



CRAB TEAM

MONITORING HANDBOOK



Welcome

Thank you for volunteering to help protect Washington's shorelines! As a volunteer monitor, you will conduct two types of survey to monitor "pocket estuaries" throughout Puget Sound, the Strait of Juan de Fuca and the San Juan Islands for invasion by European green crabs (*Carcinus maenas*): trapping and shoreline surveys. The Crab Team staff at Washington Sea Grant (WSG) has identified sites that are thought to be at highest risk of invasion based on habitat suitability. To increase the chances that we will detect green crab at the earliest possible stages of invasion into inland Washington waters, volunteers will:

- work with a team of 3-5 volunteers at an assigned site,
- conduct monthly surveys from April through September of each year,
- submit data to WSG within a week of completing surveys,
- notify WSG immediately upon finding evidence of green crab presence.

We will increase monitoring at sites where green crabs have been positively identified to determine whether crabs are successfully establishing at that site, and how they are affecting other organisms in the community.

How were sites selected?

The WSG team has created, and maintains, a map of shoreline sites in Puget Sound and the Strait of Juan de Fuca categorized by habitat suitability (www.tinyurl.com/wagreencrab). Habitat suitability is based on site characteristics that green crabs are known to prefer in the invaded range, including:

- Low wave action
 - shallow beach slope or extensive tide flat
 - meandering channels or sloughs, with undercut or sloughing banks
 - isolated lagoons or artificial impoundments (e.g., culverts)
- Low freshwater input
- Marsh vegetation, like pickleweed (*Salicornia*) that crabs can use for shelter

There are other considerations that factor into the decision about which sites will be monitored, including whether we can obtain legal access, geographic distribution relative to other sites, whether the site is large enough to accommodate the number of traps we will use, and whether volunteers can safely navigate the terrain to conduct the protocols. The Crab Team continues to refine this list on an ongoing basis by ground-truthing. Observations from trap catches and molt surveys will also help us tell if green crabs are likely to be able to live at a site based on the other species found in that habitat. To help precisely and consistently target the best sampling locations within a habitat, Crab Team will provide volunteers with GPS coordinates of the location around which they should center their sampling. These will also be delineated with semi-permanent markers (rebar stake) to provide a visual aide.

Contact us:

wsg.washington.edu/crabteam

Email: crabteam@uw.edu



WSG Green Crab Monitoring



@WAGreencrab

VOLUNTEER GUIDELINES & RESPONSIBILITIES

You will conduct two types of sampling for green crabs. All volunteers who select *high-priority* sites will be asked to conduct **trapping** and **shoreline surveys** monthly from April through September. We are limited in the number of traps we can provide, so volunteers who select *lower-priority* sites will only be asked to perform **shoreline surveys**, also monthly, from April through September. Details for each type of survey are outlined below. Please note that you should also **record the actual times you worked**, including preparation, travel, and clean up, on your data sheets each month for both survey types.

Site exploration

Though we will accompany you on your first day of monitoring, it is a good idea to familiarize yourself with the site ahead of time. You can view the site on our Google satellite map (www.tinyurl.com/wagreencrab), and even visit, access permitting, to identify and prepare for any potential obstacles, and know whether knee boots or hip waders will be needed.

Safety & Stewardship

Please be aware that, despite their mild appearance, pocket estuaries can be hazardous areas to work in. If you think an area is potentially dangerous and are uneasy about accessing it, **DON'T DO IT!** Be mindful of the tides and *always* work with a partner on site. Proper footwear (narrow ankle boots or hip/chest waders) makes it much easier to get unstuck, and you can also use shovels or buckets to lean on if you start to sink. The footing can change with the tide, so use care when traversing uneven ground, especially slippery surfaces such as wet rocks or seaweed. Don't forget weather protection, being comfortable during surveying makes the work much more fun. Please be mindful of your role as a steward of these natural areas, and minimize disturbance on the site as much as possible. Respect the property rights of local landowners.

The Washington Department of Fish and Wildlife classifies European green crab as a prohibited animal species under WAC 220-12-090. A permit is required to possess this species, even as a part of a WDFW monitoring and control program. WSG has obtained a permit covering all volunteers trained by WSG. However, **you must be carrying a copy of the permit while you are trapping in order for it to be valid.** The permit will be renewed annually, so we will provide a copy at the beginning of each sampling season.

Gear required and provided

In addition to your own boots you will need a digital camera for this project. We will ask you to submit images of your trap catches so that we can verify the species being trapped. This doesn't need to be a fancy camera, your phone will most likely take adequate pictures. We've tried to take care of providing everything else you will need for you. Here is a list of gear your team will be provided:

For trapping:

- 3 - Square Fukui traps
- 3 - Galvanized steel minnow traps
- Bait (frozen mackerel) & Bait Jars (6)
- 6 - pencil rod trap stakes
- 1 - Set calipers
- Photo ID Cards and wax pencil
- 2 - Sorting Bins

For shoreline surveys:

- 1 - 0.1 m² PVC quadrat
- 1 - 50 meter rope

General gear provided:

- Gloves
- ID guide
- Clipboard
- Datasheets (on waterproof paper)
- Zip ties (trap repair, general use)
- Hand lens

We appreciate your help sustaining this project by taking good care of the gear, and returning it to us if you ever decide to conclude your term as volunteer. Please also let us know if any additional materials would be helpful, and we will see what we can do to make your job easier.

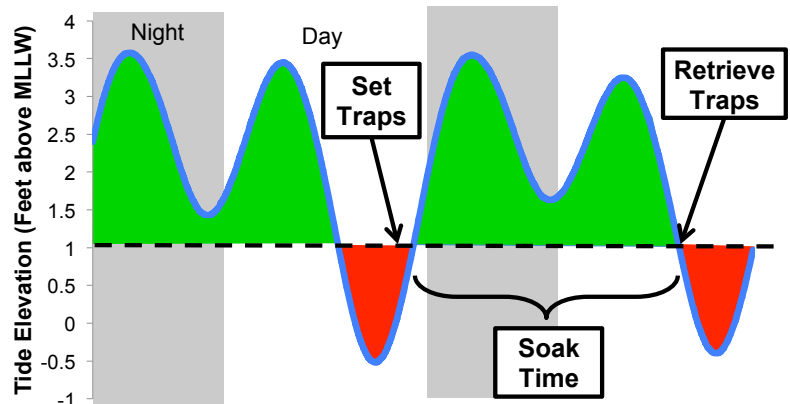
TRAPPING

You will set a total of **6 baited traps** (3 square Fukui traps, and 3 minnow traps) for **one nighttime high tide per month** from April through September.

1. Timing

Traps should be deployed (“soaked”) for one overnight high tide because that is the time that crabs are most actively looking for food. Depending on your site, and the tide, this could mean your traps are soaking for anywhere between 12 and 20 hours. The goal is to maximize the time that traps will be actively “fishing” but also ensure that any other organisms you catch will not be stranded out of the water when the tide drops to avoid mortality of native critters. This will take a bit of planning with tide forecasts.

This diagram shows a two-day tide forecast. Each 23 ½ hour tidal cycle has two high tides and two low tides - one higher, one lower for each. Set your traps on an afternoon or evening incoming tide, and retrieve them the next day, on the next tide low enough to reach your traps, as the tide is receding. You will trap monthly between April and September, but the exact timing is flexible. Because the precise timing of tides varies depending on location, you can choose dates and times that are good for your site.



Sample tide forecast showing the ideal times to set and retrieve traps located 1' above MLLW (dotted line). Traps will be submerged if the tide height (blue line) is above the trap elevation (green areas), but traps will be exposed if the tide height is below the trap elevation (red areas).

To find the tide forecast for your site:

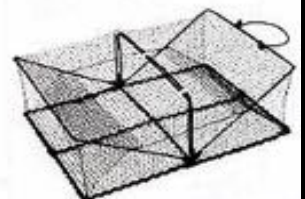
- www.tidesandcurrents.noaa.gov/tide_predictions.html
- App for iOS: Tide Graph

2. Preparation

A few days before setting traps, check that they are in good condition, clean and free of debris, and without holes in the mesh. Small holes can be repaired using zip ties. Each trap should be tagged individually with the WSG contact information. If you need more trap tags, notify WSG as soon as possible so we have time to mail them to you.

A few hours before you head out, remove the bait you will use from the freezer to allow it to thaw slightly. This will allow the bait to start attracting crabs to the traps more quickly.

Fukui Trap



Minnow Trap

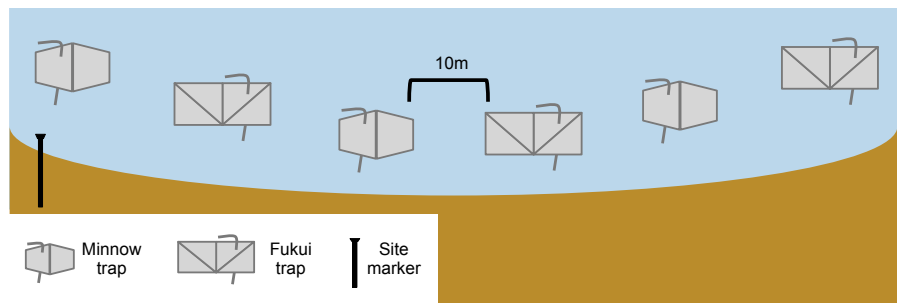


3. Setting Traps

You will set 3 Fukui square fish traps and 3 cylindrical minnow traps at each site.

- Time your trapping.** Plan to arrive at the site with enough time to set up traps on shore, and to still be able to walk out to the appropriate depth with your traps.
- Bait traps.** It's easiest to load the bait into bait jars while still on the beach. The bait has been portioned out for you; you only need empty the contents of one Ziplock bag into each of the 6 bait jars.
- Site the traps.** Traps should be arrayed in a line parallel to the shore, starting adjacent to the stake marking your trapping location. Alternate the type of trap so that minnow and Fukui traps are interspersed and spaced approximately 10 m apart (about 10 long paces).

All the traps should be at approximately the same tidal elevation. If water is retained at low tide, in a lagoon or slough, then your traps should be more than half submerged when you



set them. If your site is on a sloped beach, set the traps deep enough so they won't be exposed on a low tide before you come to collect them. We want the organisms to be healthy when we release them.

- Set up the traps.** Set up the Fukui trap by lifting the collapsible sides and clipping them at the top. The two halves of each minnow trap clip together with the pin provided -- make sure the trap is clipped fully closed. Place bait jars inside traps, but you don't need to attach it to the trap. Orient the minnow traps so that the orange tag is on top so it can be easily accessed without moving the trap.



Traps should be more than halfway submerged, with the stake securing the trap.

Sink the stake all the way through the trap, from top to bottom, so that the bent portion of the stake is level with the top of the trap, pinning it down. The top of the stake should be covering the middle bars or rings of the trap, which are sturdiest. If the substrate is too hard to securely stake the trap, try angling the stake slightly, or moving the stake and trap around slightly. If you consistently find this to be a challenge, check with Crab Team

staff. We might need to target a different part of the site, or weight traps with rebar to ensure they don't get moved or lost.

- Record data.** Record the time that your final trap was submerged, so that you can calculate the exact "soak time", or the amount of time that the traps were actually fishing for crabs.

4. Retrieving Traps

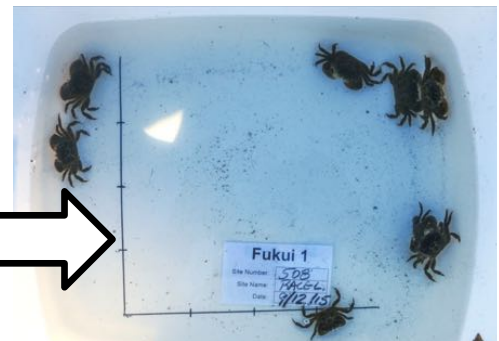
Check the traps the next time they will be out of water and **record the number and species of all organisms** in the trap. You will be sorting organisms and recording data at the same time, so it's easiest to work with a partner: one person can record data, and the other can handle the traps and organisms.

- Timing.** Plan to return to your traps as the tide is dropping. This will ensure that any organisms in the trap will remain in water, and should survive upon release.
- Record trapping data.** Take note of what time the first trap was removed from the water to calculate the total soak time. Even though it might take you a while to get through the traps, it's unlikely anything will climb into the traps once you are working at the site. Also record the predominant weather condition (*select one*) that best describes the period during which the trap was soaking.
- Remove and record organisms in first trap.** Pull the stake, remove debris, and bring the trap back to shore. Carefully, to avoid losing any critters (data!), empty the contents of the trap into the tub with the scale bar on the bottom. This is tricky with Fukui traps, and requires patience not to injure the critters.



Empty contents
of one trap at a
time into the bin

Photograph all
organisms in each trap



- Take one photograph of entire trap catch.** Try to get as many of the organisms as possible clearly visible in the photo, although this will not be possible if there is a great number. You will submit this with your trap data for data verification. Make sure to include the trap ID photo card in the photograph, with the correct date and site information filled in. Ensure reasonable resolution and avoid glare and shadows in the photos as much as possible.

Trap ID Photo Card

Minnow Trap 1

Site Number: _____

Site Name: _____

Date: _____

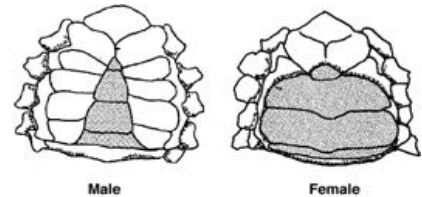
- Record trap catch on data sheet. Identify and record the number of all species present. Measure the size of up to 20 individuals of each crab species (10 of each sex)** - except hermit crabs. Fish should be counted and released first (but after photographing) because they are the most sensitive to drying out. Handle fish carefully, not only because many species have defensive spines, but also because they can be easily injured. Use care when handling crabs as well, to avoid getting pinched. Gloves will not protect you from large crab claws, but they can be helpful in guarding against pinches from the small shore (Grapsid) crabs.

On the data sheet, fill out a separate row for each species found in each trap. Fill out the trap type (M: Minnow; F: Fukui) and number (1-3) that matches with the photo card. The order is not as important as matching the photo card to the data sheet. For each species, use the 4-letter code from the ID guide, and measure and tally the individuals of that species as described below. After counting an individual, move it to the second bin to avoid re-counting.

4. Retrieving Traps (continued)

- f. For crab species *only* (except hermit crabs), count the total number of males and females of each species, and measure size for a subsample. To avoid size bias, select individuals haphazardly, without looking, until you have measured 10 males and 10 females. Measure the carapace width at the widest point (including spines) to the nearest millimeter using the calipers. If there are fewer than 10 males or females of a crab species, take size measurements on all individuals present. Record the size

To determine crab sex, look at the abdomen



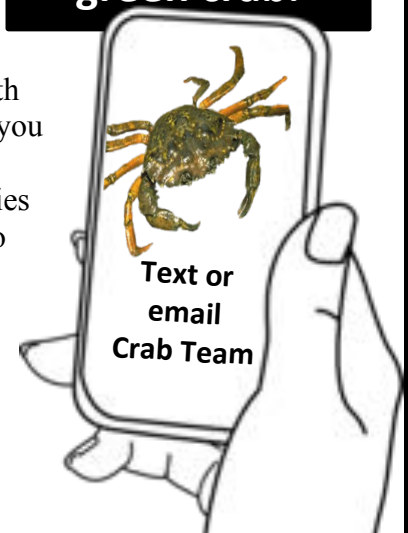
Measure the carapace at the widest point, including spines, with calipers

for each crab in one of the 10 boxes in the row for that species. When you have filled the boxes for one of the sexes, you may simply count the remaining number of *that sex* to obtain a total for each sex.

For crab species, record the total number of males and total number females on the appropriate sub-rows of the data sheet. For non-crabs and hermit crabs, record only the total number (disregard sex).

- g. **If a trap is empty, clearly indicate that on the data sheet.** Write “EMPTY” in the species box and take and submit a photo of an empty bin with the trap ID photo card. This allows us to be sure that no traps were skipped, and leaves a placeholder for all of the data.
- g. **Release all organisms in the water nearby, EXCEPT green crabs** (see below).
- h. **Repeat with each of the other traps.**
- i. **If you catch a green crab in your trap,** text a photograph to the Crab Team as soon as possible to verify ID. Photograph both sides of the crab with your trap ID photo card in the image for scale. Record the carapace width. Check with Crab Team on how to dispose of the crab. We may want to collect it live to sample tissue.
- j. **If you are unable to identify an organism,** take several photographs with your calipers or the scale bar in the bin in the photo for size reference. If you are confident the organism is *not* a green crab, release it with the other organisms. Use a placeholder on your datasheet, such as “Unknown species A” until the organism can be identified. Email photos and a description to Crab Team as soon as possible so that we can ID the organism for you before you turn in your data sheet.

If you catch a green crab:



It is our goal to identify every organism in the traps, so take a lot of pictures and notes so we can identify the species for you!

SHORELINE SURVEY

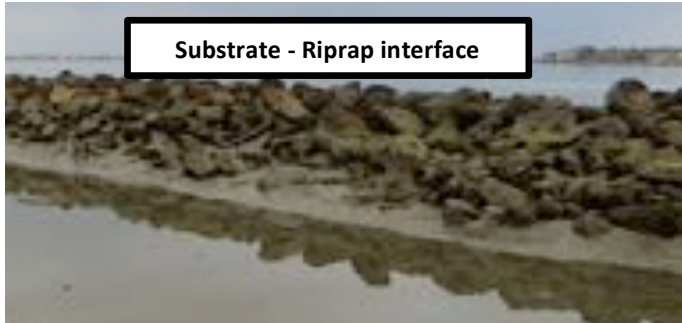
Volunteers will conduct **one habitat transect and one timed molt search** per month from April through September to characterize the shoreline vegetation, substrate, and crustacean community.

Often, green crab are detected in a new area first as a molted shell rather than a live individual. During molt surveys, you'll spend a time looking extra closely for molts. You will also complete a transect survey that will provide information about the habitat. We are likely to see molts for species that are not attracted to the traps, but that live nearby. Thus, this survey is a great opportunity to learn about the broader community of crustaceans that lives in pocket estuaries, and what habitat factors they might be associated with.

1. Habitat Transect

In order to describe the type of shoreline habitat at your site, you will conduct a transect survey. You will set a rope along the lower edge of the terrestrial habitat in the intertidal, and take measurements of what types of vegetation, animals, and substrate are found at 10 points along that rope.

- a. **Find the habitat boundary.** On a low tide (at least +1 ft or lower), identify the line at which the bare ground (mud/sand) of the subtidal environment interfaces with the lowest observed terrestrial habitat (i.e. not seagrass or algae). In general, you will find two types of shoreline habitat: vegetation and riprap.



- b. **Set your transect rope.** Stake the 50 meter rope along the line formed by the lower (deepest) boundary of vegetation or riprap, starting adjacent to your site marker. Follow the shape of the boundary, but connect gaps larger than 5 meters. You might have to work around or over natural or manmade obstacles to capture 50 m of shoreline.



1. Shoreline Characterization (continued)

c. Estimate percent cover at a subsample of 10 - 0.1 m² quadrats along the entire transect. The quadrat sampling locations are chosen by randomly-generated numbers each season (table at right). Each month you will use a new set of distances (1 - 50) for your quadrat sampling locations. For instance, in April you will survey quadrats at 10, 17, 19...and so on, meter marks along your measured rope.

Month	2017 Randomly Sampled Distances
April	10, 17, 19, 21, 22, 28, 29, 41, 47, 48
May	2, 3, 8, 20, 23, 30, 36, 42, 46, 47
June	7, 17, 18, 23, 27, 32, 35, 36, 40, 41
July	7, 19, 25, 28, 31, 45, 46, 47, 48, 49
Aug.	1, 21, 24, 25, 30, 31, 33, 36, 41, 46
Sept.	5, 10, 18, 19, 27, 28, 29, 39, 41, 49

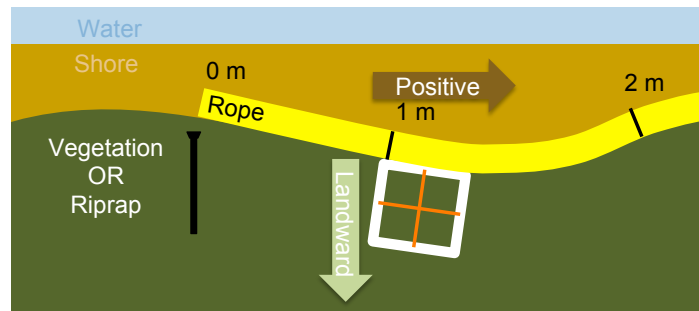


At each subsample distance, **place the square quadrat (0.1 m²) on the landward side of the rope (away from the water) on the positive side of the meter mark.**

Place the quadrat *landward* of the rope, *positive* relative to the meter mark, parallel to the rope.

d. **Box 1: Visually estimate percent cover of wrack (to nearest 5%).** You do not need to record anything that covers less than 5%. Assess only the *top layer* of wrack material, as if it were a photo. This will total 0-100%:

- **Eelgrass** (dead or live)
- **Seaweed** (dead or live)
- **Trash** (of human origin, plastic, etc.)
- **Terrestrial vegetation** (leaves, sticks)



e. **Box 2: Remove wrack, and estimate percent cover of habitat categories.** These should total exactly 100%, independent of the total percent cover of wrack from above. Again, record to nearest 5%:

- **Live, rooted vegetation** (e.g., pickleweed, marsh grass)
- **Live epifauna** (animals living at that spot, e.g. barnacles, mussels, anything that can't move out of the quadrat faster than you can estimate its cover.)
- **Bare substrate** (nothing covering ground)

f. **Box 2b: Estimate percent cover of filamentous green algae.** This can range from 0-100%, independent of other categories. These wooly mats can grow on vegetation, or directly on the mud. If dead, brown and washed up, count it as wrack - seaweed.

g. **Box 3: Record the dominant sediment type** in the quadrat as one of the categories to the right. If it is a mixture, choose the dominant category, or one that takes up the most space.



h. **Repeat steps d-f for remaining 9 quadrats.**

2. Timed Molt Search

The goal of the molt search is to collect as many molts as possible in a total of 20 minutes of search time. Two team members can divide this time in half, each searching independently for 10 minutes (4 members for 5 minutes, and so forth), *after* which volunteers will count and ID molts.

a. **Start at the site marker.** To standardize the survey for time, start with everyone standing at the site marker. Take a moment to scan the shore for areas where you think molts are most likely to pile up. Spotty patches of beach wrack are a great place to look, as is the base of vegetation, or below large beach logs. You can search anywhere at your site, not just the transect - target the areas you think will have the greatest density molts.

Most molts will be small crabs, but look for other crustaceans, too.

b. **Collect molts for a total of 20 volunteer-minutes.** Start a timer, and say “Go!”, at which point you may walk to the spots you’ve targeted, and start collecting as many molts as possible. Use a timer with an alarm, because it’s easy to lose track of time molt hunting! If you have to move to a new search area, let the timer continue to run. Many molts are quite small, especially shore crabs. Collect molts from any crustaceans, including amphipods, shrimps, etc. Don’t try to ID molts as you collect them.



* Hermit crabs should be identified to species if live (PAGR or PAHI), but lumped together (HERM) if molts, which are hard to tell apart.

Place molts into a bait jar or bin, by hand, one at a time. You’ll identify every single one, so even though you want to collect as many as possible, you don’t want thousands of crushed molts. Avoid sweeping piles of molts into your cup/bin. Small molts can be fragile and blown away by the wind.

c. **Count and identify each molt.** After you have finished collecting, sort through all of the molts collected, and identify each to species. You only need to record the total number of each species, no information about sex or size is needed. You might also find dead crabs, distinguishable from molts because the flesh is still in the shell, making it heavier and much stinkier. Sometimes a dead crab turns gray rather than a pink or reddish brown of an aged molt. Note how many are dead versus molts.



Only count molts for which you have at least half of the carapace.

This will help avoid double counting individual crabs for which the molts have broken into multiple pieces, and it’s often only possible to identify the species if you have the carapace.

d. **Dump molts on beach and crush** to avoid potentially recounting molts the following month.

WSG Crab Team - Trapping Data Sheet

Dates: 6/1-6/2/15		Site #: 302	Site Name: Awesome Bay		Trap Soak I
Volunteer Time Sheet (Names & Times)		Day 1 Start	Day 1 End	Day 2 Start	Day 2 End
1. Crab Team Captain		5:30p	7:30p	9am	12:30p
2. Crab Team Cheerleader		6:00p	7:30p	9am	11:30p
3. Crab Team First Mate		6:00p	7:30p		
4. Crab Team Scabbie		6:00p	7:30p	9a	11:30p
Weather (circle one):					Trap Soak II
					Heavy Rain
					Light Rain
					Fog/Mist
					Clouds

Last trap set

First trap retrieved

Hours include travel time, data submission etc

ONLY one weather

IF YOU FIND ANY GREEN CRABS, SAVE THEM & CONTACT WSG WITH PHOTOS ASAP															
Trap Type	Trap #	Species	Size (nearest mm) of first 10 male and 10 female crabs										# Total	Comments/Tally	
M	1	MEMA	M 67	75	60									3	111 ♀ w/eggs
			F 55											1	
M	1	HEOR	M 35	21	25	26	29	21	22	25	26	23	15	111	2 gravid ♀
			F 41	33	15	20	21						5	111	
F	1	EMPTY	M NA												
M	2	LEAR	M NA											2	
			F NA												
M	2	HEOR	M 18	23	26	29	22	22	23	23	19	24	23	111	111 111 111 111
			F 20										1	1	
F	2	CYAG	M NA											1	
			F NA												
F	2	MEGR	M 56											1	
			F											0	
M	3	LEAR	M NA											3	1 mortality
			F NA												
M	3	HEOR	M 22	26	29	27	21	20	20	19	26	25	69	111 111 111 111 111 111 111 111	
			F 33	14	27	30	21	20	19	19	18	17	12	111 111 111 111 111 111	
M	3	PAHI	M NA											4	
			F NA												
F	3	EMPTY	M NA												
			F NA												
			M												
			F												
			M												
			F												
			M												
			F												

Don't measure fish

Just total #

Total males and females separately

Don't measure hermit crabs

Use multiple rows for tallies if you need space

Clearly record empty traps

WSG Crab Team Transect Data Sheet

Ensure complete site data

Habitat type shouldn't change

Date: 6/1/15 Site #: 402 Volunteers: Captain, Swebbie, Cheerleader
 Site Name: Awesome Bay Participating:

Quadrat Survey Circle One: Riprap-Substrate Vegetation-Substrate

Set 10 quadrats at randomly assigned distances along transect. Estimate percent cover (nearest 5%) in each.

Quadrat 1 Random Distance (m): 8

1. Estimate wrack, then remove:	2. Cover:	Live epifauna	0
Wrack (dislodged floating material)		Live veg (rooted)	75
Eelgrass (dead or live)	25	*Cover total = 100%	Bare 25
Terrestrial veg (dead)	15	2b Filamentous green algae	100
Seaweed	0	3. Sediment	Mud (Sand) Gravel
Trash	0	(circle 1) Bedrock Riprap Cobble	

Quadrat 2 Random Distance (m): 15

1. Estimate wrack, then remove:	2. Cover:	Live epifauna	5
Wrack (dislodged floating material)		Live veg (rooted)	95
Eelgrass (dead or live)	0	*Cover total = 100%	Bare 0
Terrestrial veg (dead)	0	2b Filamentous green algae	95
Seaweed	0	3. Sediment	Mud (Sand) Gravel
Trash	0	(circle 1) Bedrock Riprap Cobble	

Quadrat 3 Random Distance (m): 27

1. Estimate wrack, then remove:	2. Cover:	Live epifauna	0
Wrack (dislodged floating material)		Live veg (rooted)	100
Eelgrass (dead or live)	0	*Cover total = 100%	Bare 0
Terrestrial veg (dead)	0	2b Filamentous green algae	0
Seaweed	0	3. Sediment	Mud (Sand) Gravel
Trash	0	(circle 1) Bedrock Riprap Cobble	

Quadrat 4 Random Distance (m): 29

1. Estimate wrack, then remove:	2. Cover:	Live epifauna	0
Wrack (dislodged floating material)		Live veg (rooted)	50
Eelgrass (dead or live)	50	*Cover total = 100%	Bare 50
Terrestrial veg (dead)	0	2b Filamentous green algae	10
Seaweed	0	3. Sediment	Mud (Sand) Gravel
Trash	5	(circle 1) Bedrock Riprap Cobble	

Quadrat 5 Random Distance (m): 37

1. Estimate wrack, then remove:	2. Cover:	Live epifauna	0
Wrack (dislodged floating material)		Live veg (rooted)	0
Eelgrass (dead or live)	0	*Cover total = 100%	Bare 0
Terrestrial veg (dead)	0	2b Filamentous green algae	0
Seaweed	0	3. Sediment	Mud (Sand) Gravel
Trash	0	(circle 1) Bedrock Riprap Cobble	

Quadrat 6 Random Distance (m): 40

1. Estimate wrack, then remove:	2. Cover:	Live epifauna	0
Wrack (dislodged floating material)		Live veg (rooted)	75
Eelgrass (dead or live)	0	*Cover total = 100%	Bare 25
Terrestrial veg (dead)	0	2b Filamentous green algae	0
Seaweed	0	3. Sediment	Mud (Sand) Gravel
Trash	0	(circle 1) Bedrock Riprap Cobble	

Quadrat 7 Random Distance (m): 41

1. Estimate wrack, then remove:	2. Cover:	Live epifauna	5
Wrack (dislodged floating material)		Live veg (rooted)	0
Eelgrass (dead or live)	10	*Cover total = 100%	Bare 95
Terrestrial veg (dead)	10	2b Filamentous green algae	10
Seaweed	10	3. Sediment	Mud (Sand) Gravel
Trash	0	(circle 1) Bedrock Riprap Cobble	

Quadrat 8 Random Distance (m): 43

1. Estimate wrack, then remove:	2. Cover:	Live epifauna	0
Wrack (dislodged floating material)		Live veg (rooted)	100
Eelgrass (dead or live)	10	*Cover total = 100%	Bare 0
Terrestrial veg (dead)	30	2b Filamentous green algae	100
Seaweed	0	3. Sediment	Mud (Sand) Gravel
Trash	0	(circle 1) Bedrock Riprap Cobble	

Quadrat 9 Random Distance (m): 48

1. Estimate wrack, then remove:	2. Cover:	Live epifauna	0
Wrack (dislodged floating material)		Live veg (rooted)	0
Eelgrass (dead or live)	0	*Cover total = 100%	Bare 100
Terrestrial veg (dead)	0	2b Filamentous green algae	0
Seaweed	0	3. Sediment	Mud (Sand) Gravel
Trash	5	(circle 1) Bedrock Riprap Cobble	

Quadrat 10 Random Distance (m): 49

1. Estimate wrack, then remove:	2. Cover:	Live epifauna	0
Wrack (dislodged floating material)		Live veg (rooted)	60
Eelgrass (dead or live)	0	*Cover total = 100%	Bare 40
Terrestrial veg (dead)	0	2b Filamentous green algae	25
Seaweed	0	3. Sediment	Mud (Sand) Gravel
Trash	0	(circle 1) Bedrock Riprap Cobble	

Epifauna, rooted veg and bare must total 100%

Don't forget sediment type in every quadrat

Does not need to total 100% (0-100)

Filamentous green is estimated 0-100% independent of the rest of step 2.

GREEN CRAB SURVEYING CHEATSHEET

Before you go:

- Gather your equipment:
 - Bins
 - Traps (3 Fukui, 3 Minnow)
 - Bait (6 bags) & bait jars
 - Datasheets/clipboard
 - Measuring rope
 - Stakes (6)
 - Camera
 - Copy of permit
 - Calipers
 - Gloves
 - Quadrat
 - ID Guide
- Schedule arrival as tide is returning, before water reaches the height you will set the traps.
- Remove 6 bait bags (1 large bag) from the freezer and allow to thaw slightly.

Setting traps:

- Prepare bait on shore, adding one bag of frozen mackerel to each bait jar, one jar to each trap.
- Set traps more than half submerged, 10 meters apart, alternating type, in a line parallel to shore.
- Stake traps all the way through, securing with bent metal rod, trap tag on top.
- Record the time at which the **last trap** was deployed.

Retrieving traps:

- Record the time at which the **first trap** was removed from water.
- Pull traps out and record catch one trap at a time.
 - Photograph each trap catch in bin (with trap id photo card in image).
 - **For fish:** Record total number of each species, ignore sex/size, release back into water.
 - **For crab species** (except hermit crabs): **Record carapace width** of first 10 male and first 10 female crabs selected haphazardly; **record total by sex** (total # males, total # females)
 - **For all other species:** Record total number, ignore sex and size.
 - Release all non green crabs back into water.
- Dispose of bait at home (don't reuse or dump at the site).
- Take pictures and descriptions of any unknown organisms. Email to Crab Team.
- Keep any suspected European green crabs and contact Crab Team immediately.

Shoreline Survey:

- Set the 50 meter rope along the riprap-substrate or vegetation-substrate habitat boundary.
- Set 10 quadrats at distances based on the table of randomly-generated numbers, and record percent cover of wrack, cover, and substrate type in each.
- Conduct a timed molt search, where volunteers work independently to collect as many molts as possible independently for a total of 20 volunteer-minutes (10 min each for 2 volunteers).
- Record the total number of each species of molt collected after the end of the search.
- Keep any suspected green crab molts and contact Crab Team immediately.

After returning home:

- Clean, repair, and store traps. Dispose of used bait in trash or compost.
- Decontaminate gear to avoid transporting species.
- Contact Crab Team for help IDing any unknown species.
- Submit data to crabteam@uw.edu within 1 week of sampling.