

Upwelling Case Study

A Classroom Activity for Ocean Gazing Episode #45: MBARI: A seaside sequel

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Grade Level: 9-12, or 5-8

Lesson Time: 1-2 class periods

Materials Required

Computers with Internet access, Upwelling case study:

http://www.mbari.org/earth/Coastal/UW_Case/uw_cs1.htm

Summary

Using seasonal data on California's Pacific Sardine landings from the National Marine Fisheries Service, students will discover whether high Pacific Sardine landings are correlated with strong upwelling in Monterey Bay. Students will investigate atmospheric, oceanographic, and biological data to discover which season(s) had strong upwelling during that period of time. Students will use actual data from in-water moorings in addition to other data from land-band instruments, earth-orbiting satellites, and computer models.

Objectives

- ✓ **Discuss** seasonality of upwelling using data from the case study
- ✓ **Demonstrate** an understanding of upwelling and its effect on sardine populations

- ✓ **Communicate** results by writing a summary

Key Concepts

- ✓ In all environments, organisms with similar needs may compete with one another for limited resources, including food, space, water, air, and shelter.
- ✓ The world contains a wide diversity of physical conditions, which creates a wide variety of environments. In any particular environment, the growth and survival of organisms depend on the physical conditions.

Procedure

1. Have students read about Pacific Sardines using the links on the case study main page. Have students read the case study background information to make connections between upwelling and El Niño.
2. Have students work either independently or in pairs to complete the case study.
3. Students first examine atmospheric data to determine when upwelling was likely to occur off the coast of California based on wind speed and direction.
4. Students then explore seasonal data for surface currents, sea-surface temperature, and biological data to build



evidence for their choice.

5. Once students have completed the case study, have them write up their findings. They should decide which season would have the strongest upwelling events, and back up their decision with evidence from the case study. They can support their writing using diagrams found on the website, either by copying or downloading the image, or by using a screen grab.
6. Have students discuss their findings as a group, determine if there are any discrepancies, and discuss how the upwelling events would affect the Pacific Sardine population.
7. Have students research online the current status of the Pacific Sardine population using reliable websites such as the National Marine Fisheries Service or the Department of Fish and Game.

Assessment

- ✓ *Product*: Students write a document detailing their findings on seasonal upwelling.
- ✓ *Performance*: Did student participate in class discussion? Did student successfully complete case study?

Extensions

- ✓ Students can examine current data to determine what the state of upwelling is this season
- ✓ Students can examine fish populations off other coasts to see how local currents affect them

Sources

The related podcast episode for this activity can be found by going to the podcast section of www.oceangazing.org