GEOQ PRESS RELEASES

From Finding Nemo to minerals – what riches lie in the deep sea?

EGU press release on research published in Biogeosciences

As fishing and the harvesting of metals, gas and oil have expanded deeper and deeper into the ocean, scientists are drawing attention to the services provided by the deep sea, the world's largest environment. "This is the time to discuss deep-sea stewardship before exploitation is too much farther underway," says lead-author Andrew Thurber. In a review published in Biogeosciences, an EGU journal, Thurber and colleagues summarise what this habitat provides to humans, and emphasise the need to protect it.

"The deep sea realm is so distant, but affects us in so many ways. That's where the passion lies: to tell everyone what's down there and that we still have a lot to explore," says co-author Jeroen Ingels of Plymouth Marine Laboratory in the UK.

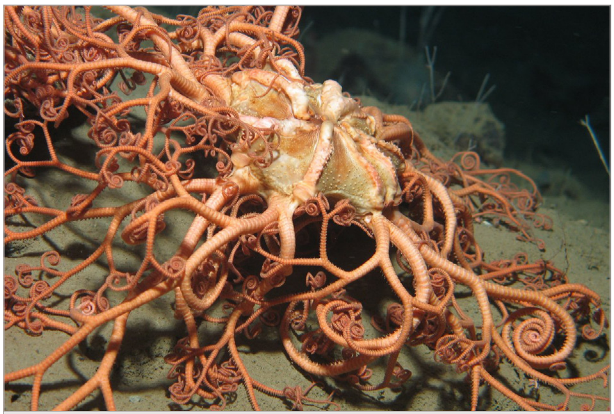
"What we know highlights that it provides much directly to society," says Thurber, a researcher at the College of Earth, Ocean and Atmospheric Sciences at Oregon State University in the US. Yet, the deep sea is facing impacts from climate change and, as resources are depleted elsewhere, is being increasingly exploited by humans for food, energy and metals like gold and silver.

"We felt we had to do something," says Ingels. "We all felt passionate about placing the deep sea in a relevant context and found that there was little out there aimed at explaining what the deep sea does for us to a broad audience that includes scientists, the non-specialists and ultimately the policymakers. There was a gap to be filled. So we said: 'Let's just make this happen'."

In the review of over 200 scientific papers, the international team of researchers points out how vital the deep sea is to support our current way of life. It nurtures fish stocks, serves as a dumping ground for our waste, and is a massive reserve of oil, gas, precious metals and the rare minerals we use in modern electronics, such as cell phones and hybrid-car batteries. Further, hydrothermal vents and other deep-sea environments host life forms, from bacteria to sponges, that are a source of new antibiotics and anti-cancer chemicals. It also has a cultural value, with its strange species and untouched habitats inspiring books and films from 20,000 Leagues Under the Sea to Finding Nemo.

"From jewellery to oil and gas and future potential energy reserves as well as novel pharmaceuticals, deep-sea's worth should be recognised so that, as we decide how to use it more in the future, we do not inhibit or lose the services that it already provides," says Thurber.

The deep sea (ocean areas deeper than 200 m) represents 98.5% of the volume of our planet that is hospitable to animals. It has



Gorgonocephalus caputmedusae (pictured) was the first species ever recovered from the deep sea. (Credit: SERPENT Project/D.O.B. Jones)

received less attention than other environments because it is vast, dark and remote, and much of it is inaccessible to humans. But it has important global functions. In the Biogeosciences review the team shows that deep-sea marine life plays a crucial role in absorbing carbon dioxide from the atmosphere, as well as methane that occasionally leaks from under the seafloor. In doing so, the deep ocean has limited much of the effects of climate change.

This type of process occurs over a vast area and at a slow rate. Thurber gives other examples: manganese nodules, deep-sea sources of nickel, copper, cobalt and rare earth minerals, take centuries or longer to form and are not renewable. Likewise, slow-growing and long-lived species of fish and coral in the deep sea are more susceptible to overfishing. "This means that a different approach needs to be taken as we start harvesting the resources within it."

By highlighting the importance of the deep sea and identifying the traits that differentiate this environment from others, the researchers hope to provide the tools for effective and sustainable management of this habitat.

"This study is one of the steps in making sure that the benefits of the deep sea are understood by those who are trying to, or beginning to, regulate its resources," concludes Thurber. "We ultimately hope that it will be a useful tool for policymakers."

This press release was originally published on the EGU website.

References

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BACK TO CONTENTS

Has Antarctic sea ice expansion been overestimated?

EGU press release on research published in The Cryosphere

New research suggests that Antarctic sea ice may not be expanding as fast as previously thought. A team of scientists say much of the increase measured for Southern Hemisphere sea ice could be due to a processing error in the satellite data. The findings are published in The Cryosphere, a journal of the European Geosciences Union (EGU).

Tabular iceberg surrounded by sea ice in the Antarctic. (Credit: Eva Nowatzki, distributed via imaggeo.egu.eu)

Arctic sea ice is retreating at a dramatic rate. In contrast, satellite observations suggest that sea ice cover in the Antarctic is expanding – albeit at a moderate rate – and that sea ice extent has reached record highs in recent years. What's causing Southern Hemisphere sea ice cover to increase in a warming world has puzzled scientists since the trend was first spotted. Now, a team of researchers has suggested that much of the measured expansion may be due to an error, not previously documented, in the way satellite data was processed.

"This implies that the Antarctic sea ice trends reported in the IPCC's AR4 and AR5 [the 2007 and 2013 assessment reports from the Intergovernmental Panel on Climate Change] can't both be correct: our findings show that the data used in one of the reports contains a significant error. But we have not yet been able to identify which one contains the error," says lead-author Ian Eisenman of the Scripps Institution of Oceanography at University of California San Diego in the US.

Reflecting the scientific literature at the time, the AR4 reported that Antarctic sea ice cover remained more or less constant between 1979 and 2005. On the other hand, recent literature and the AR5 indicate that, between 1979 and 2012, Southern Hemisphere sea ice extent increased at a rate of about 16.5 thousand square kilometres per year. Scientists assumed the difference to be a result of adding several more years to the observational record.

"But when we looked at how the numbers reported for the trend had changed, and we looked at the time series of Antarctic sea ice extent, it didn't look right," says Eisenman, who set out to figure out what was wrong.

Scientists have used satellite data to measure sea ice cover for 35 years. But the data doesn't come from a single instrument, orbiting on a single satellite throughout this period. Instead, researchers splice together observations from different instruments flown on a number of different satellites. They then use an algorithm – the most prevalent being the Bootstrap algorithm – and further processing to estimate sea ice cover from these data.

In the study published in The Cryosphere, Eisenman and collaborators compare two datasets for sea ice measurements. The most recent one, the source of AR5 conclusions, was generated using a version of Bootstrap updated in 2007, while the other, used in AR4 research, is the result of an older version of the algorithm.

The researchers found a difference between the two datasets related to a transition in satellite sensors in December 1991, and the way the data collected by the two instruments was calibrated. "It appears that one of the records did this calibration incorrectly, introducing a step-like change in December 1991 that was big enough to have a large influence on the long-term trend," explains Eisenman.

"You'd think it would be easy to see which record has this spurious jump in December 1991, but there's so much natural variability in the record – so much 'noise' from one month to the next – that it's not readily apparent which record contains the jump. When we subtract one record from the other, though, we remove most of this noise, and the step-like change in December 1991 becomes very clear."

With the exception of the longer time period covered by the most recent dataset, the two records were thought to be nearly identical. But, by comparing the datasets and calculating Antarctic sea ice extent for each of them, the team found that there was a stark difference between the two records, with the current one giving larger rates of sea ice expansion than the old one in any given period.

If the error is in the current dataset, the results could contribute to an unexpected resolution for the Antarctic sea ice cover enigma.

This press release was originally published on the EGU website.

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