

European Green Crab Monitoring Standard Operating Procedure (SOP)

In partnership with the Center for Coastal Studies, Boston University, and the New England Aquarium

Background

The European green crab (*Carcinus maenus*) arrived in New England in the early 1800s most likely as stowaways in beach rocks used as semi-dry ballast in English ships crossing the Atlantic. It has since spread to the east and west coasts of North America, parts of South America, Asia, South Africa, Australia, and Tasmania. The successful invasion of the green crab into these new geographic regions is due to its fast population growth and ability to tolerate a wide range of environmental conditions such as temperatures from 32 to 90°F, salinities from 4 to 54, starvation for up to 3 months, and air exposure in damp burrows for up to 10 days. In addition, the green crab is an omnivorous scavenger and dominant predator, feeding on anything it can get its claws on including: clams, oysters, crabs, mollusks, plants, worms, as well as dead organisms. A recent explosion of the green crab population in Nova Scotia, Maine, and Massachusetts is having significant impacts on coastal ecosystems and has been linked to rapid declines of soft-shell clams and eelgrass. There is also growing concern that the digging and foraging behavior of green crabs in salt marshes is destabilizing banks and leading to rapid rates of erosion.

More information about the green crab and other invasive species can be found on the MA Office of Coastal Zone Management's Aquatic Invasive Species Program website:

<http://www.mass.gov/eea/agencies/czm/program-areas/aquatic-invasive-species/>.

Objective

The objective of this monitoring program is to increase the understanding of the structure of the green crab population and the potential impact it is having on different salt marsh systems throughout New England.

Equipment

- trap
- brick
- bait (two hot dogs)
- contact tag
- spread sheet to record data
- pencil
- calipers or a small ruler
- bucket
- gloves
- nail polish
- hydrometer
- thermometer
- burlap bag to collect crabs (if not releasing them)

Site Selection

Select a site near the salt marsh transect that is easy to access, relatively sheltered (low exposure), and suitable for green crab. Suitable habitat includes shallow, upper subtidal (0 to 2 ft below MLW), nearshore areas in moderate to high salinities (20-34 psu).

If possible please select a site at the base of your transect line. The data collected from the transect may inform the green crab monitoring. Please make note of where the trap is placed and take photos of the area.

Trap Deployment

Arrive at the site at least one hour before desired time of deployment to set up. You will need a trap, contact tag, brick, and bait.

Baiting Traps

Place two pieces of bait in each trap.

Other details

Traps should have a contact tag with contact information in case of the unlikely event of a trap being washed away. Also, make sure the brick is placed in the center of the trap to keep it weighted down.

Location

Traps should be placed with the opening on top. Deploy the traps roughly between 0 and +2 ft mean low tide.

Time Period

Deploy gear for a minimum of one full tidal and day/night cycle (for approximately 24 hours). Please check and empty the traps after the designated period to reduce stress on the crabs.

Frequency of sampling

The preferred minimum sampling frequency is at least 3 times in July and 3 times in August.

Monitoring

Traps should be checked only after being submerged for 24 hours or a full tide cycle. At least two people should be assigned to a trap. One person should be a data recorder while the other removes crabs from the trap and measures and determines the sex of each. Any other monitors can release marked (see below) crabs back into the water, and take pictures. If it is decided to not release the crabs back into the system but dispose of them, please make note of this on the data sheet.

Removing Catch

Open the trap and put all captured organisms into the bucket. If the trap is empty, write "Empty."

By-catch Identification

Identify ALL organisms in the trap using the identification information provided by your counselors and record the name and abundance of all by-catch (non-green crab species such as rock crabs, Asian shore crabs etc.) on the datasheet.

Green Crab Measurements

When measuring crabs, hold them by their main body cavity from the back, not by their claws or legs. If you turn a crab upside down they will hold still for you. If crabs are missing appendages or have parasites such as barnacles or tunicates please note this on data sheet.

For each individual crab record the following (if there are too many crabs to work with, bag the crabs, bring them back to the building, email Alyssa at: abnovak@bu.edu)

Size

The size of a crab is determined by measuring its maximum carapace (shell) width (mm). The carapace width is the distance across the crab's back at the widest point.

Sex

The sex of a crab is determined by the width of its abdomen (shaded area) which curls around the crab's underside. The male crab has a narrow, triangular abdomen, while the female has a much broader abdomen (see below). Please note any females with eggs (gravid females).



Male green crab



Female green crab



Gravid female green crab

Marking Crabs

To estimate the size of the green crab population at your site, individuals will be marked prior to releasing them. Thoroughly dry a part of the shell & put a large dot of nail polish on the carapace. If a crab already has a dot, make note of this on the data sheet and add another dot. Please note that after a few weeks monitors may be collecting crabs with multiple dots. This information needs to be noted on the datasheet.

If it is decided to not release the crabs back into the system but dispose of them, please make note of this on the data sheet. In this instance, the crabs need not be marked.

Recording data

Each site should have a documented site name and site description. Make sure all observer names are recorded. List monitoring site, team leader, monitors, trap deployment date and time on the datasheet. Write the check date and start time on the datasheet and all by-catch and crab measurement information. Collect temperature and salinity data and enter on data sheet if possible. Finally, please take a photo of the sampling site and enter green crab measurement information on the data sheet provided.

Trap removal

Be sure to clean all debris, plants, and animals out/off your trap between surveys. Rinse and clean the trap and store it in a safe, dry, place until the next monitoring session.

On-Site Checklist

Trap Deployment

- Place trap in habitat that is suitable (0 – 2 ft below mean low water) for green crabs.
- The trap should be placed with the opening at the top.
- Make sure there is a brick inside the trap to keep it in place.
- Securely tie contact tag to trap.
- Place bait in trap.
- Fill out date and time of deployment on data sheet.

Checking Traps and Recording (24 hours after trap deployment)

- Enter name of team leader.
- Enter all monitor names on data sheet.
- Enter date and start time on data sheet.

For each trap

- Remove crabs gently and place in holding bucket if necessary.
- If trap is empty, enter trap number and “Empty” on data sheet.
- For each crab enter on the data sheet: sex (abdominal flap is pointed in males, rounded in females).
- Enter carapace width (widest part of carapace measured in mm using calipers/rulers) on datasheet.
- Enter the number of markings (nail polish) that are visible on the carapace of the crab.
- Enter appropriate notes (parasites, broken appendages, reproductive females).
- For any non-crab species enter on data sheet under by-catch notes.
- Use nail polish to mark the carapace of the crab (after a few weeks there should be multiple markings on each crab).
- Release all other crabs and by-catch back into the water at collection site.
- Fill out end time on your data sheet.

Trap Removal

- Remove bait from traps.
- Clean traps and store them in a safe, dry place until next monitoring effort.
- Return your data sheet to your monitoring coordinator.

Green Crab Monitoring Data Sheet

Monitoring Site Name: _____

Team Leader (name and affiliation): _____

Monitoring Team (total # and names): _____

	Trap Set	Trap Check
Date		
Time	AM/PM	AM/PM
Tide (circle one)	LOW/MID/HIGH	LOW/MID/HIGH
Depth of trap (set only)		----
Salinity (set only)		----
Water temp (set only)		----

By-catch information (species/abundance)

Species Name	Total No.	Description

#

Green crab measurements

	Sex (M/F)	Carapace width (mm)	Markings (# of nail polish markings)	Notes (gravid, color, barnacles, broken appendages, etc.)
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