ATTRIBUTE OF THE EUROPEAN GREEN CRAB IN SALEM SOUND, MASSACHUSETTS, USA

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TOPICS COVERED

- GREEN CRAB TRAPPING SURVEY (2013-2016)
- ADVANCEMENTS IN VENTRAL COLORATION AS BIOINDICATOR
- OPTIMAL TRAPPING AND HABITAT SUITABILITY
COLLECTING SITES

Pope’s Landing (PL)
Hill’s Yacht Yard (HYY)
Beverly Pier (BP)
Winter Island (WI)
Hawthorne Cove Marina (HCM)
Green Crab Trap, Ketcham Supply, New Bedford, MA

18” x 24” x 9”
(46cm x 61cm x 23cm)

½” x 1” wire mesh
(5mm x 10mm)

3” (9cm) diameter entrance

bait:
various fish scraps
(swordfish, salmon, herring, etc.)

monthly samples
ATTRIBUTES MEASURED

- CARAPACE WIDTH
- SEDIMENT PREFERENCE
- SALINITY
- TEMPERATURE
- VENTRAL COLOR
- SEX
- GRAVIDNESS
- FOULING
- OPTIMAL TRAPPING
- DEPTH PREFERENCE
- AND MORE…
RESULTS: CATCH PER SEASON

[Graph showing catch per season with data points for each season from Summer 2013 to Summer 2016]
RESULTS: SEX RATIO

- ABOUT 75% FEMALES
- SEX RATIOS TEND TO VARY BY REGION
RESULTS: COLOR GROUP PER SIZE CATEGORY

Individuals by Size Group by Color Group

- Green (Group 1.0 - 2.5)
- Yellow-Green (Group 3.0 - 4.5)
- Yellow (Group 5.0 - 6.5)
- Orange (Group 7.0 - 9.0)
- Red (Group 9.5 - 12.0)
DISCUSSION: WHY 30mm?

- 30mm is approx. sexual maturity (Berrill, 1982)
- Red phase = reproductive focus, Green phase = NOT
  Several differences noted between two life stages

→ QUESTION: Green phase crabs and Red phase crabs are in different life stages, but what about yellow?

“Yellow Phase” proposed as an intermediate life stage
RESULTS: COLOR VARIABILITY

0% 10% 20% 25% 30%
TRAP STUDY RESULTS

A = Trapezoidal trap
B = “Blanchard”
C = “Ketcham”
D = “Terminator”
E = Eel trap
F = “Slanted-Sides”
G = Minnow trap
TRAP STUDY RESULTS

- LAGER NOT NECESSARILY BETTER
- DEPENDS ON APPLICATION…
- Please see Young et al., 2017 for more details
BAIT STUDY RESULTS

- OILIER, THE BETTER
- Please see Young et al., 2017 for more details
DEPTH STUDY RESULTS

- NO DIFFERENCE SEEN AT DIFFERENT DEPTHS

- Please see Young et al., 2017 for more details
SEDIMENT DATA

- Finer Sediments = Increased CPUE
- BUT, N=5…

- More on that later!
The Relationship Between Methyl Farnesoate Levels and Ventral Coloration in the European Green Crab (Elliott et al., 2018, Submitted)

- Crabs were held controlled conditions and color was tracked over time with MF levels
- Separated males and females to test pheromone interference and observe differences
- Selected crabs between 40-67 mm
Methyl Farnesoate, the crustacean juvenile hormone... 

Methyl Farnesoate (MF) a widely studied hormone secreted by the **Mandibular organ** that shares functions in several aspects of crustacean physiology:

- Molting
- Reproduction
- Osmoregulation
- Morphogenesis
- and other functions...
HYPOTHESIS

• It was predicted that there will be a higher concentration of methyl farnesoate in crabs in the red phase (Nagaraju and Borst, 2008).

• IF yellow phase is indicative of an intermediate life stage, THEN the hormone levels should be different from red phase.
RESULTS: COLOR PROGRESSION

- Females a bit more dynamic in color change, while males exhibited little fluctuations over the course of the experiment (p<0.001).

- NO statistical difference in color changes between sex-isolated and mixed sex groups.

- Molting occurred across color phases, but N=6…
RESULTS: MF and Color Phases

- The results indicate that a red phase crab would likely have a higher level of MF than green and yellow phase crabs.
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- This finding reinforces the need for a distinction between green and yellow phases when measuring the physiology of crabs with different ventral pigmentation.
RESULTS: MF and Color Phases

- The results indicate that a red phase crab would likely have a higher level of MF than green and yellow phase crabs.

- This finding reinforces the need for a **distinction between green and yellow phases** when measuring the physiology of crabs with different ventral pigmentation.

- Ventral coloration has a positive relationship with increasing endogenous MF levels and sexual maturity, **BUT** additional research is needed to determine if either aspect is useful as a bioindicator for molting.
PRELIMINARY RESULTS: CURRENT PROJECTS
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THANKS EVERYONE!

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REFERENCES CITED


