The History of Seas

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Throughout the billions of years of its history, the planet has undergone a massive amount of change: everything from the climate, to the arrangements of landmasses and oceans, to the organisms that inhabit it.

Learning about the earth's history is an important part of what will allow us to live sustainably. Looking for evidence of climate patterns from millions of years ago—for example—can help us respond more effectively against our current issue of climate change. By combining different types of evidence, we can form a picture of what the earth was like—and organisms would have thrived on it—in the distant past. The formal term for this study is biogeography, which looks into how ecosystems have changed throughout history.

One aspect of this is studying the ocean. Just like the landmasses are slowly but surely drifting and rearranging, the ocean has changed over the millennia as well. Everything from the temperature of the ocean in different parts of the world to the chemicals that get dissolved in seawater changed over the years, giving us the seas and oceans as we know them today.

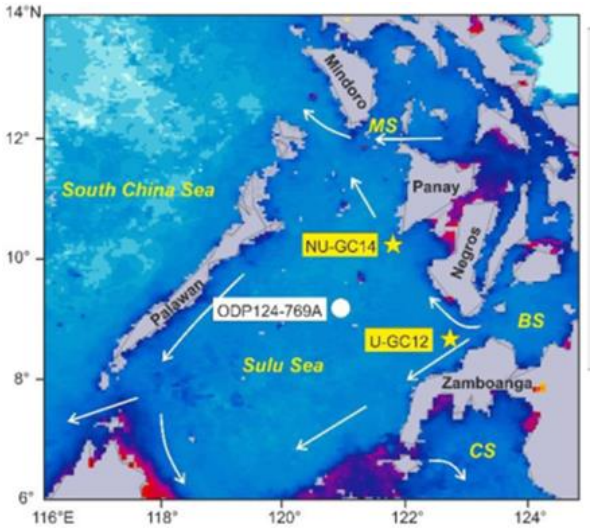
An important part of studying how the ocean acts as an environment for a diverse set of plants, animals, and microorganisms is studying something called ocean productivity. The productivity of an ocean deals with the organic matter that is produced by photosynthetic algae. Much like plants on land, these microscopic algae can turn light from the sun into energy for themselves, allowing them to survive. Also much like plants, this makes them the foundation of the many food webs taking place in the ocean. The different relationships between aquatic predators and their prey, the symbiotic relationships between cooperating species and so on, are all fueled by these algae.

While the relationship between ocean productivity and the amount of species or individuals in an area of the ocean is fairly complicated, it generally follows that more productivity (that is, more microorganisms drawing energy from the sun and being fed on by other animals), the more organisms will thrive in that part of the sea.

The Philippines—as a country with a deep connection to the seas and oceans—has plenty to gain from studying the history of the productivity of its waters.

A team of scientists from the National Institute of Geological Sciences at the University of the Philippines have recently published a paper dealing with this. Their work looks into the history of ocean productivity in the Sulu Sea, and was published in *Marine Micropaleontology*.

In particular, the scientists wanted to find out whether historical warm and cold periods—some of which has effects that were more pronounced in the northern hemisphere—had effects on tropical waters like the Sulu Sea, and to determine how the ocean productivity in different parts of the Sulu Sea might have changed throughout time.



The two areas of the Sulu sea (designated by stars) that the scientists looked at for this study

The scientists examined the northern part of the Sulu sea, near Panay, as well as the southern part, near Zamboanga. The area near Zamboanga is known to have high productivity, while the area near Panay is known to have low productivity. With biogeographical evidence of ancient conditions, the researchers wanted to determine if this disparity is fairly recent, or historical, and how previous conditions may or may not have changed them.

To figure out how ocean productivity in these areas has changed throughout the years, they used specialized equipment to dig deep into the ocean floor and bring up long columns of earth called cores. As debris falls to the ocean floor, different "layers" can be created over millions and millions of years, corresponding to different periods in time. By taking these long cores, scientists are able to study these layers, and gather evidence about what the oceans were like by looking at what is present in the earth in these different layers.

One type of debris that helps form these layers of the ocean floor are fossils, and they are what the scientists were hoping to examine in the cores that they obtained. In particular, they studied the microscopic fossils of the photosynthetic algae that drive ocean productivity.

By looking at the abundance of these fossils, as well as by identifying the different species that were present in different time periods, the team was able to get an idea of how productive or unproductive these waters were throughout history.

With this evidence, the scientists were able to determine that the waters of the Sulu Sea near Zamboanga, which are currently very productive, were also productive in the past, coinciding with cold periods from as far back as 18,000 years ago. They also found that, under different circumstances, those waters were not so productive. They also found that while the waters off Panay were also affected by different climate events, they have been unproductive for much longer than the waters off Zamboanga have been productive.

This information is important for locals, especially fishermen and those concerned with managing the country's aquatic resources. Effective long term strategies for sustainability and resource management can only come from a through knowledge of these long term trends. This is especially true considering we are in the middle of a catastrophic climate change event.

For example, measures can be taken knowing that the Sulu Sea near Panay is likely to stay much less productive, and be less affected by climate events, while the waters near Zamboanga may be more responsive to these changes.

REFERENCE

Tangunan DN, Peleo-Alampay AM. Late Pleistocene to Holocene productivity changes in the western equatorial Pacific (Sulu Sea, Philippines) from calcareous nannofossils. Mar Micropaleontol 2018; 143:1-11.

Luis Wilfrido Atienza graduated from the Ateneo de Manila University, with a BS in Biology, and a minor in poetry. He currently works as a copywriter for a sustainable agency, and spends some of his free time writing about science.