BIONEWS

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Safeguarding nature in the Dutch Caribbean

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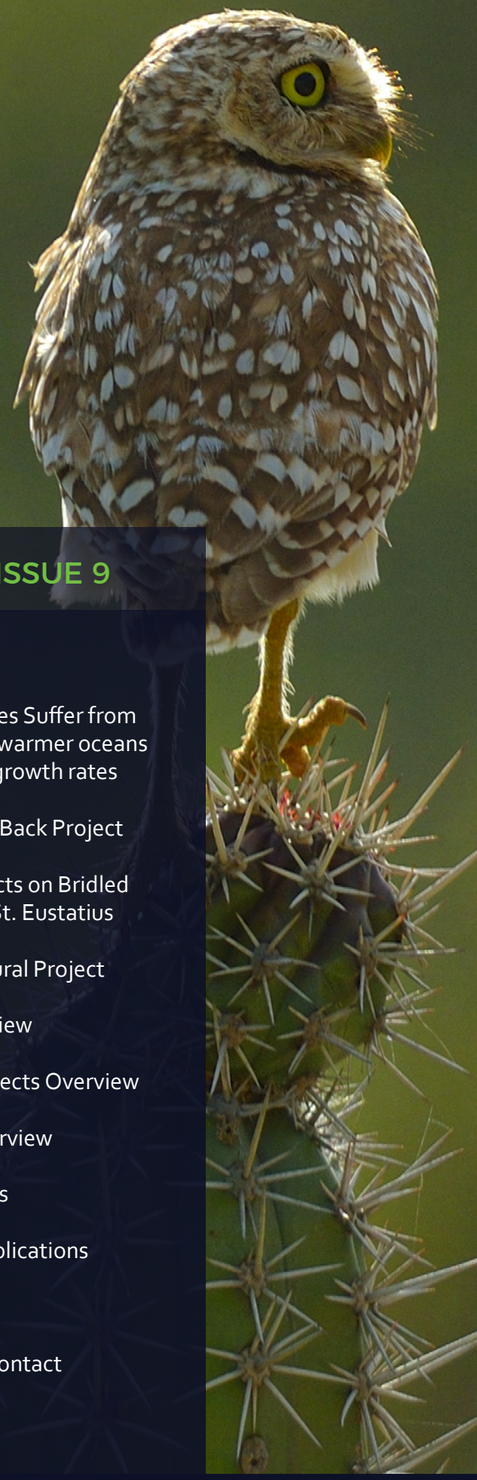

BIONEWS ISSUE 9

Editor's Letter

Dutch Caribbean, December 2017

Climate change is arguably the most serious challenge to conservation efforts within the Caribbean region, with future projections of sea level rise, increasing air and sea surface temperatures, and more frequent and extreme weather events as well as the pervasive threat of ocean acidification. In previous BioNews issues articles were published on the status of our coral reefs in the Dutch Caribbean which showed the devastating impact of global climate change on our reefs and the urgent need to increase their resilience so that they are better able to recover from disturbances such as bleaching events.

Climate change is not only having a significant impact at the ecosystem level it is also threatening the survival of many species, including sea turtles. Sea turtles populations are effected by anthropogenic pressures from coastal development which destroys vital foraging and nesting grounds, pollution from land-based and marine sources, and incidental as well as targeted capture of sea turtles. Nesting beaches are under threat due to the impact of sea level rise and issues related to the feminization of turtle populations as a result of elevated nest temperatures. In this BioNews issue we report on a recent study by Bjorndal et al. (2017) who compiled the longest, most-wide spread data set for sea turtles in the Western Atlantic. This includes data from Bonaire collected by Sea Turtle Conservation Bonaire. The data provides strong evidence that, in addition to other anthropogenic pressures, warmer oceans are driving declining growth rates of sea turtles. The human induced stressors on sea turtles has been so severe that six of the known seven species of sea turtle are at risk of extinction, with three categorized as critically endangered by the IUCN Red List of Threatened Species. Increasing their resilience by controlling local threats as well as regional-wide collaboration are absolutely critical to ensure these ancient creatures remain in our warming oceans.

Goats first made their way into Saba during colonization by the Dutch in the 1700s, and have since become the island's main livestock. Nowadays, the number of goats on Saba is very high, with many roaming freely. The goats cause extensive damage to Saba's vegetation with loss of habitat and food for many terrestrial species. Saba's overgrazed nature has resulted in increase erosion and run-off, which in turn threatens the health of the island's coral reefs. Thanks to generous funding support from The Netherlands Ministry of Economic Affairs "Nature Fund", the government of Saba has initiated a 3-year project to cull most of Saba's goat population and offer goat-owners a viable economic alternative in return.

Before Hurricanes Irma and Maria struck St Eustatius in September 2017, the islands had recorded the highest known density of Bridled Quail-doves in the region. However, a post-hurricane study, made possible thanks to the generous support of BirdsCaribbean's fundraising appeal, found a decrease in the population size and highlighted concerns that the population may decline further due to lack of food, predation and loss of habitat.

The Island Government of Saba, again thanks to funding support from The Netherlands Ministry of Economic Affairs "Nature Fund", is implementing a project which aims to stimulate and improve the island's local organic fruit and vegetable production. This project will not only contribute to Saba's pro- environment image and provide locally grown produce, but will also give the island new tourism opportunities through site tours or taste events.

Cover & Editor's Letter photo by:
© Christian König

Bad News For Green Sea Turtles In An Age Of Warming Seas: warmer oceans drive declining growth rates

To say that sea turtles are resilient is an understatement. They have swum in our oceans for close to 150 million years and survived the extinction of dinosaurs as well as five major ice ages. However, since the 1950s, a sharp increase in human population growth, consumption and technological advance has profoundly harmed nature. Our oceans have been used as dumping grounds and have suffered from overfishing and coastal development, amongst many other pressures. As a result of this unprecedented anthropogenic impact, many changes in ecosystem function, species distribution, and species abundance have taken place (Bjorndal et al., 2017). The impact on sea turtles has been so severe that six of the known seven species of sea turtle are at risk of extinction, with three categorized as critically endangered by the IUCN Red List of Threatened Species. Coastal development has destroyed vital foraging and nesting grounds, pollution from land-based and marine sources has directly impacted the health of turtles, and incidental capture as well as targeted capture has drastically reduced the number of sea turtles in our oceans.

Ocean warming is now emerging as a substantial threat to the survival of sea turtles. While sea turtles have survived many fluctuations in climate throughout their evolution, climate is now changing so rapidly that we cannot predict how they will adapt to these new conditions. This past September, Category 5 Hurricane Irma came at St. Maarten with so much strength that it devastated the island. According to Tadzio Bervoets, manager of Nature Foundation St. Maarten, about half of the island's sea turtle population might have survived this storm (König, 2017). With hurricanes gaining strength more rapidly than ever before in the Caribbean Region due to warming oceans, this is of great concern.

A number of studies have investigated the effect of climate change on sea turtles, such as the loss of nesting beaches from sea level rise (Fish et al, 2008), the negative impact of warmer ocean temperatures on coral reefs (Hoegh-Guldberg, et al., 2007; Carpenter et al, 2008) and the feminization of turtle populations due to elevated nest temperatures (Laloë et al, 2017).

Photo by: © Wexor Tmg

Sea turtles are ectotherms, meaning that the regulation of their body temperature is dependent on external sources. This makes them very sensitive to fluctuating environmental conditions. A recent study by Bjorndal et al. (2017) has looked into the long-term effects of a changing climate on the physiology of individual green sea turtles, specifically their growth rate. Green turtles are *"long-lived, highly migratory, primarily herbivorous mega-consumers that may migrate over hundreds to thousands of kilometers"* among neritic habitats and foraging grounds during their immature period (Bjorndal et al., 2017; Musick & Limpus, 1997). Large, highly migratory ectotherms are particularly useful as bio-indicators of environmental change at regional scales as their growth is strongly influenced by environmental conditions (Bjorndal et al., 2017).

Bjorndal et al. (2017) gathered growth rate data of green turtles throughout the Western Atlantic. The data set collected is the longest (1973 to 2015), most widespread (30 sites from Bermuda to Uruguay, including Bonaire with data collected by Sea Turtle Conservation Bonaire (STCB)) and largest (9690 growth increments from 3958 individual turtles) dataset ever compiled for sea turtles in the Western Atlantic. Turtles were captured through a variety of methods in mixed stock foraging aggregations and tagged. Capture date, location, carapace length and primary diet at each site were recorded. The Multivariate El Niño Southern Oscillation Index (MEI) was selected to represent the intensity of an El Niño/Southern Oscillation (ENSO) event, which is the most important coupled ocean-atmosphere phenomenon to cause global climate variability over time (NOAA, 2017). MEI is currently considered the most representative index for monitoring ENSO as it combines the study of six meteorological and oceanographic components: sea surface temperature (SST), surface air temperature, sea-level pressure, two components of surface winds, and total cloudiness of the sky (Mazzarella et al., 2013). Two strong thermal processes are believed to be the drivers behind the significant ecological regime shift (ERS) that took place in 1997/1998: the abrupt warming from the strongest El Niño Southern Oscillation (ENSO) event on record and the unprecedented warming rate over the last two to three decades (Martinson et al., 2008; Reid & Beaugrand, 2012; IPCC, 2014; Beaugrand et al., 2015; Wijffels et al., 2016). This resulted in sudden ecological changes such as the extreme global bleaching of reefs and changes in migration and reproduction timing of echinoderms, fish and seabirds, amongst others (Hoegh-Guldberg, 2007; Martinson et al., 2008; Luczak et al., 2011; Beaugrand et al., 2013, 2015; Ortega et al., 2013).

Photo by: © Kai Wulf

The study found a strong correlation between MEI and green turtle growth rates. Green turtle growth rates decreased when SST were above a threshold between 25.9 and 26.0 °C (Bjorndal et al., 2017). Below this threshold, growth rates increased with increasing SST. The decline in growth rates also coincides with the ecological regime shift (ERS) that took place in the Atlantic in 1997/1998: rates increased from 1974 to 1999 but then declined by 26% to 2015 (Bjorndal et al., 2017). Results were compared with earlier studies of somatic growth dynamics in two carnivorous sea turtle species, the West Atlantic hawksbill *(Eretmochelys imbricata)* (Bjorndal et al., 2016) and the North Atlantic loggerhead (*Caretta caretta*) (Bjorndal et al., 2013). Both studies used similar capture-mark-recapture data and modeling approach. The growth pattern of hawksbills and loggerheads follows the same pattern as green turtles, with high growth rates up to 1997 followed by a significant decline. The parallel decline in growth of all three species *"provides strong evidence that an ecological regime shift (ERS) in the Atlantic is driving growth dynamics"* (Bjorndal et al., 2017) and that growth rates of all three species are strongly related to climate drivers.

Diet was also identified as a significant factor in the growth rate of green sea turtles. Green turtles with a seagrass diet (*typically Thalassia testudinum*) grew more rapidly (63% growth increments) that green turtles on mixed seagrass/algae, algae, and omnivorous diets (22% growth increments) (Bjorndal et al., 2017). This is of great concern in light of the global destruction of seagrass beds. When seagrasses are no longer available, green sea turtles will switch to a diet of algae and invertebrates which supports slower growth rates (Bjorndal et al., 2017). The majority of seagrass loss has been attributed to anthropogenic activities such as coastal development, boat damage as well as agricultural and industrial run-off. The CARICOMP monitoring network gathered standardized data from 52 seagrass sampling sites across the Wider Caribbean from 1993 to 2014, and 43% of sites had clear trends indicating environmental deterioration caused by increased terrestrial run-off of fertilizers, sewage and sediments (van Tussenbroek et al., 2014; Linton & Fisher, 2004). The substantial increase in inhabitants of coastal areas in the Caribbean Region since the 1990s coincides with the decline in sea turtle growth rates and substantial loss of seagrass beds (van Tussenbroek et al., 2014, Waycott et al., 2009; Mcleod et al., 2011). Hawksbills and loggerheads have also seen their foraging grounds decline, with coral reefs as well as soft and hard bottom habitats suffering much degradation since the 1990s.

Bad News For Green Sea Turtles In An Age Of Warming Seas

The findings of this study, which correlates warmer ocean temperatures with lower sea turtle production, "*is not good news in an age of warming seas*" (Bjorndal et al., 2017). Whether sea turtles can adapt to climate change will depend a lot on their ability to adapt to changing conditions. Increasing their resilience by diminishing local threats is absolutely critical. The study by Bjorndal et al. (2017) found that the decline in sea turtle growth is being exacerbated by the many additional anthropogenic pressures on sea turtle habitats (Bjorndal et al., 2017). Sea turtle conservation has long been a priority for the islands of the Dutch Caribbean. At its inception DCNA invested substantially in supporting turtle tracking work on the islands both to gain scientific knowledge about turtle range states as well as a basis for public outreach and education. Sea Turtle Conservation Bonaire (STCB), whose mission is to ensure that Bonaire's sea turtles have a secure future, and to connect people to sea turtle conservation in ways that inspire caring for nature, has been a key partner in these efforts. STCB uses best practices in science and conservation to build knowledge and protection of Bonaire's sea turtles. They share their knowledge to raise awareness, affect policy and build support for biodiversity protection. Also TurtugAruba, CARMABI (Sea turtle Conservation Curaçao) STENAPA, SCF and NFSXM are working hard in the Dutch Caribbean

Photo by: © Marion Haarsma

to protect sea turtles and their environment. They are all proud members of the Wider Caribbean Sea Turtle Conservation Network (WIDECAST). Region-wide collaboration is an absolute necessity in helping these incredible ancient creatures remain in our oceans for many millions of years to come.

A solid ecological understanding is needed upon which to base a management strategy for green and hawksbill turtles in the Dutch Caribbean. Therefore Dr. Marjolijn Christianen, Dr. Lisa Becking, Dr. Per Palsbøll and Msc. Jurjan van der Zee (PhD student) working closely together with local partners on our islands on the NWO funded project "Ecology and conservation of green and hawksbill turtles in the Dutch Caribbean" that started in 2015. During this project they aim to provide knowledge on the migration routes, population demographics and habitat use by sea turtles and habitat changes by an invasive seagrass species. In the beginning of 2018 Dr. Marjolijn Christianen will continue this valuable work with an additional grant from NWO to investigate how green sea turtles, as large grazers, and invasive seagrass interactively affect seagrass ecosystem services. A tool to use green turtle foraging patterns for global monitoring of (invasive) seagrass biomass will be developed.

Bad News For Green Sea Turtles In An Age Of Warming Seas

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Goat Buy Back Project

The 2013-2017 Nature Policy for the Caribbean Netherlands flagged the threat of invasive species as a high priority, with recent inventories documenting no less than 211 exotic alien species in the Dutch Caribbean (MinEZ 2013; Smith et al, 2014). Invasive species are regarded as one of the most significant ecological threats to islands worldwide as they can decimate the islands' native flora and fauna (Smith et al, 2014; Debrot, 2016). Roaming livestock introduced to the region in the 1700s has become one of the most significant ecological challenges for the islands of the Caribbean Netherlands (Buurt & Debrot, 2012; Debrot, 2016). Saba is home to a wide range of forest habitats such as cloud forest and succulent evergreen shrubland that are rich in rare and endangered plant and animal species and these habitats are threatened by overgrazing caused by free-roaming goats. Thanks to generous funding from The Netherlands Ministry of Economic Affairs through the Nature Fund, the government of Saba has led a 3-year project to cull most of Saba's goat population and offer goat-owners a viable economic alternative in return.

Goats (*Capra hircus*) were introduced onto Saba by the Dutch in the 1700s, and have since become the island's main livestock (Buurt & Debrot, 2012). Nowadays, the number of goats on Saba is very high, with many roaming freely. The impact of these goats on Saba's vegetation has been significant. Goats cause extensive damage to the vegetation because of their preference for young seedlings, twigs and germinating plants, preventing the natural regeneration of plant species. On Curaçao, Debrot and de Freitas (1993) found that goats also alter plant communities. Vegetation that was inaccessible to livestock had a completely different species composition and diversity (high densities of bromeliads and orchids) than those grazed by livestock (principally cacti and Acacia) (Debrot and de Freitas, 1993). A loss in vegetation cover also means a loss of habitat and food for many terrestrial species. Saba's endemic and endangered red-bellied racer snake has less than 10% of its original habitat remaining, due in part to goat overgrazing. Free-roaming goats also threaten breeding seabird populations because overgrazing degrades breeding habitat (Lowrie et al, 2009).

The goats' insatiable appetite for Saba's vegetation has resulted in an increase in erosion and run-off, which threatens the health of the island's coral reefs. The bare soil left behind by goats has less water retention and is therefore more susceptible to wind and water erosion. Goats tend to prefer steep terrain and cliffs, which are more prone to erosion, exacerbating the problem. Goats have also become a nuisance to local residents because they consume agricultural produce and cause rolling rocks on the roads.

Goat control measures have taken place in other Dutch Caribbean islands with various degrees of success. On Curaçao, goats have been caught and removed from Christoffelpark since 1993 using various forms of trapping and systematic shooting. This removal of goats has been very successful: goat densities average 0.1 goat per hectare and there has been a large-scale improvement in vegetation densities as well as recovery of rare plants (Buurt et Debrot, 2012). On Bonaire, a goat-catching project was started in the Washington Slagbaai National Park in 2015, but an assessment of the methodology showed it had little success. The number of caught goats averaged to about 25% of the population caught yearly and this was found to be insufficient to reduce goat density in the long-term (Geurts, 2015).

Photo by: © Randall Johnson

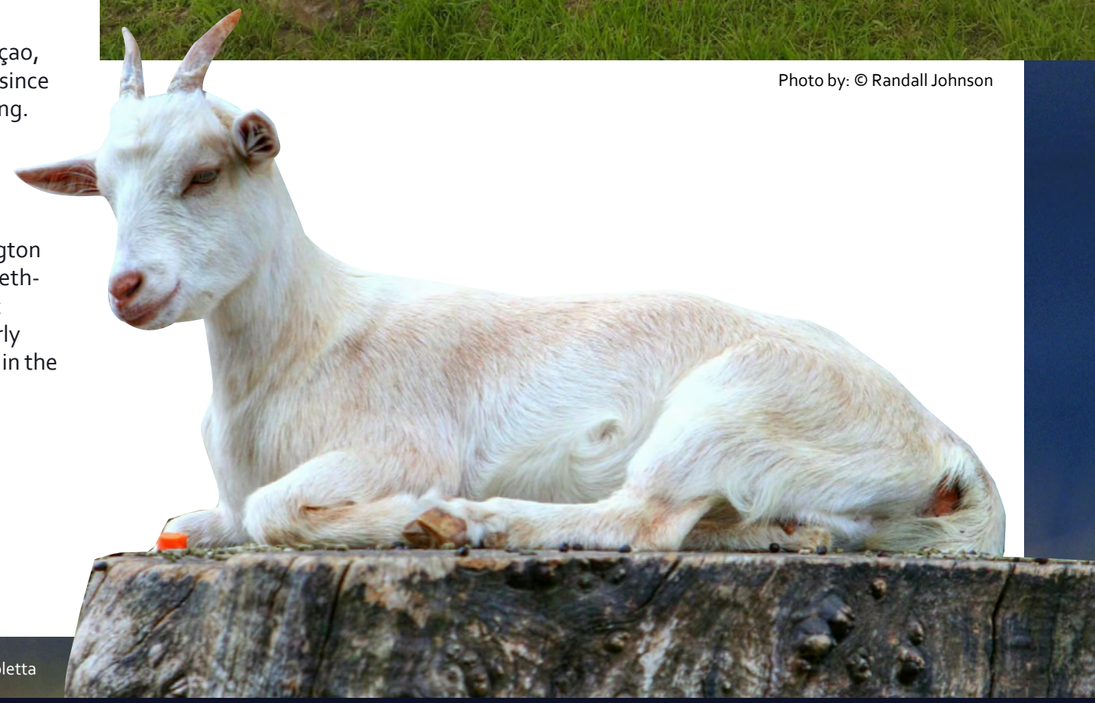

Photo by: © Violetta

Goat Buy Back Project

The eradication of goats from Saba is difficult because when threatened, goats are able to hide in inaccessible gullies and cliffs. The goal of the Government of Saba is therefore to decrease free roaming populations of goats by 70 to 80% by shooting or otherwise slaughtering the goats and selling or exporting the meat. Goat owners are offered a compensation of $5 per pound when they deliver the meat of their slaughtered goat(s) to the Department of Agriculture. The meat is then frozen and stored, inspected and sold on to the local and export (St Maarten) market. Between November 2014 and March 2016, a total of 21391,10 pounds of goat meat was delivered to the Department of Agriculture, which represents approximately 1426 goats. As a result, the number of free-roaming goats in the villages of St. Johns, Windwardside and Zion's Hill has been drastically reduced and goat owners will continue to hunt goats on their own and sell the meat to buyers on St. Maarten. The island government had to designate goat hunters to cull goats in the village The Bottom as too few goats had been killed by goat owners during the allocated time period and the population of roaming goats was still too high. The goat population in The Bottom has since decreased. The selected hunters can now hunt in any village on the island with permission from the Governor or Island Secretary.

Photos by: © Randall Johnson

The remaining goat population on Saba is being controlled through better enforcement of legislation, particularly the "Identification and Registration of Livestock and Domestic Animals Ordinance (AB2004)". This ordinance sets regulations controlling the keeping and importing of livestock and domestic animals and the registration of free roaming animals. Goat owners must ensure their goats are tagged and kept in fenced areas. The island Government and Police Department are cooperating to ensure continued enforcement of the ordinance beyond the project end-date. This is essential to control number of roaming goats, which will otherwise rapidly increase again to unsustainable levels.

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Hurricane Impacts on Bridled Quail-doves in St. Eustatius

By Hannah Madden

On September 6, 2017, Hurricane Irma, a category 5 hurricane, pummeled the northern Lesser Antilles. While St. Eustatius was spared extensive dame to infrastructure and power was restored to most homes within just a few days, forest cover in the Quill National Park did not fare quite so well. Immediately after the storm, defoliation of the vegetation was clearly visible across the dormant volcano, which rises to a maximum height of 600 meters and suffered the brunt of hurricane force winds of up to 150 mph.

Initial exploration of the Quill on September 9 revealed a shocking sight from the crater rim viewpoint at 400 meters. Areas that were once covered in lush evergreen vegetation were barely recognizable. Gone were the majestic Silk Cotton trees that once dominated the canopy; instead we were confronted with an almost bare crater wall covered in once-towering trees that looked like they had been snapped by an invisible giant. Two weeks later, Hurricane Maria passed to the south of St. Eustatius and brought over 100mm of rain but less severe winds. This rainfall helped stimulate vegetation regrowth in the Quill. However much of the original canopy was severely damaged, and any fruits, seeds or flowers that normally provided food for wildlife were lost.

There was immediate concern for the plight of the Bridled Quail-dove, a species that forages for fruits and seeds on the forest floor. The Quill is the only habitat on Statia that supports quail-doves. Population assessments were conducted in May 2017 in conjunction with a rodent control project that is being facilitated through the Caribbean Netherlands Science Institute (CNSI). Initial results indicated an estimated number of 1,030 quail-doves (standard error [SE] = 275, 95% confidence interval [CI] = 561–1,621) which were found across its local habitat of 440 hectares. This is possibly the highest known density of quail-doves in the region. Thanks to funds provided by BirdsCaribbean's fundraising appeal, surveys were completed in November 2017 to assess quail-dove populations post-hurricane.

Work was lead by Dr. Frank Rivera-Milan (US Fish & Wildlife Service), Hannah Madden (CNSI) and Kevin Verdel (student from the University of Utrecht). A total of 56 x 100m transect surveys were conducted, and repeated them 2-4 times. This was less than the original 70 x 100m transects conducted in May 2017 due to decreased accessibility of trails. Playback of the Key West Quail Dove's call was used in an attempt to elicit a response from any Bridled Quail-Doves in the survey area. Unfortunately the quail-doves did not respond to the playback, and therefore all detections during November 2017 surveys were by sight only. The perpendicular distance of the quail-dove from the transect was measured, and the data collected were analyzed to estimate the total population size.

The November 2017 surveys indicated that there had been a decrease in the Bridled Quail-Dove mean population size estimate of around 230 individuals (May 2017 = 1,030; November 2017 = 803; SE = 208, 95% CI = 451-1,229). This corresponds to a population drop of around 22% (SE = 8.2%). Statistical tests indicate that this decrease in the population is not statistically significant (Z score = 0.66, P value = 0.51). Which is good news. The bad news is that there is little food available due to the hurricane damage to vegetation. Since the dry season (Dec-Apr) is about to commence, already scarce food resources can be expected to be further depleted. These factors will no doubt effect both quail-dove survival and reproductive rates in 2017-2018. The quail-doves, which were observed during the November 2017 surveys looked lethargic and did not flush far or fast during surveys. There is therefore a real risk that the population will decline further due to lack of food. Surveys will be repeated in May 2018, during peak breeding season.

Dry forest vegetation on the outer slopes of the Quill has recovered quickly, however inside the crater approximately 50% of the evergreen seasonal forest that once covered this area has severely impacted and it is estimated that this may take decades before it fully recovers. We expect this will also have a negative effect on the quail-dove and other bird species which rely on this unique habitat for their survival and reproduction. Instead of the usual flocks of Scaly-naped Pigeons (which are now foraging for food in coastal areas), we are now seeing smaller species like Bananaquit, Lesser Antillean Bullfinch, and the migratory Black-whiskered Vireo.

Photos by: © Hannah Madden

Birds Caribbean

Recommendations to help recovery of the bridled quail-dove include removing predators and domestic animals above 250m to help the species recover and enhance its prospects for long-term survival. Rat control is important as rats, together with other invasive predator species, can be expected to increase in density and become more clumped following hurricane-induced changes in foraging resources. Columbid life-history is typically characterized by low annual survival rate and high annual reproductive rate, and Quail-doves are ground-dwellers that nest near ground level (e.g., on top of bromeliads and other similar substrates providing nest support, relying on their camouflage). Any increase in rat density would threaten Quail-dove survival and reproduction. CNSI's rat control project has great relevance for the Bridled Quail-dove and could produce important conservation results. Baiting will begin in the Quill from January 2018 and the results will be made available later in the year.

Canopy loss in crater.
Photos by: © Hannah Madden

Broken vegetation in crater.
Photos by: © Hannah Madden

Irma provided us with a unique opportunity to study the impacts of hurricanes on avian fauna on St. Eustatius (and elsewhere in the region). It is a bittersweet privilege to be able to contribute our results to the scientific community. Unfortunately, the frequency and intensity of Caribbean hurricanes are predicted to increase under human-induced global warming. It is therefore imperative to protect and enhance the integrity of our natural areas to help our birds and other wildlife survive the next hurricane strike.

Grateful thanks to BirdsCaribbean for funding Dr. Frank Rivera-Milan (US Fish & Wildlife Service), travel expenses, to St. Eustatius National Parks enabling surveys of the Quill National Park, and to CNSI for facilitating this project.

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http://www.birdscaribbean.org/2017/11/hurricane-impacts-on-bridled-quail-doves-in-st-eustatius/

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Saba: Horticultural Project

Photos by: © Randall Johnson

Sampling local food is a great way to experience the culture of a destination, and tourists will often seek out local restaurants to try out new and exciting dishes. More than 22,500 tourists visit Saba each year to enjoy the island's tranquility and unspoiled natural landscape, but few visitors have the opportunity to savor fresh, locally grown food as most of the island's produce is imported from the US. The tourism sector currently contributes the largest share to Saba's economy, with total expenditures by tourists averaging USD 31.7 million per year (Cado van der Lely et al, 2014). However, because the food tourists are eating is imported, the net economic impact of tourist expenditure on the island is significantly reduced (Bélisle, 1984). In the Caribbean region, tourism and agriculture have for the most part developed separately, with agriculture primarily satisfying export markets while local demand is met through food imports (Mc Bain, 2007).

Thanks to generous funding from The Netherlands Ministry of Economics Affairs through the Nature Fund, the Island Government of Saba is implementing a project, which aims to stimulate and improve the island's local organic production of fruit and vegetables. Promoting organic horticultural production on the island will contribute to Saba's pro- environmentally conscious image and give the island new tourism opportunities surrounding food tourism such as production site tours or taste events. Local hotels and restaurants have already expressed their eagerness to sell local produce. Additionally, this Nature Fund project will enable the establishment of a nursery of indigenous trees which will be used to help reforest the island once the issue of free-roaming goats is under control (see: Nature Funded Goat Buy Back Project). The three-year project (2015-2018) is carried out in partnership with the Agricultural Station.

The horticulture production site has been established at Zion's Hill on a leased area of 10,000 m². The land was cleared of trees, shrubs and rocks in early 2017 and fenced to prevent damage from free-roaming goats, chickens and iguanas. A storage room has also been built on the property. Fruit and vegetables grown on the farm in 2017 include sweet peppers, jalapenos, sweet potatoes, cassava, bananas, watermelons, pumpkin, cabbage, lettuce, tomatoes, peanuts, chives and thyme. In September hurricanes Irma and Maria destroyed most of the crops, but the land is now being farmed again with sweet potatoes, carrots, corn, okra, sweet peppers, thyme and parsley. Produce is sold to the public and at a local market on Wednesdays, with the goal to eventually sell products to supermarkets and restaurants. Indigenous trees are currently being grown from seed in pots with the support of the Saba Conservation Foundation.

Organic farming practices are being used at both sites, such as the use of local cattle manure as fertilizer and the installation of drip-irrigation to conserve water. To ensure the sustainability of the project and its long-term success, the island government has leased the plot of land at Zion's Hill for 10 years and plans to keep the project funded after the Nature Fund has expired. Profits from the sale of fruits and vegetables will be allocated to a special fund that will keep the horticultural production going. With hope, this project will inspire Saban people to grow food in their own backyard.

Photo by: © Nicole Köhler

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Research Overview

December 2017

CATEGORY	SUBJECT	ISLANDS	ORGANIZATION(S): LEAD SCIENTIST
Birds	Suitability study and reforestation of exclosures facilitating the Yellow-shouldered Amazon Parrots (Amazona barbadensis)	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 **STINAPA**
Coral Reef ecosystems	Coral-associated fauna of Curaçao	CUR	**Naturalis:** Bert Hoeksema **Leiden University** **CARMABI**
Coral restoration	Investigating potential differences in fitness of Acropora cervicornis on CRF Bonaire coral restoration sites	BON	**CRFB**: Francesca Virdis **WUR**: Erik Meesters **VHL**: Jorien Rippen **Students**: Valeria Pesch, Jan Koschorrek
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 Hurricanes Irma and Maria	SAB EUX SXM	**SCF**: Kai Wulf **STENAPA**: Clarisse Buma **NFSXM**: Tadzio Bervoets
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**

Research Overview

December 2017

CATEGORY	SUBJECT	ISLANDS	ORGANIZATION(S): LEAD SCIENTIST
Fish	Baited Remote Underwater Video (BRUV) to study sharks	BON	**WUR:** Erwin Winter, Dolfi Debrot, Martin de Graaf, Twan Stoffers **STINAPA:** Caren Eckrich **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
Invasive species	Evaluating the Carbon Sequestering Capacity of Halophila stipulacea	BON	Loyola Marymount University: Candice Cross (student), Demian Willette
Mangrove ecosystems	Pilot-scale testing and evaluation of mangrove ecosystem intervention options. (sediment production by calcifying algae (esp. Halimeda opuntia and incrassata) *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

Research Overview

December 2017

CATEGORY	SUBJECT	ISLANDS	ORGANIZATION(S): LEAD SCIENTIST
Plants	Habitat preference native trees	BON	**WUR:** Klaas Metselaar, Maarten van Pelt (student) **Echo**: Lauren Schmaltz, Quirijn Coolen
Plants	Exclusion of invasive herbivores: A comparison study of vegation at Roi Sango.	BON	**Echo**: Quirijn Coolen **WUR**: Pieter Zuidema, Jessie Foest (student)
Plants	Testing effective ways to grow native plants	BON	**Echo:** Quirijn Coolen, Johan van Blerk
Plants	The impact of hurricanes Irma and Maria on *Coralita*	SAB EUX	**UU:** Maarten Eppinga
Plants	Germination of seeds of indigenous trees of Curaçao	CUR	**CARMABI:** John de Freitas
Sponges	Sponge ecology and energetics	CUR	**UvA:** Jasper de Goeij **CARMABI**
Sponges	Iron limitation on Caribbean reefs	CUR	**WUR:** Mischa Streekstra **CARMABI**

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** **SECORE International**
Coral Reef Ecosystems	Bioersion 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 Virdis **SECORE Project** **CARMABI:** Mark Vermeij **UvA:** Valerie Chamberland (PhD candidate) **SCF, Sea Saba, Samford University:** Jennifer Rahn
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 Register: Taxonomic knowledge system Dutch Caribbean (http://www.dutchcaribbeanspecies.org/)	All	**Naturalis:** Sander Pieterse, Hannco Bakker, Bert Hoeksema
Interstitial biodiversity	Moleculair biodiversity 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)
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**

Long Term Projects

CATEGORY	SUBJECT	ISLANDS	ORGANIZATION(S): LEAD SCIENTIST
Molluscs	Population dynamics and role in the food chain of the Queen Conch Lobatus gigas 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
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**
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**

Long Term Projects

CATEGORY	SUBJECT	ISLANDS	ORGANIZATION(S): LEAD SCIENTIST
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**
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

Long Term Projects

CATEGORY	SUBJECT	ISLANDS	ORGANIZATION(S): LEAD SCIENTIST
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
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,	**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

Long Term Projects

CATEGORY	SUBJECT	ISLANDS	ORGANIZATION(S): LEAD SCIENTIST
"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
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	Combating Erosion and Nature Restoration on Bonaire	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

Long Term Projects

CATEGORY	SUBJECT	ISLANDS	ORGANIZATION(S): LEAD SCIENTIST
Nature communication	Campaign environment and nature on Bonaire	BON	**DRO:** Frank van Slobbe, Peter Montanus
Agriculture	Horicultural 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
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

Long Term Projects

CATEGORY	SUBJECT	ISLANDS	ORGANIZATION(S): LEAD SCIENTIST
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**
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)

Monitoring Overview

December 2017

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

Monitoring Overview

December 2017

CATEGORY	SUBJECT	ISLANDS	ORGANIZATION(S): LEAD SCIENTIST
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
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

Monitoring Overview

December 2017

CATEGORY	SUBJECT	ISLANDS	ORGANIZATION(S): LEAD SCIENTIST
Invasive species	Monkey Monitoring: abundance and distribution	SXM	**NFSXM:** Tadzio 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	Marine Mammal Monitoring (noise loggers Saba Bank)	SAB	**WUR:** Dick de Haan, Dolfi Debrot **SCF (SBMU)**: Ayumi Izioka
Molluscs	Conch (Strombus gigas) 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

Monitoring Overview

December 2017

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
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

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
BO project	Policy Supporting Research project
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
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 Netherland
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 Universitwy and Research Centre, the Netherlands
WUR (Alterra)	Wageningen Environmental Research, the Netherlands

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Reports and Publications Overview

Below you will find an overview of the reports and publications on biodiversity related subjects in the Dutch Caribbean that have recently been published.

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*

Devlin-Durante, M.K., Baums, I.B. (2017).
Genome-wide survey of single-nucleotide polymorphisms reveals fine-scale population structure and signs of selection in the threatened Caribbean elkhorn coral, Acropora palmata. PeerJ 5:e4077

Lorscheid, T., Felis, T., Stocchi, P., Obert, J.C., Scholz, D. Rovere, A. (2017)
Tides in the Last Interglacial: insights from notch geometry and palaeo tidal models in Bonaire, Netherland Antilles. Scientific reports 7:16241 DOI:10.1038/s41598-017-16285-6

Meijer zu Schlochtern, M. (2017)
Nature Foundation Marine Park, Reef & Marine Research Assessments Post Hurricane Irma

Photo by: © Christian König

Calendar

December

1	Symposium	2nd AcroporaNet Symposium, Amsterdam, the Netherlands.
4	Celebration	20 years managing the marine park, STENAPA, St. Eustatius
4-6	Workshop	Regional workshop on ecosystem-based management and application of decision support systems in the Wider Caribbean region, Panama
6-7	Conference	6th Statia Sustainability Conference (SSC6), St. Eustatius.
7-9	Meeting	ICRI General meeting, Nairobi.
11-12	Meeting	DCNA board meeting, Curaçao.
13-15	Symposium	European Coral Reef Symposium, Oxford, UK.

January

January-July 18	Expedition	NICO expedition organized by NIOZ and NWO-Science
31- 4 Feb	Meeting	47th session of the Intergovernmental Panel on Climate Change (IPCC 47) at a location to be determined.

February

2	Event	World Wetlands Day
5-8	Forum	Social Coast Forum, Charleston, South Carolina, USA
6-9	Workshop	Expert Workshop on Marine Protected Areas and Other Effective Area-based Conservation Measures for Achieving Aichi Biodiversity Target 11 in Marine and Coastal Areas, Montreal, Canada
7-8	Symposium	World Symposium on Climate Change Communication, Graz, Austria
11-16	Meeting	Ocean Sciences Meeting, Portland, Orgeon, USA

IYOR 2018
INTERNATIONAL YEAR OF THE REEF

The International Coral Reef Initiative (ICRI) has declared 2018 the third International Year of the Reef (IYOR 2018)

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

Photo by: © Kai Wulf, taken in Saba

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www.naturefoundationsxm.org

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References

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.

Green Sea Turtles Suffer from Warming Seas: warmer oceans drive declining growth rates

Beaugrand, G., McQuatters-Gollop, A., Edwards, M., Goberville, E. (2013). Long-term responses of North Atlantic calcifying plankton to climate change. Nature Climate Change, 3, pp. 263-267.

Beaugrand, G., Conversi, A., Chiba, S., Edwards, M., Fonda-Umani, S., Greene, C.,... Sugisaki, H. (2015). Synchronous marine pelagic regime shifts in the Northern Hemisphere. Philosophical Transactions of the Royal Society B-Biological Sciences, 370, 20130272.

Bjorndal, K.A., Schroeder, B.A., Foley, A.M., Witherington, B.E., Bressette, M., Clark, D., ... Bolton, A.B. (2013). Temporal, spatial, and body size effects on growth rates of loggerhead sea turtles (Caretta caretta) in the Northwest Atlantic. Marine Biology, 160, pp. 2711–2721.

Bjorndal, K.A., Chaloupka, M., Saba, V.S., Diez, C.E., van Dam, R.P., Krueger, B.H., ... Bolton, A.B. (2016). Somatic growth dynamics of West Atlantic hawksbill sea turtles: a spatio-temporal perspective. Ecosphere, 7(5).

Bjorndal, K.A., Bolten, A.B., Chaloupka, M., Saba, V.S., Bellini, C., Marcovaldi, N.A., ... Kenyon, L. (2017). Ecological regime shift drives declining growth rates of sea turtles throughout the West Atlantic. Glob Chang Biol., 23(11), pp. 4556-4568.

Carpenter, K.E., Abrar, M., Aeby, G., Aronson, R.B., Banks, S., Bruckner, A.,... Wood, E. (2008). One-Third of Reef-Building Corals Face Elevated Extinction Risk from Climate Change and Local Impacts. Science, 321:5888, pp. 560-563.

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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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