

A scenic photograph of a beach at sunset. The sun is a bright, glowing orb on the horizon, casting a golden light across the sky and reflecting on the water. The beach is sandy with some driftwood and a seashell in the foreground. Palm trees are silhouetted against the sky on the left side.

Invasive Species

Chris Li

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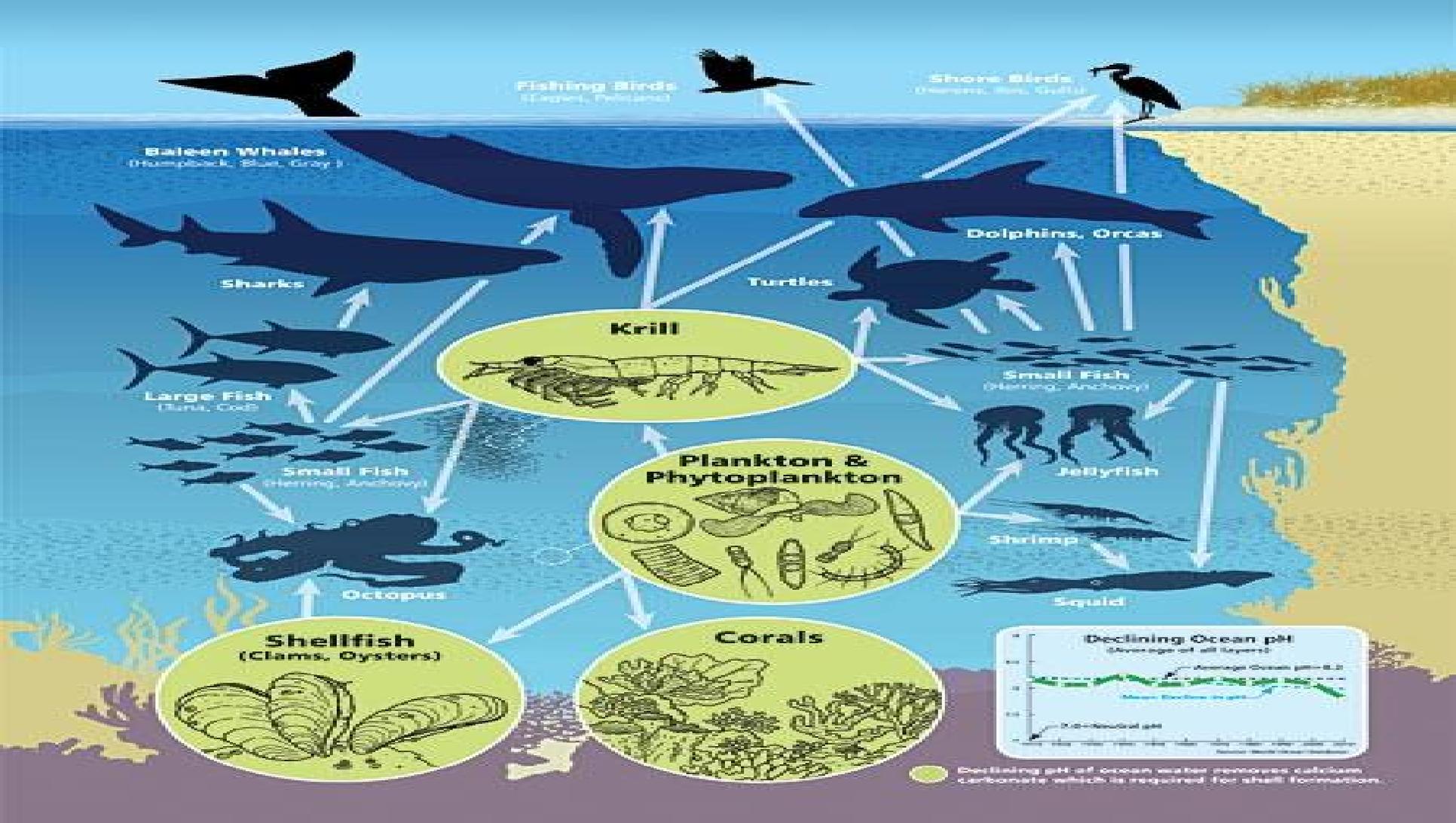
Overview

- The complexity of the Ocean Ecosystem
- Human Interference
- Invasive species effect on biodiversity
- How Do Invasive Species Spread?
- How Can you Help?
- How we Took Action

A photograph of a beach at sunset. The sun is low on the horizon, creating a bright orange and yellow glow. The sky transitions from orange near the horizon to a clear blue at the top. In the foreground, a large, smooth, light-colored shell lies on the sand. To the left, several palm trees are silhouetted against the bright sky. The ocean waves are visible on the right side of the frame.

The Ocean's Complexity





Fishing Birds
(Seagulls, Petrels)

Shore Birds
(Owens, King, Gulls)

Baleen Whales
(Humpback, Blue, Gray)

Sharks

Dolphins, Orcas

Turtles

Krill

Small Fish
(Herring, Anchovy)

Large Fish
(Tuna, Cod)

Small Fish
(Herring, Anchovy)

Plankton & Phytoplankton

Jellyfish

Octopus

Shrimp

Squid

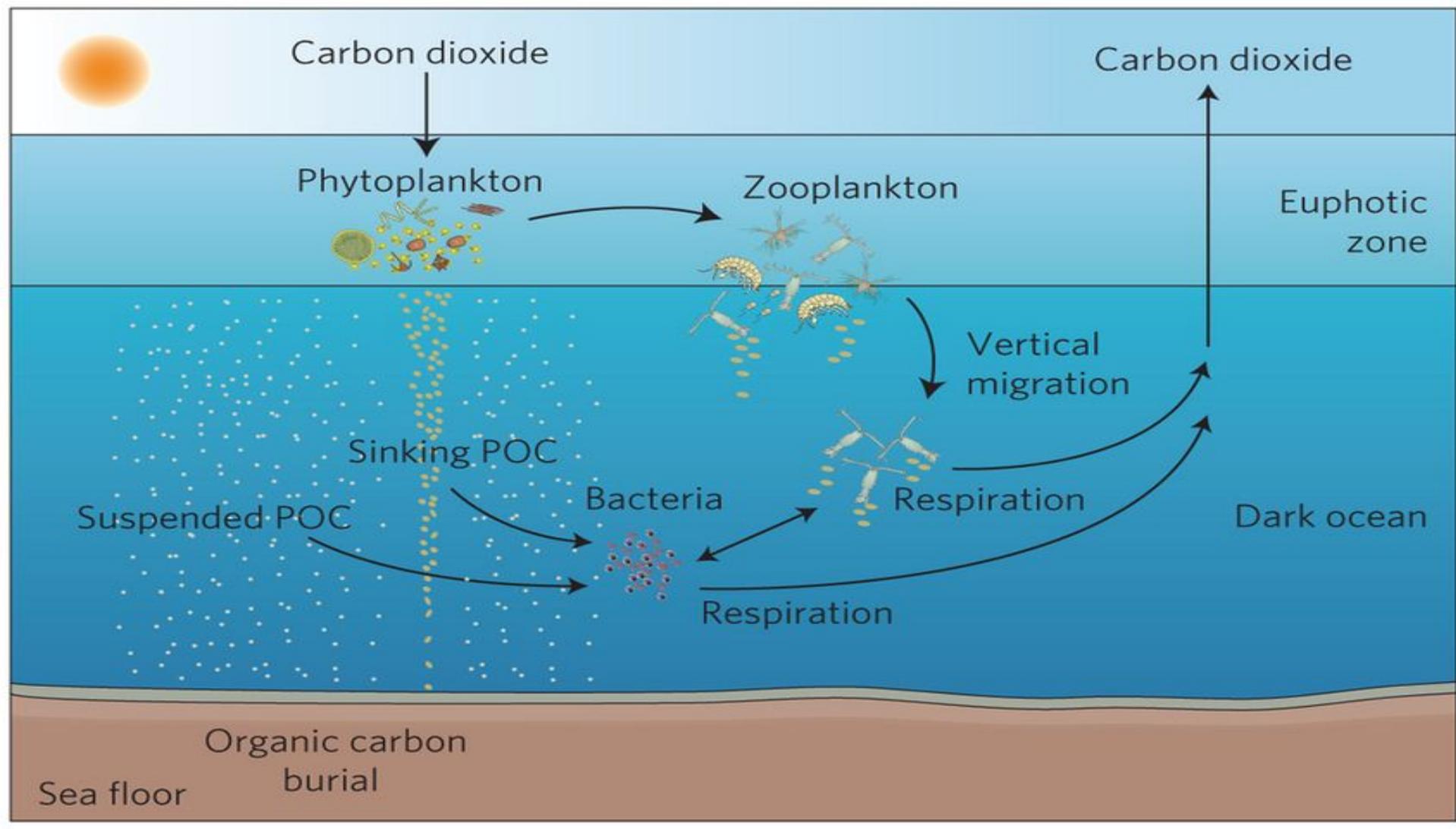
Shellfish
(Clams, Oysters)

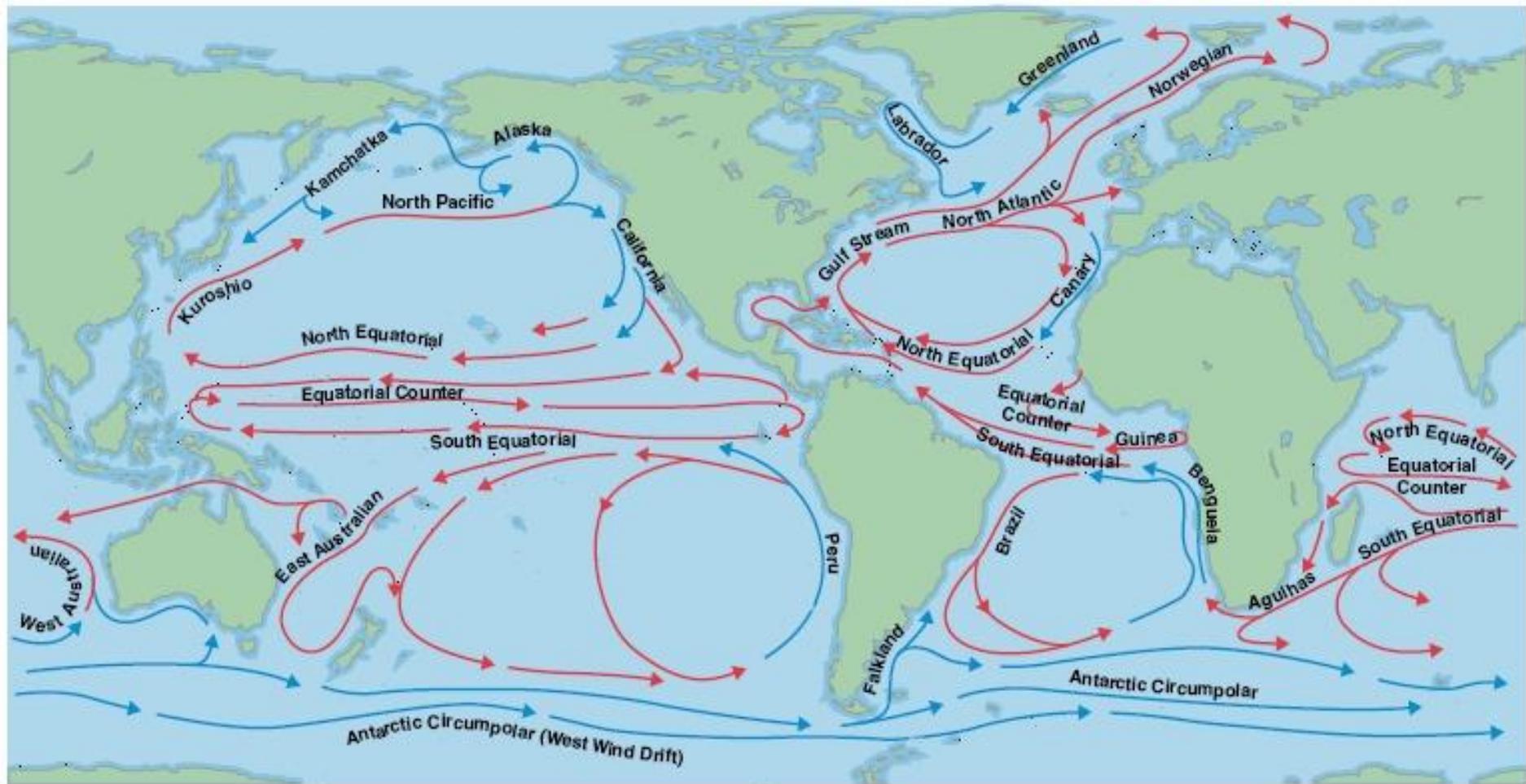
Corals

Declining Ocean pH
(Average of all layers)



Declining pH of ocean water removes calcium carbonate which is required for shell formation.



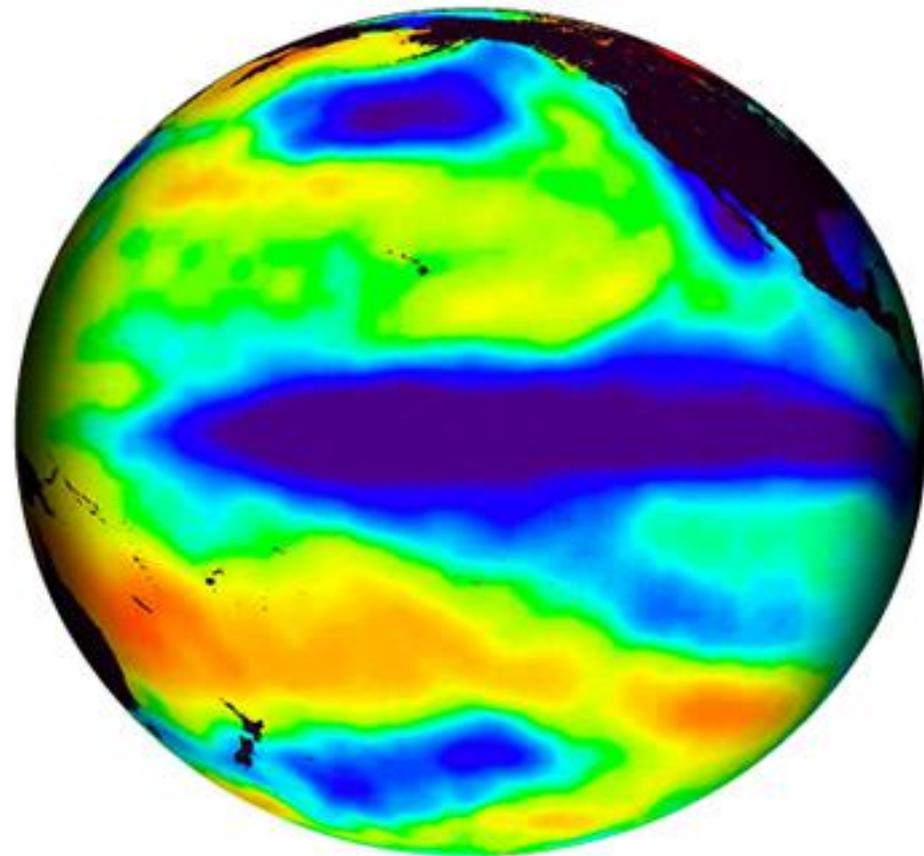
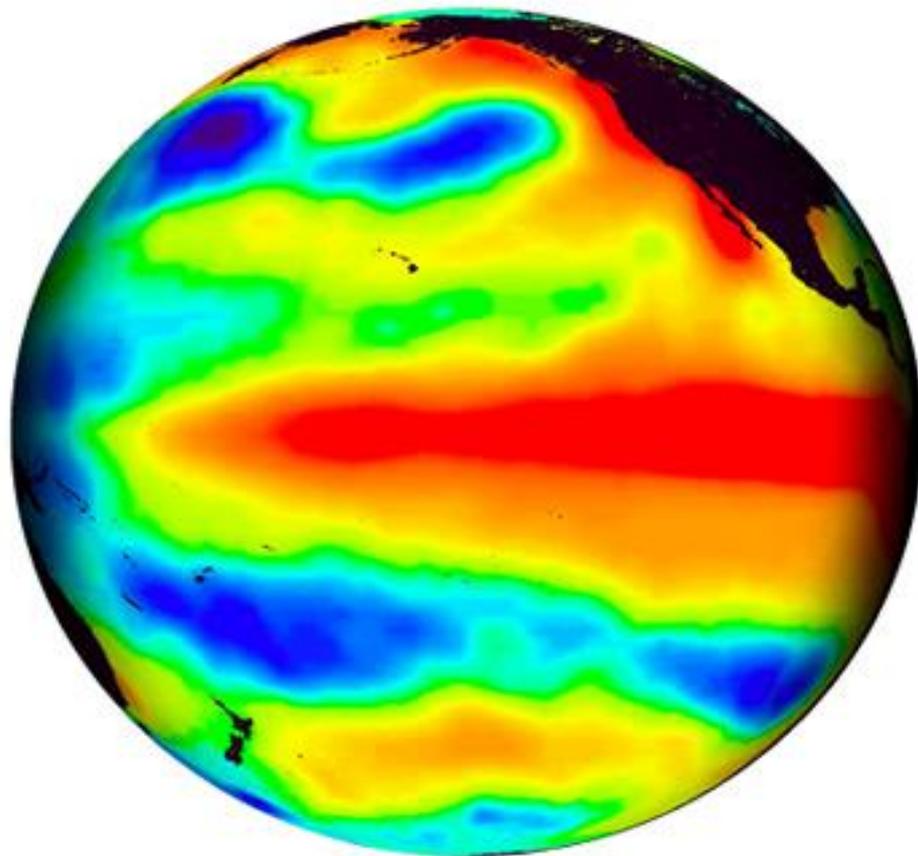


→ Warm-water current

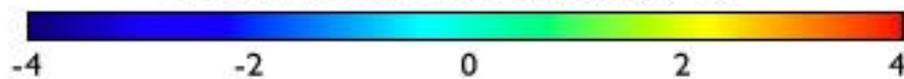
→ Cold-water current

El Niño

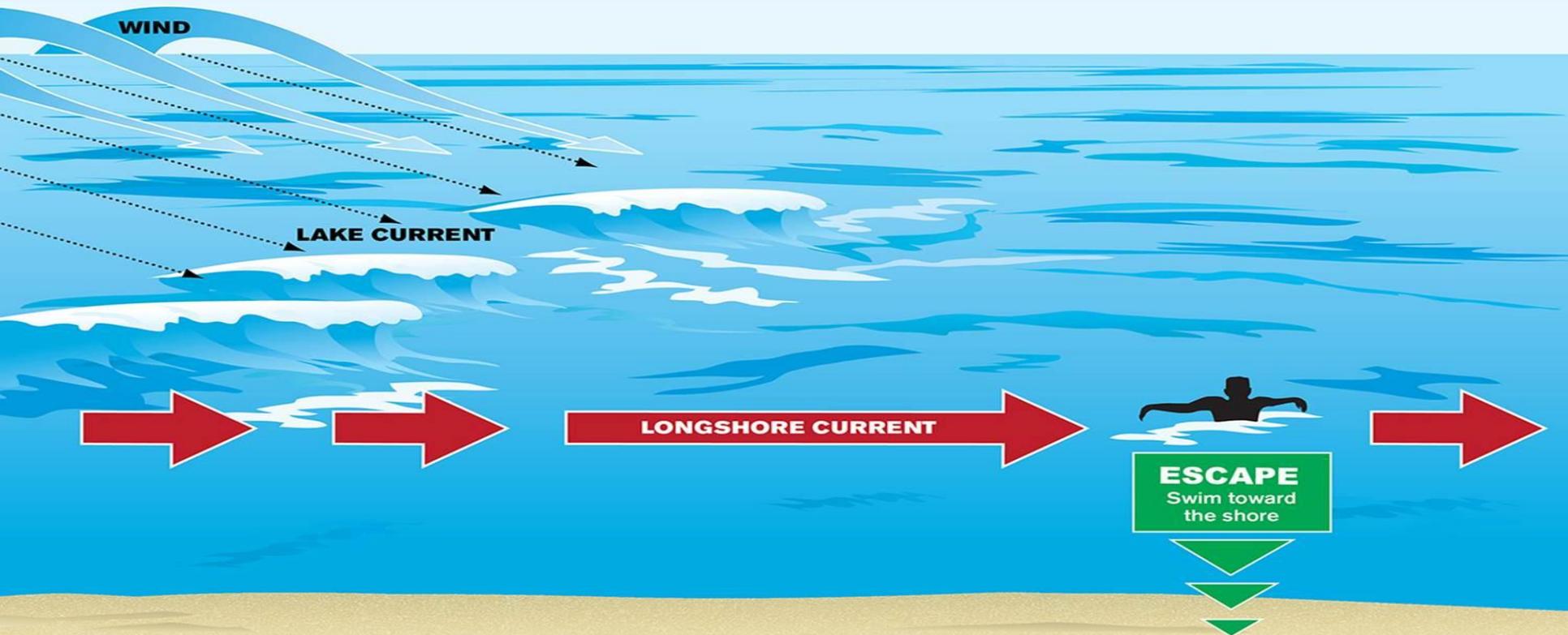
La Niña



Sea Surface Temperature Anomaly ($^{\circ}\text{C}$)



LONGSHORE CURRENTS



surface winds
push surface water away from an area.



warmer surface water
moves offshore.

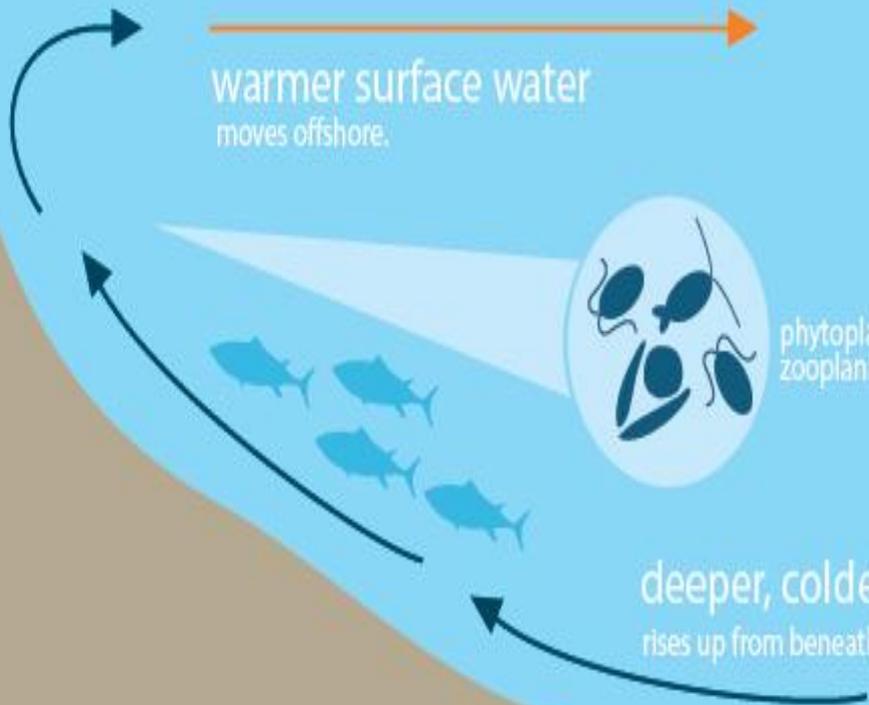


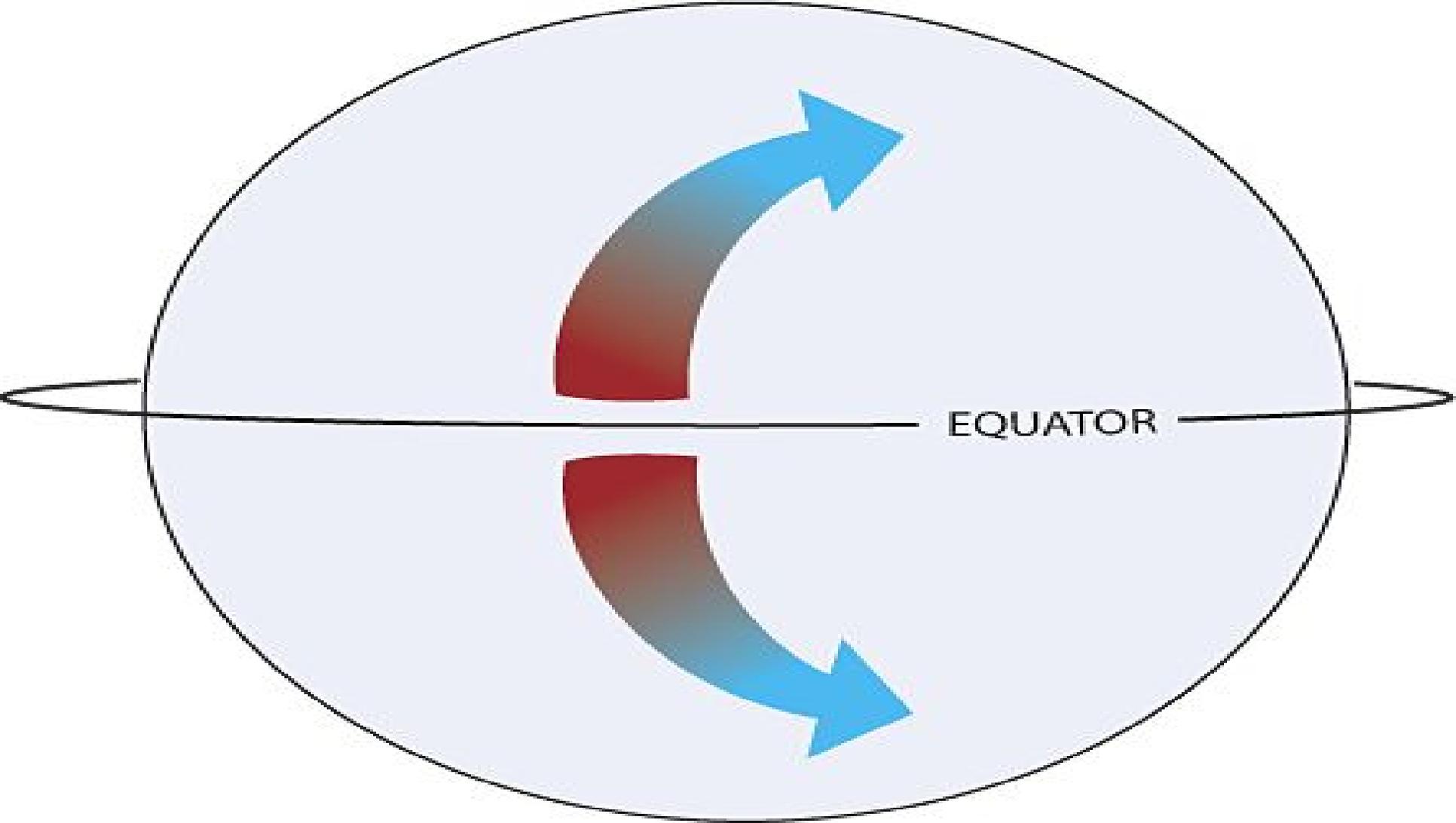
UPWELLING



phytoplankton
zooplankton

deeper, colder, nutrient rich water
rises up from beneath the surface to replace the water that was pushed away.





EQUATOR

Factors Affecting the Complex Ocean Ecosystem

- Varying Food Web
- Primary Production shifts
- Phytoplankton trends (cyanobacteria, dinoflagellates, coccolithophores, diatoms)
- Ocean Pressure changes
- Seasonal Changes (**El Niño and La Niña**)
- Ocean Currents (Upwelling, Longshore, Rip, and Gulf Stream)
- Ocean Circulation
- Ocean acidification
- Coriolis Effect
- Biological Pump
- Human Effects
- Thermocline, Pycnocline and Halocline Gradients
- Depth of Euphotic Zone

Human Interferences

A scenic photograph of a beach at sunset. The sun is a bright, glowing orb on the horizon, casting a golden light across the sky and the wet sand. The sky transitions from a deep blue at the top to a warm orange near the horizon. In the foreground, a seashell lies on the sand, and the silhouettes of palm trees are visible on the left side of the frame. The overall mood is peaceful and serene.

Oil Spills



Overfishing



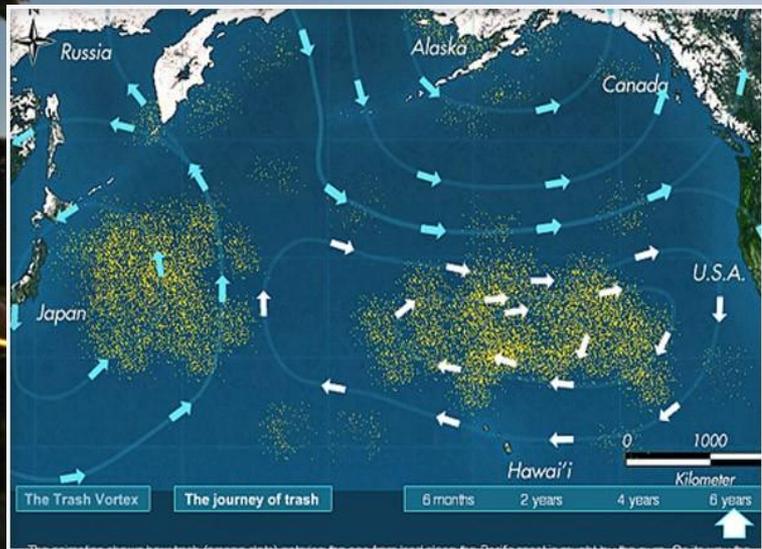
Trawling



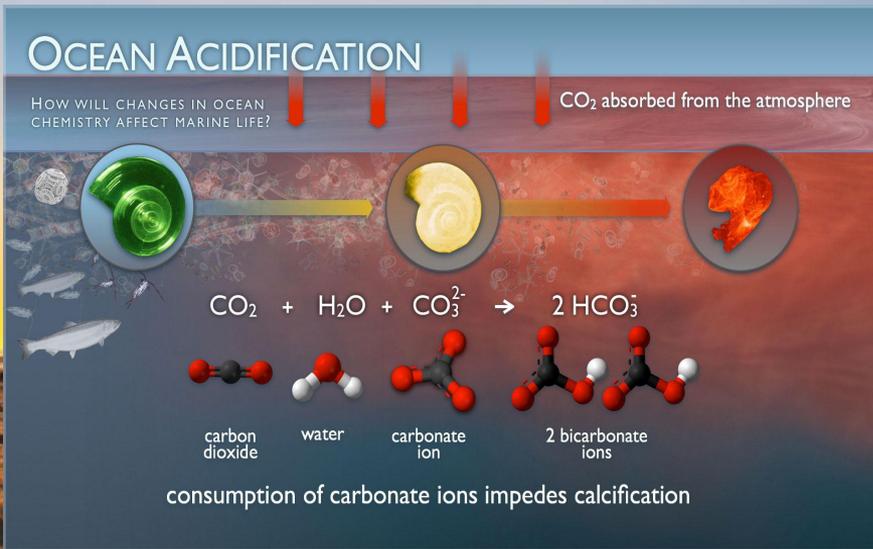
Reckless Shipping



Pollution



Ocean Acidification





So, it's no surprise that we have also allowed invasive species to thrive

Invasive species is a huge threat to biodiversity

- Out of 1880 endangered species in the U.S. 49% of them are endangered because of invasive species which is around 921 of those species
- Compared to disease, pollution and fishing, Invasive species is a bigger threat to biodiversity than all of these threats combined
- Invasive species pose such a threat to biodiversity because they prey, out-compete, and prevent native species from reproducing
- Invasive species change food webs and alter ecosystem conditions effectively creating a complete shift in habitat for that of native species

How Do Invasive Species Spread?

- Fish Collectors
- Shipping boats- collect organisms in their ballast water
- Wood Products- insects can get into that is then shipped around the world
- Ornamental Plants- seeds, or an irresponsible consumer can set them into the wild
- Pet Trade- an irresponsible consumer can let them loose

Changes in climate allowing for higher rates of snow and rain will allow some invasive plants like the garlic mustard, kudzu, and the purple loosestrife to move into new areas

How Can You Help?

- Plant native species and remove any invasive species from your garden
- Be aware of the species around you
- Clean your outdoor equipment to avoid bringing insects, and plant seeds into a new environment
- When camping buy firewood which is close to your area to avoid foreign bugs getting loose
- Don't pick up shells from the beach

How We Took Action

- Sent a letter to Helene Schneider (Santa Barbara Mayor) about our concern over shipping lanes being too close to the coast putting the Santa Barbara channel at risk
- Researched species and their effect on the environment
- Avoided bringing invasive species through not picking up shells, not using foreign firewood, and cleaning our shoes

These changes were fairly **easy** to implement because with invasive species most measures to prevent their spread is based on awareness

Our References

Primary Sources

- <http://www.actionbioscience.org/biodiversity/simberloff.html>
- <https://www.nwf.org/Wildlife/Threats-to-Wildlife/Invasive-Species.aspx>
- Emily Wilson

Sources

- <https://www.invasivespeciesinfo.gov/animals/main.shtml>
- <https://www.washingtonpost.com/news/energy-environment/wp/2015/02/23/like-most-invasive-species-pythons-are-in-the-u-s-to-stay/>