Sea Star Wasting Disease Citizen Science Protocol
Cornell University and University of Washington

Introduction

Field observations and experiments West Coast-wide suggest that ***18 species of sea stars now harbor a virus or bacterium that is making them sick***. Visible symptoms include:

- white lesions
- loss of arms
- flattened, flabby body that is peeling off vertical walls (like dock pilings)

Researchers need to track the rate of spread of the disease. This means repeated surveys at individual locations, where you count all of the individuals within a prescribed area. We call this: ***50 meters or 50 stars***. Researchers are also trying to understand ***why stars die in higher numbers at some locations than others***. One hypothesis is an effect of temperature.

Contributions from citizens are essential for researchers to collect enough data points in space and time to accurately track this disease - there are simply not enough scientists out there, but there are millions of coastal residents.

With this protocol, a non-expert will be able to:

- collect rigorous data on the number, size and health of stars
- collect on-site temperature information
- enter those data directly to a database managed by Cornell University

Although data on any star is important, the ***most valuable data*** will come from the ***five most common species***, depicted in this protocol.

Tools Needed:

- Accurate tidal chart
- Centimeter tape measure
- Digital camera or phone camera
- ruler, for scale
- Data sheet and clipboard or mobile app
- Thermometer for recording air temperature ***in ^{o}C*** (purchase from a hardware store). Note you can collect data without collecting temperature, but this is valuable information.

Safety Gear Needed:

- Good waterproof boots
- Bright (LED) headlamp and an extra flashlight – for evening low tides and looking under rocks
- Warm clothes and wind-proof outer gear
- Cell phone

Safety Precautions to Protect You:

- Always survey with at least one partner, a team is better
- Always file a "flight plan" with friends or neighbors indicating where you are going and when will be back home
- Make sure your cell phone is fully charged
- Double check you have all needed gear before you leave home

***Essential* Safety Precautions to Protect Stars**:

- ***Never touch a star*** – you might transmit disease between stars

Before the Survey:

Check the tide – you want to go out on a low tide.

Measure your paces – go outside and pace a known distance (minimum 10 meters), counting paces. Do this three times, to get an ***average number of paces***. Divide by 10 to get ***average paces per meter***.

At the Beach:

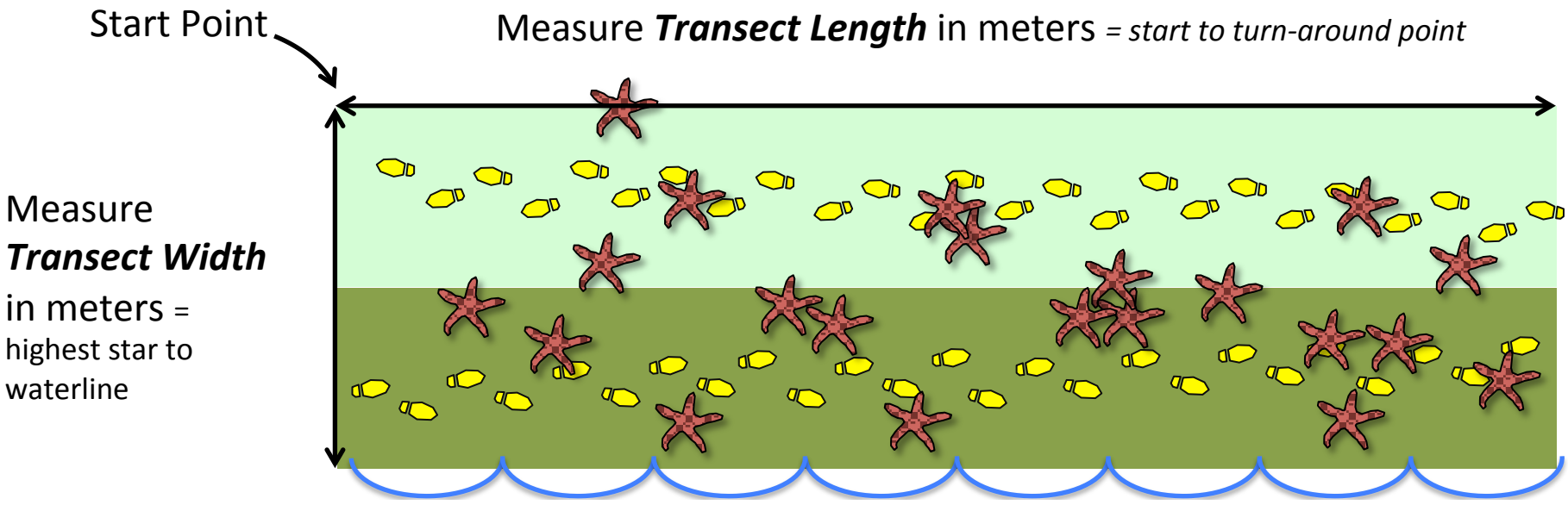
Record the **Substrate Type** (*choose predominant*) options are:

- Bedrock/Rocky Bench (all rock)
- Artificial: Riprap or seawall
- Artificial: Pilings or docks
- Boulders and/or Rocky Outcroppings surrounded by sandy beach
- Cobble (basketball to dinnerplate to tennisball sizes; >10cm diameter)
- Gravel (chicken egg to aspirin sizes; 0.5cm – 5cm)

Record the following: Beach Name, Geolocation (if known), Orientation, Date, Start Time, Weather, Names.

Doing a Transect:

Fill in the information on the front, top side of the data sheet.
Decide where you want to start your first transect.
The end point of the survey is either 50 meters from the start point (parallel to the water) or the location of the 50th star you encounter, whichever comes first. Approximate meters in paces using your average paces per meter as a guide. When you finish – pace off the ***Transect Length*** and ***Transect Width***.
Repeat the transect protocol in new locations as you have time.



After the Transect:

Take the ***Substrate Temperature***: put the thermometer on the substrate for 2 minutes. If it is sunny, you should shade it.

Submitting your data:

After you complete a survey, please submit your data *as soon as possible* using one of the methods below:

Visit the Cornell Star Sickness website: http://www.udiscover.it/applications/seastar/and click the "submit observations" link at the bottom of the page to enter your data online and upload your photos *(no need to submit your data to COASST).*

Scan your datasheet and email your data and photos to Morgan Eisenlord <morganeisenlord@gmail.com> (please see below for how to name your files).

Mail your data sheets and photos to the Fridya Harbor Labs using the address below.

Morgan Eisenlord
620 University Rd
Friday Harbor Labs, Friday Harbor, WA 98250

Best practices for submitting data and photos electronically:

When submitting datasheets or photos electronically, please save your files using the following format:

Data sheet:

Format: LastNameFirstInitial_Location_MonthDayYear.pdf

Example: ParrishJ_AlkiBeach_06122014.pdf
(Datasheet for Survey by Julia Parrish at Alki Beach on 6/12/14)

Photos

Format: LastNameFirstInitial_Location_MonthDayYear_Transect letter_Star#.jpg

Example 1: ParrishJ_AlkiBeach_06122014_T1_1.jpg
(Photo 1 on Transect #1 by Julia Parrish at Alki Beach on 6/12/14)

Example 2: ParrishJ_AlkiBeach_06122014_T3_2.jpg
(Photo 2 on Transect #3 by Julia Parrish at Alki Beach on 6/12/14)

Going Again:

Ideally, one or more transects at the same beach location every two weeks will give researchers at Cornell University the greatest chance of calculating the spread of the disease, and analyzing the influence of temperature. The study will continue at least through summer into early fall.

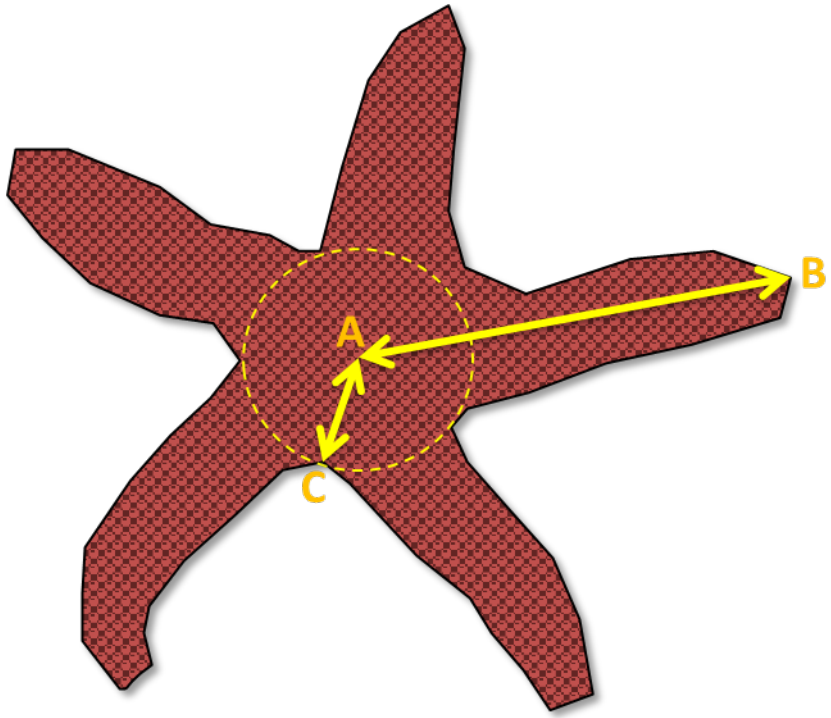
Additional Information:

For additional information about the sea star monitoring effort, including a map tracking the spread of sea star wasting along the west coast of North America, or to document observations for additional species not included on this site, please visit the MARINe Sea Star Wasting website: http://www.eeb.ucsc.edu/pacificrockyintertidal/data-products/sea-star-wasting/

At the Star (4 things):

1. Record the ***species***. To use the 5 Star Guide you'll need to:

- Count the arms
- Measure the length of a fully grown arm in cm from center of disk to outer tip of arm (A to B)
- Measure ***disk radius*** from center of disk to "armpit" (A to C)
- Note the color of the upperside of the star
- Note the texture of the upperside of the star (pimply, spiny, bumpy plates, smooth)



2. Record whether the star is ***small or large*** as determined by the distance from the center of disk to outer tip of arm (A to B)

- Small stars are less than or equal to 5cm
- Large stars are greater than or equal to 5cm

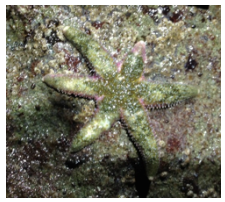
3. Categorize ***star health:***

- **Dead** if it is completely deflated or dissolved into a pile of white spicules (skeletal parts) and bacteria.
- **Sick** if it has obvious lesions, has lost arms, is flat, thin, flaccid or falling off the substrate. Don't be fooled by the madreporite, a small, round, raised disk on the upper surface. If you can't decide if it is sick or healthy, call it healthy.
- **Healthy** if there are no lesions and the star seems stiff and "pumped up."

4. Take a ***photo*** of ***all sick or dead stars*** encountered (healthy stars can just be counted) that includes the COASST survey slate, or a photographic ruler, for scale.

Remember to ***never touch a star***. If you can't get a clear look, since many are under rocks, simply do the best you can.

5 Star Guide

	Size	Arm Count	Color	Upperside Surface	Arm:Disk Ratio
 **Ochre Star**	up to 50cm	5	orange to purple, but never red/pink	spiny/pimply	long; ~2.5-4x disk radius
 **Sunflower Star**	up to 100cm	variable, 15-24	orange to purple	spiny/pimply	long; ~3x disk radius
 **Mottled Star**	up to 80cm	5	green, brown, gray, red, or orange, occ. w mottled bands; white spines	spiny/pimply	very long; ~5-8x disk radius
 **Dawson's Sunstar**	up to 40cm	11-12	orange to brown, often w darker disk	smooth, bumpy plates	long; ~3x disk radius
 **6-armed Star**	up to 10cm	6	variable brown, purple, green, often w darker chevron-shaped bands	spiny/pimply	long; ~3-5x disk radius