Science Fair Final Draft

by Emma Compton

Sea Stars - On the Rise?

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Abstract

The main idea of this project is to show whether or not the population of sea stars is increasing or decreasing. Sea Star Wasting Syndrome had dramatically decreased the population of the sea stars along the West Coast, at one point the population had dropped up to 85%. The data I gathered has proved that sea stars are making a come back! I tested between early October 2014 through January 2015. In plot one there has been a 166% increase in the population, in plot two there was a 150% increase. If the population has grown this much since October, then the sea stars will soon have a stable population once again!

Introduction

Statement of Purpose

I have always been interested in marine biology as well as ecology and when I heard how the sea stars population was rapidly decreasing, I thought that monitoring the population would be the ideal science fair project!

Investigative Question

Since the most recent outbreak of Sea Star Wasting Syndrome, specifically with Pisaster Ochraceus (Ochre Sea Stars) , how has the population been affected?

Hypothesis

I believe that the population of the Pisaster Ochraceus sea star will be stable in the beginning, then as time passes the population will begin to rise. I believe this because the outbreak will still be affecting the Ochre Sea Stars and towards the end of my data gathering it will lessen, thus making the population increase slightly.

Background

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Mr. Nestlerode

Science 8

15 October, 2014

Background Research

Recently people across the West Coast of the United States have been noticing that sea stars are slowly dying off. This is caused by Sea Star Wasting Syndrome. Since the first signs of the disease appeared, up to 85% of the population has died. There is no cause therefore it is difficult to understand why this is happening. There is extensive research being done, however, there is information about the syndrome we understand such as: the symptoms, where it is happening, and past outbreaks.

Symptoms of Sea Star Wasting Syndrome aggressively progress from the time they are introduced to the disease. A single star can go from perfectly healthy to falling limbs and dying in under twenty-four hours. When the star is first introduced with the disease a white lesion appears around the limbs. White lesions are signs that the sea star's flesh is disintegrating. Next the limb of the star will slowly detach from the body. Unlike healthy stars the limbs are unable to regrow, so there is little to no chance of survival after the limbs tear apart from the body. Researches are perplexed on what are causing these symptoms. Most say that evidence points towards a virus caused by the warming waters due to the upcoming El Nino. Although, scientists did rule out the possibility of Fukushima

because other species would have been equally affected. (UCSC, 7 October 2014) The symptoms are destructive among the sea stars but the cause still remains unknown. (Scientific American, 14 August 2014)

Sea Star Wasting Syndrome has a large spectrum of where the affected sea stars live. There have been reported cases up from northern Mexico up to the southern part of Alaska. However, the disease has mostly affected the central states along the west coast such as Oregon. There have been a few announced cases along the east coast. (NPR, 18 June 2014) The east coast plague has had a less dramatic effect, but the reports uncover new information about the cause of the disease as well as how severe the outbreak has been. The most recent reports indicate that the plague is worst than ever before and researchers are not sure whether or not the stars will regain to a stable population. Due to the widely spread outbreaks the effects of Sea Star Wasting Syndrome are severe. (UCSC, 7 October 2014)

In past years there have been other outbreaks of Sea Star Wasting Syndrome. In the years 1997, 1982, 1978 and during the 1940s the disease were quite severe. The disease did not have a large scale effect. The outbreak which is currently happening had such a large effect that the ecosystem is being affected in ways that are unrepairable. Mussels, sea slugs, which sea stars are eating, are now covering the tide pools like a blanket. They both are now found in large quantities in just about every intertidal tidepool. The outbreaks occurring in 1997, 1982, and 1978 were happening at a local scale and did not seem to be spreading. Unlike the past outbreaks, the recent disease among sea stars is showing signs that it is spreading. Research shows that the disease is traveling through

one sea star to the next, as time went on it has gotten increasingly worse and has spread throughout the West Coast. Due the outbreaks happening in the past and the one currently happening, we are now able to see that the Sea Star Wasting Syndrome may be able to lessen or stop as time passes.(Environment 360, 17 July, 2014)

Many questions still remain about the Sea Star Wasting Syndrome. Researchers and Scientists are able to look at the symptoms, where it occurs, and the past outbreaks to gain knowledge about how the disease is caused. This has been the most dramatic case of the drop of the sea star population. This is not only effecting the stars, but the ecosystem where they live. Recent research, however, has proven that there may be an upcoming end to such a traumatic syndrome. (UCSC, 7 October 2014)

Procedure

Procedure Summary

In my project I will be monitoring the sea star population at Natural Bridges State Beach, specifically Pisaster Ochraceus sea stars. I will use two plots to accurately count the stars. While counting and measuring I will also be checking if they are affected with Sea Star Wasting Syndrome.

Materials

1. Non Toxic chalk
2. Measuring Tape
3. Ruler
4. Category Chart
5. Tide Pools
6. Sharpie

Method

First I will arrive at the tide pools and use the measuring tape to outline the plot originally established by the UCSC Long Marine Lab. I will look for sea stars, when I find one I will analyze it and identify which category it should be placed in based on the size and how much it is affected with the disease. First, I will determine the size by measuring the radius with a ruler using millimeters. Second, I will check whether or not the sea star has the disease by looking for lesions or any missing limbs and place the star in a category accordingly. Third, I use non toxic chalk to mark the rock so I know that I have already

counted that particular star. I follow this data gathering and analysis plan from the month of October 2014 through January 2015.

Data & Results

Plot 1:
Date: October 9, 2014
Site: Natural Bridges

Size	Healthy Sea Star	less than 1 lesions	less than 2 lesions	missing 1-2 limbs	missing 3-4 limbs
Radius (MM)	**0**	**1**	**2**	**3**	**4**
5					
10					
20	2				
30	3				
40					
50	1				
60	1				
TOTAL: 6					

Plot 2:
Date: October 9, 2014
Site: Natural Bridges

Size	Healthy Sea Star	less than 1 lesions	less than 2 lesions	missing 1-2 limbs	missing 3-4 limbs
Radius (MM)	**0**	**1**	**2**	**3**	**4**
5					
10	1				
20	1				
30	1			1	
40	5				
50	1				
60					
70					
80					
90					
100					
110	1				
Total: 10					

Plot: 1
Date: November 6, 2014
Site: Natural Bridges

Size	Healthy Sea Star	less than 1 lesions	less than 2 lesions	missing 1-2 limbs	missing 3-4 limbs
Radius (MM)	**0**	**1**	**2**	**3**	**4**
5					
10	1				
20	1				
30	2				
40	2				
50					
60					
Total: 6					

Plot: 2
Date: November 6, 2014
Site: Natural Bridges

Size	Healthy Sea Star	less than 1 lesions	less than 2 lesions	missing 1-2 limbs	missing 3-4 limbs
Radius (MM)	**0**	**1**	**2**	**3**	**4**
5					
10	3				
20	4				
30	2				
40	2				
50	1				
60					
70					
Total: 12					

Plot: 1
Date: November 22, 2014
Site: Natural Bridges

Size	Healthy Sea Star	less than 1 lesions	less than 2 lesions	missing 1-2 limbs	missing 3-4 limbs
Radius (MM)	**0**	**1**	**2**	**3**	**4**
5					
10					
20	5				
30	1				
40	3				
50	1				
60				1	
70	1				
Total: 11					

Plot: 2
Date: November 22, 2014
Site: Natural Bridges

Size	Healthy Sea Star	less than 1 lesions	less than 2 lesions	missing 1-2 limbs	missing 3-4 limbs
Radius (MM)	**0**	**1**	**2**	**3**	**4**
5					
10					
20	7				
30	4				
40	5	1			
50	2				
60					
70					
80	1				
Total: 19					

Plot: 1
Date: December 21, 2014
Site: Natural Bridges

Size	Healthy Sea Star	less than 1 lesions	less than 2 lesions	missing 1-2 limbs	missing 3-4 limbs
Radius (MM)	**0**	**1**	**2**	**3**	**4**
5					
10	2				
20	6				
30	3				
40	2				
50	1				
60					
Total: 14					

Plot: 2
Date: December 21, 2014
Site: Natural Bridges

Size	Healthy Sea Star	less than 1 lesions	less than 2 lesions	missing 1-2 limbs	missing 3-4 limbs
Radius (MM)	**0**	**1**	**2**	**3**	**4**
5					
10	4				
20	8				
30	6				
40					
50	1				
60					
70					
80	1				
Total: 20					

Plot: 1
Date: January 19, 2015
Site: Natural Bridges

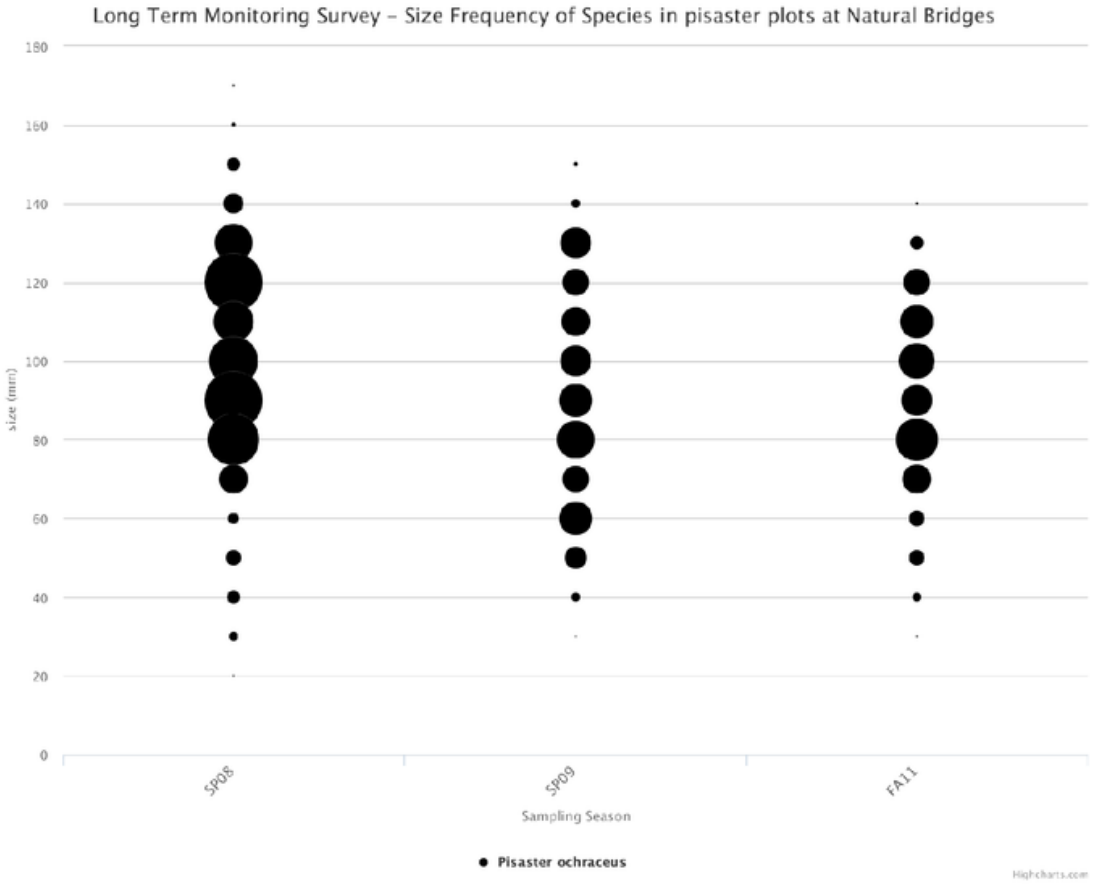
Size	Healthy Sea Star	less than 1 lesions	less than 2 lesions	missing 1-2 limbs	missing 3-4 limbs
Radius (MM)	**0**	**1**	**2**	**3**	**4**
5					
10	3				
20	10				
30	1				
40	2				
50					
60					
Total: 16					

Plot: 2
Date: January 19, 2015
Site: Natural Bridges

Size	Healthy Sea Star	less than 1 lesions	less than 2 lesions	missing 1-2 limbs	missing 3-4 limbs
Radius (MM)	**0**	**1**	**2**	**3**	**4**
5					
10	8				
20	13				
30	3				
40					
50					
60					
70					
80	1				
Total: 25					

Population vs. Time Graph from the years 2008-2011 (skipping 2010):

http://data.piscoweb.org/marine1/speciessize.html?sites=Natural+Bridges&targetspecies=pisaster&photolump=Pisaster+ochraceus&photoseason=allseasons&graphtype=column



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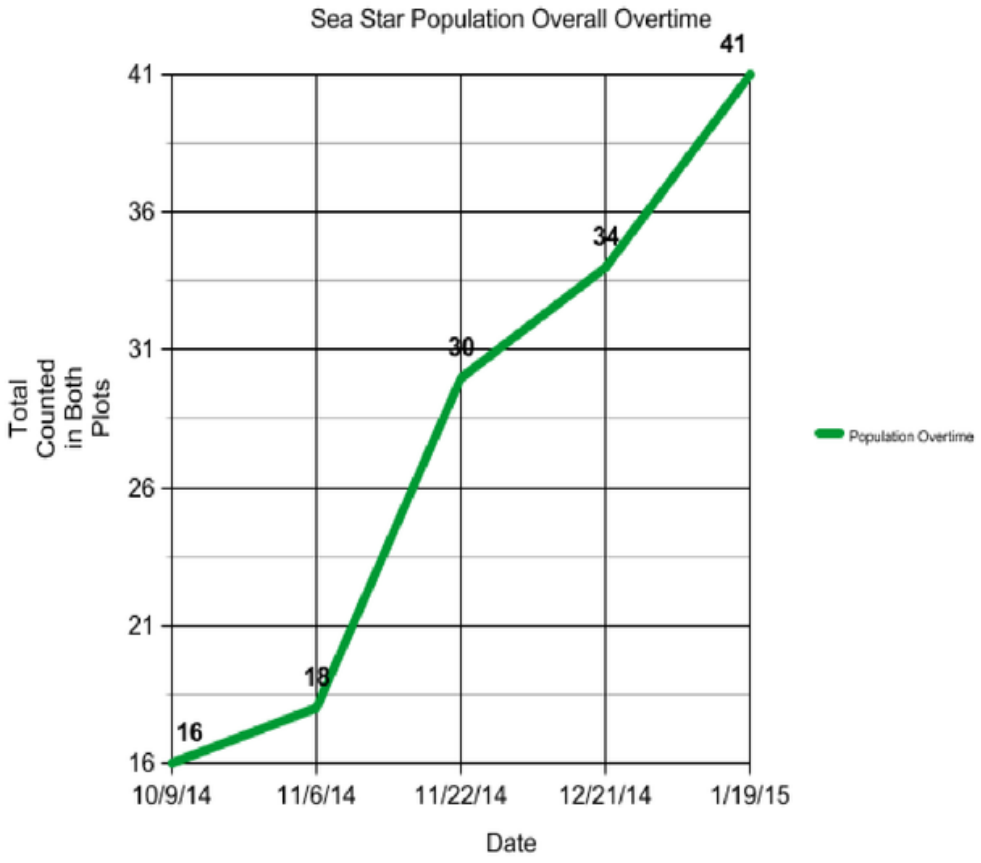
Population Overtime from October - January (the total number of both plots):



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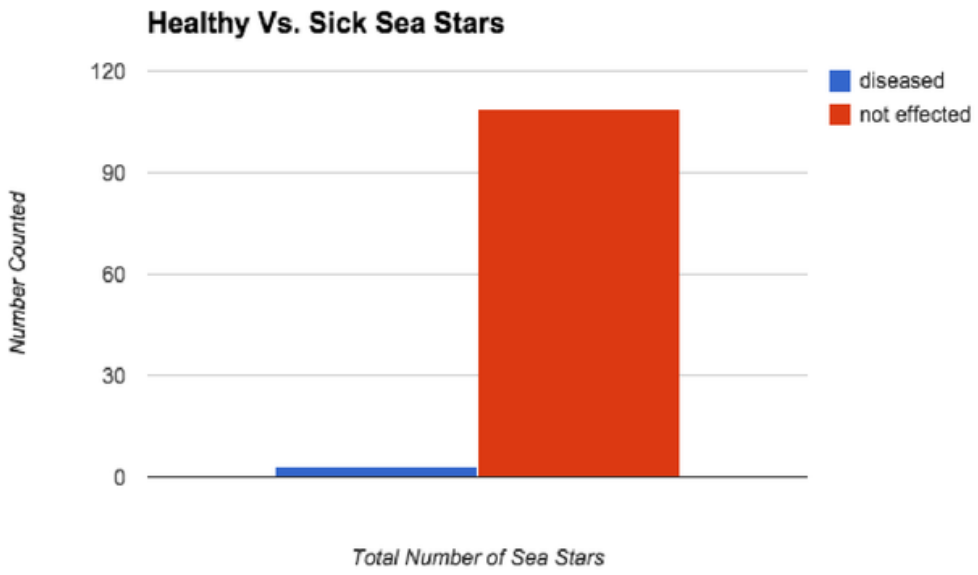

(Discussion / Conclusion)

The ocean covers 71% of the earth's surface and within the ocean millions of species are dependent on other organisms for survival. If you were to remove a species from the food web a catastrophe could happen, animals would overpopulate while others could become extinct. This would have been reality for sea stars. Sea stars were affected with Sea Star Wasting Syndrome which crippled the population so much so that extinction became a possibility. The goal of my project was to monitor the population to see whether or not the population of the sea stars is increasing or decreasing

I focused on mainly the sea star called Pisaster Ochraceus, commonly known as Ochre Sea Stars. These stars range in a variety of colors such as, purple, reddish, and brown and are found in the Pacific Ocean. In Natural Bridges, they are the most common species of sea star. Overall, regarding size I noticed a large difference from data in 2008-2011. Between the years 2008-2009 the biggest Ochre Sea Star recorded was 170 millimeters (using the radius), while in the data I most recently collected I observed an 110 millimeter (using the radius) sea star. This proves that there has been a recent increase in the number of juveniles.

In my project I used two plots which allowed me to compare the data I gathered from each area. In the first plot, there was a 166% increase. While in the second plot there was an 150% increase which is a huge improvement in the population. If the sea star

population keeps continuing to grow, the population will stable.

My project goal was to see if the population is still decreasing due to the unfortunate disease, Sea Star Wasting Syndrome. However, the disease happens in a short amount of time. Within 24 hours the sea stars goes from perfectly healthy to close to death, so it is hard to accurately count the amount of diseased sea stars. This could have affected the number of overall diseased sea stars which may have given the results a more accurate count. I also could have tested over a longer period of time which would have given me more data to analyze. In future testing, I could continue to add on data to the previous results and this could show how the population may fluctuate.

In conclusion, I have learned that how an organism so small, such as sea stars can affect other animals that were dependent on them for survival. I was able to see this first hand, when muscle population was over grown due to the decrease in population of the sea stars.

Acknowledgements

I would like to acknowledge Pete Raimondi and Laura Anderson from the Ecology and Evolutionary Biology Department at UCSC. Thank you for helping me narrow down my ideas and helping in my initial data collection.

References

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GRADEMARK REPORT

FINAL GRADE

19/20

GENERAL COMMENTS

Instructor

I'm going to look over your final draft once you are done. The main thing is looking at how to improve this over time and since the data isn't too conclusive or flushed out and could connect to the other data that is out there

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