



NIOZ Saba Bank Expedition: Environmental impacts on carbon metabolism of reef ecosystems

NIOZ organised an expedition to the Saba Bank aboard the research vessel “Pelagia” from 19th August to 8th September 2016. Thirteen scientists* from NIOZ, Wageningen Marine Research, TU Delft, UvA and Utrecht University set out to investigate how environmental conditions are impacting the coral reef ecosystem functioning on the Saba Bank.

This second expedition is part of an NWO funded project entitled “*Caribbean Coral Reef Ecosystems - interactions of anthropogenic ocean acidification and eutrophication with bioerosion by coral excavating sponges*”.

The goal of NIOZ's Saba Bank expeditions is to understand the interaction between the environment and coral reef functioning. Researchers aim to better understand the hydrography and to determine if net ecosystem calcification occurs on the Saba Bank. In other words is the Saba Bank growing or eroding and which factors can explain these processes?

Healthy coral reefs exist in dynamic environments in which its primary builders, corals, experience a balanced growth (calcium carbonate (CaCO_3) production) and erosion. Corals are exposed to bioeroding organism such as sponges, worms and parrotfish scraping off the associated algae or directly degrading the reef's carbonate skeleton. For example coral excavating sponges are reported to be the most important bioeroding organism in the Caribbean often killing the corals when competing for space. A variety of human-induced pressures cause ocean acidification and eutrophication of the marine environment. This negatively affects corals and other carbonate producing organism living on our reefs.

Recent studies have demonstrated that ocean acidification not only weakens the calcium carbonate skeleton of coral but also increases sponge biomass

and therefore the rate of reef erosion. Thus, a primary threat of ocean acidification is the potential that eroding processes exceed the production rate of CaCO_3 , thereby resulting in the loss of corals. It is however not known exactly how and to what degree (combined) climate change impacts and other environmental conditions are affecting different benthic organism such as sponges and how this influences the carbon metabolism of reef ecosystems.

The Saba Bank is an excellent study site to investigate these processes due to its' remoteness, large shallow area and cover of corals, benthic algae, sponges and gorgonians.

To answer these questions, many different experiments and (long-term) measurements have to be taken to understand the functioning of this complex system. The most important component of this recent expedition was to find horizontal and vertical gradients related to calcium carbonate production and loss such as seawater chemistry (e.g. dissolved oxygen, alkalinity, nutrients), currents, light, dissolved and suspended organic matter (phytopigments and particulate organic matter POM) and pico- and nano-plankton concentrations. This data will be assessed to determine how these gradients are linked to the benthic composition of calcifying and non-calcifying organism. All these measurements will be used to calculate the net calcium carbonate production in different areas on the Saba Bank.

Researchers aim to understand the carbon metabolism of reef ecosystems and the role of bioeroding sponges in dissolution of CaCO_3 in relation to ocean acidification and eutrophication and other environmental factors. The expedition data are now being processed and analyzed and resulting papers and publications will be listed in future editions of BioNews.



Dutch Research Vessel Pelagia of NIOZ Royal Netherlands Institute for Sea Research. The Pelagia has two dry labs and a wet lab and may host up to nine interchangeable (laboratory) containers. The ship offers berths for up to 14 scientists and has an 11-member crew skilled in the hauling of equipment and moorings. *Photo credit: Fleur van Duyl (NIOZ)*

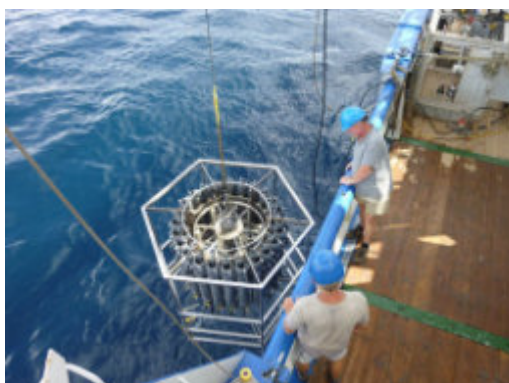


*Participating scientists:

Scientist	Institute	Specialism
Lennart de Nooijer	NIOZ	Chief scientist
Steven van Heuven	NIOZ	Carbonate chemistry
Fleur van Duyl	NIOZ	Pelagic-benthic coupling, Coral reef ecology
Eric Meesters	Wageningen Marine Research	Coral reef ecology
Adam Candy	TU Delft	ADCP, turbulence/ flow modeling
Alice Webb	NIOZ	Carbonate chemistry
Didier de Bakker	Wageningen Marine Research/NIOZ	Coral reef ecology, carbonate chemistry
Rene van Westen	Utrecht University	Microturbulence
Avila Lindgren	UvA	Phytopigments
Barry Boersen	NIOZ	Technician
Bob Koster	NIOZ	Technician
Jan van Ooijen	NIOZ	Nutrients
Sharyn Ossebaar	NIOZ	Carbonate chemistry, dissolved oxygen



Water filtration set-up in wetlab.
Photo credit: Fleur van Duyl (NIOZ)



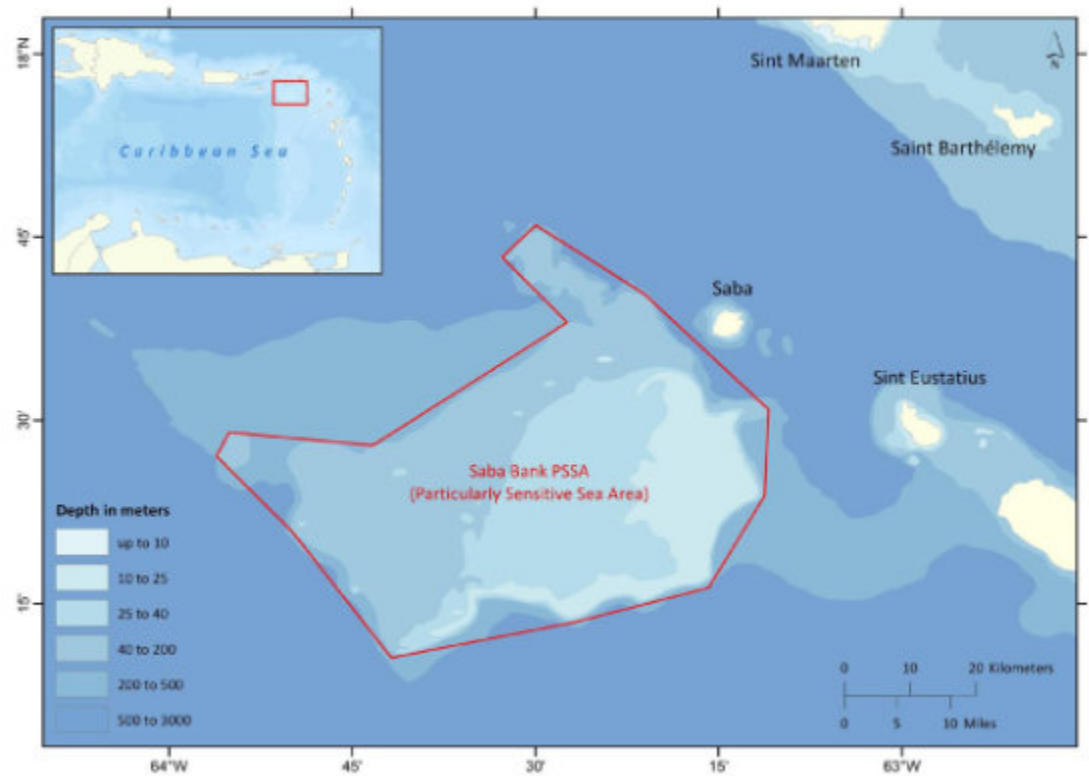
Bottom water gradient sampler is lowered into the water.
Photo credit: Fleur van Duyl (NIOZ)

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Saba Bank



The Saba Bank lies just 5 kilometres (3 miles) south west of the island of Saba. It is the second largest submerged carbonate platform of its kind in the world, and it is spectacularly rich in biodiversity and includes coral reefs, patch reefs, sand flats, macroalgal beds as well as limestone pavements overgrown with unique and diverse assemblages. The total area of the Saba Bank is around 2,200 km² (849 mi²), and the total reef area has been estimated at approximately 150 km² (58 mi²). The Bank is a flat-topped carbonate seamount rising

1,800 metres (5,905 feet) from the sea floor, crowned by growing coral reef on its fringes. The summit nowhere reaches the water's surface. Most of the bank lies at depths of 20 to 50 metres (66 to 164 feet), but a large area to the east and south side of the bank lies between 10 and 20 metres (33 to 66 feet) and has extensive reef development down to 40 meter depth or more. About one-third of the Saba Bank lies within Saban territorial waters and 1.3% within St. Eustatius' territorial waters.