The ocean is a critical part of the world's economy. Forty percent of the world's population lives within 100 km (62 mi) of a coastline, with fisheries and aquaculture supporting about 12% of the world's livelihoods. In the U.S., there are nearly 3 million jobs related to the ocean.

**PACE will provide the first-ever global measurements designed to identify the composition of communities of phytoplankton. This will significantly improve our ability to decipher Earth's changing marine ecosystems, manage natural resources such as fisheries, and identify harmful algal blooms (HABs).**

## PACE MISSION

PACE will extend and improve NASA's 20 plus years of global satellite observations of our living ocean, atmospheric aerosols, and clouds and initiate an advanced set of climate-relevant data records. By determining the distribution of phytoplankton, PACE will help assess ocean health. It will also continue key measurements related to air quality and climate.

### Science Goals

To extend systematic ocean color, atmospheric aerosol, and cloud data records for Earth system and climate studies.

To address new and emerging science questions by detecting a broader range of color wavelengths that will provide new and unprecedented detail.

### Key Mission Characteristics

- **Hyperspectral ocean color instrument**
- **Two multi-angle polarimeters**
- **Launch readiness date: January 2024**
- **675 km (419 mi) orbital altitude**
- **Sun-synchronous, polar orbit**
- **Global coverage every two days**
- **Managed by Goddard Space Flight Center**


**National Aeronautics and Space Administration**

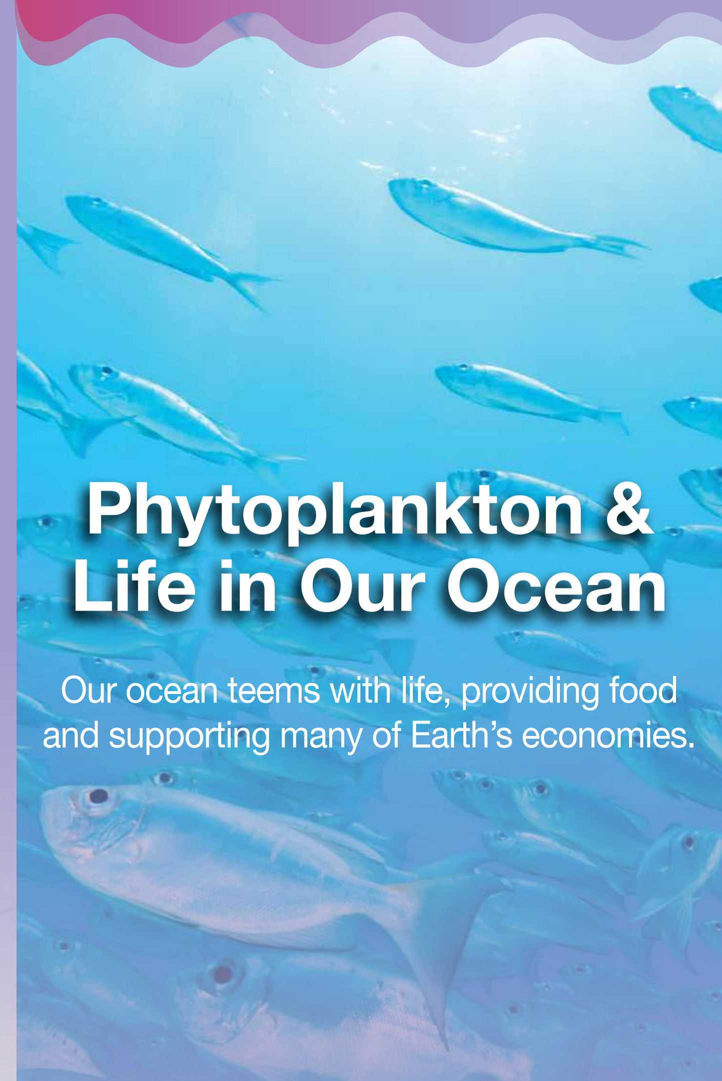
**Goddard Space Flight Center**
8800 Greenbelt Road
Greenbelt, MD 20771
www.nasa.gov/goddard

**www.nasa.gov**



NP-2018-09-268-GSFC (rev 1/22)


National Aeronautics and
Space Administration



# Phytoplankton & Life in Our Ocean

Our ocean teems with life, providing food and supporting many of Earth's economies.

**Plankton, Aerosol, Cloud, ocean Ecosystem**

*More wavelengths.*

*Unprecedented information.*

# Phytoplankton & Ocean Life

Constantly in motion, the ocean hosts the largest three-dimensional living space on earth. This vast volume teems with life but many of its most vital species are also its tiniest inhabitants.

Like on land, the ocean has deserts, forests, meadows, and jungles, providing habitats for many forms of life. The types of life in these habitats are determined by microscopic algae that float in our ocean. Known as *phytoplankton*, they come in many different shapes, sizes, and colors. The diversity of phytoplankton types present determines the roles they play in ocean habitats.

For example, the North Atlantic is home to highly productive "pastures" each spring. Its blooms of carbon-rich phytoplankton fuel the fisheries of New England. Phytoplankton are the primary food source for small zooplankton, tiny animals that float in our ocean. Larger zooplankton prey upon smaller zooplankton and – step by step – energy captured from phytoplankton transfers

to bigger organisms. As the energy climbs the marine food web, many fish and shellfish will ultimately be consumed by humans.

The international trade in coastal and marine fisheries contributes $70 billion annually to the U.S. economy. Yet 70% of the world's fish stocks are being harvested at maximum capacity or, in extreme cases, overfished to the point of collapse. Data from PACE will be used to help improve the way our ocean's food resources are managed.

Another key habitat is the crystal-clear water around Florida, home to productive fisheries and coral reefs. At times, however, this area is plagued by species of toxic phytoplankton. Harmful algal bloom (HAB) events in the U.S. have been estimated to result in economic impacts averaging $50 million each year. HABs

***PACE will reveal the diversity of organisms fueling marine food webs and how ecosystems respond to environmental change.***

***Why do we need PACE? To understand how phytoplankton diversity impacts human life.***

can wreak havoc on commercial fisheries or force the closure of recreational areas. Direct human impacts include illness or even death through consumption of toxic shellfish, along with asthma attacks through inhalation of airborne HAB toxins.

PACE data will aid in the development of computer programs that identify and quantify specific phytoplankton groups, including helpful species that fuel our ocean's food resources and potentially toxic species. These types of tools will also be used to understand the environmental factors that govern the appearance and demise of fisheries and HABs.

**Today's satellites reveal the quantity of phytoplankton at the ocean surface. Yet we cannot detect the diversity of species. For the first time, PACE's unprecedented technology will:**

- **Reveal the diversity of phytoplankton found in our ocean on global scales**
- **Allow us to understand the role that phytoplankton diversity has on life in the ocean**
- **Help us predict the "boom or bust" of fisheries along with marine hazards such as HABs**

Plankton, Aerosol, Cloud, ocean Ecosystem

Learn more at pace.gsfc.nasa.gov