

In Dark Seas

SWIMMING WITH SEA BUTTERFLIES

As scientists work to answer progressively more complex questions about the earth and its changing climate, they are becoming more aware of the importance of communicating their findings to the public. To ensure that their messages are heard, understood and made accessible, they are increasingly turning to art.

For nearly a hundred years, scientists have known that plankton — the microscopic organisms that drift and float in the ocean, also known as marine microbes — form the basis of the ocean's food web. However, scientists are now learning that plankton play an even larger role in the earth's complex biogeochemical systems.

Despite representing only 1-2% of global plant biomass, primary production by phytoplankton accounts for 40-50% of carbon fixation on earth. Without this process (by which these organisms transform CO₂ from the atmosphere into organic compounds), known as the biological pump, the atmospheric concentration of carbon dioxide would be significantly higher. As a result, scientists have turned their attention to investigating how plankton and other marine microbes control the production, removal and transformation of carbon in the ocean.

Between 2017 and 2019 the Bermuda Institute of Ocean Sciences (BIOS) worked with artists Lesli Bell and Samm Newton — each with a different background and preferred artistic medium — as part of on-ongoing research projects into pteropods (a type of ocean-dwelling snail) and copepods (tiny aquatic crustaceans) led by scientists Dr Amy Maas and Dr Leocadia Blanco-Bercial.

Together the artists took an interdisciplinary approach to the project, blending art and science in order to examine the physics and motion of pteropods for insights into their fluttering, butterfly-like swimming mechanics and exploring the diversity in the groups.

The interplay between art and science has long been an important tool in understanding Bermuda's natural history. The works here build on the legacy left by oceanographer and naturalist Dr William Beebe, whose deep-sea observations from the Bathysphere in 1930 were captured by artists at the surface.

Recognizing that art and science are two parts of the same human drive to know and to understand, this multi-disciplinary approach reminds us how art can be used to more deeply appreciate our place on this planet and the processes that connect each of us to it.

OUR OCEANS, OUR BREATH

The following is an excerpt from the forthcoming book, *Our Oceans, Our Breath*, by Liz Cunningham. It is an in-depth exploration of how the ocean drives all life on our planet, from the tiniest microorganisms to the earth's largest living creatures. The author, who is a passionate advocate for ocean conservation, participated in a research cruise in October 2018 on the BIOS research vessel the R/V Atlantic Explorer with Dr Amy Maas.

Liz Cunningham is the author of the award-winning book, *Ocean Country*, with a foreword by Carl Safina. More information about her work can be found at www.lizcunningham.net

The creatures that populate the migrating deep scattering layers that confounded sonar operators are zooplankton. The word zooplankton is derived from the Greek word, *zoon*, meaning animal, and *planktos*, the word for wanderer or drifter. Diminutive as they might be, some only visible under a microscope, zooplankton are nevertheless animals. They breathe. They eat. And they try to avoid being eaten.

The “little animals” migrate up and down every night in every sea of the world, be it Atlantic Ocean or Indian Ocean, the Pacific, the Mediterranean or Arctic or Antarctic seas. Arctic terns are the record holders for the longest annual migration, 44,000 miles roundtrip, back and forth between Greenland and Antarctica. But measured by mass of organisms the deep scattering layer is the greatest migration on earth.

The speed of that passage is also nothing to sneeze at. The pteropod *Clio pyramidata* swims up and down every night about 400 meters each way, up from 450 meters deep to 50 meters and back down again. It's one centimeter long. That would be like me—at five and a half feet—swimming over eighty miles in the course of a night. *Every night.*

We would wait a few more hours, so the sea was as dark as it could be and everyone had swum up, before casting the net. I gazed through an open door to the back deck. Behind the heaving deck, the last orange glow of the sunset was fading into darkness.

There was something very appealing about these diminutive world-class swimmers that belied the very category of their existence—they were, after all, snails. “Can you imagine it?” Amy mused, “As the sun moves across the world, this wave of life heads up. It's this huge blanket of organisms rising up in the ocean.”

FURTHER RESOURCES

<https://library.wcs.org>

The Wildlife Conservation Society Library and Archives includes illustrations from the Department of Tropical Research, which was led by William Beebe.

<https://www.instagram.com/escapeartist.ci/>

See more watercolour illustrations by Lesli Bell, who grew up in Bermuda and now resides in Christmas Island, Australia.

<https://www.lizcunningham.net/>

Find out more about author and ocean conservation activist Liz Cunningham and her forthcoming book, *Our Oceans, Our Breath*, an in-depth exploration of how the ocean drives all life on our planet.

<http://www.bios.edu/research/projects/invertebrate-physiology/> and

<http://www.bios.edu/research/projects/zooplankton-ecology/>

Learn more about the biological diversity of plankton and its role in Bermuda's local food webs in the Maas and Blanco-Bercial Labs of BIOS.

<https://www.murphyfluidslab.com/>

Learn more about Biological, Ecological and Environmental Fluid Mechanics in the Murphy Lab at the University of South Florida.

<https://ecotaxa.obs-vlfr.fr/>

Explore EcoTaxa, a web application dedicated to the visual exploration and the taxonomic annotation of images that illustrate the beauty of planktonic biodiversity.

About the Bermuda Institute of Ocean Sciences

BIOS is an independent US non-profit scientific research and educational organization based in Bermuda. For over 100 years BIOS-based researchers and visiting scientists have worked to explore the ocean and address important local and global environmental issues.

www.bios.edu



About the Bermuda National Gallery

Situated in the heart of Hamilton in the City Hall & Arts Centre, BNG houses Bermuda's national art collection and connects the island's community through art, culture and dialogue. A dynamic arts and culture institution with an energetic staff and volunteer team, it hosts engaging exhibitions, events and programmes for all ages.

www.bng.bm

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