ANTARCTIC CLIMATE EXPEDITION 2023
aurora expeditions

OCEAN & CLIMATE

NEWSLETTER CONTRIBUTION BY THE PRINCIPAL EXPEDITION TEAM

THE ANTARCTIC CLIMATE EXPEDTITION 2023 (ACE 2023)

Aims to bring about public and government awareness of the importance and the splendor of the Antarctic, to address the warming climate and loss of ice in the southern polar region as a direct threat to the future of human life on this planet.
The purpose of this Expedition is to confront the consequences and develop creative strategies for everyone to radically reduce carbon emissions, with the goal that each one of us will take more active ownership of our carbon footprint, then find ways to reduce and offset their emissions.
Hence the primary mission is for the ACE 2023 Team to propose and champion 23 Resolutions to reduce and offset emissions within our lives, communities, and countries to pace up in reaching Net Zero.
The principal expedition team for this important climate summit will comprise conservationists, celebrities, and ocean luminaries. 100 people will be selected to be part of ACE 2023. You can be one of them. Find out more here.

#ACE2023, #AntarcticClimateEpic, #AntarcticClimate, #OceanGeographic, #ACETEAM

This species of diatom, Coscinodiscus Wailesii (280 to 500 micrometers in diameter), is often so abundant that it clogs fishing nets in the North Sea. It is one of the species of phytoplankton most affected by climate change. Micrograph courtesy of Sir Alister Hardy Foundation for Ocean Science.

THE TUNE OF THE OCEAN

WRITTEN BY CHRISTIAN OLSZEWSKI

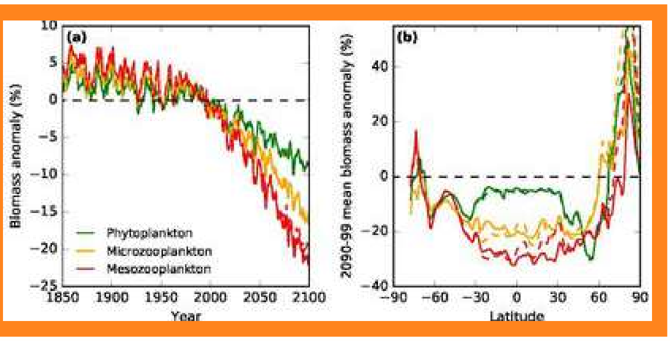
The ocean is like an orchestra with instruments- once playing in harmony but it's now completely out of tune.

Oceans cover nearly 70% of our planet so it is imperative that we understand how climate change is affecting our marine life. When we hear about climate change, it is usually limited to the context of melting polar ice caps, or rising water levels. However, it affects most species all over the world in a variety of ways. We know now that marine species will move or adapt to their changing habitat as our planet becomes warmer. Not only are all marine species responding to climate change, but the level of response differs throughout the community and seasonal cycle, leading to a mismatch between trophic levels and functional groups. This could have catastrophic compounding consequences for the food chain known as trophic cascade. Trophic cascade is an ecological phenomenon triggered by the addition or removal of top predators and involving reciprocal changes in the relative populations.

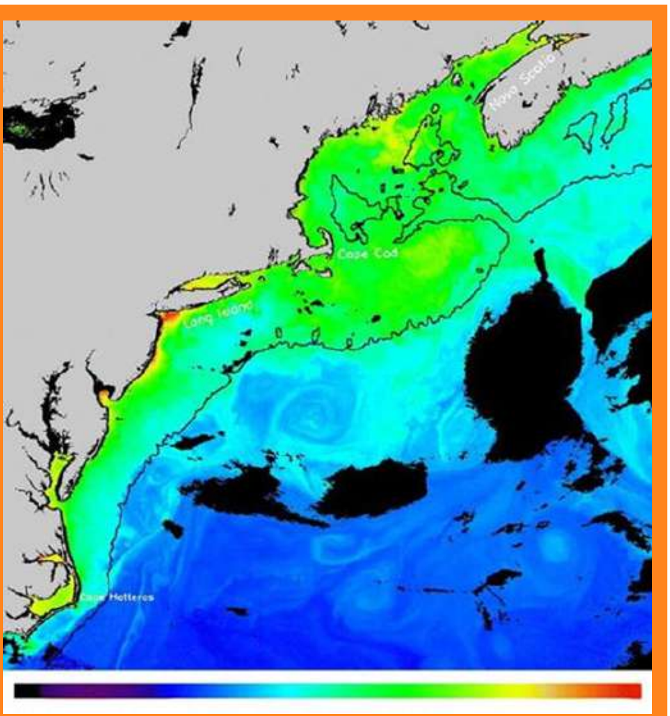
At the base of the marine food chain are plankton and the evidence of climate change effects on plankton numbers and location over recent decades is strong. From the smallest, such as krill and microscopic coccolithophores to the largest, medusae and siphonophores, plankton are showing the effects of climate change. The term plankton comes from the Greek word "planktos," to drift or to wander. Plankton can swim up and down in the water column under their own power but otherwise can't move unless they hitch a ride on a current. Plankton, whether microscopic or macroscopic, are important in a variety of ways. Some recycle nutrients from the surface to the depths and back again, while others are fuel for fish and whales.

Unlike marine species such as fish and intertidal organisms, few members of the plankton are commercially exploited. "Therefore, any long-term changes in their populations can be attributed to climate change," wrote Hays and colleagues in the journal Trends in Ecology and Evolution (June 2005). Since most plankton are short-lived, plankton population size isn't influenced by persistence of individuals from previous years. "There's a tight coupling between climate change and plankton dynamics," says Hays. "Because they're free-floating and can respond easily to changes in temperature and ocean currents, plankton can easily expand and contract their ranges." However, if plankton populations crash, recovery is slow. Plankton ecosystems in Earth's oceans took 3 million years to fully recover after the mass extinction event 65 million years ago, according to scientists Helen Coxall and Steve D'Hondt of the University of Rhode Island Graduate School of Oceanography and James Zachos of the

University of California—Santa Cruz. If such an event were to occur, the time required to repair food chains and reestablish an integrated ecosystem would be millions of years.



This figure displays the projected percentage of plankton biomass anomaly by year from 1850 to 2100, as well as according to latitude. All three populations of plankton (phytoplankton, microzooplankton, and mesozooplankton) decrease in biomass; however, it can be concluded that the zooplankton will be much more negatively affected than the phytoplankton. It can also be deduced that in the lower latitudes, where it is warmer, zooplankton will also be more negatively affected than phytoplankton (Lester et al. 2018). University of Miami.



A large phytoplankton bloom near Labrador, Newfoundland is visible in this SeaWiFS image. Such satellite images show that plankton cover huge swaths of the ocean surface. Courtesy of NASA's SeaWiFS Project and Orbimage.

Climate change is heating our northernmost, colder waters much faster than it is those near the equator. The Arctic is said to be warming twice as fast as the rest of the world. But that rate of warming, researchers now say, is closer to four times faster than the global average. The old boundaries are shifting northward as warm-water species displace cold-water species, causing trophic cascades. "Sea-surface warming in the northeast Atlantic Ocean has resulted in increasing phytoplankton abundance in cooler regions and decreasing phytoplankton abundance in warmer regions," says scientist Anthony Richardson of the Sir Alister Hardy Foundation for Ocean Science in Plymouth, United Kingdom. "This impact transfers up the food web from phytoplankton to zooplankton and beyond. Future warming is therefore likely to place additional stress on already depleted fish and mammal populations." While the plankton have shifted northward in response, warm-water and subtropical fish like squid, jellyfish and red mullet are now being seen in formerly frigid seas.

Seabirds in Northern waters are also suffering declines as a result of global warming. For example, on the isle of Shetland off the coast of Scotland, there once were more than 1200 nesting pairs of guillemots. In recent summers, there were none. The birds returned to their cliffside nesting grounds, but nests remained empty. Elsewhere on Shetland, more than 20,000 nests of another seabird, the arctic tern, were vacant. And a few miles away, on the island of Foula, the largest colony in the world of great skuas had only a few chicks. Ornithologists say they have never seen such reproductive failure. It has resulted in the loss of hundreds of thousands of the world's seabirds.

The adults of all these species, it appears, are starved for food. They subsist on fish called sandeels, small, silvery fish usually abundant in the waters of the North Sea. But now the sandeels have disappeared, and little other prey exists. So, the birds are forced to fly farther and farther seaward to find food. Most have not been able to locate enough sandeels or other fish to eat to have the energy to produce eggs. Sandeels are disappearing because the cold-water plankton the fish eat have moved farther north. Historically icy waters between England and Scandinavia have become too warm for the plankton to survive there.

GREENLAND'S SPALTE GLACIER-BEFORE (1986) AND AFTER (2020)
Courtesy of climate.nasa.gov

Similarly in the Southern Ocean, phytoplankton are also the base of the Antarctic food web. They sustain the wealth and diversity of life for which Antarctica is renowned. Over the vast expanse of the Southern Ocean, the climate is experiencing increased warming, strengthening wind, acidification, shallowing mixed layer depths, increased light (and UV), changes in upwelling and nutrient replenishment, declining sea ice, reduced salinity, and the southward migration of ocean fronts.

Climate change effects are different in warmer waters vs colder waters. Warm-water species will feel the wrath of climate change, but the change is less drastic for warm water fish as they are closer to the equator. But they still must adapt to new temperatures, and observable behaviors like migration patterns, feeding times, and breeding periods may change. Most species that live in warm waters rely on the surrounding environment for their temperature regulation. As Craig Roghair, Fisheries Biologist, Forest Service Southern Research Station put it, "Environmental temperature strongly influences metabolic rates, the timing of key behaviors, growth, recruitment, bioaccumulation rates, and a suite of physiological processes in ectotherms" (Roghair 2019) Any change in temperature will affect all these systems in the species around us.

The main group of species that help "buffer" climate change are corals. They complete photosynthesis and act in conjunction with microscopic algae that give them their color. As they are impacted by climate change, and these algae can leave the coral, causing them to appear whiter. This phenomenon is known as coral bleaching and "rising temperatures cause coral bleaching and the loss of breeding grounds for marine fishes and mammals." (IUCN Ocean Warming Issues Brief). On top of a loss in breeding grounds, species like the parrotfish, which feed on the algae that live in the coral, would move elsewhere and the entire ecosystem will be forced to adjust. Other animals like whales will be forced to migrate over shorter distances and at contrasting times. Actions like this will again send a shockwave through the food web around the world since species will change in location and behavior to best meet their needs.

Figure 1. An image from Magel, J. M. T., Dimoff, S. A., & Baum, J. K. (2020) Coral reefs minimally affected by climate change (top left), moderately affected (top right), severely affected (bottom right), and completely destroyed (bottom left)

At this point, our survival depends on slowing the warming of our Earth and protecting the species that are most at risk. One method of doing so is by utilizing Hope Spots, created by Sylvia Earle, which she describes as "a global network of marine protected areas…large enough to save and restore the ocean" (Earle 2021). She originally introduced the idea in a Ted Talk in 2009, and they truly are one of our best chances at preserving life in our oceans. These areas are identified as critical to the long-term health of the ocean. Just as our national parks are used to preserve the health of our land and species living there, Hope Spots are just one of many ways to preserve our oceans and hopefully slow the destruction caused by climate change.

In the next issue, we will go into the role of Corporates in solving Climate Crisis.

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