

BIONEWS

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Editor's Letter

Dutch Caribbean, October 2017

An increase in the number and strength of storms in the Caribbean region has emerged as one of the most significant threats for the coral reefs in the area. In this issue of BioNews, we take a closer look at the island of Saba and the impact of Hurricanes Irma and Maria. The Saba Conservation Foundation (SCF) conducted an initial assessment of the damage caused to the island's reefs and their vegetation on land. Dive schools, volunteers, interns and other community services assignees have been assisting SCF in the assessment and restoration of impacted reefs and hiking trails. We report on their findings, which indicate among others that the reefs appeared to have incurred limited damage.

The last inventories of invasive species of the Dutch Caribbean counted a staggering 211 exotic alien species in the wild. Invasive species are a significant issue for islands, where fragile native species often cannot compete or become the prey. Rats are by far one of the most damaging species that humans have introduced to islands in the Caribbean. Not only do they threaten the survival of native plant and animal species but they also pose a great health risk to the island's inhabitants. St. Eustatius has a serious rat problem with no control system in place, until now. We are happy to report on a two-year rat control project

for the island funded by Netherlands's Ministry of Economic Affairs through the Nature Fund and facilitated through the Caribbean Netherlands Science Institute (CNSI).

On Bonaire, invasive seagrass species have been the focus of a new study in Lac, where seagrasses are a key foraging habitat for endangered green sea turtles. The invasive seagrass species *Halophila stipulacea*, which originates from the Red Sea, is proliferating in the area and competing for space with the native seagrass species *Thalassia testudinum*. We provide an overview of the study, which investigates how ecosystem services and sea turtle populations will be affected.

The introduction of predators on St. Eustatius, notably cats and dogs, combined with other stressors including hunting and habitat loss have all contributed to the island's local iguana becoming endangered. We link to a video message from the Lesser Antillean Iguana released by the St. Eustatius National Parks Foundation (STENAPA) to bring attention to the plight of this reptile.

Happy reading!
The DCNA Team

Saba: Hurricane Impacts

Assessment of Reefs and Trails after Hurricanes underway on Saba

Since the passage of hurricanes Irma and Maria through the windward islands, the staff of the dive operators on Saba, comprising Saba Divers, Sea Saba and Explorer Ventures, interns and volunteers have been actively assisting the Saba Conservation Foundation (SCF) with the assessment and first restoration of Saba's coral reefs, the reefs on the Saba Bank National Marine Park as well as essential trail maintenance and clearance. These efforts are being supported by the Dutch Caribbean Nature Alliance (DCNA), the Wereld Natuur Fonds (WNF) and the Dutch Ministry of Economic Affairs.

Marine Park

Staff members of SCF were relieved to see that initial results indicated that Saba's deep reefs coped surprisingly well with the storm surges. Even shallow inshore dive areas suffered only limited damage. Photos taken at key sites, in depths between 6 and 20 meters (20 to 65 feet) showed healthy intact reefs. More exposed reefs, like Diamond Rock, had some sections which were wave impacted, while minimal effects could be observed around Green Island to the north.

After initial assessments, coral restoration work involved reattachment of broken coral fragments to the substrate and transfer of smaller fragments to the undamaged coral nursery. This will be followed by extensive surveying of 50 representative sites in the Saba National Marine Park and 25 sites on the Saba Bank, according to standards as set forth by the Global Coral Reef Monitoring Network (GCRMN), which will allow comparative assessments to be made with data collected in previous years. To further improve the resilience of the reefs around Saba a final phase is planned which will include intensified removal of invasive lionfish, utilizing innovative traps in depths scuba divers cannot reach, as well as dive and yacht mooring maintenance or replacement.

Island and hiking trails

Not surprisingly a high percentage of the vegetation on Saba was impacted by the hurricanes with the majority of trees having lost their foliage. On a positive note, nearly all of the magnificent mountain mahogany trees on Mount Scenery are still standing and doing well after the storms.

SCF staff, trail rangers, interns, volunteers and other community services assignees have made tremendous progress towards clearing Saba's historic trail network. The path to the top of Mount Scenery has almost been restored, as well as large parts of other prominent tracks and scenic views. It is envisioned to have all major trails reopened before the start of the upcoming tourism season in mid November.

Initial restoration has included attempting to preserve monumental trees in the nature reserves, by properly pruning broken branches and sealing off cuts, to speed up their healing and regrowth process. In a later phase it is hoped to establish tree nurseries to aid rejuvenation of Saba's unique cloud forest.

The future

"There is certainly no way to deny that we are in a climate change. We have to prepare ourselves for more severe storms in the next decades," Kai Wulf (manager of SCF) warned. Wulf said what the outside world can do to support Saba is, "not cancel their plans. They should come to the island if they love the island that much. Even though everything will not be perfectly back up, but to keep our economy going this helps everybody. We rely on fees from tourists. If there are no dive fees or nature fees we would not be able to operate either. So everything is totally interlinked." (Durand, 2017)

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St. Eustatius: Rat Control Program

Introduced predators such as cats, dogs, and rats can be found all over St. Eustatius and are a primary threat to the island's biodiversity. Rats, which are not limited to urban areas, can be found all the way up to The Quill and have become an especially challenging issue as they not only threaten the survival of native plant and animal species but also potentially pose a serious health risk to the island's inhabitants. Thanks to funding from the Netherlands Ministry of Economic Affairs under their Nature Fund initiative, a two-year rodent control project facilitated through the Caribbean Netherlands Science Institute (CNSI), was launched in early 2016 on St. Eustatius.

The goal is to establish a rat control program in key biodiversity and residential areas that will lead to a decrease in density of rats in those areas. The two project leaders are CNSI's Hannah Madden and Dr. Teresa Leslie from the Eastern Caribbean Public Health Foundation (ECPHF), in close cooperation with St. Eustatius National Parks (STENAPA) and the St. Eustatius Public Health Department. From February 2019, the Public Health Department will continue implementing the program to ensure its long-term success.

St. Eustatius' Black Rat (*Rattus rattus*) population, which most likely arrived in the Americas in the mid-1500s on the ships of early European explorers (Leslie & Madden, 2015), has firmly established itself on the island and poses a threat to its biodiversity. Rats consume everything from native plants, flowers and fruits to agricultural products, which according to Madden "could very well result in a reduction of the number of different plants and animals found on St. Eustatius, which has been documented on other rat-infested islands" (Saint Martin News Network). Rats eat eggs, and for this reason are one of the most serious threats to island seabird populations worldwide (Sarmiento et al., 2014; Jones et al., 2008). On St. Eustatius camera traps have documented egg predation by rats at Red-billed Tropicbird nesting cavities (Madden & Ellis, 2013; Madden, 2014; Madden, 2015). This is significant as St. Eustatius,

along with Saba, is an important breeding area for Red-billed Tropicbirds, with estimates of 100 to 200 tropicbirds breeding and nesting each year in St. Eustatius's coastal areas. Not only are the nests easily accessible to rats, but Tropicbirds are especially vulnerable to egg predation due to its single egg clutch size.

Beyond the impact of rats on biodiversity, there is a real fear that they could carry "potential diseases which pose a direct risk to human and animal health" explains Dr. Leslie. "The bacterial disease leptospirosis¹, which is often associated with rats, poses a serious threat in the Caribbean and is not adequately documented" (Saint Martin News Network).

Data on rat ecology is being collected to ensure that the rat-control program will target the correct areas. Such data includes density and distribution of rats as well as their specific biodiversity impact. Hannah Madden, who is spearheading the project's efforts to protect St. Eustatius's biodiversity from rats, spent time this July 2017 with Elizabeth Bell, senior ecologist from New Zealand's Wildlife Management International Ltd. and a leading expert on invasive species control, to learn more about rat control. Together they installed tracking tunnels in one area of the Quill National Park to assess rodent presence and density, whereby 60% of the tunnels documented rat prints. Dr. Teresa Leslie, who is spearheading the project's investigation into the public health threat of rats, is collaborating with the Ross University School of Veterinary Medicine in St. Kitts to gather data on what pathogens the rats may be carrying. A team of nine scientists, led by Dr. Sree Rajeev, visited St. Eustatius earlier this year and carried out necropsies on caught rats. The collected kidney samples were tested for the presence of the spirochaete bacteria that cause leptospirosis and which can be spread by rat urine. The results provided possible evidence of leptospirosis circulating among the rodent population, but more data is needed to have conclusive results.

¹ Leptospirosis is an infection caused by bacteria called *Leptospira*, a genus of spirochaete bacteria. Symptoms of infection with *Leptospira* may range from none to mild such as headaches and fevers, but can also be severe such as kidney failure and bleeding into the lungs (World Health Organisation, 2003).

While St. Eustatius's inhabitants are aware of the rat infestation issue, there currently is no systematic control system beyond the personal use of rat poison (Leslie & Madden, 2015). On many other Caribbean islands the mongoose (*Herpestes auro-punctatus*) was introduced to control the island's rat population. These efforts have been unsuccessful as mongoose are a diurnal species, whereas rats are nocturnal. In many cases this has led to the decimation of birds and small animal populations. Baited programs have had great success at controlling and eradicating rat populations, and rodenticide baits have been used to eradicate rats on more than 20 other Caribbean islands without harming native wildlife (Dasgupta, 2016). The baiting program on St. Eustatius began this September 2017 in the Pilot Hill area, a known nesting site for red-billed tropicbirds. The public is being warned not to consume land crabs collected from the treatment areas for up to one year due to possible second-hand poisoning. Whilst crabs are not affected by the bait, it can accumulate in their flesh. Monitoring will then take place to measure the effectiveness of

control. Bell Laboratories, Inc, a manufacturer of rodent control products, which supports a number of rat extermination projects on other islands, generously donated supplies of rodenticide and bait stations to the project. The residential baiting program will begin in November 2017 and will be a joint effort between the Eastern Caribbean Public Health Foundation and the St. Eustatius Public Health Department.

An essential component of the rat control program is to consistently involve and cooperate with government departments, community members and local stakeholders (Leslie & Madden 2015). Their involvement will not only help ensure the programs success but also its sustainability. Community members must be involved and feel empowered and clearly understand that they are a key component of solving the island's rat problem. Ongoing outreach activities include lectures and seminars for the public. The key message: rats are a culprit for decreasing biodiversity, and biodiversity is vital for island and population (human) health (Leslie & Madden, 2015).

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Fieldwork on Seagrass Ecosystem Services: Lac, Bonaire

Seagrasses are essential components of coastal zones ecosystems due to their extremely high productivity and the high biodiversity they support. Inside Lac, Bonaire, seagrasses cover the sea floor and provide a key-habitat to a growing population of endangered green sea turtles (*Chelonia mydas*).

Invasive seagrass *Halophila stipulacea* (originating from the Red Sea) appears to be outcompeting native seagrasses such as *Thalassia testudinum*. Using 49 fixed locations, we observed that between 2011 and 2015 the occurrence of *H. stipulacea* in the bay increased significantly from 6% to 20% while native *T. testudinum* occurrence decreased significantly from 53% to 33% (Smulders et al., 2017). The consequences for the

seagrass ecosystem services are still not known. In February 2017, several fieldwork projects were conducted on seagrass ecosystem services and foraging behaviour of sea turtles in Lac by a team of local experts (Sabine Engel, STINAPA and STCB), together with researchers from Groningen University, NIOZ and NIOO led by Marjolijn Christianen¹.

The project included the final measurements of a sea turtle-exclosure study which was established in Lac in 2015. Plots excluded turtle grazing in order to study the impact of grazing on the different seagrass species and the expansion of the invasive seagrass. Although results are still being analysed, first results show that grazing may impact the expansion rate of the invasive seagrass. A day after

¹ *co-PI NWO program Ecology and conservation of green and hawksbill turtles in the Dutch Caribbean.

the sea turtle-exclosure cages were removed, the long *T. testudinum* leaves were already cropped by the turtles.

Seagrasses can stabilize sediments, resulting in clear water and the dampening of waves. Sediment stabilisation and hydrodynamics depend on interactions with plant cover, different vegetation types and grazing activity. This can be studied in "flumes", where water currents and waves are mimicked and this work is most often conducted in laboratory environments. In Lac, the first prototype of a portable wave-flume in the field alongside a current-flume was tested. This project was executed by a team from the Royal Netherlands Institute of Sea Research (NIOZ) led by Prof. Tjeerd Bouma with PhD students Rebecca James (NWO SCENES project) and Jaco de Smit. First results show that sediment stabilisation is closely correlated with the amount of above ground biomass, with ungrazed *T. testudinum* being very effective at stabilising sediment. Whereas *H. stipulaceae* and heavily grazed *T. testudinum* provide no significant stabilisation of the surface sediment when exposed to waves or currents.

In the last 2 years, several green sea turtles were tagged with satellite transmitters to study their movement in foraging habitats in the Dutch Caribbean. In Lac, green sea turtles spend much of the daytime grazing on seagrass meadows and they often revisit the same site. They maintain their own underwater gardens and clip the grass short so that they can eat nitrogen rich fresh leaves. These turtle "gardens" were checked and monitored for species cover, grazing marks and isotope samples were collected. At night, the sea turtles return to the reef outside of the bay to rest.

Also a pilot experiment was installed to test the use of "BESE-elements", biodegradable potato starch polymer structures (<https://www.bese-elements.com>) for seagrass restoration. This work is part of a global initiative and the BESE-elements are currently being developed and tested by Bureau Waardenburg and Radboud University. A 1m² biodegradable structure is installed either below the sediment or on top of the sediment and seagrass shoots (*T. testudinum*) are planted in the middle. Instead of transplanting large seagrass patches, this method temporarily facilitates seagrass growth of a few shoots by simulating positive feedback mechanisms (e.g. reducing hydrodynamics, predation or macroalgae cover). Once seagrass becomes established, the BESE-elements are expected to completely break down in situ leaving newly established seagrass beds.

Sabine Engel (STINAPA) is monitoring the BESE-elements and the results are encouraging. *"Since the deployment of the BESE-elements the site has been revisited 8 times. In the beginning the rhizomes and shoots looked as if they were wasting away, but now we can see that some rhizomes have been established, and new shoots are appearing. The BESE-elements have been placed on top and in the sediment, and a difference in success and growth is already evident. We will monitor the site for one full year. Best results so far were found where the BESE-elements have been placed in the sediment. The places where BESE-elements were placed on top of the substrate are doing reasonable. There is no more seagrass in the control sites, where the rhizomes were placed without the BESE-elements."* (Sabine Engel, personal communication).



Nederlandse Organisatie
voor Wetenschappelijk Onderzoek

This project is funded by NWO.
Involved organisations: Radboud University, Bureau Waardenburg, STINAPA, STCB, NIOZ, and NIOO.

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Video Message from St. Eustatius's Local Iguana

St. Eustatius National Parks Foundation (STENAPA) has released a video message from the endangered Lesser Antillean Iguana. Developed by Veldkijker, wildlife film and photography studio, this video gives St Eustatius's local iguana a voice. It details the many threats that the Lesser Antillean Iguana faces which are pushing it closer to extinction. The voice in the video is calling on residents of St Eustatius and the international community to eliminate these threats.

You will find the video on our Youtube channel here: <https://www.youtube.com/watch?v=N-QDxUle5jc>

STENAPA and RAVON are working together to ensure the long-term survival of the Lesser Antillean Iguana as a flagship for the unique biodiversity of St. Eustatius, and perpetuating it as a symbol of pride for the people of the island.

Want to know more about this conservation program?

Please visit: <http://www.SOSiguana.org>

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Research Overview

October 2017

CATEGORY	SUBJECT	ISLANDS	ORGANIZATION(S): LEAD SCIENTIST
Birds	Suitability study and re-forestation of exclosures facilitating the Yellow-shouldered Amazon Parrots (<i>Amazona barbadensis</i>) on Bonaire	BON	Echo: Lauren Schmaltz, Quirijn Coolen
Coral Reef ecosystems	Surveys (based on AGRRA and GCRMN) for the assessment of fish and benthos communities including corals, algae, sponges to 20 m depth	BON	WUR: Erik Meesters Student: Roger Meijs, Sil Piek, Sarah Veillat, Yun Scholten
Coral Reef ecosystems	Coral-associated fauna of Curaçao	CUR	Naturalis: Bert Hoeksema Leiden University CARMABI
Economics of ecosystems	The Economics of Ecosystems and Biodiversity (TEEB) on Aruba	AUA	Wolfs Company: Esther Wolfs, Boris van Zanten VU: Pieter van Beukering YABI consultancy: Francielle Laclé
Environmental damage	Environmental Damage after Hurricane Irma and Maria	SAB EUX SXM	SCF: Kai Wulf STENAPA: Clarisse Buma NFSXM: Tadzio Bervoets

CATEGORY	SUBJECT	ISLANDS	ORGANIZATION(S): LEAD SCIENTIST
Erosion	Assuring the adoption of soil conservation measures: The case of a small island	SAB	WUR: Jesse Opdam (student), Michel Riksen, Aad Kessler SCF Agriculture Department of Public Entity Saba
Fish	Baited Remote Underwater Video (BRUV) to study sharks	BON	WUR: Erwin Winter, Dolfi Debrot, Martin de Graaf, Twan Stoffers STINAPA HAS: Mavelly Velandia (student) WUR: Sander Delacauw (student)
Fish	Distribution of local and regional surgeonfish disease using a novel technique - Google Images.	BON	CIEE: Rita Peachey, Franziska Elmer, Madeline Roth, Lucia Rodriguez, Sasha Giammetti, Megan Hoag
Fish	Identification of the parasite and hosts of the turbellarian infecting reef fish species in Bonaire	BON	University of North Texas: Zac Kohl (PhD Candidate) CIEE: Franziska Elmer; Rita Peachey; Lisa Kram; Ashley Novak; Andrew Paton
Fishery	Mas Piska pa Boneiru	BON	KITLV, Leiden University: Stacey Mac Donald (PhD student) (Funded by WWF - Netherlands & KITLV / Royal Netherlands Institute of Southeast Asian and Caribbean Studies)
Invasive species	Research into mitigation measures for Sargassum Seaweed	SXM	NFSXM: Tadzio Bervoets Government of St. Maarten
Invasive species	Environmental DNA (eDNA) of lionfish in Lac Bay: A tool for detecting the invasive species in complex habitats (mangroves)	BON	CIEE: Rita Peachey Indiana University: Stephen Glaholt
Mangrove ecosystems	Pilot-scale testing and evaluation of mangrove ecosystem intervention options (fish fauna, epibionts on mangrove prop roots) *Part of Nature Funding Project: Ecological restoration Lac Bay and South coast, Bonaire	BON	WUR: Dolfi Debrot, Douwe Boerstra (student), Laura Timmerman (student) STINAPA: Sabine Engel

CATEGORY	SUBJECT	ISLANDS	ORGANIZATION(S): LEAD SCIENTIST
Nature Policy Planning	Developing a nature policy plan for Bonaire	BON	Wolfs Company: Boris van Zanten, Esther Wolfs, Sacha van Duren DRO
Plants	Exclusion of invasive herbivores: A comparison study of vegetation at Roi Sango.	BON	Echo: Quirijn Coolen WUR: Pieter Zuidema, Jessie Foest (student)
Plants	Germination of seeds of indigenous trees of Curaçao	CUR	CARMABI: John de Freitas
Plants	Testing effective ways to grow native plants	BON	Echo: Quirijn Coolen, Johan van Blerk

Long term projects

CATEGORY	SUBJECT	ISLANDS	ORGANIZATION(S): LEAD SCIENTIST
Coral Reef Ecosystems	Deep Reef Observation Project (DROP) (ARMS: Autonomous Reef Monitoring Structures)	CUR	Smithsonian: Carole Baldwin
Coral Reef Ecosystems	Postsettlement dynamics of Caribbean corals & Reef restoration	CUR	UvA: Valerie Chamberland (PhD candidate) CARMABI SCORE International
Coral Reef Ecosystems	Bioerosion of reefs by coral-excavating sponges	BON, CUR, SAB, EUX	NIOZ: Fleur van Duyl WUR: Erik Meesters, Didier de Bakker (PhD student)
Coral Reef Ecosystems	Development of restoration methods for threatened Caribbean coral species	BON, CUR, SAB	CRF Bonaire: Augusto Montbrun, Francesca Viridis SCORE Project CARMABI: Mark Vermeij UvA: Valerie Chamberland (PhD candidate) SCF, Sea Saba, Samford University: Jennifer Rahn

CATEGORY	SUBJECT	ISLANDS	ORGANIZATION(S): LEAD SCIENTIST
Coral Reef Ecosystems	Developing a plan to manage the waters around Curaçao sustainably, profitably, and enjoyably for this and future generations - including mesophotic reef dropcam project	CUR	Waitt Institute (Blue Halo Curaçao): Kathryn Mengerink
Database	Dutch Caribbean Species Catalog: Taxonomic knowledge system Dutch Caribbean (http://www.dutchcaribbean-species.org/)	All	Naturalis: Sander Pieterse & Berry van der Hoorn
Environmental	Effects of dispersants on the fate of oil in realistic conditions (C-IMAGE consortium, TripleP@ Sea Program)	EUX	WUR: Tinka Murk, Marieke Zeinstra-Helfrich (PhD student) CNSI
Environmental	Ecotoxicological aspects of rational application of chemicals in response to oil spills to reduce environmental damage Development of an area specific net environmental and economic benefit analysis (NEEBA) to support oil spill mitigation decisions; with St. Eustatius as example	EUX	WUR: Tinka Murk, Sophie Vonk (PhD student) Lei Wageningen UR: Stijn Reinhard CNSI
Interstitial biodiversity	Moleculaire biodiversiteit analysis of marine communities by metabarcoding	EUX	Naturalis: Arjen speksnijder ANEMOON: Niels Schrieken
Invasive species	Combatting the economic and ecological impacts of overgrazing on inhabited islands	BON	UsA: Michaela Roberts (PhD student)

CATEGORY	SUBJECT	ISLANDS	ORGANIZATION(S): LEAD SCIENTIST
Marine ecosystems	Taxonomy and biodiversity in Lac Bay	BON	STINAPA Sabine Engel, Caren Eckrich Ecosub: Godfried van Moorsel CEAB: Daniel Martin
Marine ecosystems	Marine species discoveries in the Dutch Caribbean	All	Naturalis: Bert Hoeksema CNSI CARMABI
Molluscs	Population dynamics and role in the food chain of the Queen Conch <i>Lobatus gigas</i> in the Dutch Caribbean Territories	EUX, SAB, SXM	WUR: Aad Smaal, Leo Nagelkerke, Martin de Graaf Erik Boman (PhD student) SCF (SBMU): Ayumi Izioka CNSI
Public Health	DNA waterscan: Monitoring disease vectors in the Caribbean (mosquitoes and midges)	EUX	Naturalis: Kevin Beentjes ECPHF: Teresa Leslie
Sustainability	Sustainable development Dutch Caribbean (TripleP@Sea Program) - Are human activities a risk for ecosystem services? - Green Statia or how to regain balance between nature and agriculture?	EUX	WUR: Diana Slijkerman WUR (Alterra): Rene Henkens CNSI
Terrestrial biodiversity	Baseline assessments and DNA barcoding of biodiversity of St. Eustatius	EUX	Naturalis: Michael Stech, Berry van der Hoorn, Jeremy Miller STENAPA CNSI
NWO Projects in the Dutch Caribbean			
Bioproducts	Stand-alone production of algal products for food, feed, chemicals and fuels	BON	WUR: R.H. Wijffels CIEE: Rita Peachey
Coral Reef Ecosystems	Caribbean coral reef ecosystems: interactions of anthropogenic ocean acidification and eutrophication with bioerosion by coral excavating sponges - Bioerosion and climate change	BON, SAB, EUX	NIOZ: Fleur van Duyl, Steven van Heuzen (PostDoc), Alice Webb (PhD student) STENAPA CNSI

CATEGORY	SUBJECT	ISLANDS	ORGANIZATION(S): LEAD SCIENTIST
NWO Projects in the Dutch Caribbean			
Coral restoration	Artificial Reefs On Saba and Statia (AROSSTA)	SAB EUX	VHL: Alwin Hylkema, Marlous Heemstra WUR: Dolfi Debrot STENAPA: Jessica Berkel, Erik Houtepen SCF: Kai Wulf, Aymi Izioka CNSI: Johan Stapel Students: Callum Reid, Esmee vd Griend, Daniel Heesink
Environmental	Caribbean island biogeography meets the anthropocene	AUA, BON, CUR, EUX, SXM	VU: Jacintha Ellers, Matt Helmus, Wendy Jesse (PhD. Student), Jocelyn Behm (Postdoc) CNSI
Environmental psychology	Confronting Caribbean Challenges: Hybrid Identities and Governance in Small-scale Island Jurisdictions - Behavioral differences between/within the BES islands when it comes to nature conservation and cultural heritage.	BON, SAB, EUX	KITLV, Leiden University: Gert Oostindie (Project director) KITLV, Leiden University: Stacey Mac Donald (PhD student)
Geosciences	Stability of Caribbean coastal ecosystems under future extreme sea level changes (SCENES) - The effects of climate change on calcifying algae	BON, EUX, SXM	UU: Henk Dijkstra, NIOZ: Peter Herman, Rebecca James (PhD student) TU Delft: Julie Pietrzak STENAPA CNSI
Geomorphological	4D crust-mantle modelling of the eastern Caribbean region: toward coupling deep driving processes to surface evolution - Reconstructing past climate change	EUX	UU: Wim Spakman NIOZ: Lennart de Nooijer Alfred Wegener Institute Germany CNSI
Invasive species	Exotic plant species in the Caribbean: foreign foes or alien allies? (1) Socio-economic impacts of invasive plant species (2) Ecological impacts of invasive plant species-Utrecht University	BON, SAB, EUX	(1) UU: Jetske Vaas (PhD student), Peter Driessen, Frank van Laerhoven and Mendel Giezen (2) UU: Elizabeth Haber (PhD student), Martin Wassen, Max Rietkerk, Maarten Eppinga. CNSI

CATEGORY	SUBJECT	ISLANDS	ORGANIZATION(S): LEAD SCIENTIST
NWO Projects in the Dutch Caribbean			
Reptiles	Ecology and conservation of green and hawksbill turtles in the Dutch Caribbean	AUA, BON, CUR, SAB, EUX, SXM	RuG: Per Palsbøll, Jurjan van der Zee (PhD student) RU: Marjolijn Christianen, WUR: Lisa Becking STCB: Mabel Nava CARMABI STENAPA CNSI
Tourism and sustainable development	Vulnerability is dynamic: Enhancing adaptive governance to climate change for Caribbean tourism through interactive modelling	CUR	WUR: Jillian Student, Machiel Lamers UOC: Filomeno A. Marchena
BO-projects in the Dutch Caribbean (Min EZ)			
Coral Reef Ecosystems	BO-11-019.02-038– Analysis photomaterial coral reefs	BON, CUR	WUR: Erik Meesters
Coral Reef Ecosystems	BO-11-019.02-022 – Inventory corals Includes monitoring and research of the longest coral reef time-series in the world (since 1973)	BON, CUR	WUR: Erik Meesters
Conservation	BO-11-019.02-060 – Status of nature conservation of the Caribbean Netherlands (for new nature policy plan)	BON, SAB, EUX	WUR: Dolfi Debrot, Rene Henkens, Peter Verweij EZ: Paul Hoetjes, Yoeri de Vries (eds.)
DCBD	BO-11-019.02-002 - Expansion knowledge system Dutch Caribbean	AUA, BON, CUR, SAB, EUX, SXM	WUR (Alterra): Peter Verweij

CATEGORY	SUBJECT	ISLANDS	ORGANIZATION(S): LEAD SCIENTIST
BO-projects in the Dutch Caribbean (Min EZ)			
Fisheries	BO-11-019.02-055 – Fisheries Dutch Caribbean	SAB, EUX	WUR: Dolfi Debrot Thomas Brunel, Martin de Graaf SCF (SBMU): Ayumi Izioka NIOZ: Kimani Kitson-Walters Students: Fedor den Elzen, Ivo Damen
Marine biodiversity	BO-11-019.02-008 – Saba Bank – Marine biodiversity	SAB	WUR: Erik Meesters (benthic communities), Dolfi Debrot, Thomas Brunel, Leo Nagelkerke (fish stocks)
Marine mammals & sharks	BO-11-019.02-054 – Marine mammal sanctuary	SAB, EUX	WUR: Dolfi Debrot, Dick de Haan, Meike Scheidat, Ayumi Izioka SCF (SBMU): Ayumi Izioka
Marine mammals	BO-11-019.02-005 – Marine mammals in the Dutch Caribbean	BON, SAB, EUX	WUR: Dolfi Debrot
World Heritage nomination	BO-11-019.02-050 – World Heritage nomination Bonaire National Marine Park	BON	WUR: Dolfi Debrot Wolfs Co.: Esther Wolfs UNESCO: Josephine Langley DRO: Frank v Slobbe CARMABI: Mark Vermeij, John de Freitas Curacao Footprint Foundation: Leon Pors
“Nature Funding” Projects in the Dutch Caribbean (Min EZ)			
Coastal ecosystems (Lac Bay: Mangroves and seagrass beds)	Ecological restoration Lac Bay and South coast, Bonaire	BON	STINAPA: Sabine Engel WUR: Klaas Metselaar STCB: Mabel Nava DRO: Frank van Slobbe
Sustainable Agriculture	The sustainable agriculture and rural development program (POP Bonaire)	BON	Bonaire Agri & Aqua Business BV: Sherwin Pourier Wayaká Advies BV: Jan Jaap van Almenkerk DRO: Frank van Slobbe
Invasive species	Feral Pig Control	BON	Echo: Julianka Clarenda DRO: Frank van Slobbe
Reforestation	Reforestation Project	BON	Echo: Lauren Schmaltz, Quirijn Coolen DRO: Frank van Slobbe

CATEGORY	SUBJECT	ISLANDS	ORGANIZATION(S): LEAD SCIENTIST
"Nature Funding" Projects in the Dutch Caribbean (Min EZ)			
Invasive species	Goat eradication and control in Washington Slagbaai National Park	BON	STINAPA DRO: Frank van Slobbe
Coral ecosystems	Coral Restoration	BON	CRF Bonaire: Augusto Montbrun DRO: Frank van Slobbe
World Heritage nomination	World Heritage Nomination Bonaire Marine Park and/or other interconnected sites	BON	Wolfs Company: Esther Wolfs, Boris van Zanten, Amilcar Guzman, Viviana Lujan DRO: Frank van Slobbe
Terrestrial ecosystems	Erosion control and nature restoration	BON	Bonaire Agri & Aqua Business BV: Sherwin Pourier Wayaká Advies BV: Jan Jaap van Almenkerk DRO: Frank van Slobbe
Terrestrial ecosystems	Cave and karst nature reserve	BON	DRO: Frank van Slobbe CARIBSS: Fernando Simal
Nature communication	Campaign environment and nature on Bonaire	BON	DRO: Frank van Slobbe, Peter Montanus
Agriculture	Horticultral Project	SAB	Government of Saba: Randall Johnson
Recreation	Hiking trails	SAB	Government of Saba: Robert Zagers
Pollution	Tent Reef Protection	SAB	Government of Saba: Robert Zagers
Invasive species	Goat buy-back program	SAB	Government of Saba: Randall Johnson
	Yacht mooring project	SAB	Government of Saba SCF: Kai Wulf
	Saba national park	SAB	Government of Saba SCF: Kai Wulf SABARC: Ryan Espersen
	Crispeen trail project	SAB	Government of Saba: Robert Zagers SCF: Kai Wulf
Community outreach	Nature Awareness project	EUX	Government of St Eustatius STENAPA: Clarisse Buma CNSI: Johan Stapel, Hannah Madden

CATEGORY	SUBJECT	ISLANDS	ORGANIZATION(S): LEAD SCIENTIST
"Nature Funding" Projects in the Dutch Caribbean (Min EZ)			
Nature management	Strengthening management of nature	EUX	Government of St Eustatius STENAPA: Clarisse Buma
Invasive species	Rodent assessment and control	EUX	Government of St Eustatius CNSI: Johan Stapel, Hannah Madden ECPHF: Teresa Leslie
Coral ecosystems	Coral restoration	EUX	Government of St Eustatius STENAPA: Jessica Berkel CNSI: Johan Stapel
Erosion	Erosion control	EUX	Government of St Eustatius CNSI: Johan Stapel
EU-BEST funded Projects in the Dutch Caribbean			
Marine ecosystems	Marine Park Aruba	AUA	Directie Natuur en Milieu: Gisbert Boekhoudt TNO: Kris Kats
Coral Reef Ecosystems	Restoration Ecosystem Services and Coral Reef Quality (Project RESCQ)	SAB, EUX, SXM	WUR: Erik Meesters SCF STENAPA NFSXM Turks & Caicos Reef Fund Students: Niels Wagenaar, Silvan Allard, Pam Engelberts, Roxanne Francisca, Lotte Staat, Carmen Carpendale, Daniela Simal, Emma Louise Pratt, Renate Olie, Amber Mulder
Conservation	Watershed & Biodiversity Conservation of Roi Sangu valley	BON	Echo: Lauren Schmaltz, Quirijn Coolen
Terrestrial habitat restoration	Restoration of Key Biodiversity Areas of St. Maarten	SXM	EPIC (Project lead): Kippy Gilders Subcontractors: Les Fruits des Mer: Mark Yokoyama (reptile, amphibian, and invertebrate assessment) The Leon Levy Native Plant Preserve, Bahamas: Ethan Freid (plant assessment)

CATEGORY	SUBJECT	ISLANDS	ORGANIZATION(S): LEAD SCIENTIST
Birds	Flamingo Abundance	BON	DRO: Frank van Slobbe Cargill STINAPA: Paulo Bertuol
Birds	Monitoring vulnerable parrot nests (remote camera sensing work)	BON	Echo: Laura Schmaltz, Sam Williams
Birds	Yellow-shouldered Amazon parrot roost counts	BON	Echo: Lauren Schmaltz DRO: Peter Montanus STINAPA: Paulo Bertuol
Birds	Bird Monitoring (Caribbean Waterbird Census)	AUA BON SXM	FPNA DLVV: Tatiana Becker STINAPA: Paulo Bertuol EPIC: Adam Brown
Birds	Tern monitoring (artificial nesting islands)	BON	STINAPA: Paulo Bertuol Cargill DRO WUR: Dolfi Debrot
Birds	Terrestrial Bird Monitoring Program for Bonaire	BON	Echo: Lauren Schmaltz STINAPA
Birds	Red-billed Tropicbird monitoring	SAB EUX	STENAPA SCF: Kai Wulf
Birds	Pelican monitoring	SXM	NFSXM: Melanie Meijer zu Schlochtern
Coral reef ecosystems	Global Coral Reef Monitoring Network	BON CUR SAB EUX SXM	STINAPA: Caren Eckrich CARMABI: Mark Vermeij SCF (SBMU): Ayumi Izioka STENAPA: Jessica Berkel NFSXM: Tadzio Bervoets CNSI: Johan Stapel
Corals reef ecosystems	Doobies Crack reef damage recovery survey	EUX	STENAPA: Erik Houtepen
Corals reef ecosystems	Staghorn coral field monitoring survey	EUX	STENAPA: Jessica Berkel

CATEGORY	SUBJECT	ISLANDS	ORGANIZATION(S): LEAD SCIENTIST
Coral reef ecosystems	Monitoring and research of the longest coral reef time-series in the world (since 1973) (Part of BO-11-019.02-022 –Inventory corals)	BON CUR	WUR: Erik Meesters, Didier de Bakker (PhD student) NIOZ: Fleur van Duyl, Rolf Bak
Coral reef ecosystems	Coral reef monitoring (Since 2007 using AGRRA methods and filming of permanent transects)	BON	CIEE: Rita Pearchey
Environmental	Water quality testing	SXM	NFSXM: Tadzio Bervoets EPIC: Natalia Collier
Environmental	Nutrient (phosphate, ammonium, nitrate and nitrite) monitoring of St Eustatius' coastal waters	EUX	CNSI: Johan Stapel
Fish	Shark monitoring: - Shark sightings - Shark Abundance, distribution and movements (tagging, acoustic telemetry)	BON CUR SAB SXM EUX	WUR: Erwin Winter, Dolfi Debrot, Martin de Graaf STINAPA: Caren Eckrich CARMABI: Mark Vermeij SCF(SBMU): Ayumi Izioka STENAPA: Jessica Berkel NFSXM: Tadzio Bervoets
Fish	Spawning monitoring: Red hind surveys on Moonfish Bank	SAB	SCF (SBMU): Ayumi Izioka
Insects	Bee tracking	BON	Echo: Lauren Schmaltz
Invasive species	Goat and/or donkey removal: - Washington Slagbaai National Park - Lac Bay area (exclusion plots) - Quill National Park (exclusion plots)	BON EUX	STINAPA: Paulo Bertuol WUR: Dolfi Debrot DRO: Frank van Slobbe STENAPA
Invasive species	Lionfish abundance and control	BON CUR SXM SAB EUX	STINAPA: Paulo Bertuol (50 meter traps) CARMABI: Mark Vermeij NFSXM: Tadzio Bervoets SCF (SBMU): Ayumi Izioka STENAPA: Jessica Berkel

CATEGORY	SUBJECT	ISLANDS	ORGANIZATION(S): LEAD SCIENTIST
Invasive species	Monkey Monitoring: abundance and distribution	SXM	NFSXM: Tazio Bervoets
Invasive species	Feral pig population assessment (trapping)	BON	Echo: Nathan Schmaltz, Sam Williams
Mammals	Bat monitoring	AUA BON	FPNA WildConscience: Fernando Simal, Linda Garcia
Mammals	Dolphin monitoring (since 1999)	BON	Ron Sewell
Mammals	Caribbean Humpback Acoustic Monitoring Programme (CHAMP)	BON, AUA	NOAA: Heather Heenehan, Sofie Van Parijs, Peter Corkeron, Fred Wenzel STINAPA: Wijnand de Wolf AMMF: Angiolina Henriquez RCN: Paul Hoetjes
Mammals	Marine Mammal Monitoring (noise loggers Saba Bank)	SAB	WUR: Dick de Haan, Dolfi Debrot SCF (SBMU): Ayumi Izioka
Molluscs	Conch (<i>Strombus gigas</i>) on St. Eustatius, Saba Bank, Anguilla	SAB EUX	WUR: Martin de Graaf, Erik Boman (PhD student) SCF (SBMU): Ayumi Izioka
Natural resource use	Fishery monitoring (including lionfish, shark bycatch and marine mammal sightings) (* Part of BO-11-019.02-055 – Fisheries Dutch Caribbean)	SAB EUX	SCF (SBMU): Ayumi Izioka Gem City Consulting: Erik Boman LVV: Kiman Kitson-Walters WUR: Dolfi Debrot, Fedor den Elzen (student), Ivo (student) Damen
Plants	Phenology of bats in cacti landscapes of Aruba	AUA	WildConscience: Linda Garcia, FPNA
Plants	Monitoring of tree growth and survivorship in reforestation areas	BON	Echo: Quirijn Coolen, Nicholas Verhey
Plants	Terrestrial Habitat Monitoring Program for Bonaire	BON	Echo: Lauren Schmaltz

CATEGORY	SUBJECT	ISLANDS	ORGANIZATION(S): LEAD SCIENTIST
Reptiles	Lesser Antillean Iguana: Monitoring population density & removing invasive Green Iguana and hybrids	EUX	STENAPA RAVON: Tim van Wagensveld EcoPro: Hannah Madden
Reptiles	Boa and Cascabel Monitoring	AUA	FPNA, Toledo Zoological Society: Andrew Odum
Reptiles	Behavior of the endemic Aruban Whiptail lizard	AUA	FPNA, Auburn University: Jeff Goessling (PhD candidate)
Seagrass and mangrove ecosystems	Seagrass and mangrove monitoring (BON: also conch and benthic fauna)	BON SXM	STINAPA: Sabine Engel, Caren Eckrich WUR: Klaas Metselaar NFSXM: Tadzio Bervoets
Seagrass and mangrove ecosystems	Seagrass restoration BESE elements	BON	RU: Marjolijn Christianen STINAPA : Sabine Engel
Reptiles	Sea turtle monitoring: -Satellite tracking -Nest monitoring -In water surveys (BON, CUR, SXM) -Fibropapillomatosis presence (BON)	AUA, BON, CUR, SAB, EUX, SXM	TurtugAruba Foundation STCB: Mabel Nava CARMABI (STCC): Sabine Berendse STENAPA: Jessica Berkel SCF: Kai Wulf NFSXM: Tadzio Bervoets

Reports and Publications Overview

Hartmann, A.C., Marhaver, K.L.M., Vermeij, M.J.A. (2017)

Corals in healthy populations produce more larvae per unit cover, Conservation letter, 1-12, doi: 10.1111/conl.12410.

Student Reports

Van Bets, L.K.J. (2017) (PhD thesis)
Marine Communities. Governing oil, gas activities and cruise tourism in the Arctic and the Caribbean, 218 pages, DOI 10.18174/420861.

These reports and publications can be found in the Dutch Caribbean Biodiversity Database (DCBD) (<http://www.dcbd.nl>). The DCBD is a central online storage facility for all biodiversity and conservation related information in the Dutch Caribbean.

If you have research and monitoring data, the DCNA secretariat can help you to get it housed in the DCBD. Please e-mail us: research@DCNAnature.org

List of Acronyms

AUA	Aruba		
BON	Bonaire		
CUR	Curaçao		
SAB	Saba		
EUX	St. Eustatius		
SXM	St. Maarten		
AMMF	Aruba Marine Mammal Foundation		
BEST	Biodiversity and Ecosystem Services in Territories of European overseas		
CARIBSS	Caribbean Speleological Society		
CARMABI	Caribbean Research and Management of Biodiversity Foundation		
CEAB	The Blanes Centre for Advanced Studies, Spain		
CIEE	Council of International Educational Exchange, Bonaire		
CRF	Coral Reef Foundation		
DCNA	Dutch Caribbean Nature Alliance		
DCBD	Dutch Caribbean Biodiversity Database		
DRO	Directorate of Spatial Planning and Development, Bonaire		
DLVV (Santa Rosa)	Department of Agriculture, Livestock, Fishery and Farmers market (Santa Rosa), Aruba		
EcoPro	Ecological Professionals Foundation		
ECPHF	Eastern Caribbean Public Health Foundation		
EPIC	Environmental Protection in the Caribbean		
FPNA	Fundacion Parke Nacional Arikok, Aruba		
HAS	HAS University of Applied Sciences, the Netherlands		
LVV	Department of Agriculture, Animal Husbandry & Fisheries, St. Eustatius		
NFSXM	Nature Foundation St. Maarten		
		Naturalis	Naturalis Biodiversity Center, The Netherlands
		NIOO	Netherlands Institute of ecology (NIOO-KNAW)
		NIOZ	NIOZ Royal Institute for Sea Research, the Netherlands
		NWO	NWO Netherlands Organisation for Scientific Research
		RAVON	Reptielen Amfibieën Vissen Onderzoek Nederland
		RuG	University of Groningen, the Netherlands
		RU	Radboud University Nijmegen, the Netherlands
		SBMU	Saba Bank Management Unit
		SCF	Saba Conservation Foundation
		Smithsonian	Smithsonian's National Museum of Natural History
		STCB	Sea Turtle Conservation Bonaire
		STCC	Sea Turtle Conservation Curacao
		STENAPA	St. Eustatius National Parks Foundation
		STINAPA	National Parks Foundation Bonaire
		UsA	University of St. Andrews, Scotland
		UU	University of Utrecht, the Netherlands
		UvA	University of Amsterdam, the Netherlands
		VHL	University of Applied Sciences VHL, the Netherlands
		VU	VU University Amsterdam, the Netherlands
		Wildconscience	Wildlife Conservation, Science and Education
		WNF	World Wide Fund for Nature
		WUR	Wageningen University and Research Centre, the Netherlands
		WUR (Alterra)	Wageningen Environmental Research, the Netherlands

Calendar

November

6-10	Meeting	70th Meeting of GCFI, Merida, Mexico.
14	Workshop	Second workshop NICO expedition organized by NIOZ and NWO-Science, the Netherlands
16-17	Conference	Green Aruba, sustainability in motion, Aruba.
20-24	Meeting	2nd Meeting of the Advisory Committee and 2nd Workshop of the Conservation Working Group of the Sharks MoU, Habitat, Bonaire.
25	Event	Fundraising Auction (STCB) El Encanto Boutique Hotel, Bonaire.
26-01 Dec	Meeting	69th meeting of the CITES Standing Committee, CICG, Geneva, Switzerland.

December

1	Symposium	2nd AcroporaNet Symposium, Amsterdam, the Netherlands.
6-7	Conference	6th Statia Sustainability Conference (SSC6), St. Eustatius.
7-9	Meeting	ICRI General meeting, Nairobi.
11-12	Meeting	DCNA board meeting, Curaçao.
13	Symposium	European Coral Reef Symposium, Oxford, UK.

January

January - July 18	Expedition	NICO expedition organized by NIOZ and NWO-Science
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2018 declared International Year of the Reef by the International Coral Reef Initiative (ICRI)

More events to add to this calendar?
Please e-mail us: research@DCNAnature.org

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Ministry of Economic Affairs,

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Fieldwork on Seagrass Ecosystem

Services: Lac, Bonaire

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The reports and publications on biodiversity related subjects in the Dutch Caribbean can be found in the Dutch Caribbean Biodiversity Database (DCBD) (<http://www.dcbd.nl>). The DCBD is a central online storage facility for all biodiversity and conservation related information in the Dutch Caribbean.

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