An Investigation into the Scallop Parasite Outbreak on the Mid-Atlantic Shelf: Transmission Pathways, Spatio-Temporal Variation of Infection, and Consequences to Marketability

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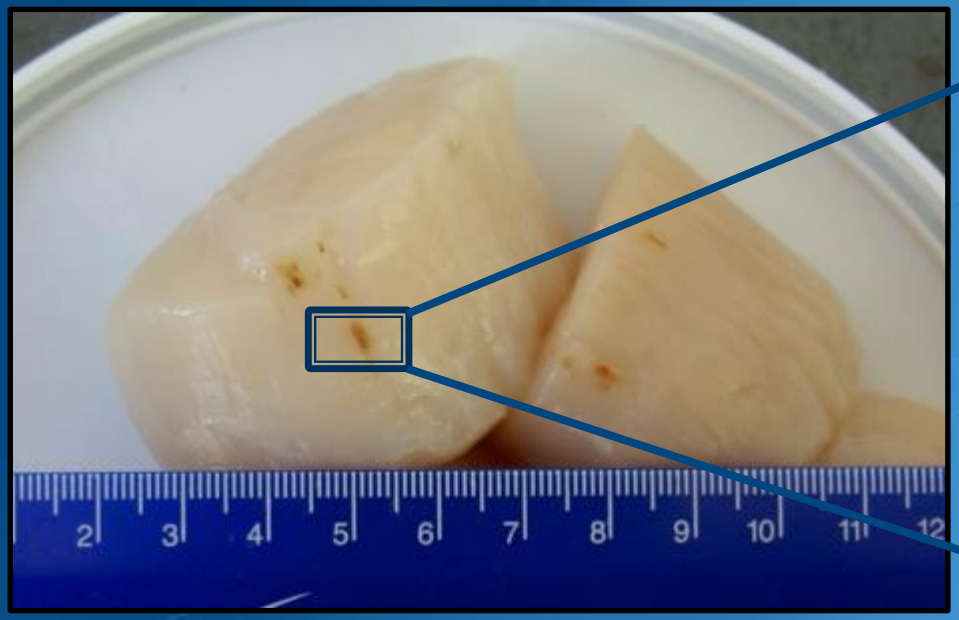
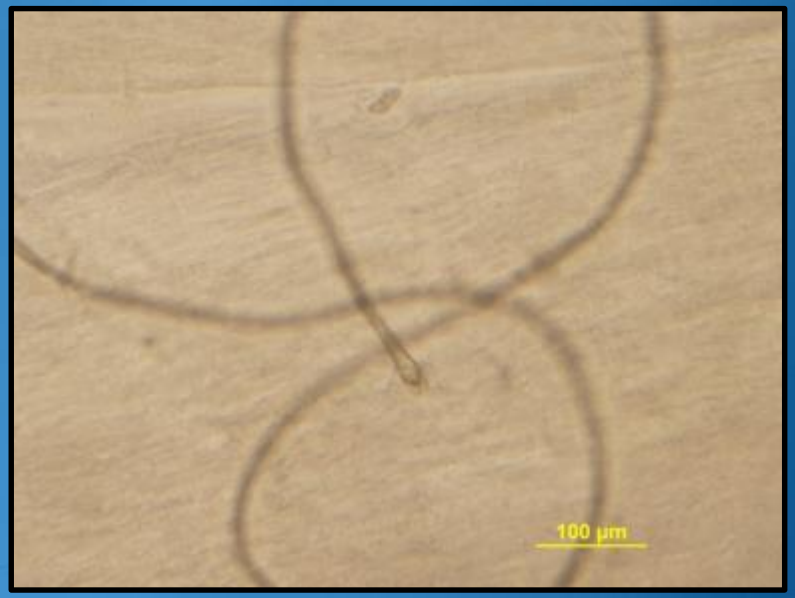
Affected Scallops

Fresh squash mount





Larval nematode coiled within brownish lesion in sea scallop adductor muscle.

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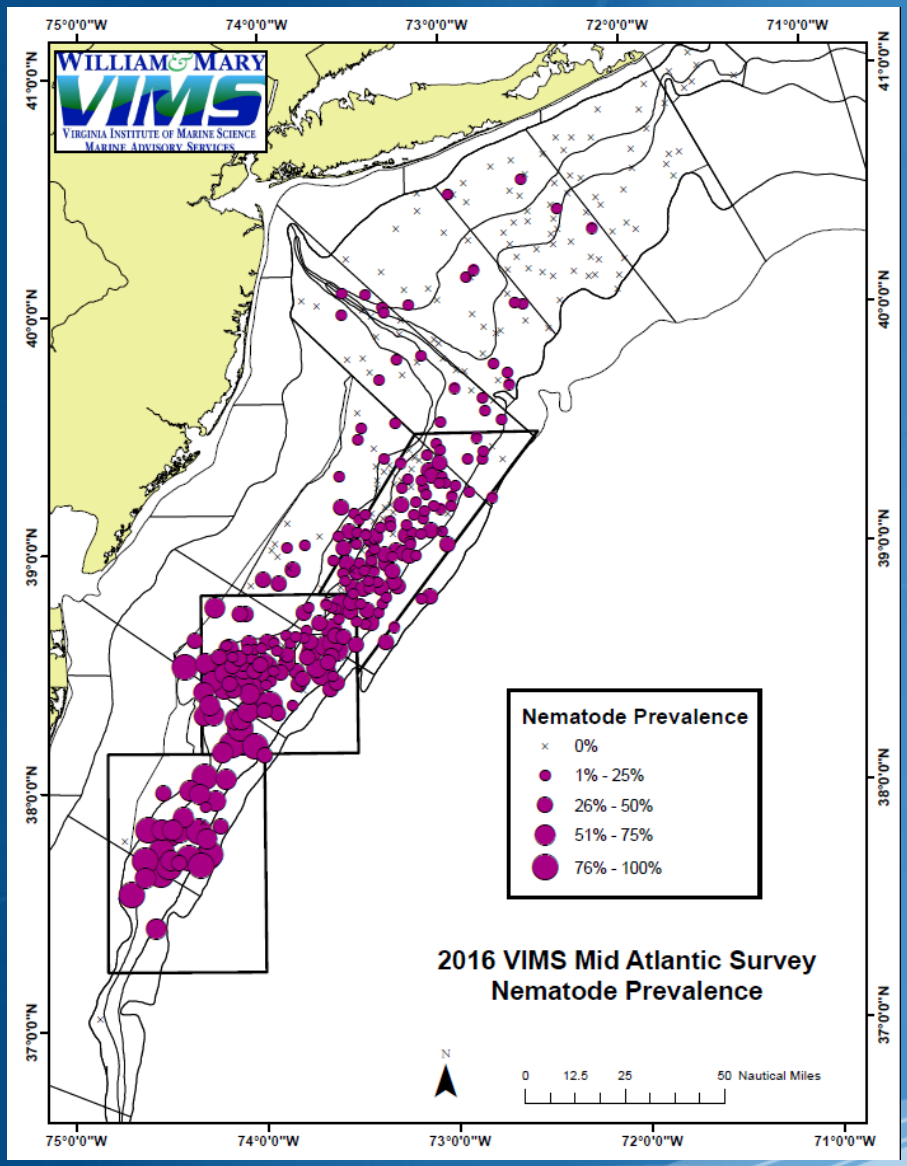
Nematode Prevalence



- Spatial distribution of the prevalence of the parasite in the sampled scallops.
- For each station with sampled scallops, a proportion of the sample that contained at least one nematode was calculated.
- Intensity appears to increase as a function if decreasing latitude.
- Prevalence appears to be increasing in the ET and Hudson Canyon compared to 2015.
- For 2016, no infected scallops observed in the NLCA or the CAII survey areas.

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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.
- 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.

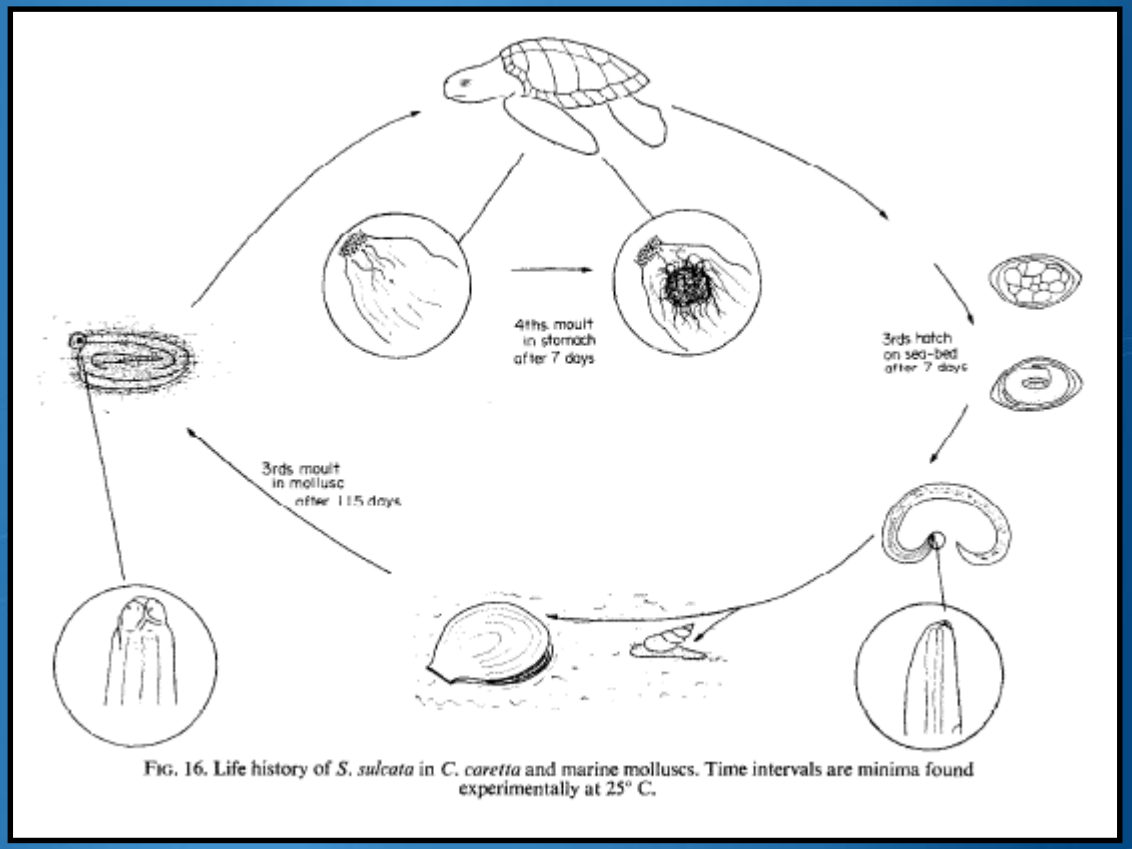

FIG. 16. Life history of *S. sulcata* in *C. caretta* and marine molluscs. Time intervals are minima found experimentally at 25° C.

From Berry and Cannon, 1981

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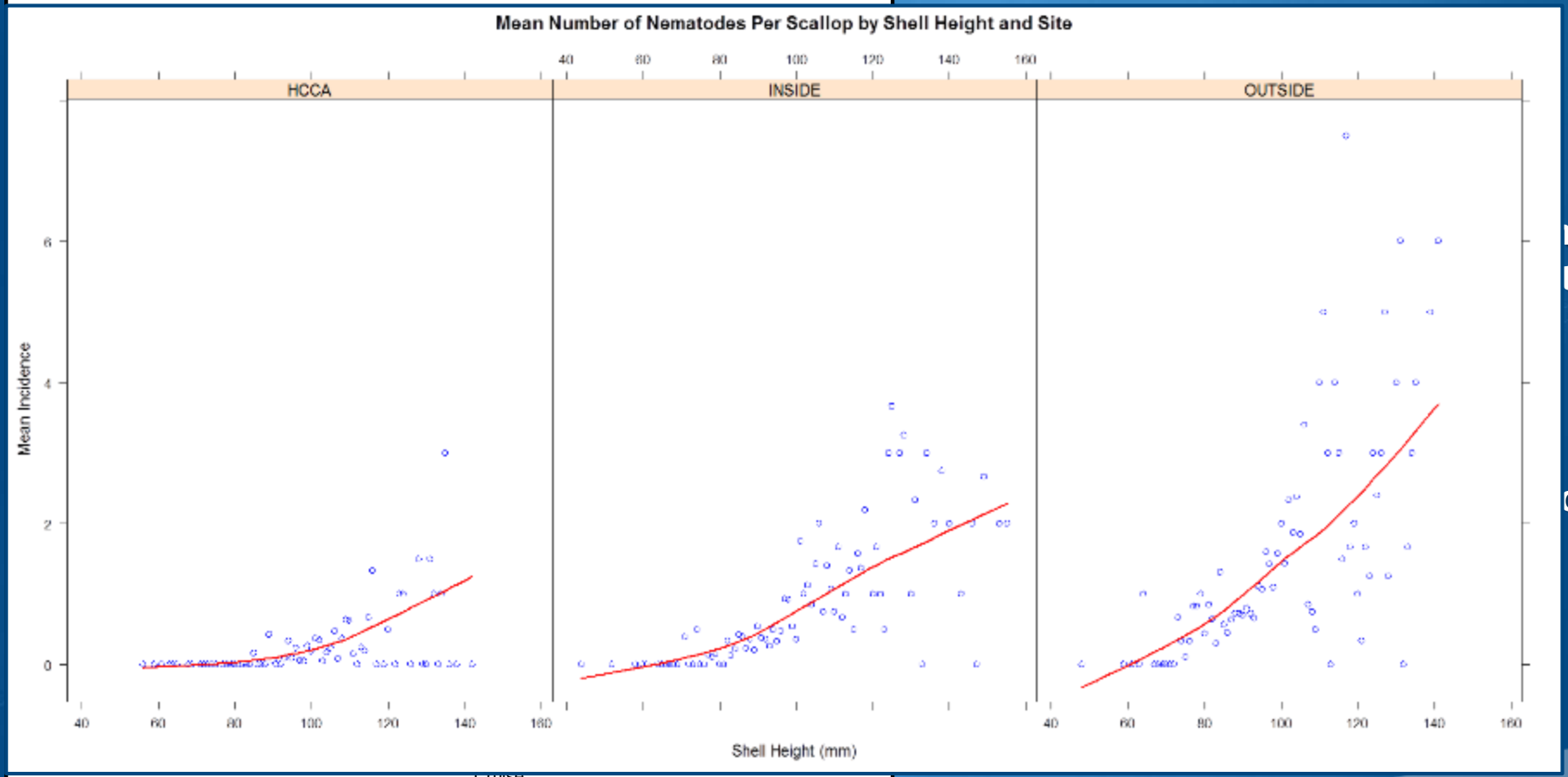
Fixed station survey



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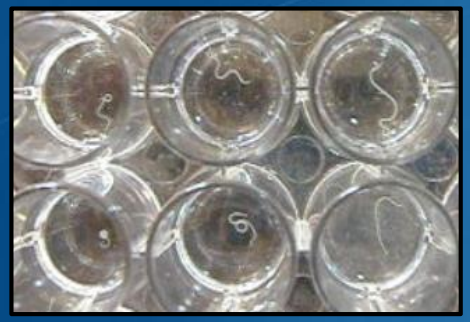

Scallop nematode lab studies

1. Do parasite loads change seasonally?
   a. Seasonal collection: Sep, Nov, Jan, Mar, May, July
   b. What is relationship between prevalence and intensity?
   c. Do all lesions contain nematodes throughout the year?

2. Do scallop discards (whole or shucked) facilitate direct transmission?
   a. Examined shedding rates of live and shucked/shredded scallops
   b. "Uninfected" dosed with shucked infected scallops

3. Do nematodes survive warm temperatures?
   a. Nematodes exposed to 37C, 56C, 75C, and 95C
      i. controls at 4C & 23C

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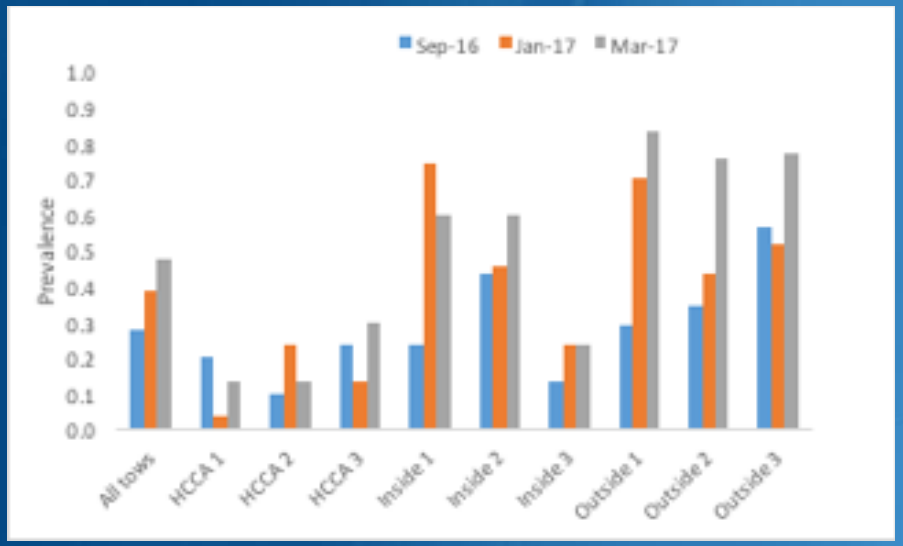
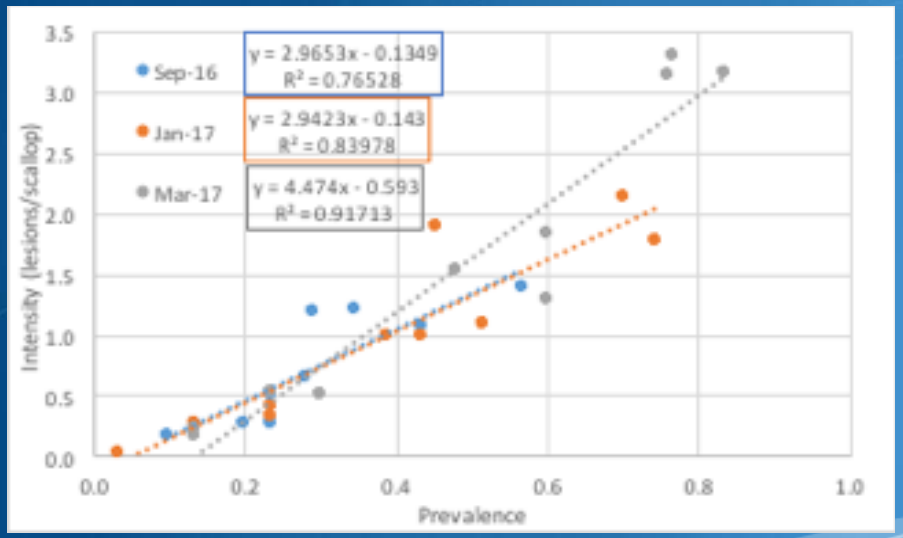
Prevalence and intensity – lab observations





- Prevalence and intensity appear to increase from fall through winter.
- Consistent across sites, except where prevalence is low.
- Intensity of infections increases with the prevalence.
  - the more scallops with lesions, the more lesions present per scallop.
  - appears to hold seasonally.

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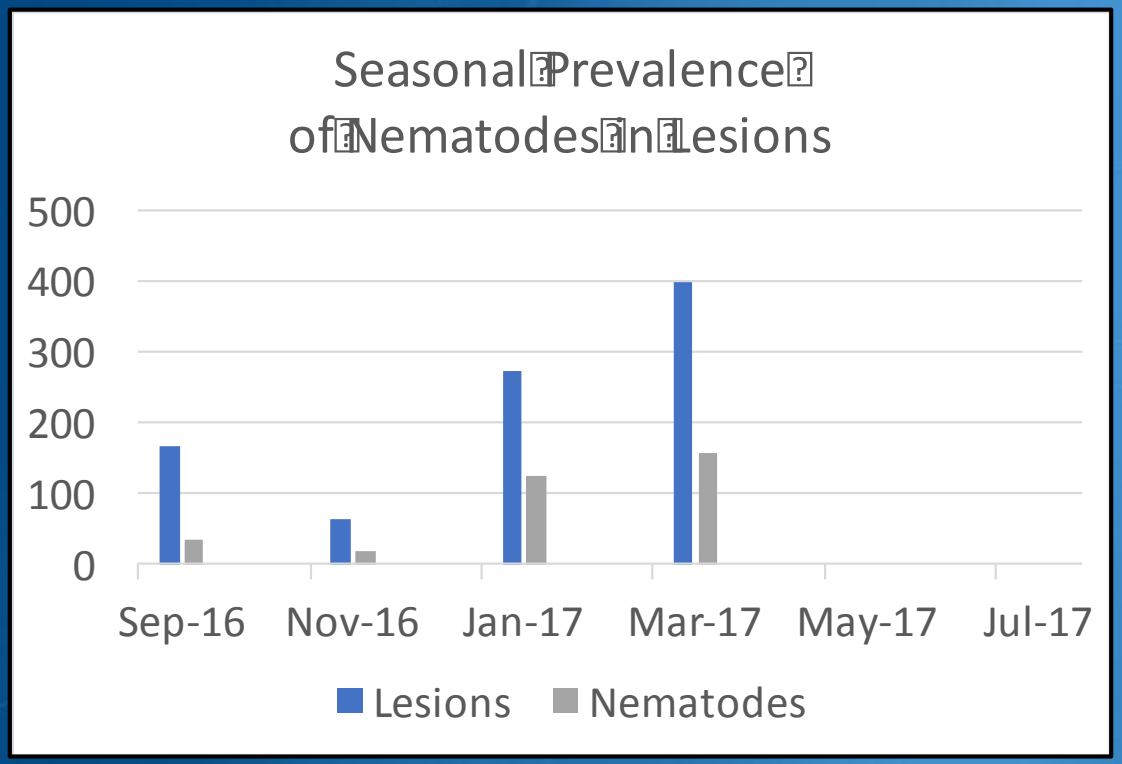
Not all lesions contain nematodes



Collection Date	% lesions w/ nematodes
Sep 2016	20%
Nov 2016	29%
Jan 2017	46%
Mar 2017	39%
May 2017	
July 2017	

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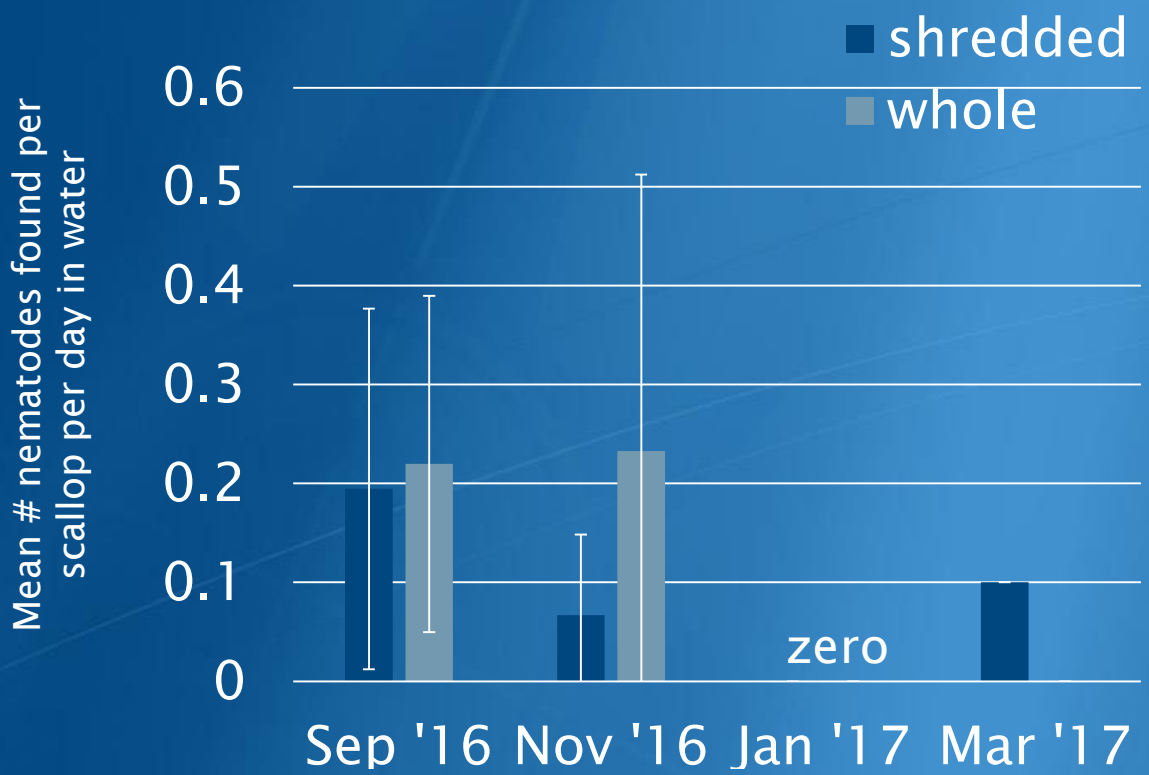
Shedding

Do scallop discards (whole or shucked) shed nematodes?



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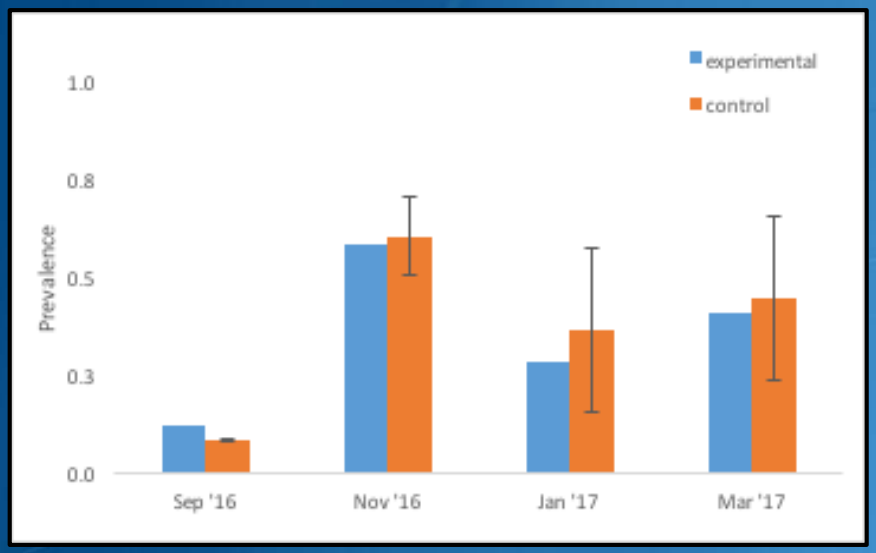
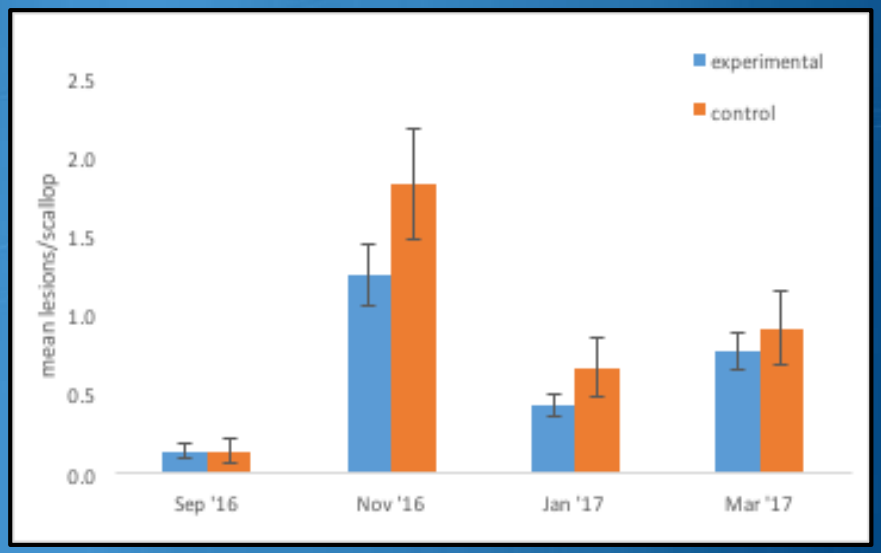
Transmission Study: Do discarded infected scallops transmit nematodes to other scallops?

Prevalence



Intensity



Neither prevalence nor intensity appear to increase, no apparent direct transmission

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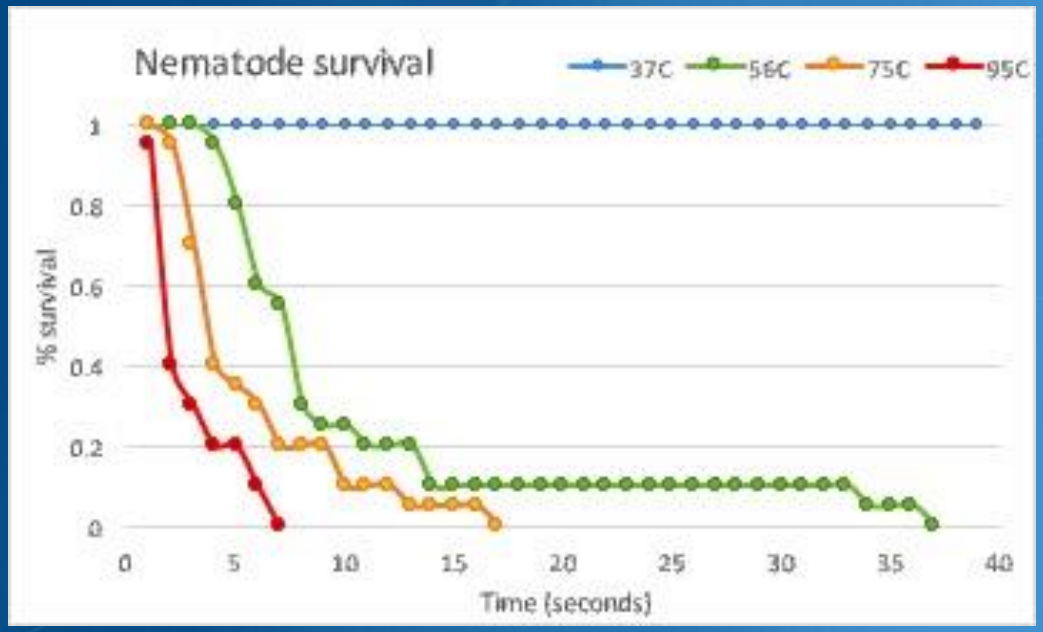
Thermal tolerance

Do nematodes survive warm temperatures? No



Temperature (ºC / F)	N	Time to death
95 / 203	20	1-6 seconds
75 / 167	20	3-17 seconds
56 / 132.8	20	4-37 seconds
37 / 98.6	22	3 – 7 hours
23 / 73.4	20	24 hours +
4 / 39.2	100	3 - 8 weeks +

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Summary and Future Efforts

- We continue to verify and refine the spatio-temporal distribution of the nematode as well as the life cycle.
  - Limited monthly sampling suggests that the nematode has persisted.
  - Larger scallops have more lesions and higher prevalence is associated with higher intensity.
  - Not all lesions contain nematodes.
  - Nematode larvae appear incapable of direct transmission between scallops.
  - Nematodes are killed quickly at elevated temperatures.
- Longer term effects on scallop host.
- Management strategies?

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