

Activity 8

Fish Biogeography

Introduction: Water temperature is an important factor in limiting fish population distribution. In the North Pacific ocean there are three main temperature regions: tropical (around the equator with a 20 degree Celcius minimum), temperate (14 to 16 degrees Celcius) off the North American Continent, and polar (8 to 10 degrees Celsius) in the Northern Arctic zone. Transition areas are present between the tropical and temperate water regions and may have species from both zones. California is considered a transition zone between the tropical region of Baja California and temperate region north of Point Conception. For Example, the California Halibut (*Paralichthys californicus*) from the temperate zone and the California Lizardfish (*Synodus lucioleps*) from the tropical zone are both found off California. Onboard the *R/V Sea Explorer*, students will collect marine fish using an otter trawl net and record data on the numbers of different species found in the sample. This data will be used to monitor changes in local fish populations and will be correlated with seasonal shifts in water temperature.

Background Information: The science of fish biogeography is concerned with geographical distributions of fish over the world. Geographic ranges of fish are pulsating and dynamic, constantly evolving in some places, spreading into other places, and dying out in others - all of which contributes to the formation of new distribution patterns. The North American Pacific Region extends along the Pacific coast from Baja California north to the end of the Aleutian Island chain. There is a gradual change from a tropical fauna, to a mixed tropical-temperate fauna, to a largely temperate fauna, to a mixed temperate-arctic fauna. Coastal features, like Point Conception along the California coast, mark sharp boundaries in the fish fauna. The cold California current allows coldwater fish fauna to extend farther southward along the American coast. In years when the California current is not flowing strongly, species from the gulf of California can be found further north. Cold temperate fishes like rockfishes (Scorpaenidae), sculpins (Cottidae), surfperches (Embiotocidae) and flatfishes (Pleuronectiformes) are typically caught in the otter trawl net.

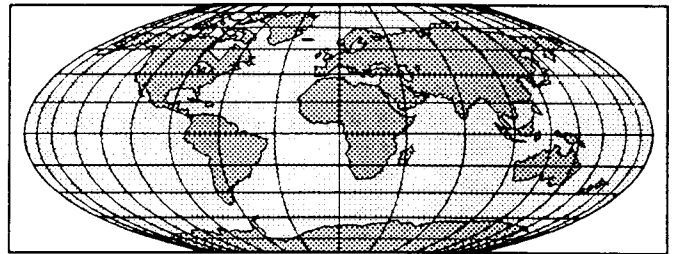


Figure 1: The World's Oceans

Research Application: Marine Institute biologists collect data on the distribution and abundance of benthic (demersal) fish populations off the Southern California coast. Shifts in surface temperature every few years, because of warm water "El Nino" events, warm up the expanse of water along the Pacific coastline from Chile to British Columbia and fish that normally live in the tropical and sub-tropical waters either migrate or are displaced poleward. The effects of *El Nino* on fish distribution off southern California are seen as soon as the surface water temperatures start to warm up. Big game fish like *Swordfish*, *Marlin*, *Skipjack*, *Big Eye* and *Yellowfin tunas* start appearing in larger numbers than usual. These big game fish travel north because the cold water that normally keeps their range farther south is gone. Fish normally abundant off Southern California start to decrease in number during the onset of *El Nino*. These include the *California Halibut*, *English Sole*, *Speckled fin* and *Long fin Sanddabs*, and *Hornyhead turbot*. Their decrease could be due to a disruption in the food chain, or thermal stress. A year to several years after an *El Nino* event species normally found well to the south start appearing off the Southern California coast. *Lumptail Searobins* and *Smooth Stargazers* appear in otter trawl net samples from *R/V Sea Explorer*. Pelagic species like *Pacific Seahorses*, *Green Jacks*, *White Mullet*, *Red Crabs*, *Cortez Angelfish* and *Cortez Grunts* have also been found. The reason for their occurrence is that they were transported here as planktonic larvae during the warm water influx with the *El Nino* event and we just didn't notice them until they grew up.

Vocabulary:
Biogeography

Temperate

Tropical

El Nino

Fauna

Science dealing with biological distribution of organisms

Part of the ocean with moderate temperatures between the tropics and polar circles

Part of ocean with temperatures ranging between 72 - 85 C between Cancer and Capricorn

Warm water current that first appears around Christmas along the coasts of Ecuador and Peru

animal life of a region during a specific geological period or time