

## Science News

from research organizations

### The 'phytoplankton factory' -- from nutrients to algae growth

International study provides new insights into the basis of the marine ecosystem

*Date:* August 6, 2021

*Source:* Helmholtz Centre for Ocean Research Kiel (GEOMAR)

*Summary:* Phytoplankton are the foundation of ocean ecosystems: like rainforests, they consume carbon from the atmosphere, form the basis of the marine food web and have a decisive influence on fish abundance and global climate. A recent study provides new insights into the complex biogeochemical processes at the base of the marine ecosystem.

*Share:* [!\[\]\(faf942dc3e59ce8eb64b4ac481eca7e0\_img.jpg\)](#) [!\[\]\(f6b0299e0b5e4340e509b71914970da0\_img.jpg\)](#) [!\[\]\(b5153706f6ea2fc2c42e8803b6804d18\_img.jpg\)](#) [!\[\]\(2b8adb27d8c9518333278b6317e2d8a2\_img.jpg\)](#) [!\[\]\(a190466037967efc7087885259e58e7a\_img.jpg\)](#)

#### FULL STORY

Phytoplankton are the foundation of ocean ecosystems: like rainforests, they consume carbon from the atmosphere, form the basis of the marine food web and have a decisive influence on fish abundance and global climate. An international study with the participation of GEOMAR Helmholtz Centre for Ocean Research Kiel, which has now been published in the journal *Science Advances*, provides new insights into the complex biogeochemical processes at the base of the marine ecosystem.

All life starts at a small scale, also in the ocean. Microscopic organisms, phytoplankton, form an important basis for the entire marine ecosystem, which ultimately determines how fish stocks develop and how much atmospheric carbon dioxide is taken up by the ocean. In this respect, understanding the basis of the marine ecosystem is important for two elementary questions for the future of our human population: nutrition and climate.

Scientists from Dalhousie University, University of Liverpool, GEOMAR Helmholtz Centre for Ocean Research Kiel and Scripps Institution of Oceanography have developed a new model for studying phytoplankton growth in the ocean. The model was coupled to metaproteomic and environmental data to allow accurate predictions of e.g. phytoplankton growth rates in the Southern Ocean. "You can think of phytoplankton growth like industrial manufacturing in a factory: Materials come into the factory and are processed on assembly lines, creating the final product," explains Scott McCain, lead author of the study and a PhD student in the Department of Biology at Canada's Dalhousie University. "We asked ourselves how to increase output, which is the amount of products leaving the factory," McCain adds. Applied to phytoplankton, that means how can they grow faster?

"As part of the study, we found that phytoplankton rearrange their 'cellular assembly lines' to do this," explained Prof. Dr. Eric Achterberg, co-author of the study from GEOMAR. "We were not concerned with the amount of available nutrients, including iron and manganese, that are important for the growth of phytoplankton, but rather with the question of how the 'cellular assembly lines' in the phytoplankton that process the source substances for their growth adapt to changes," Achterberg continued. To do this, the researchers created a mathematical model of a phytoplankton that enabled them to simulate these processes. The model was linked to laboratory and cruise data from the Southern Ocean on metaproteomics, dissolved iron and manganese. This allowed them to obtain new explanations for various phytoplankton processes. "Our results show that cumulative cellular costs determine how environmental conditions change the growth of phytoplankton," says Professor Achterberg.

"This fundamentally changes the way we look at phytoplankton growth and will lead to better predictions of how phytoplankton will grow in the ocean," adds Scott McCain. According to the Canadian scientists these findings are also important for predictions on the development of fish stocks and global climate change.

---

### Story Source:

Materials provided by **Helmholtz Centre for Ocean Research Kiel (GEOMAR)**. *Note: Content may be edited for style and length.*

---

### Journal Reference:

1. J. Scott P. McCain, Alessandro Tagliabue, Edward Susko, Eric P. Achterberg, Andrew E. Allen, Erin M. Bertrand. **Cellular costs underpin micronutrient limitation in phytoplankton**. *Science Advances*, 2021; 7 (32): eabg6501 DOI: 10.1126/sciadv.abg6501

---

### Cite This Page:

MLA	APA	Chicago
-----	-----	---------

---

Helmholtz Centre for Ocean Research Kiel (GEOMAR). "The 'phytoplankton factory' -- from nutrients to algae growth: International study provides new insights into the basis of the marine ecosystem." ScienceDaily. ScienceDaily, 6 August 2021. <[www.sciencedaily.com/releases/2021/08/210806171910.htm](http://www.sciencedaily.com/releases/2021/08/210806171910.htm)>.

---

### RELATED STORIES

#### Tiny Marine Organisms as the Key to Global Cycles

Apr. 6, 2020 — Marine microorganisms play a very important role in global cycles such as of the uptake of carbon dioxide from the atmosphere. However, little is known about how they function. New approaches are for ...

#### Tuna Carbon Ratios Reveal Shift in Food Web

Nov. 13, 2019 — The ratio of carbon isotopes in three common species of tuna has changed substantially since 2000, suggesting major shifts are also taking place in the phytoplankton populations that form the basis ...

#### Ecologists Find Strong Evidence of Fishing Down the Food Web in Freshwater Lake

Sep. 18, 2019 — Research by ecologists shows strong evidence in a freshwater lake of 'fishing down the food web' - the deliberate shift away from top predatory fish on the food chain to smaller species closer to the ...

From Tiny Phytoplankton to Massive Tuna

Jan. 23, 2017 — Phytoplankton are the foundation of ocean life, providing the energy that supports nearly all marine species. Levels of phytoplankton in an ocean area may seem like a good predictor for the amount of ...

## FROM AROUND THE WEB

---

*ScienceDaily shares links with sites in the TrendMD network and earns revenue from third-party advertisers, where indicated.*

### **Estuarine nurseries for marine fish**

Filipe Martinho et al., Management of Environmental Quality, 2012

### **Processes of coastal ecosystem carbon sequestration and approaches for increasing carbon sink**

Yao ZHANG et al., SCIENCE CHINA Earth Sciences, 2017

### **Ocean productivity set to fall**

International Journal of Productivity and Performance Management, 2007

### **Plant Physiology of the “Missing” Carbon Sink**

Christopher B. Field, Plant Physiol, 2001

### **Conditions for phytoplankton development. III Modeling of algal cultures. An approach to the conditions for succession**

A. Dauta, Annales de Limnologie - International Journal of Limnology

### **Ocean productivity set to fall**

Work Study

### **Harvard, Akonni Partnership Wins \$29M to Develop Drug-Resistant Tuberculosis Diagnostic | Genomeweb**

Madeleine Johnson, GenomeWeb

### **Hong Kong's Take2 to Commercialize Early Cancer Detection Test; Focus on Healthcare Informatics | Genomeweb**

Monica Heger, GenomeWeb

---

Powered by **TREND MD**

## Free Subscriptions

---

Get the latest science news with ScienceDaily's free email newsletters, updated daily and weekly. Or view hourly updated newsfeeds in your RSS reader:

 Email Newsletters

 RSS Feeds

## Follow Us

---

Keep up to date with the latest news from ScienceDaily via social networks:

 Facebook

 Twitter

 LinkedIn

## Have Feedback?

---

Tell us what you think of ScienceDaily -- we welcome both positive and negative comments. Have any problems using the site? Questions?

 Leave Feedback

 Contact Us

[About This Site](#) | [Staff](#) | [Reviews](#) | [Contribute](#) | [Advertise](#) | [Privacy Policy](#) | [Editorial Policy](#) | [Terms of Use](#)

Copyright 2021 ScienceDaily or by other parties, where indicated. All rights controlled by their respective owners.

Content on this website is for information only. It is not intended to provide medical or other professional advice.

Views expressed here do not necessarily reflect those of ScienceDaily, its staff, its contributors, or its partners.

Financial support for ScienceDaily comes from advertisements and referral programs, where indicated.