

# Evidence of Change

Using historical accounts of fish populations in the Sea of Cortez as evidence of long-term changes.

## Overview

Teaching students a framework with which to make logical scientific arguments can be accomplished using the Claim-Evidence-Reasoning method. It provides students with an easy to remember and accomplish way to use evidence to support scientific assertions. This activity combines student practice with C-E-R with group discussion of the types of evidence that are useful and available. Students must support their scientific claims using the evidence provided.

Although empirical scientific evidence is preferable, it is simply not always available. Especially when investigating historical ecological conditions, anecdotal evidence can provide insight into changing environments.

Student groups will read and evaluate potential evidence from three sources.; John Steinbeck's *The Log from the Sea of Cortez*, which details the ecological communities encountered during his 1940 scientific expedition with marine biologist Ed Ricketts, a 2004 journal article from *Frontiers in Ecology and the Environment*, which compares the evidence from the 1940 trip to an expedition to the same locations in 2004, and a personal narrative, *Memorias de un Pescador en el Golfo de California*.

## Lesson objectives

The AP Environmental Science course description requires that all students:

- 1) Analyze and interpret data
- 2) Make conclusions from data and interpret their validity

The students will practice evaluating empirical and anecdotal evidence and writing using the Claim-Evidence-Reasoning framework.

## Engage:

The lesson should begin with a teacher-led whole class discussion of what constitutes evidence as well as some examples of evidence-based conclusions

## Explore:

- 1.) Working in groups of 2-3, the students should first read the assigned pages in *The Log from the Sea of Cortez*, scanning for statements that describe the numbers of individuals and the species sighted by the group during the 1940 expedition.
- 2.) The students should enter the statements that they find into the data chart labeled **1940 Observations from The Log from the Sea Of Cortez**.

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## C-E-R

- Students practice using the Claim-Evidence-Reasoning framework for scientific writing.
- Students Evaluate empirical and anecdotal evidence

## Readings:

- *The Log from the Sea of Cortez*, A book by John Steinbeck
- *Memorias de un Pescador en el Golfo de California*, a personal narrative by Guillermo Castro Miranda
- *Remembering the Gulf: Changes the Marine Communities of the Sea of Cortez since the Steinbeck and Ricketts expedition of 1940*, a journal article from *Frontiers in Ecology and the Environment*, 2008,

## Explore:

3.) The students should divide the reading of the two articles up among the group members. Statements in the two readings that describe the numbers of individuals and the species should be entered into either the **Observations from Memorias de un Pescador en el Golfo de California** or the **Data from Remembering the Gulf** charts.

4.) Once all data and observations have been collected, the student groups should discuss the evidence that they have collected and determine what conclusions can be drawn from that evidence.

5.) Each student should write a summary that answers the following question using the Claim-Evidence-Reasoning framework.

**How have the marine communities of the Sea of Cortez changed between 1940 and today?**

