



2013
Upwelling of cool water near the coast keeps temperature lower.

2014
With little wind to cool ocean, blob develops in winter. Very low snowpack in 2014 / 2015.

2015
Blob heat wave envelops West Coast.
Elevated temperatures ashore.
El Niño develops.

2016
West Coast waters cool but Gulf of Alaska remains warm.

2017
Cooling continues, ocean trends back.
Arctic remains warm.

OCEAN CONDITIONS

ECOLOGICAL CHANGES

Krill plentiful off West Coast.

Salmon migration routes shift.

Sardine spawning farther offshore.

Species shifting north to cooler waters.

Warmer water species such as skipjack tuna found in Alaska.

Krill and forage fish decline.

Harmful algal bloom spreads in shellfish from SE Alaska to Southern California.

Fish species move northward hundreds of miles.

Juvenile salmon going to ocean find poorer quality food.

Pyrosomes appear farther north than ever recorded before.

Lacking krill, humpback whales feed on anchovy closer to shore, where crab traps are.

Shift in food web from crustaceans to gelatinous organisms with less value to fish.

Pyrosomes multiply to extent never seen before.

Return to cooler conditions.

Snowpack increases.

IMPACTS

Elevated sea lion strandings in Southern California, as sardines farther away.

About 95 percent of endangered winter-run Chinook salmon eggs are lost to drought.

Clamming shut down, Dungeness crab season delayed by algal toxins.

Large whale unusual mortality event (UME) in Alaska.

Some 4,000 stranded California sea lions.

Seabird die-offs.

Reduced size and survival of salmon going to the ocean.

Cod in Alaska skinnier than usual.

Fishing nets clogged with pyrosomes.

Dungeness crab season opens.

Increase in whale entanglements.

Some fish smaller, poorer body condition.

Reduced salmon survival leads to reduced returns.

Sea lion strandings continue.

Pacific cod decline in Alaska.

Alaska, Washington: salmon

California: salmon, Dungeness crab

Surge in krill, increase in anchovy.

Cod collapse off Alaska.

FISHERIES DISASTERS

Fraser River sockeye

Fraser River sockeye

Washington: coho, pink salmon, Dungeness crab

California: sardine, red sea urchin, Dungeness crab

Alaska, Washington: salmon

California: salmon, Dungeness crab

Cod collapse off Alaska.