

Observations on a re-emerging epizootic of the sea scallop, *Placopecten magellanicus*, resource: Population level impacts and implications for the fishery

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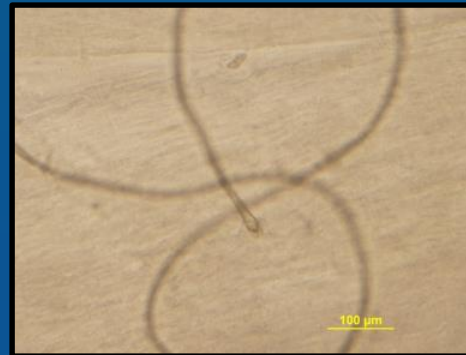
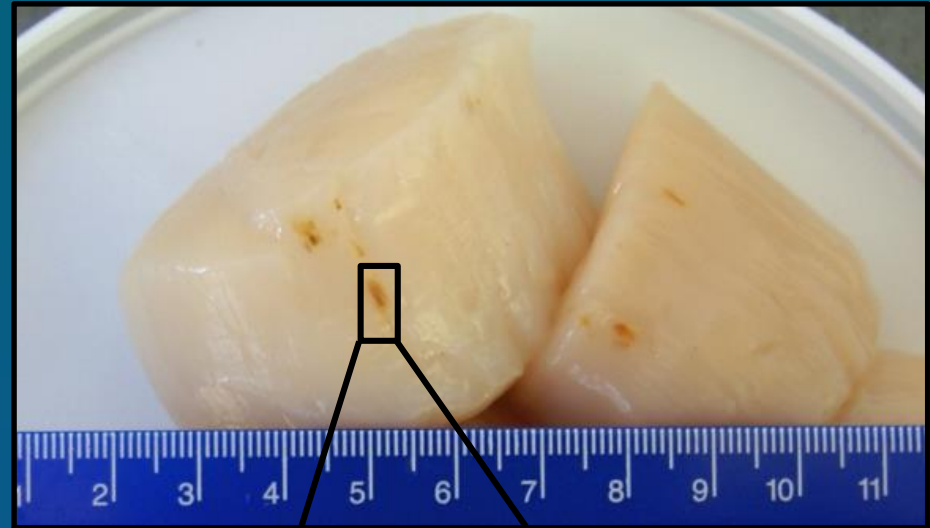


Sea Scallop Stock Assessment Working Group
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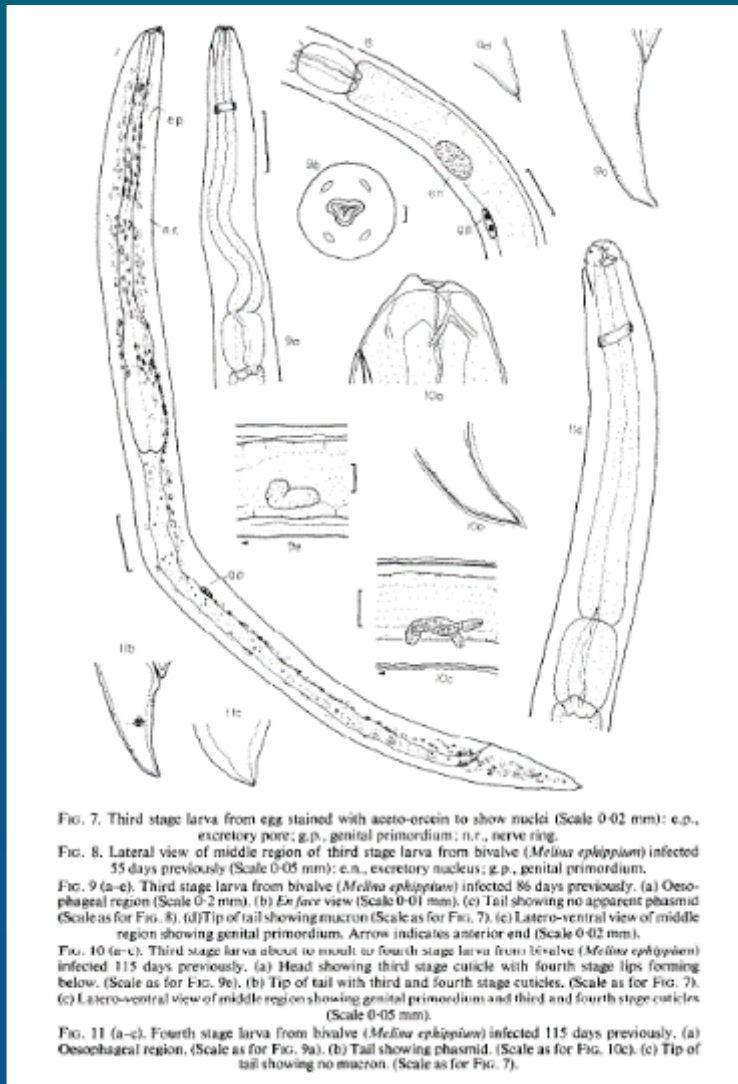


A re-emerging epizootic

- Nematodes were first observed in 2015 in the newly re-opened MAAA.
- Initial research efforts have focused on species identification, biology, life history and spatial distribution.
- 3 years of survey information related to spatial extent of affected scallops.



Preliminary identification



- Preliminary morphological and molecular analysis have been completed on samples taken from the 2015/16 MAB surveys.
- DNA results suggest that the sequences analyzed have a high correspondence identity with reference samples of *Sulcascaris sulcata* from GenBank.
- This species is cosmopolitan and has been identified in many genera of bivalve molluscs.
- Saucer scallop (Aus.), Calico scallop (US), Surf clams (US).
- Similar ephemeral observation of similar affected sea scallops was reported in May 2003.

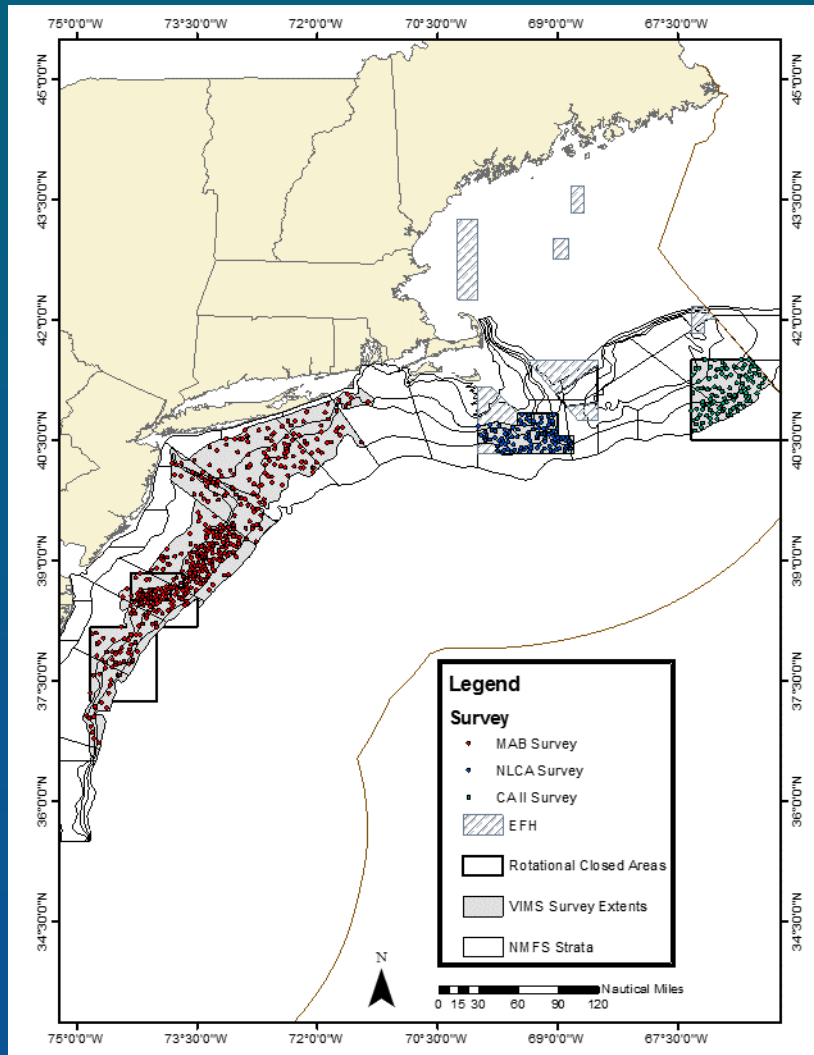
Sulcascaris sulcata life cycle

- The life cycle of *Sulcascaris sulcata* involves two hosts.
- Adult nematodes attach to the GI tract of Loggerhead and Green sea turtles (CFF video).
- Eggs pass through the GI tract and enter the benthos via the feces.
- Eggs are filtered by benthic molluscs and the larval stages (1-4) develop.
- Fourth stage larvae are ingested by turtles.



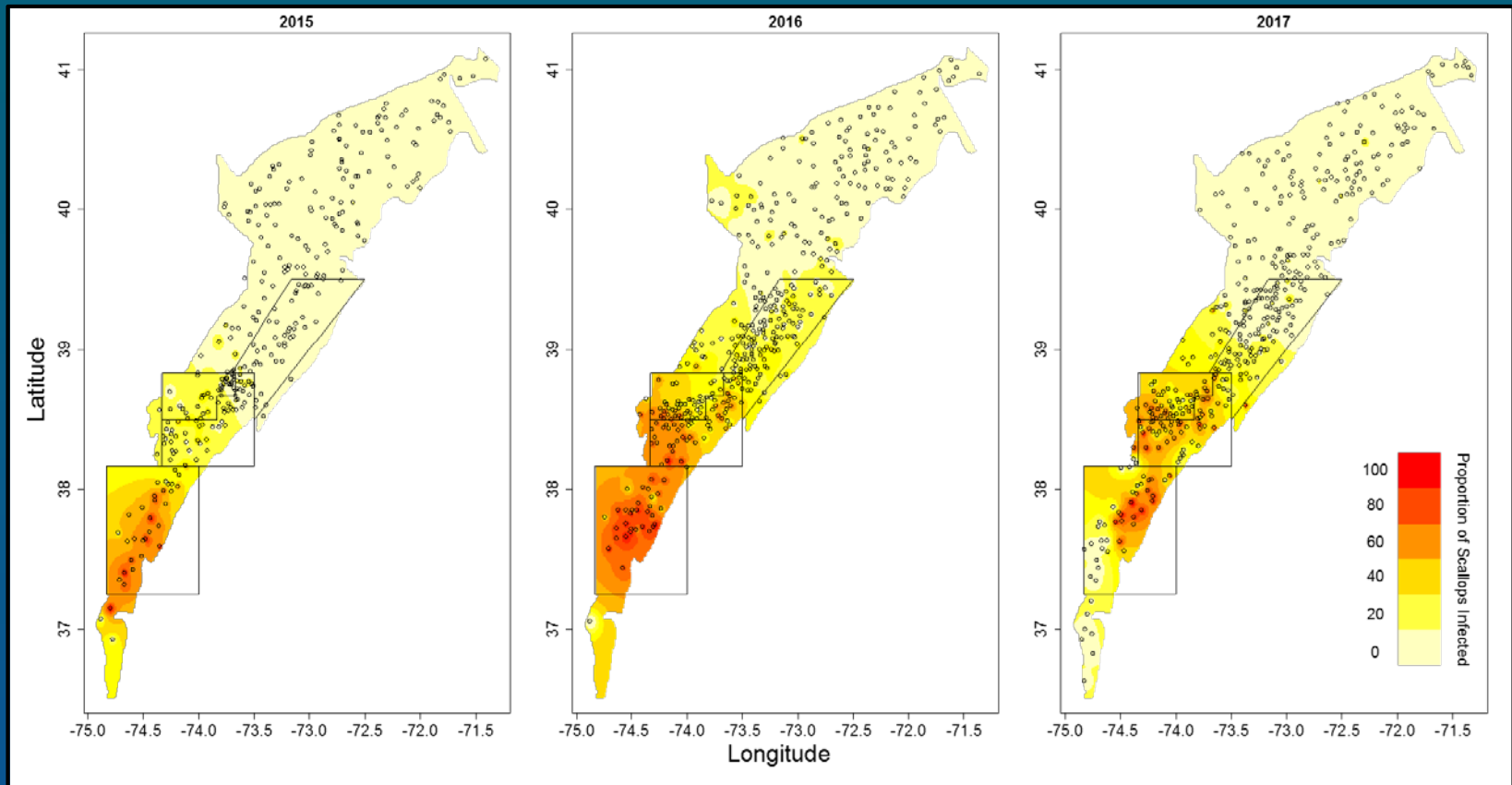
From Berry and Cannon, 1981

Parasite surveillance



- For the 2015-17 surveys, VIMS expanded the biological sampling protocol to capture the spatial extent of the parasite as well as the prevalence and intensity of infected scallops.
- Sampled 15 animals at every station that had scallops .
 - Histological and genetic samples.
 - Gross observation of the number of infected scallops/sample (prevalence).
 - Gross observation of the number of nematodes/scallop (intensity).

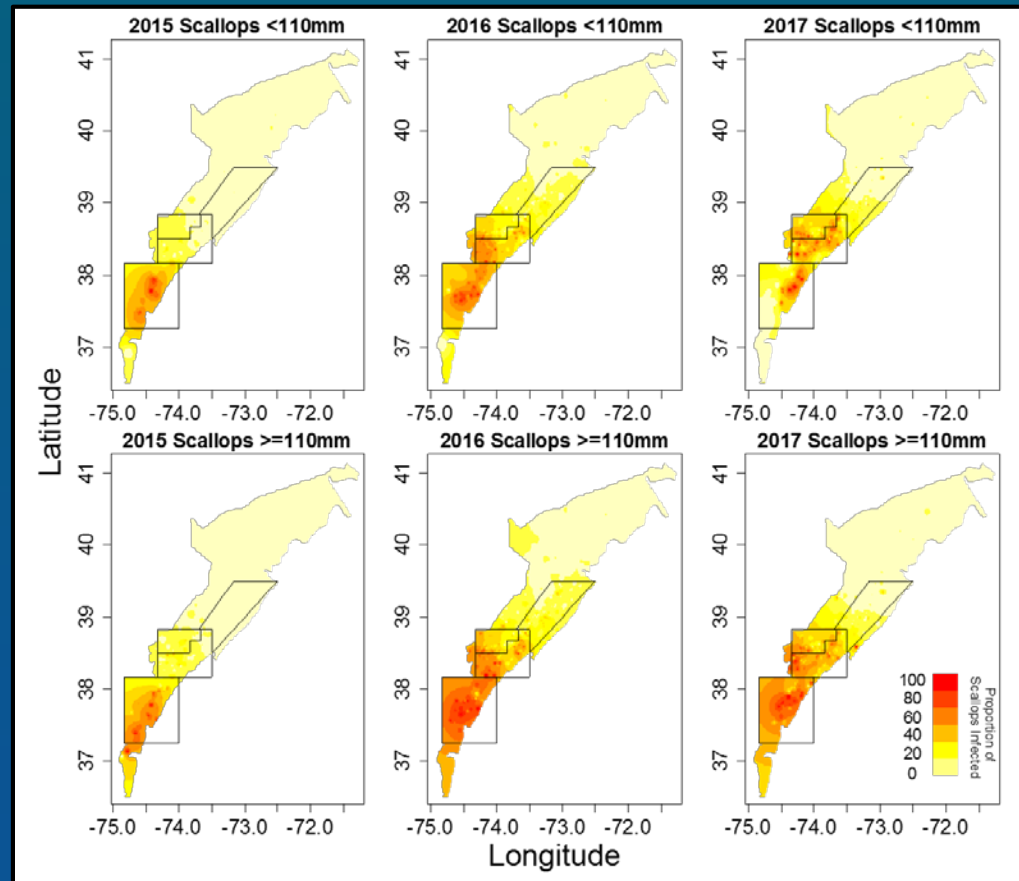
Nematode Prevalence 2015-17



- % of scallops in a sample that contain at least one lesion.
- Northward expansion 2015-16.
- Apparent stabilization of the spatial extent 2016-17.

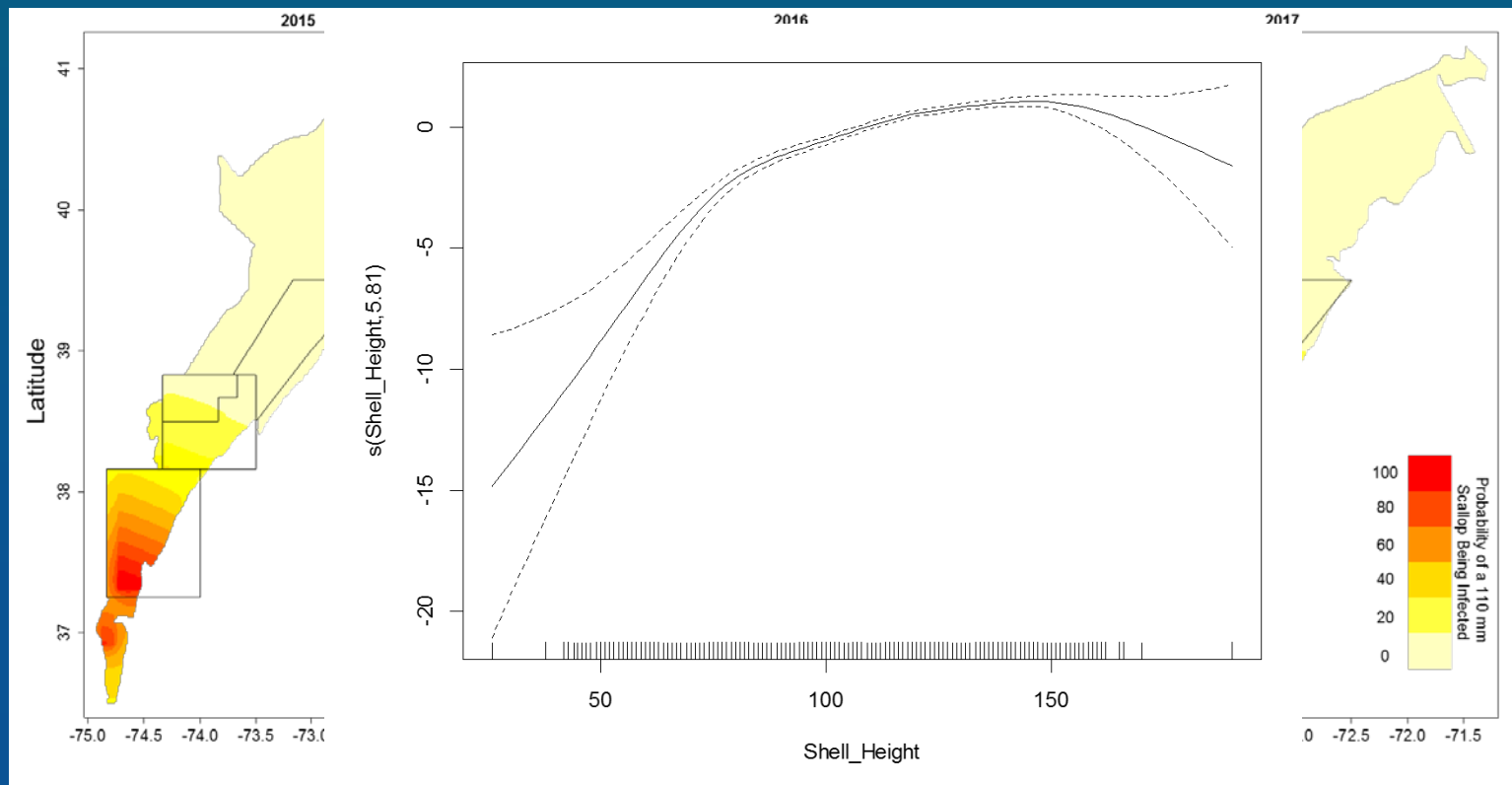
Size-based nematode prevalence 2015-17

- Spatial distribution of the prevalence of the parasite in sampled scallops by year and size class
- Smaller sizes appear to be less infected over time
- The spatial extent of infections in larger scallops has contracted in 2017 compared to 2016, but the extent still covers the majority of the southern range.



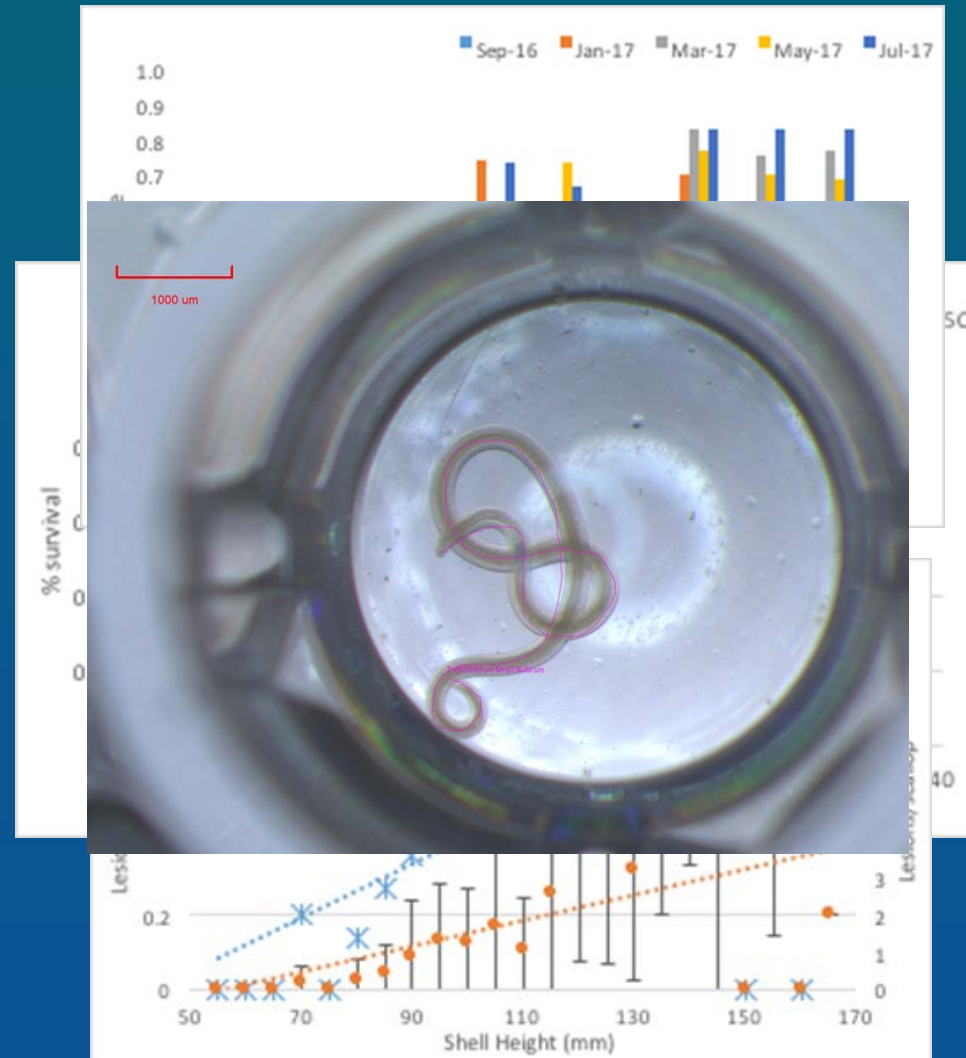
GAMM for nematode prevalence 2015-17

- GAMM was developed to predict the probability of a scallop being infected with nematodes.
 - Covariates evaluated [shell height, bottom temp, depth, density, SAMS area, year]
- Significant predictor variables included year, tensor product of latitude & longitude, SAMS area & shell height.



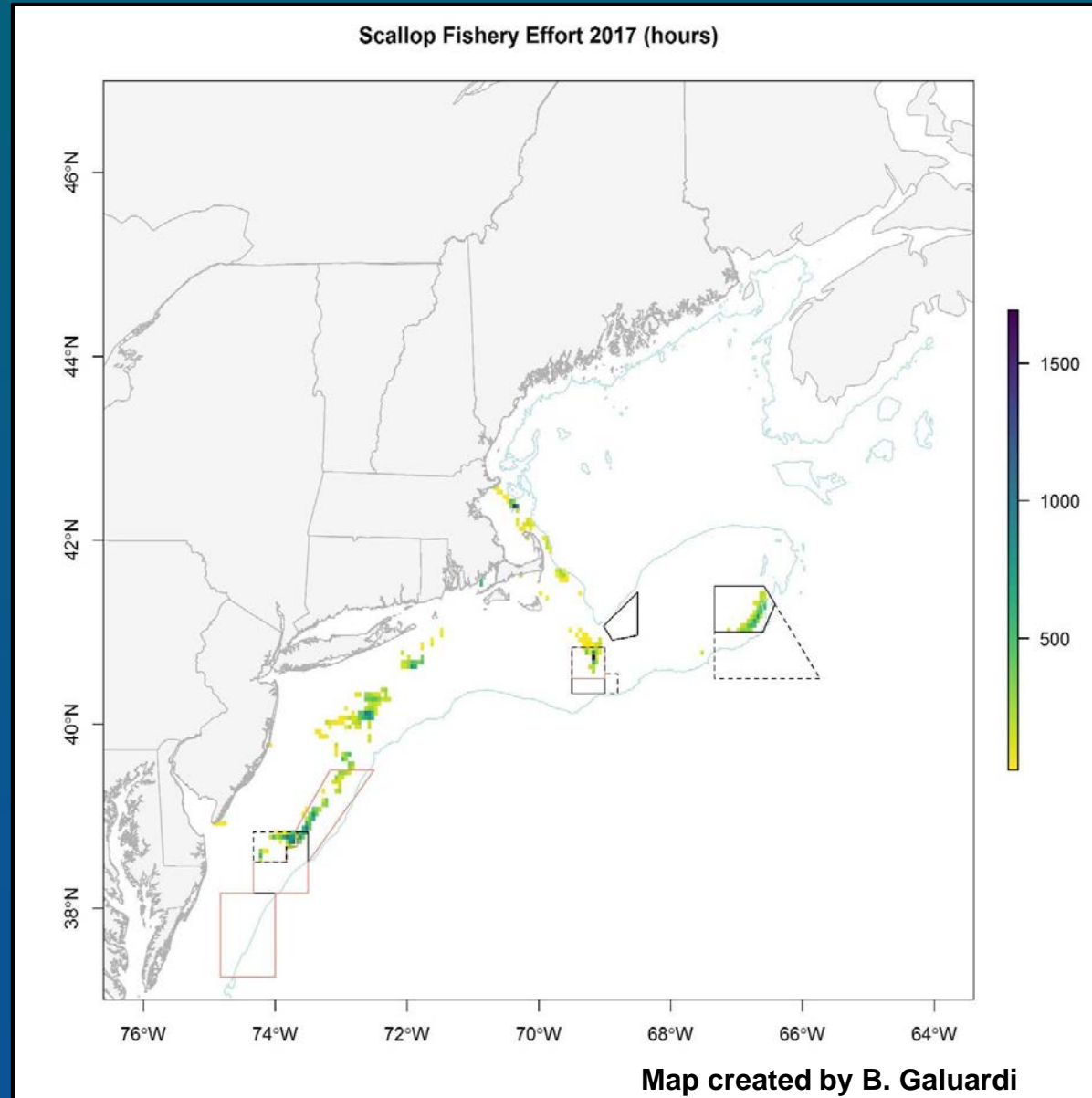
Nematode biology

- Rutgers/VIMS collaboration
- Investigated the etiology of the parasite/host relationship
 - Do larvae migrate from discarded viscera/meats?
 - Do larvae transmit from infected to uninfected scallops?
 - Seasonality of infection
 - Thermal tolerance of larvae
 - Infected scallop survival



2017 Fishery Effort

- Aggregate 2017 effort (March-July).
- MAAA effort centered upon “flex and HC portions.
- Very little effort in ET Open and DelMarVa.
- Potentially influenced by product quality issues?



Summary

- Data suggests that nematode distribution did not appreciable expand in 2017 from levels observed in 2016.
- Southern areas of the resource (i.e. DMV, ETCA) still appear to be affected.
- Distribution in affected areas is patchy.
- Larger scallops appear to be more likely to be affected.
- Inter-scallop transmission unlikely.
- Possible increase in mortality.**
- Nematodes potentially affecting distribution of fishing effort.