

The Wild Atlantic Way: Ring of Kerry, Ireland

Who owns the oceans?



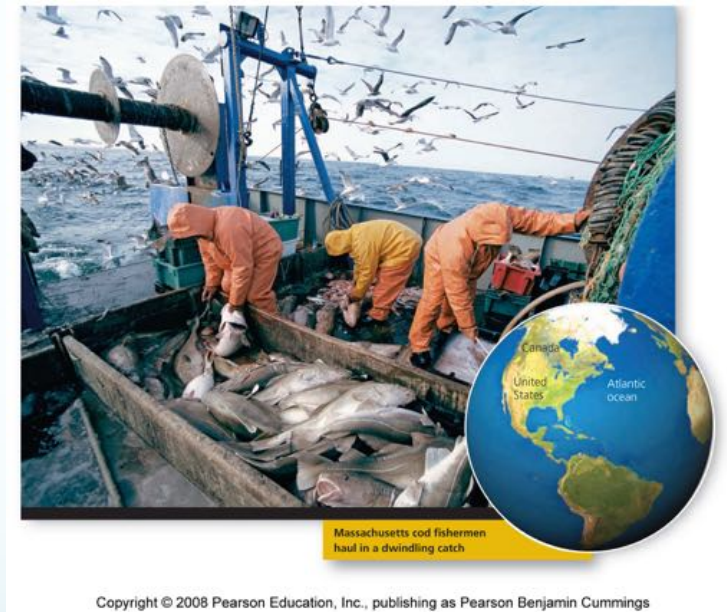
Territorial Waters

- **Territorial Sea:**
12 nautical miles
- **Contiguous Zone:**
24 nautical miles
- **Exclusive Economic Zone:**
Up to 200 miles

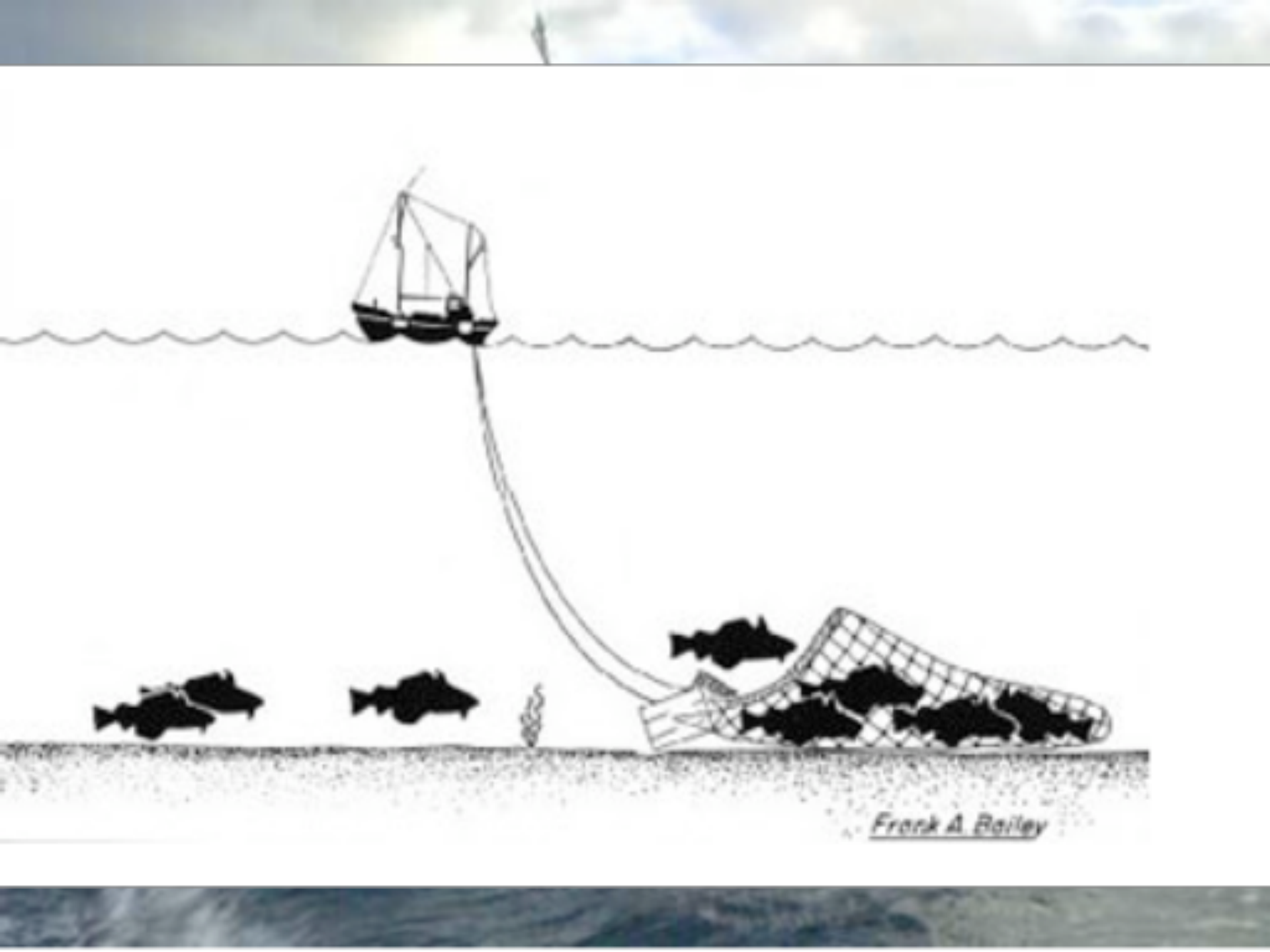


Central Case: Collapse of the Cod Fisheries

- No fish has more impact on human civilization than the Atlantic cod
- Eastern Canadians and U.S. fishermen have fished for cod for centuries
- Large ships and technology have destroyed the cod fishery
- Even protected stocks are not recovering
 - Prey may now be competing with, and eating, young cod



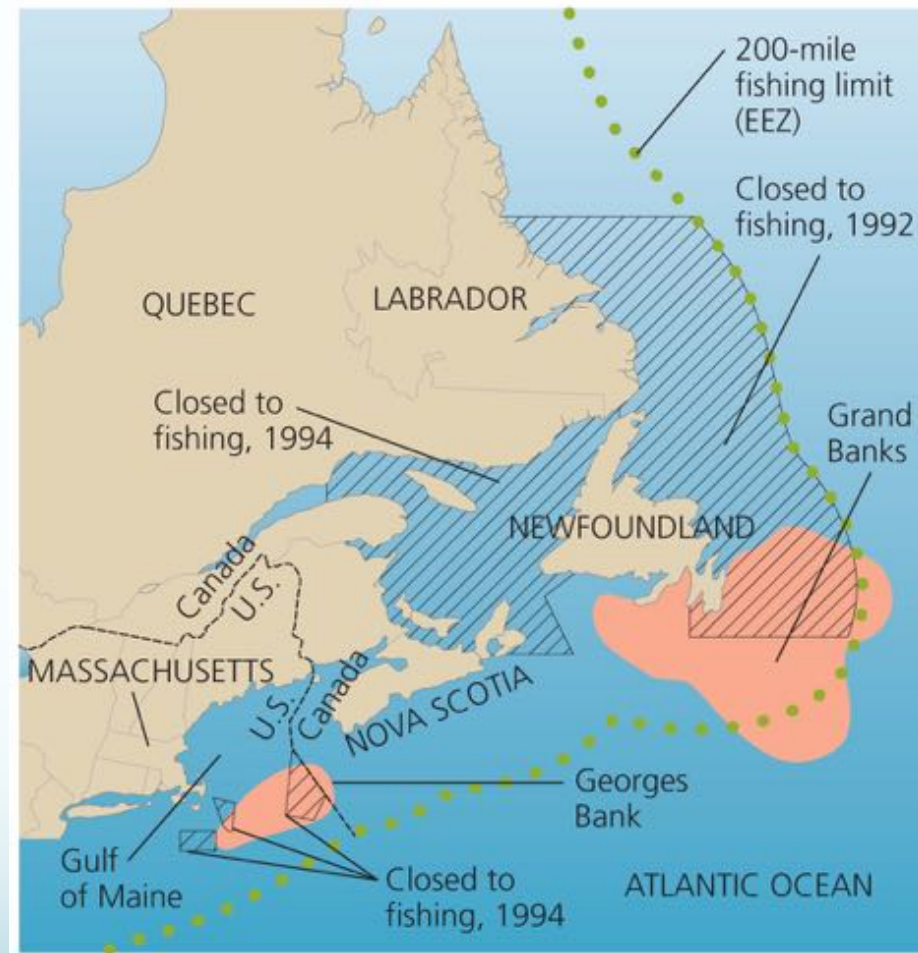
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Frank A. Bailey

Cod Are Groundfish

- **They live or feed along the bottom**
 - Halibut, pollock, flounder
- Cod eat small fish and invertebrates
- They grow to 60-70 cm long and can live 20 years
- Inhabit cool waters on both sides of the Atlantic
- There are 24 stocks (populations) of cod



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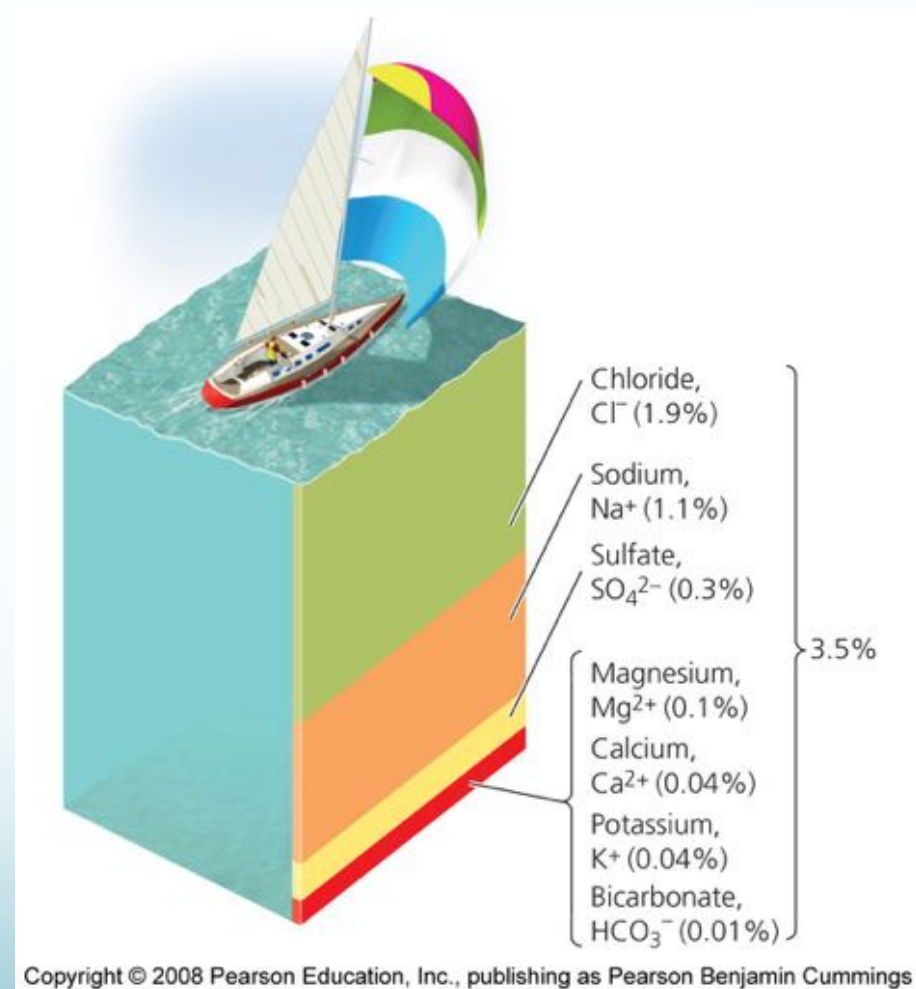
Oceans Cover Most of Earth's Surface

- The oceans influence global climate, teem with biodiversity, facilitate transportation and commerce, and provide resources for us
- They cover 71% of Earth's surface and contain 97% of Earth's surface water
- Oceans influence the atmosphere, lithosphere, and biosphere



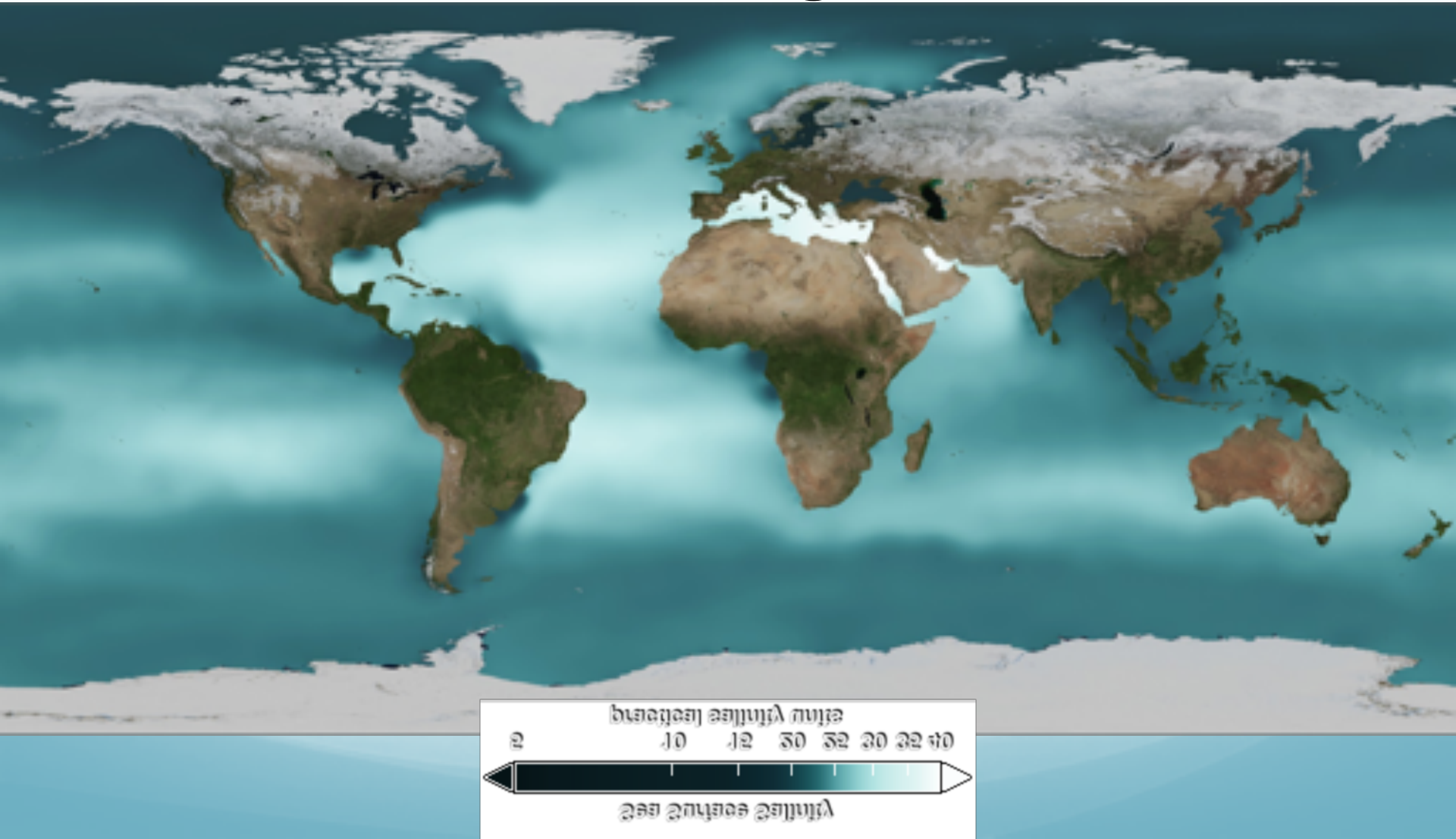
The Oceans Contain More Than Water

- Ocean water is 96.5% water
 - Plus, ions of dissolved salts
- Evaporation removes pure water and leaves a higher concentration of salt
- Nutrients (nitrogen and phosphorus)
- Dissolved gas
 - Oxygen is added by plants, bacteria, and atmospheric diffusion



Average Sea Surface Salinity (SSS)

Is ocean salinity in equal concentrations around the globe?

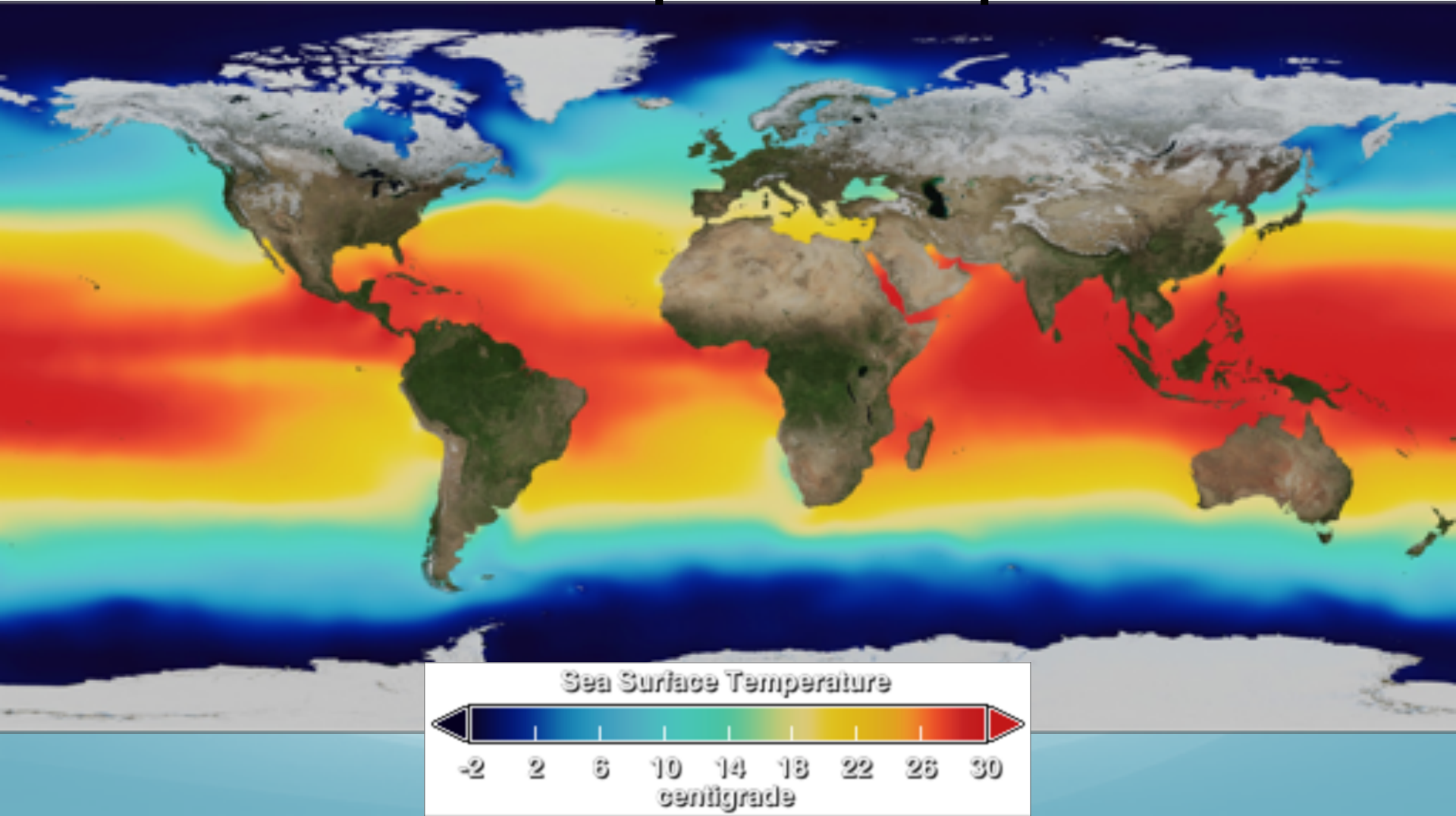


Check In Question #1: **Turn & Talk**

- Ocean water is saltiest _____:
 - A. Where there is a large amount of glacial melting
 - B. Where rains are the heaviest
 - C. Where there is high evaporation and low precipitation
 - D. In estuaries
 - E. At the equator

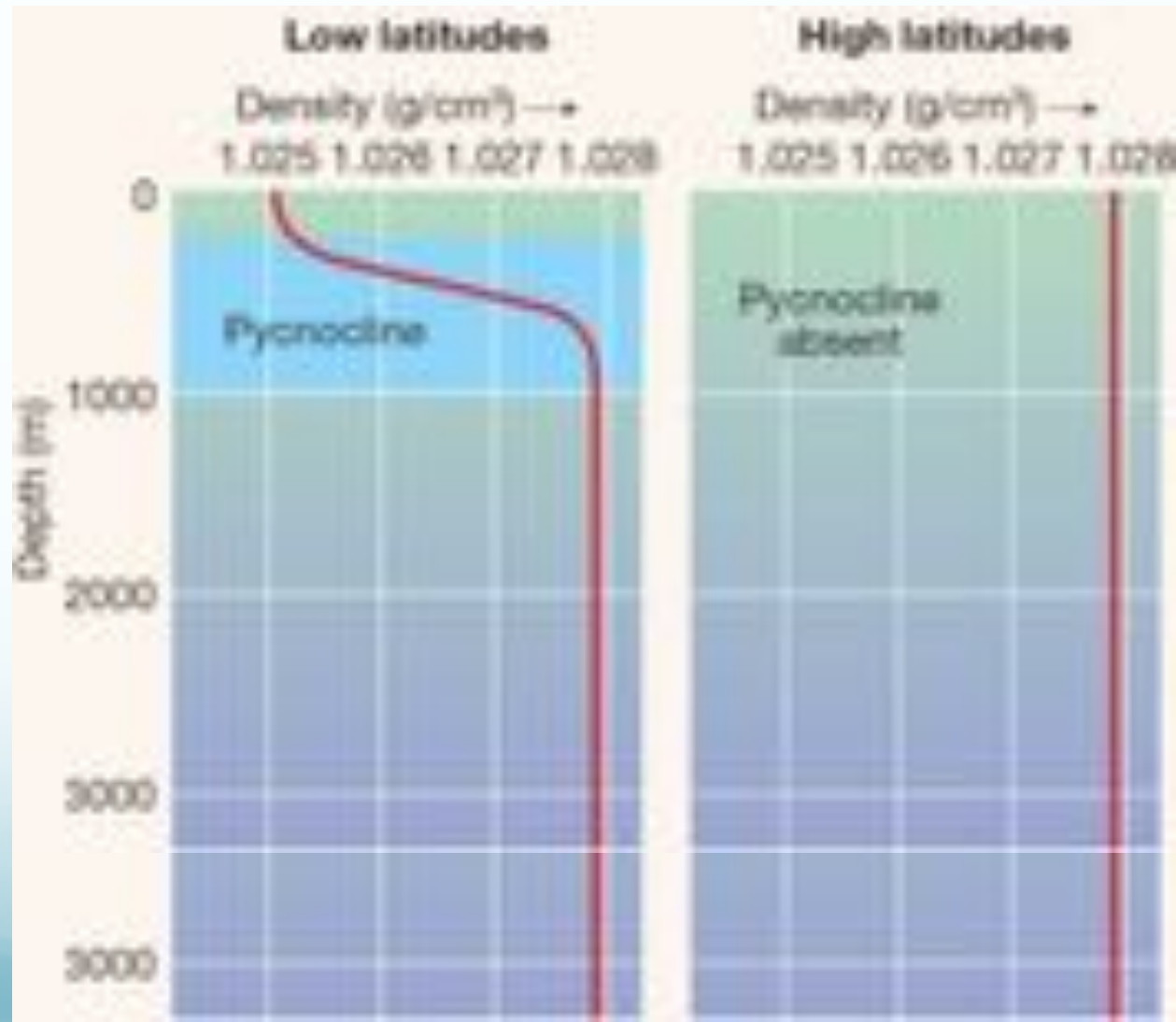
Average Sea Surface Temperature (SST)

What about deep water temperature?



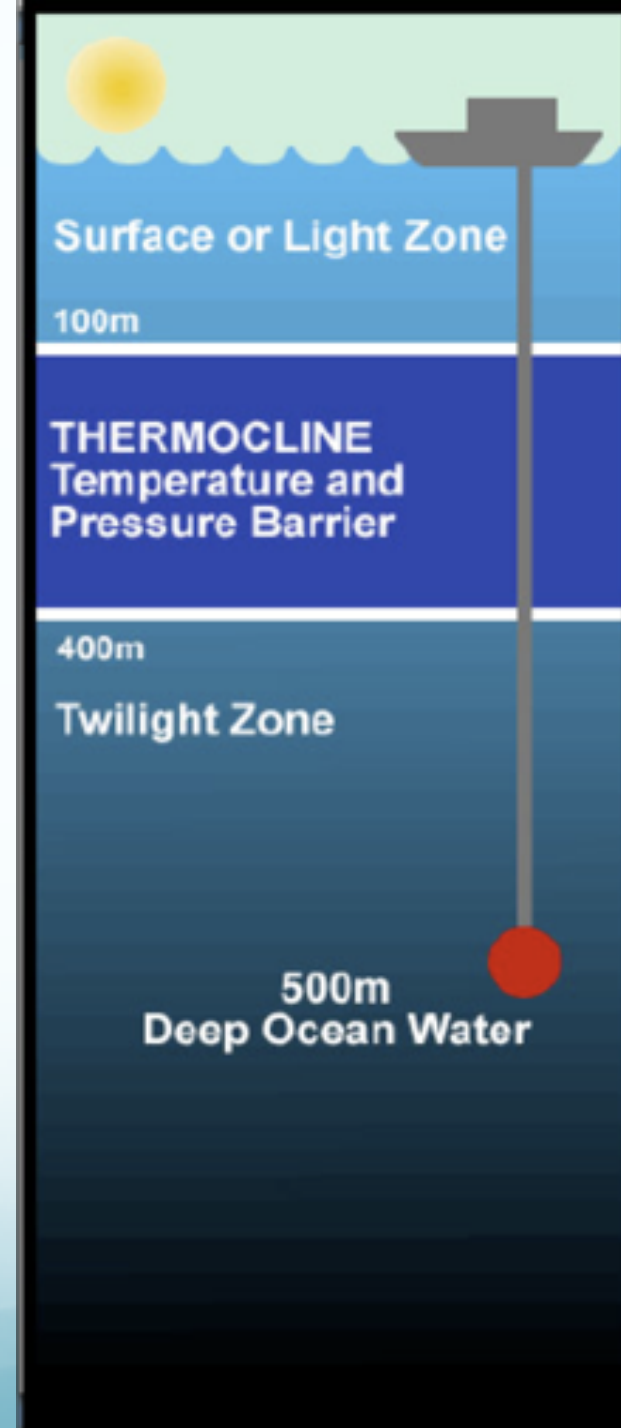
Ocean Water Is Vertically Structured

- Temperature declines with depth
- Heavier (colder saltier) water sinks
 - Light (warmer and less salty) water remains near the surface



The Ocean Has Seven Layers

- Surface zone
 - Warmed by sunlight and stirred by wind
 - Consistent water density
- **Pycnocline:** Below the surface zone
 - Density increases rapidly with depth
- **Deep Zone:** Below the pycnocline
 - Dense, sluggish water
 - Unaffected by winds, storms, sunlight, and temperature



Check In Question #2:

Turn & Talk

- About 80% of the ocean's water is found in the _____.
- A. Surface zone
 - B. Pycnocline
 - C. Deep zone
 - D. Thermocline
 - E. Euphotic zone

Check In Question #3:

Turn & Talk

- Water in the surface zone of the ocean is, for the most part _____.
- A. Low in oxygen
 - B. The coldest
 - C. The densest
 - D. The saltiest
 - E. Well mixed

Stability of Ocean Temperatures

- Temperatures are more stable than land temperatures
 - Water's high heat capacity
 - It takes much more heat to warm water than air
- Oceans regulate the earth's climate
 - They absorb and release heat
 - Ocean's surface circulation

Specific Heats of Common Materials

MATERIAL	SPECIFIC HEAT (calories/gram • C°)
Water {	solid
	liquid
	gas
Dry air	0.24
Basalt	0.20
Granite	0.19
Iron	0.11
Copper	0.09
Lead	0.03

Essay Question: **Turn & Talk**

1. What proportion of Earth's surface do oceans over?
2. What is the average salinity of ocean water?
3. How are density, salinity, and temperature related in each layer of ocean water?