BioNews

Bringing you the latest in research and monitoring news from the Dutch Caribbean

Dutch Caribbean Nature Alliance
Safeguarding nature in the Dutch Caribbean
www.DCNAnature.org

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This Issue

Photo credit: Reur van Duyl

Welcome to BioNews

BioNews is a monthly newsletter featuring recent biodiversity research and monitoring on and around the six islands of the Dutch Caribbean. BioNews also provides an overview of recent publications, current research and monitoring activities, and upcoming events.

For any questions or feedback, or if you would like to make a contribution, please contact us at research@DCNAnature.org

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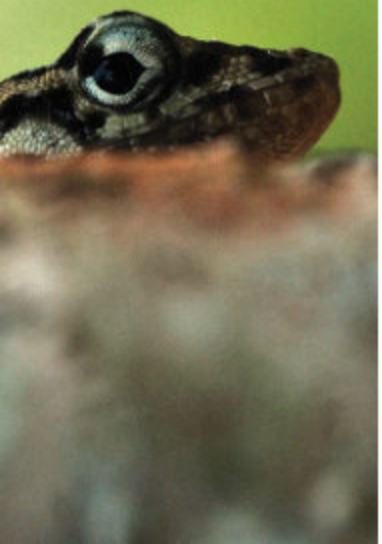

Editor's Notes

This months edition of BioNews takes a look at recent research expeditions to the Dutch Caribbean including terrestrial and marine expeditions organized by Naturalis to St. Eustatius, two marine expeditions to the Saba Bank by NIOZ and DCNA and the Waitt Institute marine surveys of the waters around Curaçao which were part of their "Blue Halo" initiative.

Scientific research expeditions are of particular interest because they bring together groups of scientists and nature conservationists often from diverse disciplines and because they able to conduct a lot of experiments and amass large datasets of information over a very short period of time. Their goals can be diverse but what they have in common is that scientific expeditions take a lot of time and energy to prepare and execute and require long and dedicated working days.

In this issue you can read about the DCNA's shark tagging expedition to the Saba Bank. This expedition is part of the Dutch Postcode Lottery funded "Save Our Sharks" project. Little is known about the abundance and diversity of sharks in the Dutch Caribbean and much less is known about their movements. This expedition not only tagged 22 sharks but also, for the first time in Dutch waters, placed satellite tracking devices on four Tiger sharks. This will allow us to gain a unique glimpse into their migration patterns and determine their range state.

As part of a NWO funded project, scientists from five Dutch research institutions recently completed a marine expedition to the Saba Bank to investigate how environmental conditions are impacting the coral reef ecosystem functioning on the Saba Bank.

The Smithsonian Institute has organized numerous marine research expeditions in the last years aimed at exploring the deep reefs of Curaçao. Their work has resulted in an astounding number of discoveries of species new to science.

The Marine Scientific Assessment of the waters around Curaçao by the Waitt Institute in collaboration with the Government of Curaçao will be used to develop a Sustainable Ocean Policy for the island aimed at improving the health of their marine ecosystems and supporting coastal economies and livelihoods.

Not content with one expedition, Naturalis Biodiversity Center organized both a marine and terrestrial expedition to St. Eustatius last year. The goal of both expeditions was to create a complete biodiversity database for the island. In this issue you can read about their results and the discovery of a species new to science.

So if you feel in the mood for adventure... read on. And to those of you planning or about to embark on an expedition, "good luck" and we hope to see your work profiled in future editions of BioNews.

DCNA Team

View into the crater from the rim of the Quill volcano during the Naturalis expedition to St. Eustatius.
Photo credit: Ton de Winter (Naturalis)

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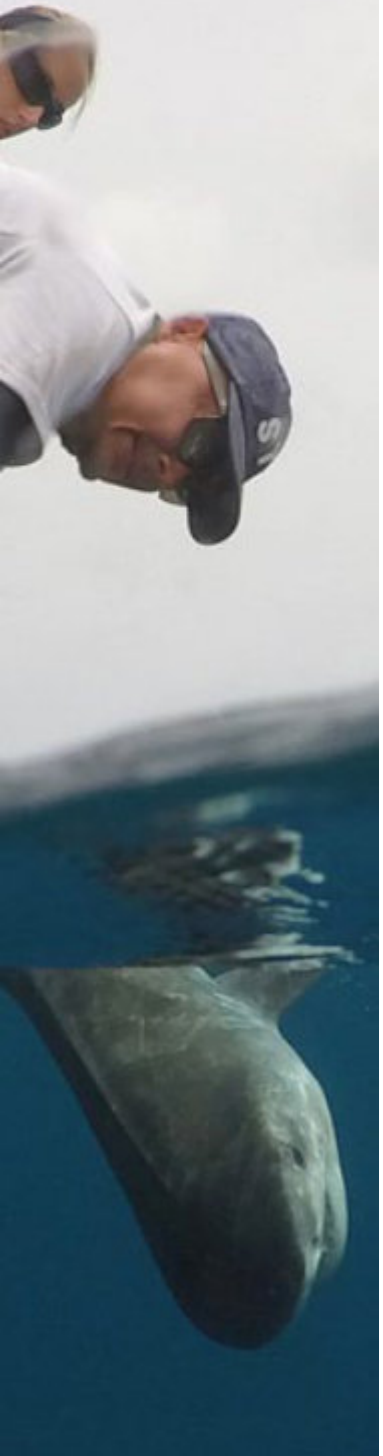
The team deploying the satellite tag on the tiger shark.
Photo credit: Duncan Brake



Unique shark tagging expedition to the Saba Bank

In October 2016, the Dutch Caribbean Nature Alliance (DCNA) organized a unique shark tagging expedition to the Saba Bank. Little is currently known about the status of shark populations in Dutch Caribbean waters and shark tagging studies are a pivotal first step in determining which sharks are present, where they can be found and most importantly to provide insights into their range state and migration patterns. This information will be used to determine how best to manage and protect these important apex predators.

During the shark tagging expedition, scientists and conservationists from the Saba Conservation Foundation (SCF), Nature Foundation St. Maarten (NFSXM), Florida International University (FIU) and Sharks4Kids used the research vessel "*Caribbean Explorer II*" to assess the abundance and diversity of sharks on the Saba Bank.

Drum lines were used to catch a total of 22 sharks during the course of the six-day expedition. The sharks, which were tagged, included 16 Caribbean reef sharks (*Carcharhinus perezii*) and 6 adult tiger sharks.

The Caribbean reef sharks were each fitted with PIT tags. These tags were inserted under the skin just below the first dorsal fin. PIT stands for Passive Integrated Transponder, which acts essentially as a lifetime barcode for a specific animal, allowing scientists to identify individual animals and to record where they are spotted.

The team also caught 6 adult tiger sharks (*Galeocerdo cuvier*), which are known to be highly migratory (Papastamatiou *et al*., 2013) and to overwinter in the Caribbean. Along with PIT tags, four of these sharks were equipped with Wildlife Computers SPOT (Smart Position or Temperature Transmitting) tags, which were attached to the first dorsal fin. These tags transmit to satellites, which allow the sharks to be tracked through the ARGOS system for up to 4 years. The tags use radio transmissions, so the satellite unit must be exposed to air in order to transmit. Each time the dorsal fin breaks the surface a geo location provides an approximate location with an accuracy of a few hundred meters.

In contrast to most other species of shark, tiger sharks spend some time at the surface (Werry *et al*., 2014) making them ideal subjects for satellite tagging studies. Both Caribbean Reef sharks and Tiger sharks are listed as "near threatened" on the IUCN red list of Threatened species (Friendlander and DeMartini, 2002; Simpfendorfer, 2009). Tiger sharks in particular, provide important trophic links between distant habitats throughout the Caribbean, since they are known to migrate up to 6747 km across ocean basins (Kohler *et al*., 1998). Tiger shark dispersal patterns are complex and can be considered a mix of inter-island movements, potentially linked to foraging, and long-distance migration, which may be triggered by their reproductive cycle, since their reproductive cycle is believed to be triennial and 3-yearly migration patterns have been observed in adult female tiger sharks (Papastamatiou *et al*., 2013).

Despite the precipitous decline of shark populations worldwide due to chronic overfishing and slow reproductive life-history characteristics (Myers *et al.,* 2007), a relatively high number of sharks can

Tadzio Bervoets (NFSXM) releases the tiger shark after a successful 'work-up'.
Photo credit: Jillian Morris

SAVE OUR SHARKS

Tiger shark alongside the boat seen from an underwater perspective.
Photo credit: Duncan Brake

be found on the Saba Bank (Stoffers, 2014). Using BRUV (Baited Remote Underwater Video) studies in the Bahamas (Brooks *et al*., 2011) and Belize (Bond *et al*., 2012) for comparison, shark numbers on the bank seem relatively high. Sharks are found close to the shallow edges of the bank in the South and East, where the ocean floor continues in a steep drop-off. The relatively high shark abundances on the Saba bank could be explained by the lack of destructive industrial fishery methods, such as long-lining, gillnetting and directed fisheries for shark fins. This is a good sign for the health of the Saba Bank ecosystem, since sharks are apex predators, making them a prime indicator for ecosystem health.

Preliminary results from the shark tagging expedition are allowing a juvenile female Tiger shark to be tracked in the near shore waters around St. Maarten ranging from the French to the Dutch side of the islands and back again. Strikingly the shark is most active at the surface at dawn and dusk. Of the four tracking devices placed on adult female Tiger sharks, two are transmitting but the sharks have not surfaced long enough for them to be positively located, one has yet to transmit data and one large female Tiger shark has been providing excellent data and has travelled as far as the waters off Grenada and St. Lucia.

This shark tagging expedition was funded by the Dutch Postcode Lottery as part of a region wide "Save Our Sharks" project. The aim of the three year long project is to generate substantial public support for shark conservation, to ban commercial and targeted fishing for sharks in Dutch Caribbean water and ultimately establish shark sanctuaries as safe haven for sharks.

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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 acidif cation 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 calcif cation 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 parrotf sh 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 acidif cation 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 acidif cation 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 acidif cation 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 inf uences 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 nanoplankton 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.

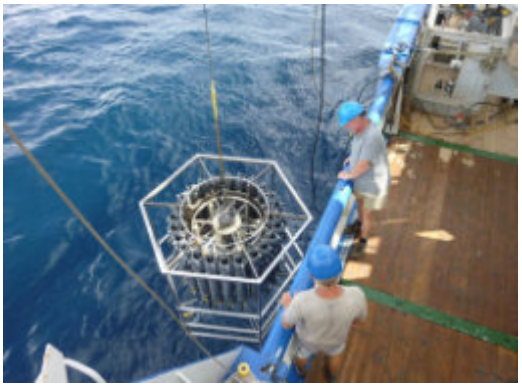
Dutch Research Vessel Pelagia of NIOZ Royal Netherlands Institute for Sea Research. The Pelagia has two dry labs and a wet lab and may host up to nine interchangeable (laboratory) containers. The ship offers berths for up to 14 scientists and has an 11-member crew skilled in the hauling of equipment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

NIOZ Royal Netherlands Institute for Sea Research

*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/ f ow 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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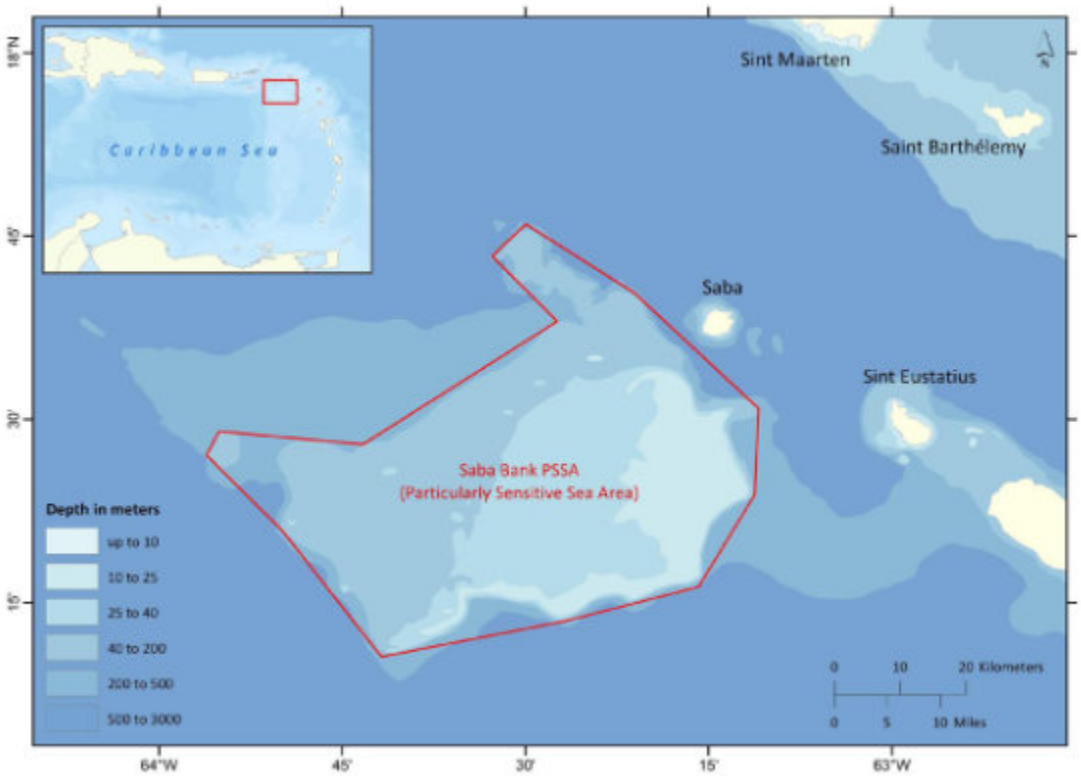
Saba Bank



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 meters (66 to 164 feet), but a large area to the east and south side of the bank lies between 10 and 20 meters (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.

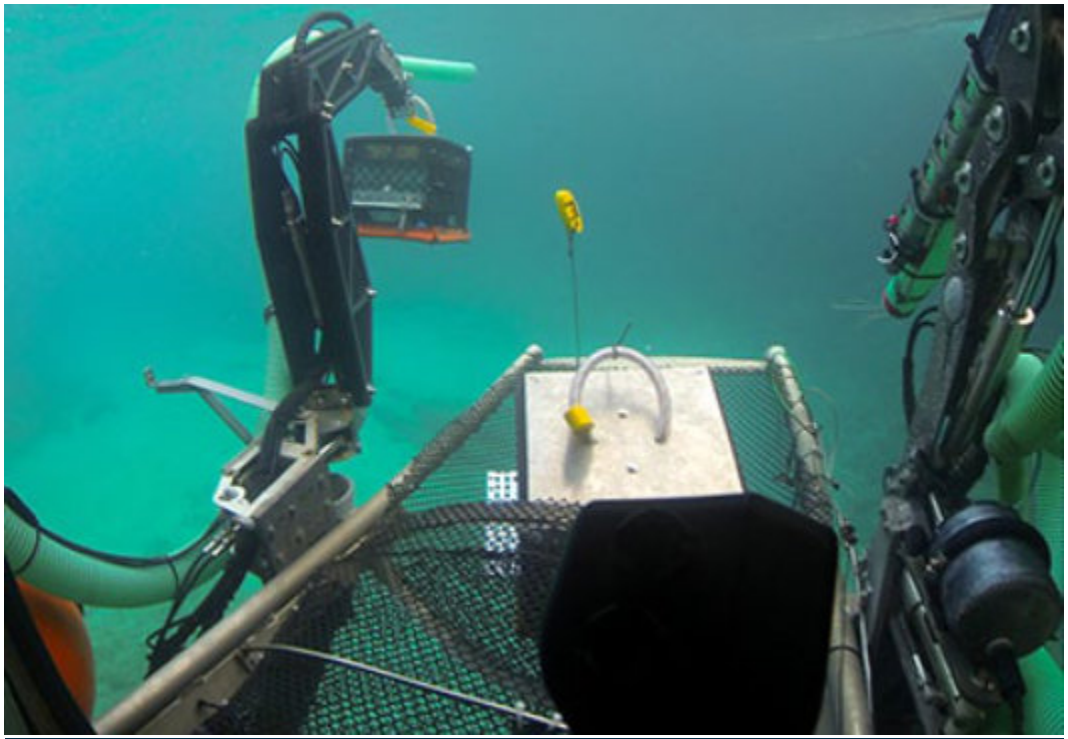
The Smithsonian Institution's Deep Reef Observation Project (DROP)

Compared to shallow coral reefs there has been very little scientific research on reefs below 45 meters largely due to limitations imposed by SCUBA diving. Since 2010 researchers under the leadership of the Smithsonian's Dr. Carole Baldwin began exploring deeper reefs to depths of 300 meters off the coast of Curaçao using the mini-submarine "CuraSub" from Substation Curaçao. This has so far resulted in the discovery of more than 50 new fish and invertebrate species.

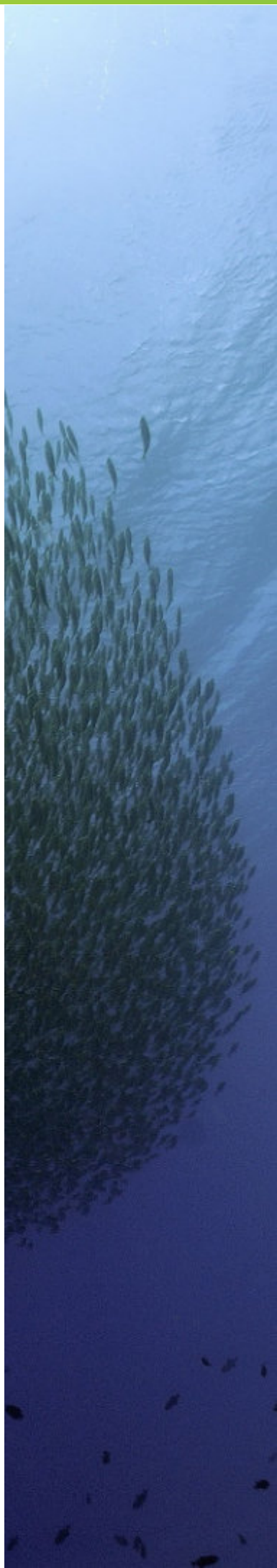
In October 2016 a research team revisited Curaçao to retrieve sampling gear that had been previously deployed. Eleven temperature loggers that recorded temperatures every minute for one year at depths of 15 to 250 m were retrieved for Year 4 temperature data and re-deployed for Year 5 data.

The data collection on Curaçao also includes samples from small, long-term collecting devices called ARMS (Autonomous Reef Monitoring Structures) that were placed on both shallow and deep reefs. ARMS are used by colonizing invertebrates, such as sponges, tunicates and bryozoans, to settle. Some mobile animals such as crabs, shrimps, and fishes also take up residence. Smithsonian will continue to retrieve and redeploy these units for years to come. The ARMS will provide a multi-year comparative dataset on biological changes on diversity, distribution, abundance, and community structure of the cryptic fauna on a vertical reef profile.

ARMS (Autonomous Reef Monitoring Structures) 04 image
Photo credit: Chris Meyer (Smithsonian Institution)



Studying Curaçao's deep reefs with the mini submarine "CuraSub". With robotic 'collecting arms' specimens and other objects can be collected.
Photo credit: Carole Baldwin (Smithsonian Institution)



Scientif c Assessment of Curaçao's Reefs

Blue Halo Curaçao, a partnership between the Waitt Institute and the Government of Curaçao, in close cooperation with researchers from CARMABI and Scripps Institution of Oceanography recently completed a Marine Scientific Assessment. The Assessment evaluated the status of Curaçao's marine resources as well as how the island's resources are valued and used by fishers and divers. The resulting report will be used to support development of a Sustainable Ocean Policy for Curaçao aimed at improving the health of marine ecosystems, support coastal economies and livelihoods.

Blue Halo Curaçao aims to ensure the ecologically, economically, and culturally sustainable use of Curaçao's ocean resources to support current and future generations. The Waitt Institute's approach is to collaborate with scientists, stakeholders, local communities and organisations and to partner with governments to provide the tools needed to design locally appropriate policies, facilitate the policymaking process, and build capacity for effective implementation and long-term success.

The Marine Scientif c Assessment combines data gathered from a marine expedition, interviews and historical resources. The marine expedition, led by the Waitt Institute, took place in November 2015, to evaluate the abundance and composition of benthic and f sh communities as well as water quality at 148 sites around the island. This work was done with researchers from CARMABI (Curaçao) and Scripps Institution of Oceanography (U.S.A.), Reef Support (Bonaire), the National Oceanic and Atmospheric Administration (U.S.A.), Moss Landing Marine Lab (U.S.A.), University of South Florida (U.S.A.), and San Diego State University (U.S.A.).

The expedition used Caribbean-Global Coral Reef Monitoring Network (GCRMN) baseline scientif c monitoring methods meaning that the data will contribute to the regional understanding of status and trends of Caribbean coral reefs. Eight distinct zones with similar ecological conditions were identif ed around Curaçao (see Figure 1) and results showed the east side of the island, Klein Curaçao and Oostpunt, contained the healthiest coral reefs.

In addition, researchers interviewed 99 f shers and 92 divers to collect information on the areas they use to f sh and dive as well as their most valued locations. This data was used to develop ocean use maps of f shing and diving intensities and values within the eight zones.

One of the f rst conclusions was that Westpunt (zone 7) is of particular concern since it includes high f shing pressure and high value to f shermen, but low f sh biomass indicating that this area is being overexploited.

Marine Scientif c Assessment data were compared to existing spatial data of Curaçao and other Caribbean islands. Combining these data provided insights in the natural and anthropogenic impacts on the health of Curaçao's reefs. Whilst Curaçao's reefs are degrading, they are still amongst the healthiest reefs in the Caribbean particularly around Klein Curaçao and Oostpunt.

Curaçao faces three major challenges to restore the health and status of their reefs:

1. Coral cover decreased over 50% between 1982 and 2015. This trend could have a serious negative impact on Curaçao's tourism industry.
2. Declines in f sh populations, especially predatory f sh, is a cause for concern as this can have serious ecological consequences
3. Water pollution is mainly caused by land-based sources, such as sewage and runoff. The discharge of sediments, pollutions, excessive nutrients are having a negative impact on Curaçao's mangroves, seagrass beds and coral reefs. -

The Waitt Institute used this work to develop a Sustainable Ocean Policy for the island of Curaçao and they presented these recommendations to the Government of Curaçao in August 2016 (Figure 2). They are currently under review by the Government of Curaçao.

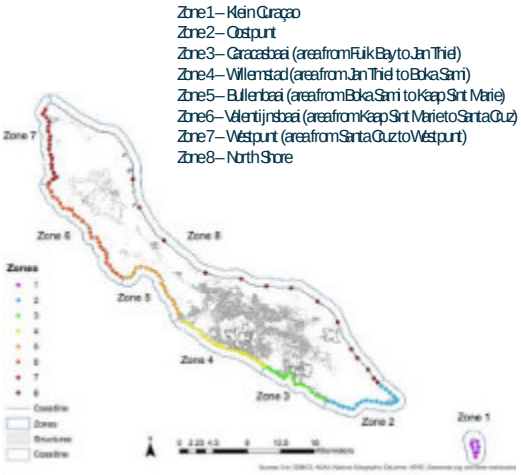


Figure 1. Based on the marine expedition eight zones with similar ecological conditions were identified and used for creating maps. In the Marine Scientific assessment report maps can be found with coral cover, juvenile cover density, turf- and macroalgae, f sh biomass, infrastructure, sewage, trash, f shing pressure and diving pressure per zone.
Sources: Esri, GEBCO, NOAA, National Geographic, Delorme, HERE, Geonames.org, and other contributors

The recommendations include:

- The protection and restoration of marine ecosystems through the creation of Marine Protected Areas around Klein Curaçao, Oostpunt and Caracasbaai, with Oostpunt identified as the most important area (Figure 2).
- Improvement of domestic fisheries for example by improving Curaçao's ability to implement fisheries laws related to gear usage and permits, as well as protection of key species, development of robust 'territorial use rights for fisheries (TURF's)' system and collecting more fishery research and monitoring data.
- The treatment of sewage waste particularly in the Willemstad area and the need for more research and monitoring data on water quality.

Marine spatial planning (science and public-based planning for sustainable use of the marine area) and coordinated ocean governance (inter-ministerial collaboration) are necessary as well as the development of long-term financial systems for the implementation of the sustainable ocean policy, for example through the introduction of tourist fees.

Other components of the work completed by the Waitt Institute and partners, which will contribute to the successful implementation of the Sustainable Ocean Policy are community consultations, an analysis of Curaçao's legal system, a marine science literature review and an economic valuation of the island's marine resources.

From 7 to 17th of November 2016, the Waitt institute together with the Sandin Lab (SIO), STENAPA, SCF, NFSXM and CARMABI took part in a marine expedition to St. Eustatius, Saba and St. Maarten. The team made on average seven dives a day monitoring the islands' coral reef ecosystem using the Global Coral Reef Monitoring Network (GCRMN) protocol, a data collection method developed by Caribbean GCRMN members to make their data useful for local and regional understanding of status and trends of Caribbean coral reefs. Data on the following ecosystem components was collected:

1. Abundance and biomass of key reef fish taxa
2. Relative cover of reef-building organisms (corals) and their dominant competitors
3. Assessment of coral health
4. Coral recruitment
5. Abundance of key macro-invertebrate species
6. Water quality

It is anticipated that the marine scientific assessment report will be become available at the end of 2016 on their website (http://waittinstitute.org/bluehaloinitiative/curacao/) and in the Dutch Caribbean Biodiversity database (www.dcbd.nl).

Blue Halo Curaçao is expected to run till 2019 and you can follow their activities and achievements on twitter, instagram, youtube, vimeo, facebook and website: (http://waittinstitute.org/bluehaloinitiative/Curaçao).

BLUE HALO CURAÇAO

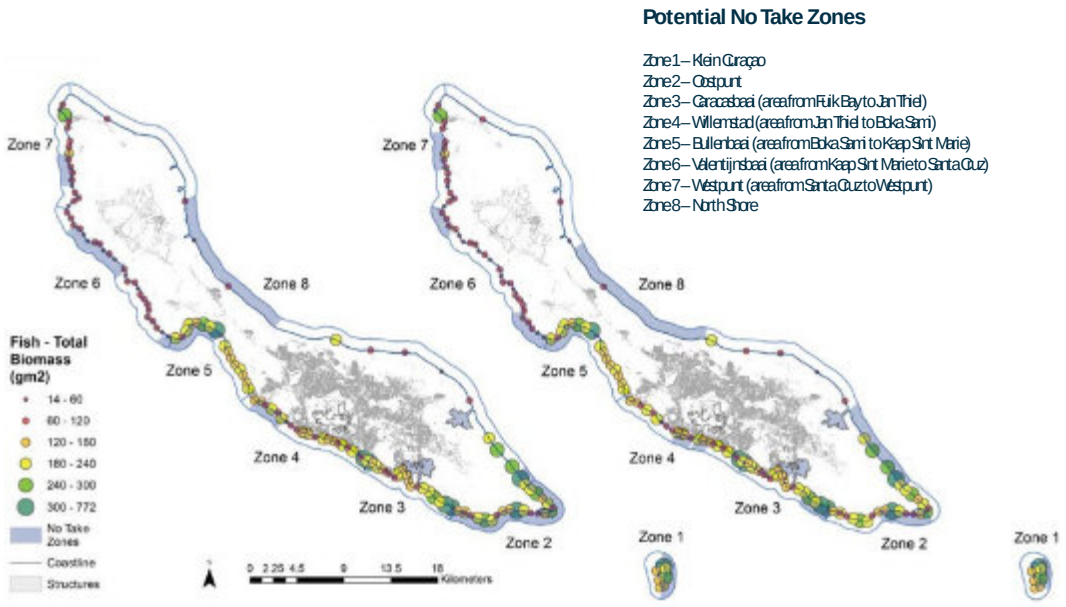
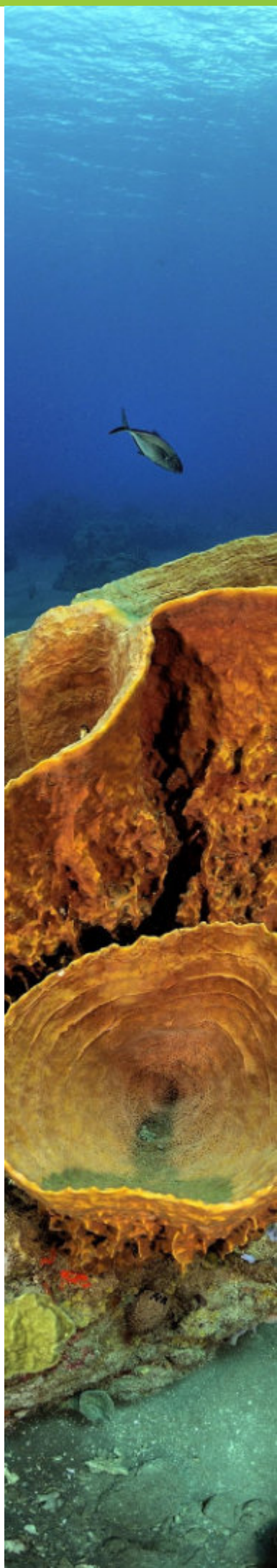


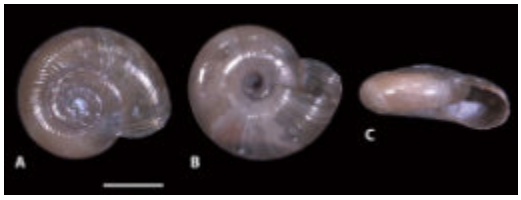
Figure 2: Potential Marine Protected Areas (MPAs) around Curaçao. The map on the left is created to optimize conservation of fish biomass and the map on right also includes the preservation of the most highly valued fishing and diving areas.



Naturalis Expedition to St. Eustatius: discovering a new species of land snail

Since 2010 the tiny island of Sint Eustatius, or Statia, as it is known locally, has been a special municipality of the Netherlands. And despite being part of the Kingdom of the Netherlands for over three centuries, the biodiversity of the islands has not been well studied. For this reason Naturalis sent two expeditions to the island in 2015 to explore both the marine and terrestrial biodiversity. The expeditions lead to the discovery of an abundance of new species.

From 2nd – 18th October, an interdisciplinary team of 28 scientists and seven students from Leiden University alongside two park rangers from the St. Eustatius National Parks Foundation (STENAPA) explored and documented the biodiversity of St Eustatius. Their work was facilitated both by STENAPA and by the newly established Caribbean Netherlands Science Institute (CNSI) and their staff, providing essential knowledge, assistance, accommodation, lab space and work areas.



Shell of the new snail species (scale bar 2 mm).
Photo credit: Ton de Winter (Naturalis)

Besides scientists from Naturalis, specialists from different Dutch Universities and organisations were present such as the Netherlands Mammal Society, RAVON foundation (specialized in reptiles, amphibians and fresh water fish) and Netherlands EIS foundation (specialized in insects).

A variety of research methods were used to collect data on plants, insects, mollusks, birds, reptiles and mammals in and around 11 pre-selected plots of 25 x 25 meters in different vegetation types. Methods included automatic camera systems, netting and 250 ground traps to collect insects and invertebrates. Besides creating a complete species database for St. Eustatius, the researchers aimed to combine all data to discover linkages between different species. For example whether areas with the highest density of birds also contains the highest density of plants and insects. This can help to identify which areas and species are interesting for protection.

More than 80 new plants and animals were discovered including beetles, flies, bees, snails, birds and bats. Most of these species are already present on the other Caribbean islands, but had not been documented on St. Eustatius. Additionally several possible species new to the Caribbean or science have been collected. These have been brought to the Netherlands for further investigation including DNA techniques.

Last month a species new to science was identified from this collection. During the expedition, a land snail, recorded as empty shells in the 1980's under a provisional name, was rediscovered alive. Study of the soft parts morphology and DNA allowed Ton de Winter (Naturalis), Sylvia van Leeuwen (ANEMOON foundation) and Ad Hovestadt to establish the systematic position of this approx. 5 mm-sized snail as member of the family of Glass snails (Oxychilidae). The soft parts characters and shell morphology could not be matched with that of any validly named species, and the species was described as a new species, *Glyphyalus quillensis*. The name *quillensis* comes from the Quill volcano, where this snail was found and is restricted to the forested upper slopes and crater bottom, the least disturbed habitats on Statia.

The species has so far only been recorded from Statia, but it may also occur on the adjacent Caribbean islands of St. Kitts, Saba and Puerto Rico, where the presence of similar forms has been reported in the past, but of which no or insufficient material was available. It is suggested that the species is potentially of conservation value and may be used as indicator of habitat quality. The description of this new species is published on 8 October, 2016 in Basteria, journal of the Dutch Malacological Society.

*Text on *Glyphyalus quillensis* provided by Ton de Winter (Naturalis)

Habitat of the snail on the Quill crater bottom.
Photo credit: Ton de Winter (Naturalis)

Naturalis Marine Expedition: Results marine biodiversity of St. Eustatius

By Bert W. Hoeksema (Naturalis Biodiversity Center, Leiden, The Netherlands) and Niels Schrieken (Monitoringproject Onderwater Oever (MOO), Anemoon Foundation, The Netherlands)

In September, a report on the preliminary results of the Statia Marine Biodiversity Expedition (from June 2015) was published. This expedition served as the f rst extensive baseline study to explore the marine biota of St. Eustatius, a small island belonging to the Caribbean Netherlands on the boundary between the eastern Caribbean Sea and the West Atlantic. Various undescribed species were discovered during the expedition. In addition, already described species were reported that previously were not known to occur in the Caribbean or even in the Atlantic Ocean.

The expedition was organized by Naturalis Biodiversity Center in Leiden in collaboration with Stichting ANEMOON, a Dutch organization of citizen scientists and would not have been possible without the help and support of local partners including Caribbean Netherlands Science Institute, STENAPA and Scubaqua Dive Center.

The report contains many new species records for St. Eustatius, which were sampled from approximately 70 f eld stations by 22 scientists (including students and citizen scientists) over a depth range of 0-30 m.

The total number of observed species are approximately:

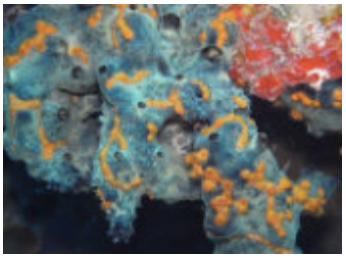
- N BDSPBMMBF TFBX FFE
- TQPOHFT
- TUPOZDPSBNT
- PDUPDPSBNT
- FODSVTUBDIBOFN POFT[P- antharians),
- I ZESPJET
- TFB BOFN POFT BOE DPSBMM morpharians,
- QPMZDI BFUFX PSN T
- EFDBQPET TI SN QT DSBCT lobsters),
- UVOLDBUFT
- TBN QMFTPGBTTPDJBUFE DP- pepods,
- OVN FSPVT BTTPDJBUFE BN QI J-

A green turtle resting in between octocorals near sea grass beds at Double Wreck. *Photo credit: Bert W. Hoeksema, Naturalis.*

Netherlands. This information will serve as a baseline for future marine biodiversity assessments.

Meanwhile various articles about expedition results have been published online in scientific journals. Most of these articles will appear in the printed version of a special issue on Caribbean coral reefs of the scientific journal Marine Biodiversity at the end of 2016 with papers on fish, algae, and hydrozoans. Other papers will address associations and interactions among different species. One of the newly discovered species (a sand-dwelling amphipod) will be described as new to science: *Microcharon quilli* Vonk and Lau, 2016. The special issue will also include some articles on coral reef research carried out on Curaçao.

The report is available from the repository of Naturalis Biodiversity Center, Leiden: www.repository.naturalis.nl/record/616970 and can also be found in the Dutch Caribbean Biodiversity Database: www.dcbd.nl/document/marine-biodiversity-survey-st-eustatius-dutch-caribbean-2015.



Strings of zoantharian polyps living in a sponge, Chien Tong wreck. *Photo credit: Bert W. Hoeksema, Naturalis.*

Fireworm eating from a gorgonian coral on the Chien Tong wreck. *Photo credit: Bert W. Hoeksema, Naturalis.*