no hot spots

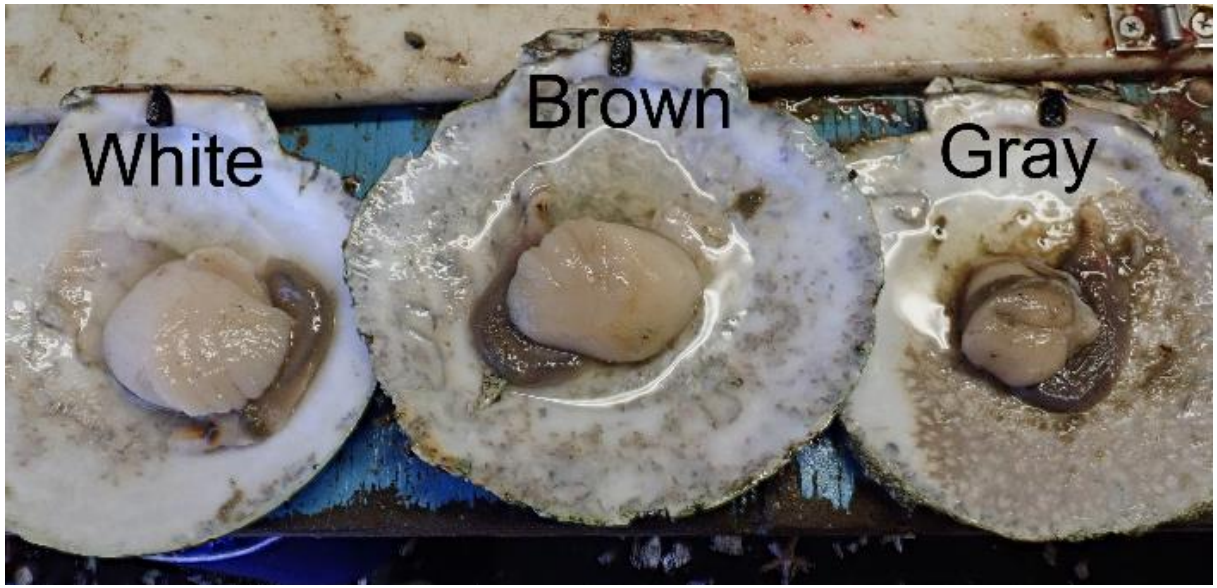
Gray meats per station for the 2017 and 2018 projects



- Totals from 8 trips with 700-800+ scallops per trip
- Number of scallops with gray meats very low

Gray meat modeling

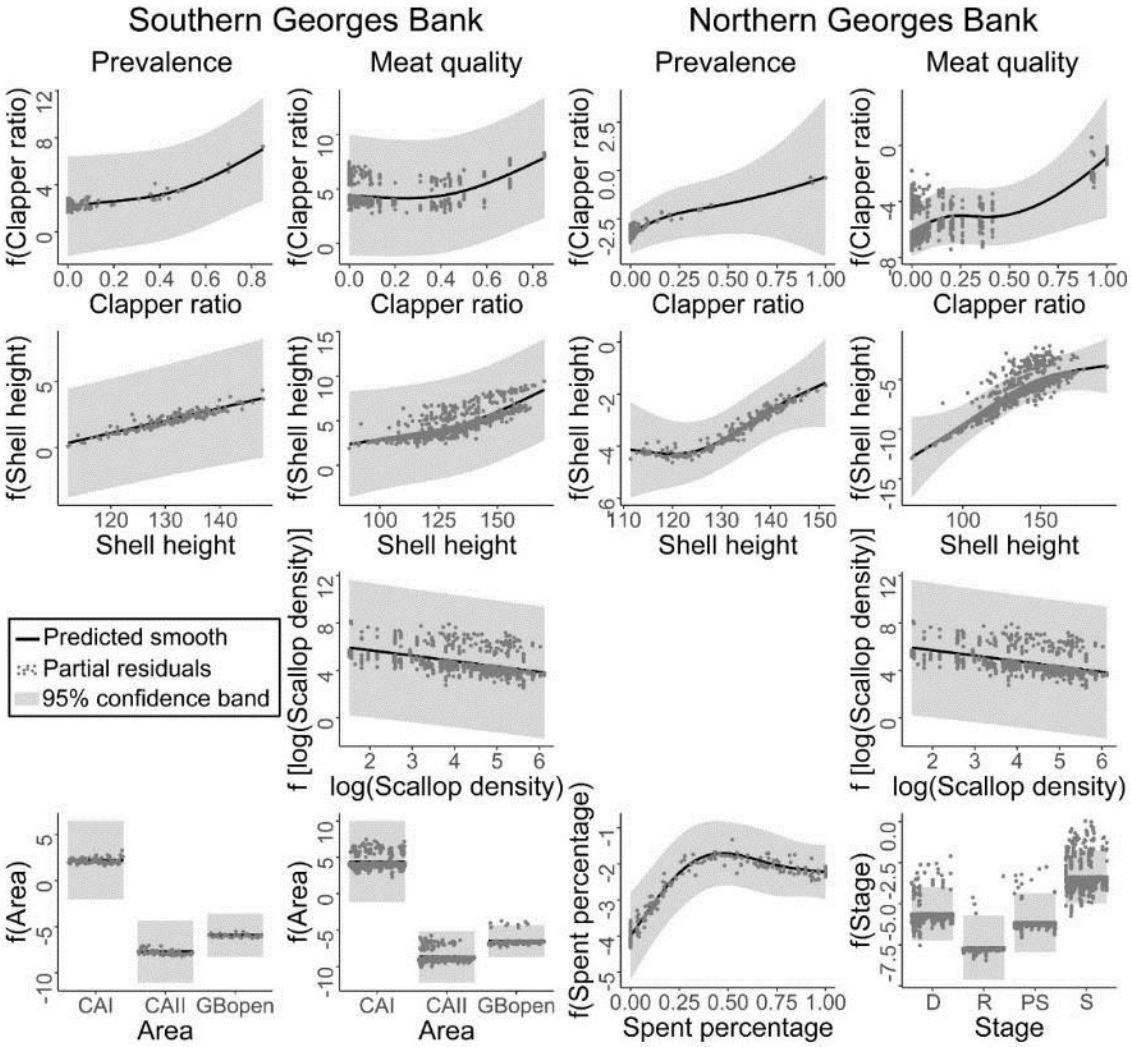
- Goal was to examine the impact of biotic and abiotic factors on gray meat prevalence and the likelihood of individual scallops having gray meats
- Meat quality was assessed based on a qualitative color scale with three categories and colors ranging from white to brown to gray
- A subset of the collected meats were evaluated for the presence of apicomplexan parasites at the Aquatic Diagnostic Laboratory at Roger Williams University



Siemann LA, Garcia LM, Huntsberger CJ, and Smolowitz RJ. 2019.Investigating the impact of multiple factors on gray meats in Atlantic sea scallops (*Placopecten magellanicus*). Journal of Shellfish Research 38(2): 233-243.

- **Gray meat prevalence** at each station for each survey trip
- **Meat quality of individual scallops** as gray meat presence (gray or brown) or absence (white)
- Southern and northern stations were modeled separately due to the survey area shift between 2014 and 2015
- Fixed effects used for modeling (prevalence/meat quality of individuals)
  - location ("easting" and "northing" in UTM space)
  - bottom depth (29 – 106 m)
  - bottom temperature (4 - 19°C)
  - scallop density (0.38 - 640 bushels/km^2)
  - average shell height/shell height
  - clapper ratio as proxy for natural mortality (0 - 2.0)
  - spent percent (0 – 100%)/scallop reproductive stage (developing, ripe, partially spent, or spent)
  - area (CAI, CAII S, CAII N, GB S, GB N)
  - downstream distance from a closed area (in a closed area, < 5 km from a closed area, between 5 and 10 km from a closed area, or >10 km from a closed area)

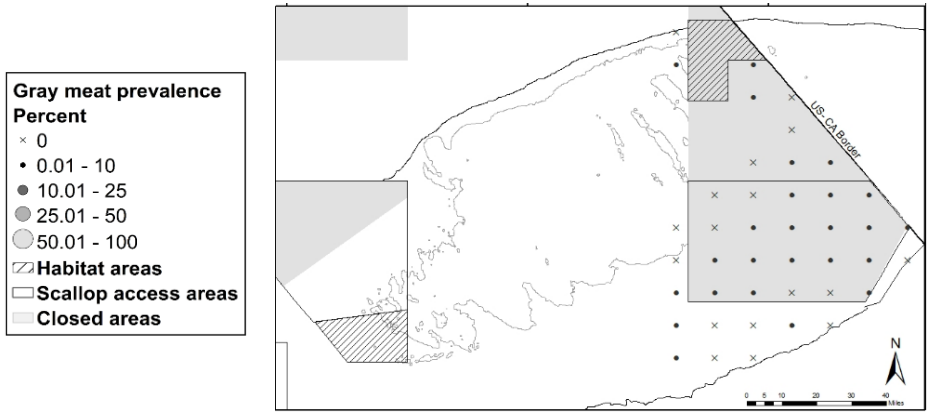
Predictors of scallop meat quality

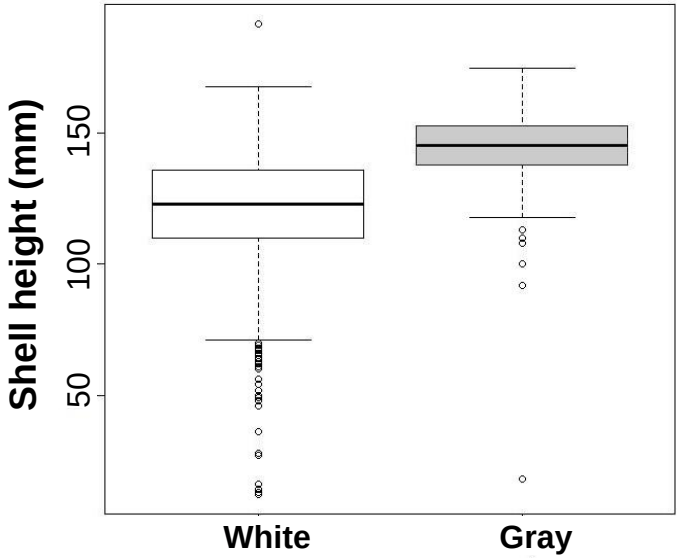


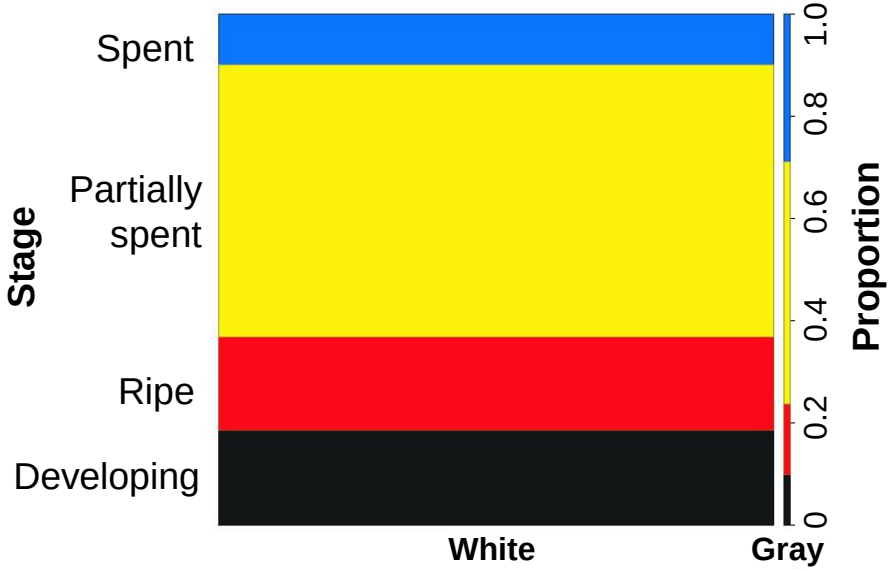
- Gray meat increases with increasing scallop mortality
- Gray meat increases as scallops get larger/older
- Gray meat increases at lower scallop densities
- Gray meats more likely in CAI in the south and after spawning in the north

Different causes for gray meats observed in these areas (and years) – disease vs stress/energy depletion following spawning?

Gray meat model results and 2017-2018 data

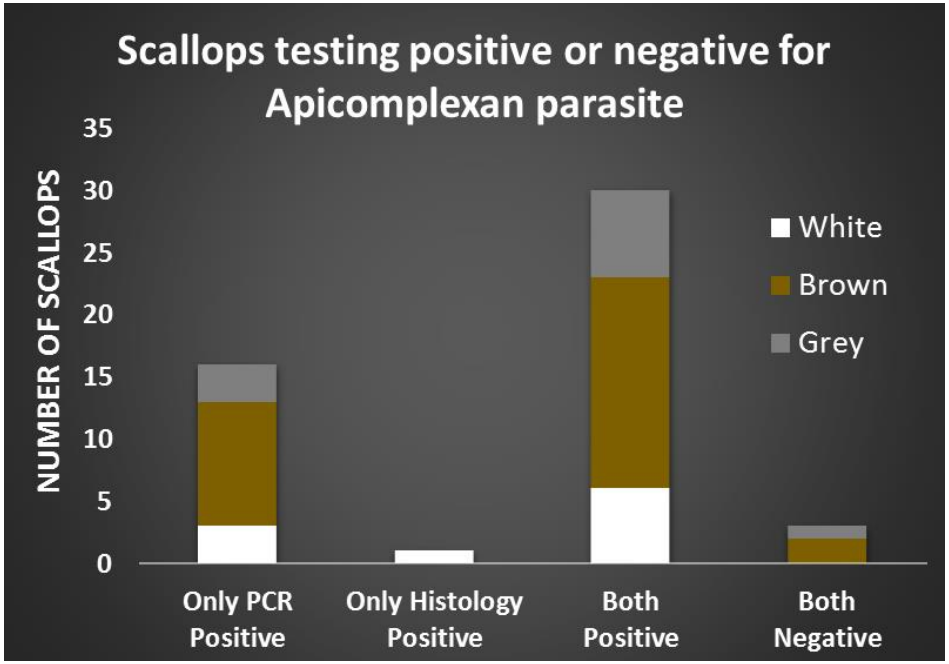


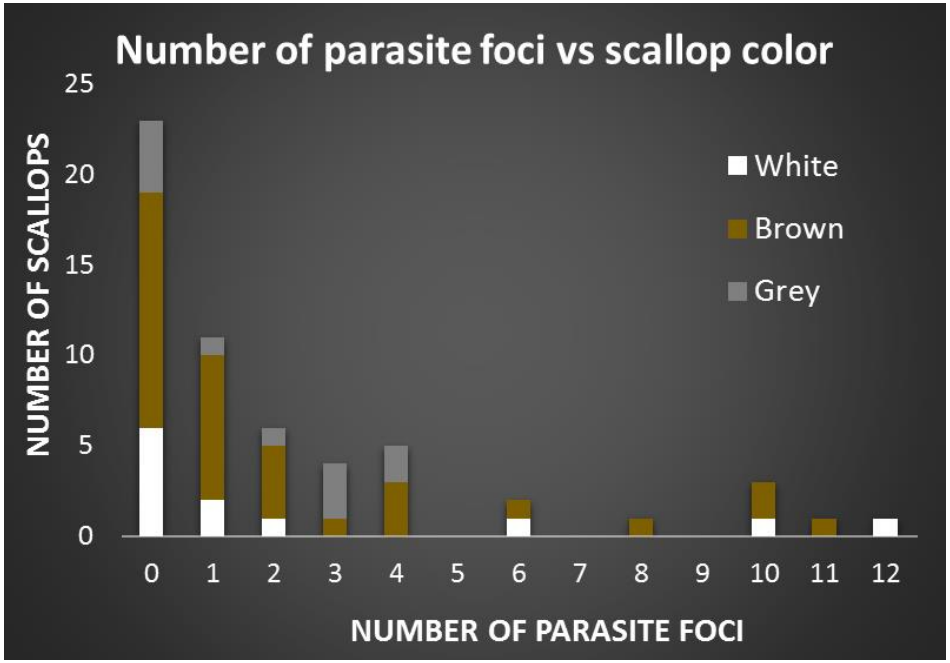




Results are consistent – gray scallops are larger on average and a higher proportion are spent or partially spent.

Apicomplexan parasite in discolored meats from northern and eastern Georges Bank



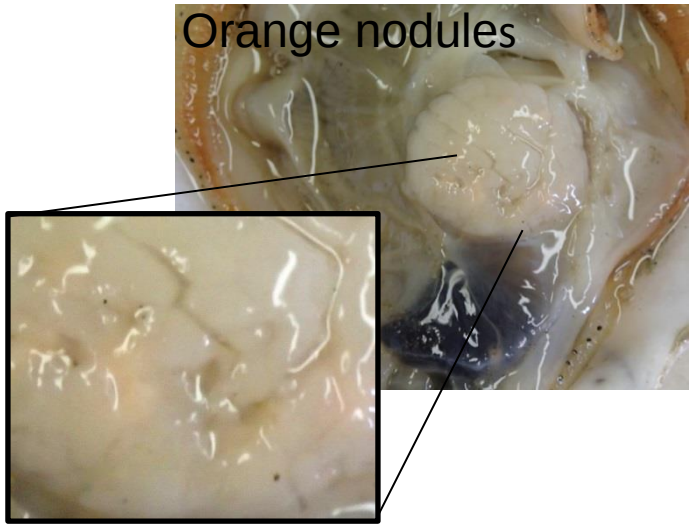


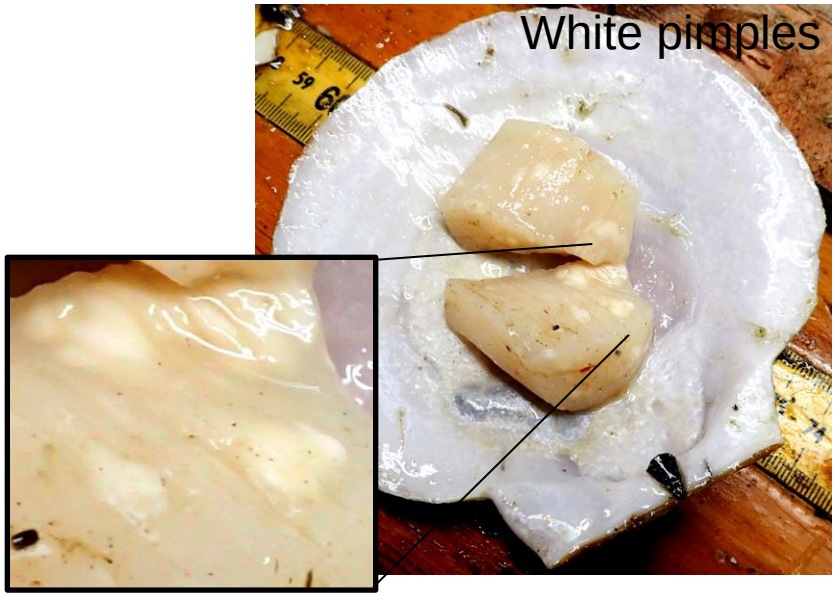
Figures adapted from Gourlay et al. presentation at NACE 2019

Relationship between meat color and severity of infection (assessed using histological techniques) and presence of parasite (assessed using PCR) is unclear

Other meat quality issues in 2017-2018

- **Orange nodules (Mycobacterium infection)**
  - Documented in CAI in 2013-2014
  - 7/12,629 scallops = **0.06%**
- **Nematodes**
  - 0/12,629 scallops
- **Stringy meats**
  - 295/12,629 scallops = **2.34%**
- **New "white pimple" disease??**
  - 1/12,629 scallops





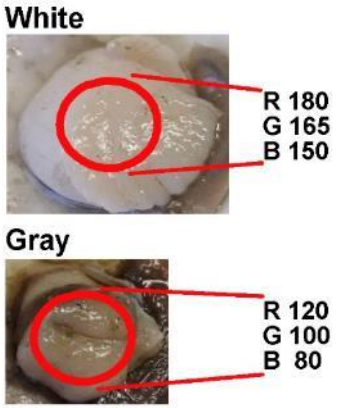
Future Directions

Certified Quality Reader

Quantify different meat colors/textures

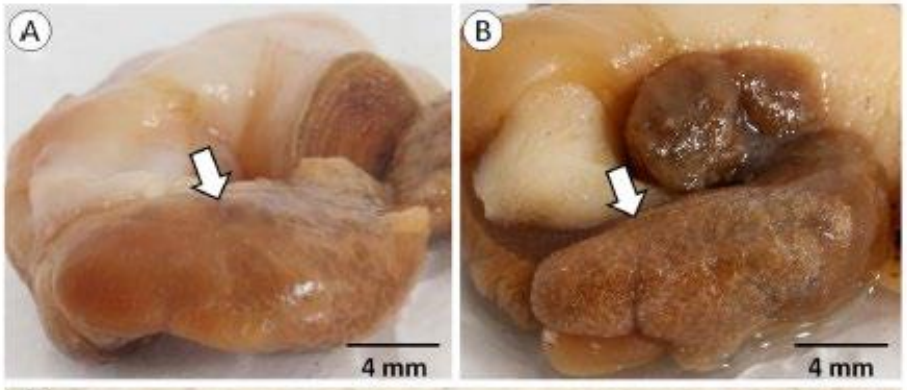
Rugged colorimeter

Numerical color measurements at sea



Apicomplexan parasite

Sampling other scallop tissues and hosts



qPCR

Quantitative measure of infection