

# Determining peak molting periods for European green crabs in New Hampshire.



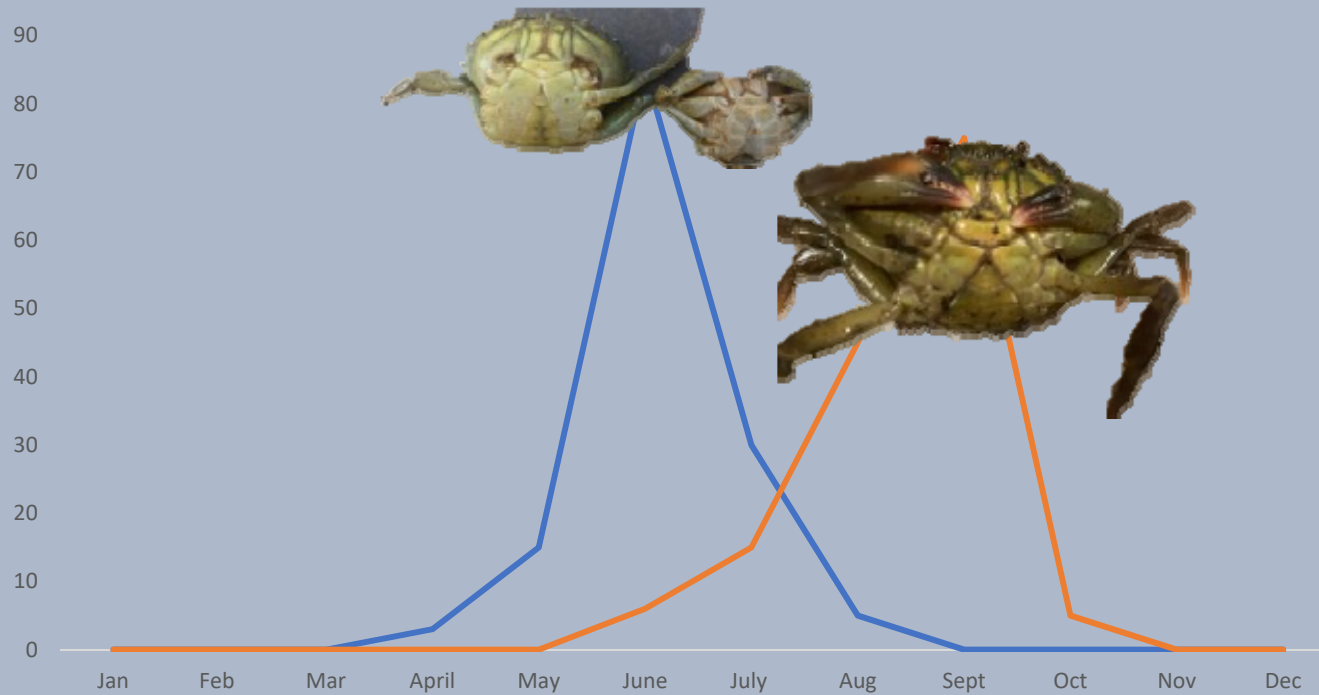
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*June 6, 2018*

*Portland, ME*



**Extension**



# Background

For the last several years- as part of an overall investigation into developing markets and a fishery for the invasive European green crab, NH Sea Grant has been researching several components of the molting process in the European green crab, *Carcinus maenas* including:

- Morphological molt indicators/cues
- Temporal component of molting
- Spatial component of molting
- Male vs. Female molting processes



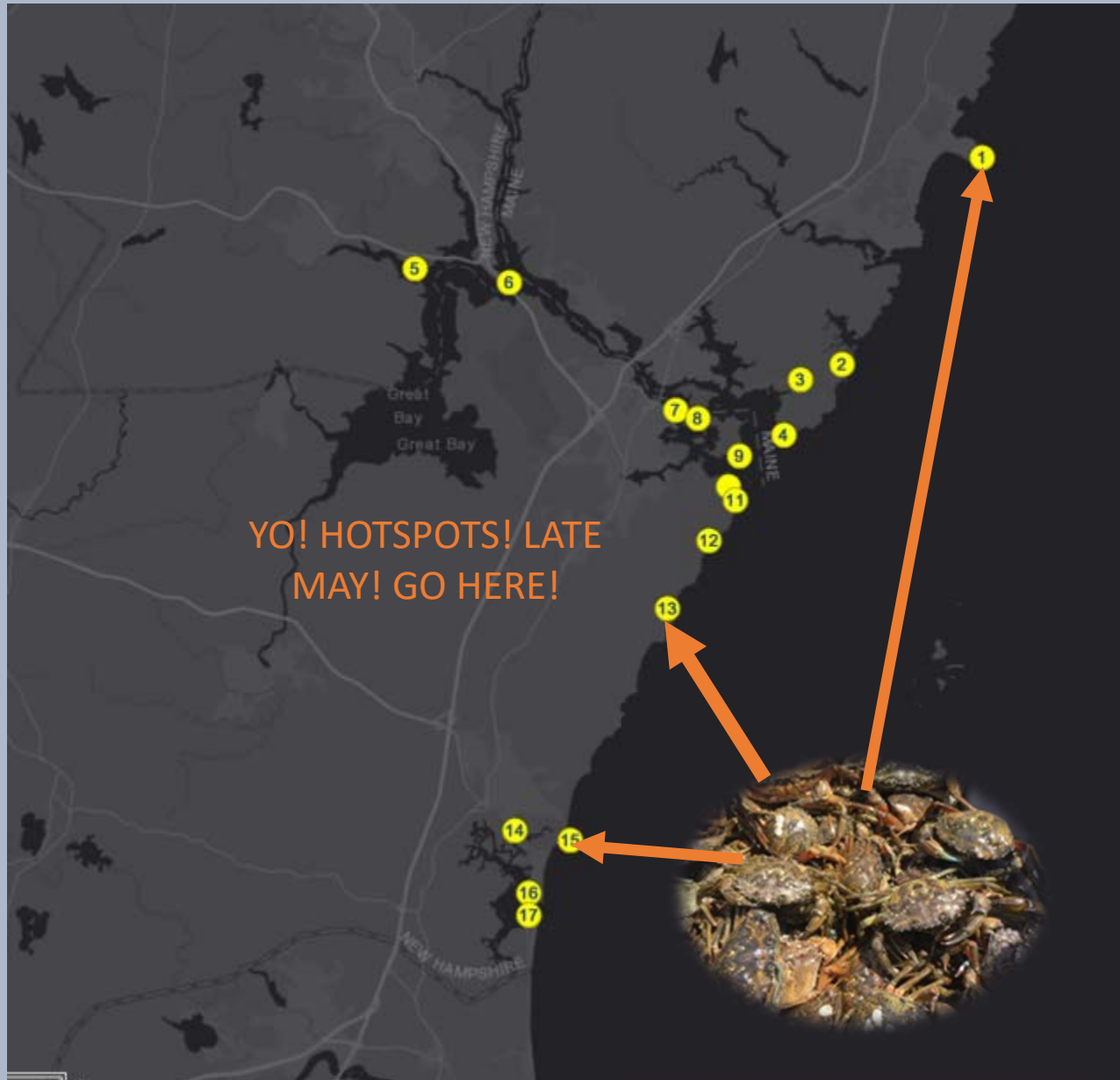
# Rationale

The more we understand about the **when, where and how** of molting in green crabs, the higher the likelihood of increasing the quantity of soft-shell crabs available to meet emerging market demand.

AND we anticipate the likelihood **of fishermen willing to participate** in a removal/fishery strategy will increase because....



# Goals



We hope to use the molting and spatial and temporal and sex data to:

- Create an efficient, targeted and streamlined fishing/trapping protocol that will yield high quantity of pre-molt and molting crabs per fishing effort.
- Identify 'hotspots' to direct potential crabbers to
- Identify 'Peak' molting times

# How Are We Doing That?

## *In the Lab*

For the first two years, while trying to identify and document ‘fool proof’ morphological molting indicators- we noticed:

- Couldn't find ANY males when trapping began in June
- Had to do two seasons of molting studies on females only

Season 1:  
ALL Females

Exp.	% Crab Molted Cont	% Crab Molted Exp	% Crab Mortality Cont	% Crab Mortality Exp
Exp 1 (6/18/15-7/17/15)	0%	0%	20%	40%
Exp 2 (7/20/15-8/13/15)	10%	10%	50%	50%

































Early Summer experiments: NO MOLTS  
Mid-Summer experiments: seeing some molting of females-HMMM...

# How Are We Doing That?

# *In the Lab*

Season 2: Based on data from previous season, specifically ran a late summer/early fall experiment -8/26/16-10/4/16-to test hypothesis that females molted later in the summer/fall.

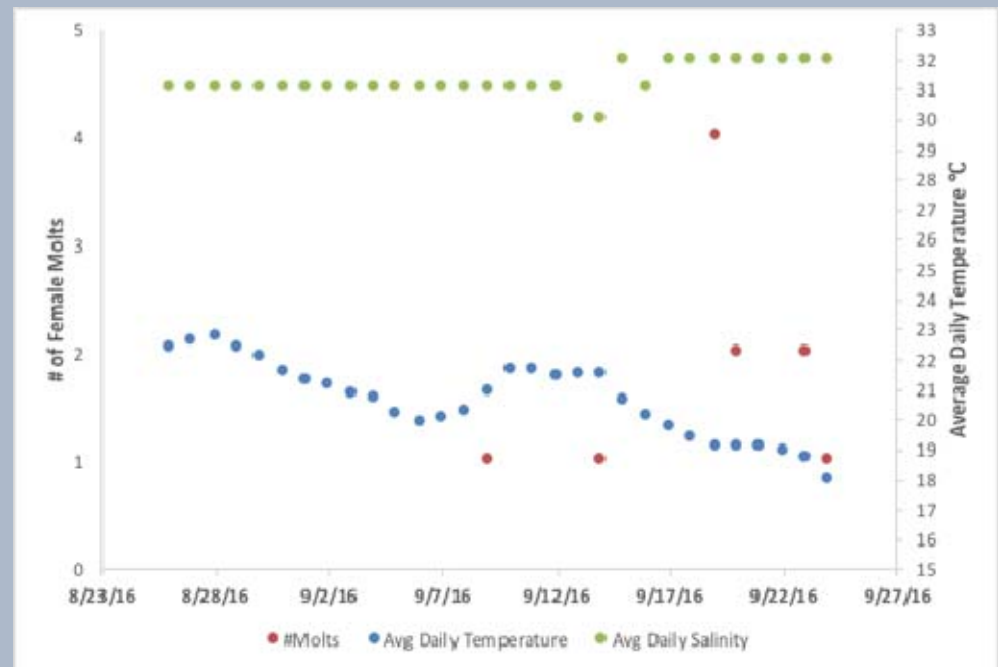
\*Interestingly-Late summer yielded more males and 2 males did molt-suggesting a PEAK with some outliers... but had yet to experiment with males

% females molted (n=11)		% males molted (n=7)		Total % of crabs molted		Average Carapace Width increase (mm)		Average days it took to molt					
81%		28%		61%		8mm		23					
A				FII	NA			MI					
					MI					F1			
					F1					FII			
B				FI									

# How Are Doing That? *In the Lab*

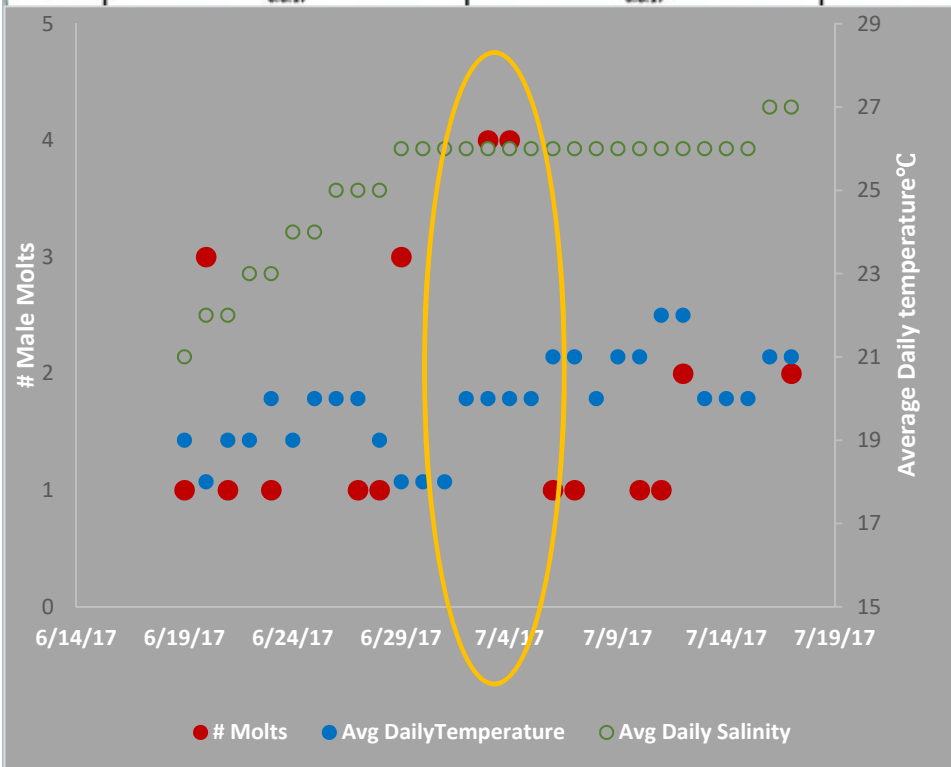
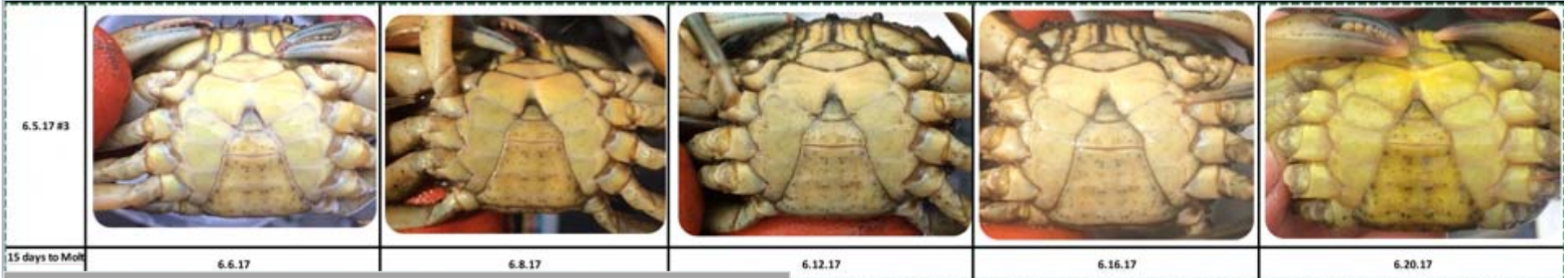
## Season 2: More female stats:

- Temp. with the most molts: **19.1 ° C:**
- All molt events occurred at temp range: **17°C-23°C**
- Salinity with the most molts: **32 ppt**
- All molt events occurred at salinity range of: **31-32 ppt**
- All molt events occurred between: **9/9/16-9/24/16**
- Female “autumn” molt window-influenced by temperature and salinity.



# How Are Doing That? *In the Lab*

Season 3: Finally trapped males- Late May 2017-Mid July 2017



- Temp. range with the most molts: **19-20 ° C:**
- All molt events occurred at temp range: **18°C-24°C**
- Salinity with the most molts: **26 ppt (n=17)**
- All molt events occurred at salinity range of: **21-27 ppt**
- All molt events occurred between: **6/19/17-7/17/17**
- Male “spring” molt window-influenced by temperature and salinity.

**\*\*July 3-4- real peak- 8 crabs molted**



# How Are We Doing That?

# *In the Lab*

Season 3: Females- July 26-Sept 18, 2017-but missed peak bc had to abruptly cancel exp.

7.26.17#6  
7 days to molt



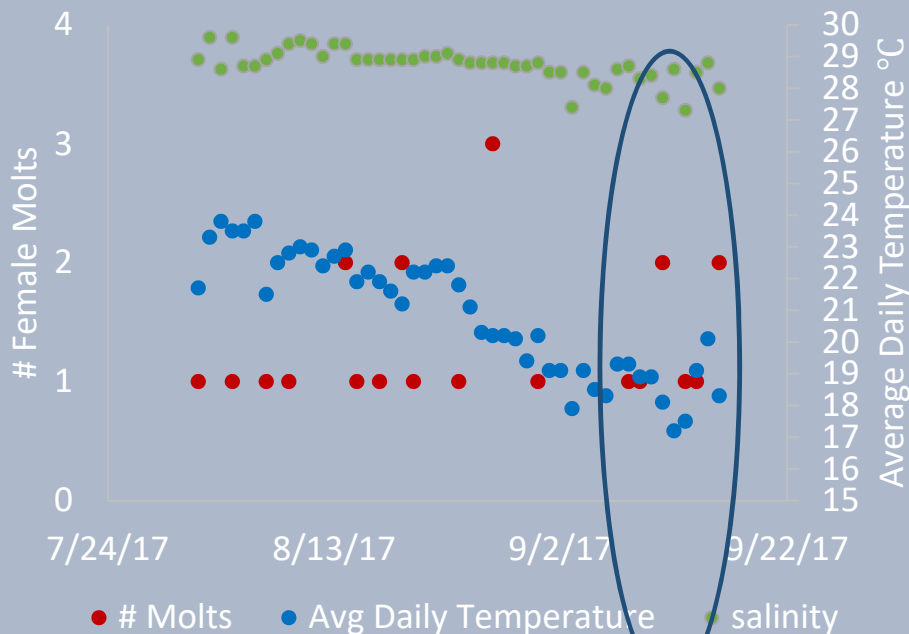
7.26.17



7.31.17



8.4.17



- Temp. with the most molts: **22 ° C:**
- All molt events occurred at temp range: **18°C-24°C**
- Salinity with the most molts: **29 ppt (n=14)**
- All molt events occurred at salinity range of: **27-30 ppt**
- All molt events occurred between: **8/1/17-9/16/17**

**\*\*Sept 8-16 -molting more frequently**

## How Are We Doing That?

## *In the field*

In 2017 we began a monitoring program with the idea of tracking the emergence of green crabs in the spring to see if we could better define molting peaks for males. Additionally we wanted to increase the public's awareness and begin to plant the idea of 'Eat the Invaders'.

Using a field collection app- **SURVEY 123** we developed a survey that would collect specific data.

- Initially only interested in males (had a data gap!)
- Only wanted 'market size' (CW 1.5-3")
- Only interested in crabs exhibiting 'pre-molt' indicators

Turned out to be TOO SPECIFIC and hard to train citizen scientists in 'pre-molt' sign identification.

BUT...piloted it anyway and preliminary data suggested that we were catching peak molt in the field and in the lab!



# How Are We Doing That?

# *In the field*

## This year- we have re-branded!

- Have monthly training sessions called “ The Great Green Crab Hunt” from April -October
- Goals are still to find pre-molt crabs but to make it easier- ANY crab, and molt phase, 0.5’ and up, color, shell hardness



If you missed the first  
**GREAT GREEN CRAB HUNT**-Sign up for the next one!  
This Thursday, May 10<sup>th</sup> at 1 PM! Go to: <https://bit.ly/2FShe6>



# How Are We Doing That?

## *In the field*



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- Have added interactive map with monitoring sites for trained volunteers to collect data on their own
- Began in April and have noticed some interesting things already including:
  - Emergence of crabs in the intertidal is late- begins in late march and only small crabs and few and far between
  - Begins to pick up by late April- crabs still small
  - Early May small crabs begin to molt regardless of sex
  - Late May- Early June bigger males begin to molt and incidence of bigger soft shells increases rapidly
  - Beginning to coincide with what is happening in the lab.