



Education and Research: Testing Hypotheses

Penguin Dynamics Along the West Antarctic Peninsula – Lab Sheet

(Adapted from EARTH 2016 Activity, "Are Adelie Penguins Getting the Cold Shoulder," Original lesson written by Katie Lodes, Jeff Robbins, Tara Sain, and Miriam Sutton)

LAB INVESTIGATION QUESTION: *How are penguin populations responding to changes in climate along the West Antarctic Peninsula (WAP)?*

HYPOTHESIS: _____

TEST YOUR HYPOTHESIS

Materials/Procedures/Data Collection –

1. **PAL-LTER DATASET #1:** Use the PAL-LTER Datasets (provided in xCel) to generate three graphs illustrating changes in Population Percentages of Adelie, Chinstrap, and Gentoo penguin populations along the WAP between 1974 and 2010. Use the **xCel Tutorial** to assist you in the layout of your graphs.
2. **WAP and PENGUIN ECOSYSTEM GRAPHICS:** Use the **Graphics for Penguin Dynamics Handout** to assist in identifying variables affecting changes in penguin populations along the WAP:
 - a. Use the "Comparison of Adelie and Gentoo Ranges and Nests" Map to observe the historical nesting data for Adelie and Gentoo Penguins along the WAP.
 - b. Use the "West Antarctic Peninsula Sea Ice at Palmer Station Graph" to observe changes in sea ice along the WAP since 1979.
 - c. Open this website interactive to explore summer and winter seasonal changes in the Antarctic Food Web: <http://polardiscovery.whoi.edu/antarctica/summer.html>.
 - d. Use the "Antarctic Food Web and Biological Pump" Graphic to observe the relationship between sea ice, the biological pump, and the aquatic food web found along the WAP.
 - e. Use the "Effects of Changing Sea Ice on Food Web" Graphic to observe the relationship between sea ice and the aquatic food web found along the WAP.
3. **PAL-LTER DATASET #2:** Use the Palmer LTER Data Tutorial to access the PAL-LTER Portal to assist you in downloading the data and generating a pie chart illustrating the Adelie Penguin Diet Composition.

ANALYZE YOUR RESULTS

Data Analysis – Use your Penguin Population Graphs and the Graphics Document for your analysis.

1. **PAL-LTER DATASET #1 ANALYSIS:**

a. Describe changes occurring in the **Adelie** penguin population between 1974 and 2010.

b. Describe changes occurring in the **Chinstrap** penguin population between 1974 and 2010.





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- c. Describe changes occurring in the **Gentoo** penguin population between 1974 and 2010.

2. WAP and PENGUIN ECOSYSTEM GRAPHICS ANALYSIS:

GRAPHIC #1: Comparison of Adelie and Gentoo Ranges and Nests:

- a. Identify the 6 study sites shown on the map and describe the changes occurring in the Adelie penguin nests between 1975 and 2014.

- b. Locate the Biscoe Point nesting data and describe the changes occurring in the Gentoo penguin nests between 1975 and 2014.

GRAPHIC #2: West Antarctic Peninsula Sea Ice at Palmer Station:

- c. Describe the changes occurring in the duration of sea ice coverage between 1979 and 2009.

- d. Explore Antarctica's food web using the **GRAPHIC #3: Antarctic Food Web & Biological Pump** graphic and the **GRAPHIC #4: Antarctic Food Web Interactive** and describe the relationship between Antarctica's food web and sea ice.

- e. Based on the **GRAPHIC #5: Effects of Changing Sea Ice on Food Web** graphic, describe how fluctuations in sea ice, observed during Southern Annular Mode (SAM) episodes, affect the Antarctic Food Web.



