

Planet Ocean

A few amazing facts about the last great frontier

WHEN IT COMES to matters oceanic, most of us are illiterate. A recent study commissioned by the federal government to measure the nation's ocean literacy found that Massachusetts—with its hundreds of miles of coastline, rich maritime history, and busy fishing ports—deserved an F. So did low-lying Florida, surrounded by water, vulnerable to a rising sea. The highest grade, C, went to Mississippi. In ways most of us have never imagined, and science is just beginning to describe, planet Earth is really planet ocean. The sea maintains our climate, provides life-giving rain, and supplies millions of people with essential protein. All life, including ours, depends on the sea. The United Nations has declared June 8 World Oceans Day. Here's an ocean primer to celebrate.

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DIVERSITY OF LIFE

Each day, each of us takes at least 20,000 breaths of oxygen. Most Americans think the air they breathe is produced by terrestrial plants, but at least half is produced by tiny plants floating in the ocean. Many of these plants are microscopic, such as the honey-combed diatoms, and coccolithophores, which look like pineapple rings.



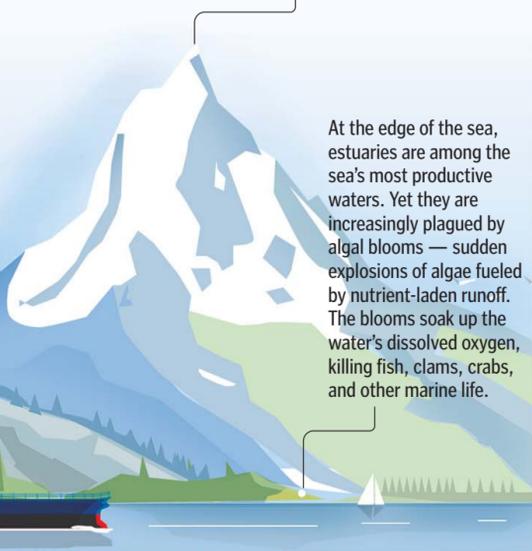
Copepods, no larger than a grain of rice, are among the most abundant animals in the sea. They are critical links in marine food webs, feasting on drifting microscopic plants, and serving as nutritious meals for larger fish.



Coral looks and feels like rock, but it can "see." Light sensors tuned to moonlight cue corals to spawn on the same night at roughly the same time. Making up only two-10ths of 1 percent of the sea floor, coral reefs are hot spots of marine diversity, home to 25 percent of all known marine life. If carbon dioxide emissions continue at their present rate, 60 percent of earth's coral reefs may disappear in the next few decades.

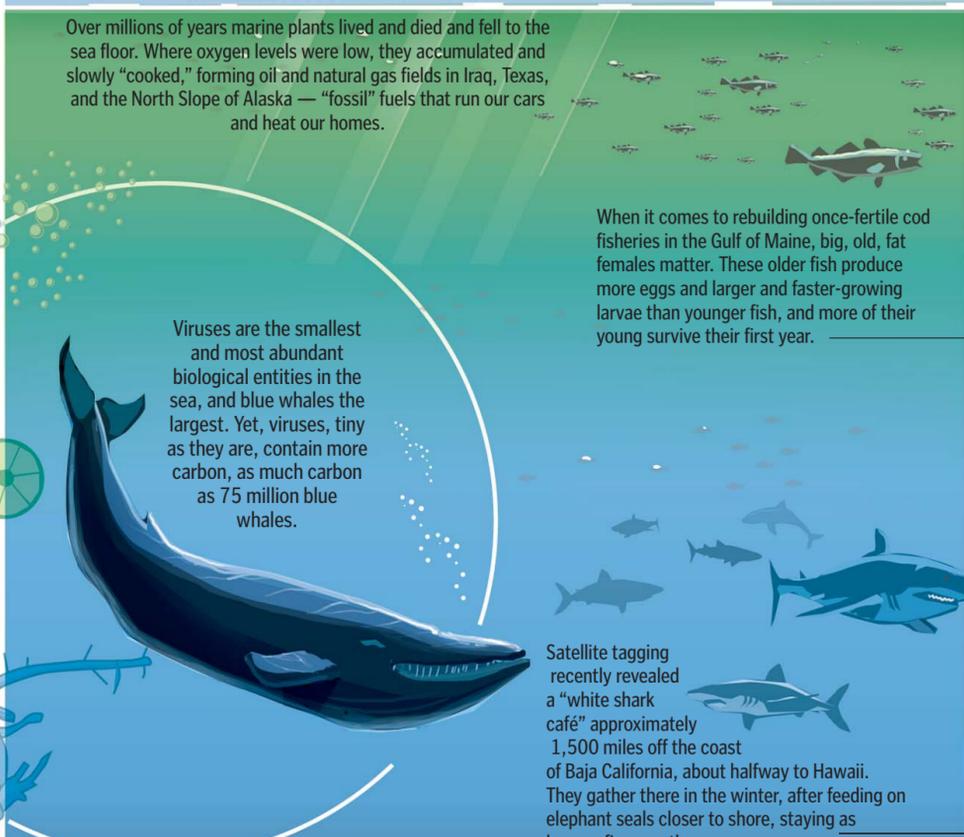
Life endures, even in the ocean's hottest waters, where 700-degree Fahrenheit water gushes from deep sea hot springs. A high concentration of hydrogen sulfide, lethal to most animals, is manna to the creatures adapted to living at the deep sea smokers. There, bacteria turn the gas into food, supporting lush gardens of blood-red tube worms, clams as large as dinner plates, and swarms of shrimp.

The bottoms of old ocean basins are recycled into mountains. High in the Andes at the Continental Divide, Darwin found seashells. On Mount Everest are fossils of animals that lived in the sea and were buried on the sea floor.



At the edge of the sea, estuaries are among the sea's most productive waters. Yet they are increasingly plagued by algal blooms — sudden explosions of algae fueled by nutrient-laden runoff. The blooms soak up the water's dissolved oxygen, killing fish, clams, crabs, and other marine life.

Over millions of years marine plants lived and died and fell to the sea floor. Where oxygen levels were low, they accumulated and slowly "cooked," forming oil and natural gas fields in Iraq, Texas, and the North Slope of Alaska — "fossil" fuels that run our cars and heat our homes.



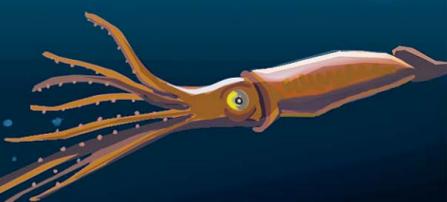
Viruses are the smallest and most abundant biological entities in the sea, and blue whales the largest. Yet, viruses, tiny as they are, contain more carbon, as much carbon as 75 million blue whales.

When it comes to rebuilding once-fertile cod fisheries in the Gulf of Maine, big, old, fat females matter. These older fish produce more eggs and larger and faster-growing larvae than younger fish, and more of their young survive their first year.

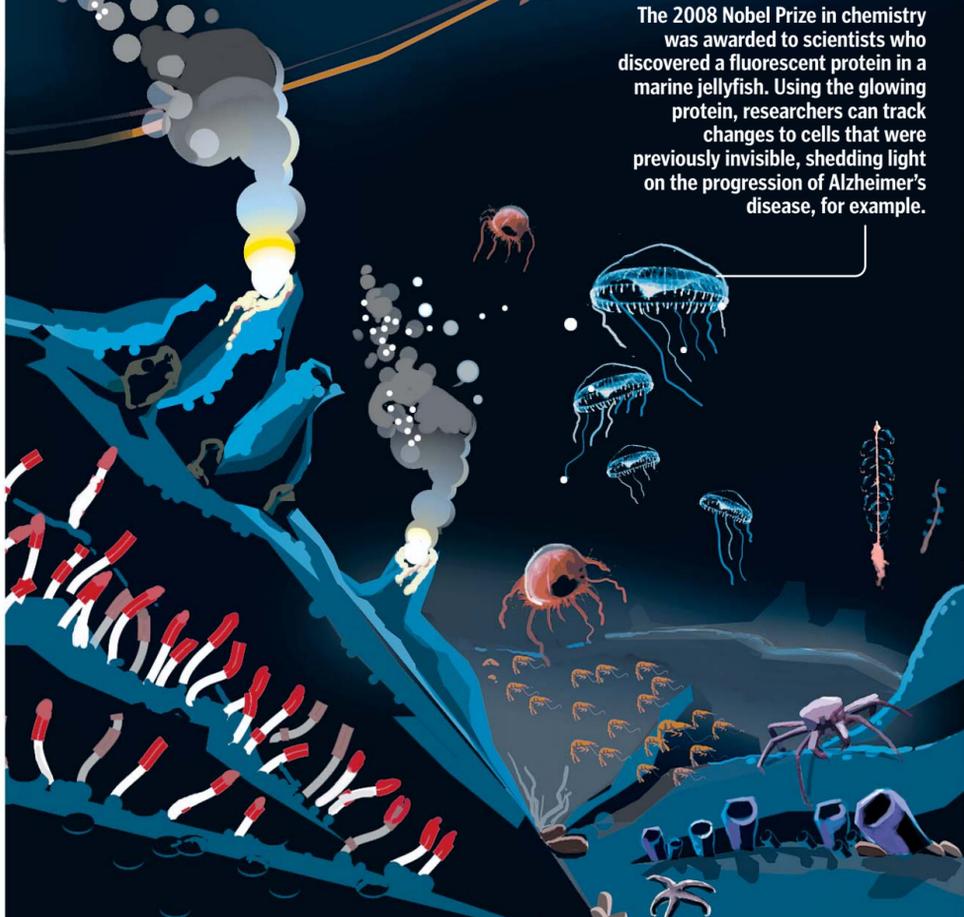
Satellite tagging recently revealed a "white shark café" approximately 1,500 miles off the coast of Baja California, about halfway to Hawaii. They gather there in the winter, after feeding on elephant seals closer to shore, staying as long as five months.

UNDERWATER PEAKS

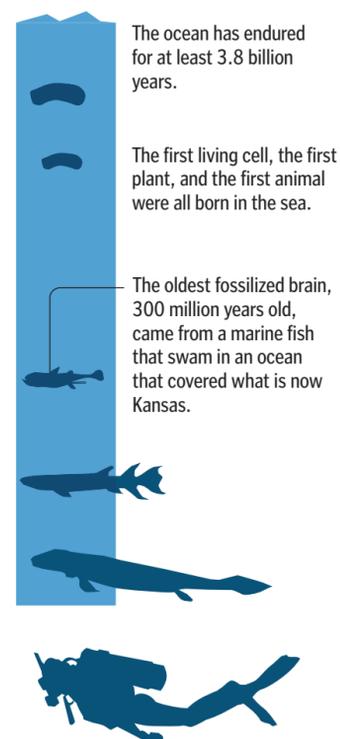
Few have scaled the summits or walked the valleys of earth's longest mountain range, the Mid Ocean Ridge, which circles the planet like the seam of a baseball. Its mountains are more rugged than the Andes and its steep valleys rival the Grand Canyon. Earth's tallest mountain, Mount Everest, could easily be hidden in the Mariana Trench, the deepest part of the ocean.



The 2008 Nobel Prize in chemistry was awarded to scientists who discovered a fluorescent protein in a marine jellyfish. Using the glowing protein, researchers can track changes to cells that were previously invisible, shedding light on the progression of Alzheimer's disease, for example.



OUT OF THE WATER



The ocean has endured for at least 3.8 billion years.

The first living cell, the first plant, and the first animal were all born in the sea.

The oldest fossilized brain, 300 million years old, came from a marine fish that swam in an ocean that covered what is now Kansas.

Humans, newcomers who have lived on the planet for approximately 200,000 years, are highly specialized fish. Our limbs came from their fins, and our jaws from their gills.

EARTH IS REALLY OCEAN

The sea is our lifeline. It brought us here and still sustains us, providing air to breathe, fish to eat, a benign climate, and life-giving rain, yet only a tiny portion is fully protected from commercial activity, and none from the effects of global warming.



Deborah Cramer is the author of "Smithsonian Ocean: Our Water, Our World," the companion to the new, permanent Sant Ocean Hall at the National Museum of Natural History in Washington. This article is adapted from the book. For more: www.smithsonianocean.com and ocean.si.edu. Javier Zarracina is a graphic designer for the Globe.