CARIBBEAN NETHERLANDS SCIENCE INSTITUTE

ANNUAL REPORT 2017

L.E. Saddlerweg 5 - PO Box 65
St Eustatius - Caribbean Netherlands
cnsi@nioz.nl +599 318 2040 - www.cnsi.nl

CNSI is enabled by NIOZ Royal Netherlands Institute for Sea Research

Annual Report 2017

MISSION CARIBBEAN:

THE SUSTAINABILITY OF SMALL ANTILLEAN ISLAND ECONOMIES REQUIRES CONNECTING SCIENTIFIC AND PRACTICE INSPIRED RESEARCH, OUTREACH TO CARIBBEAN COMMUNITIES AND EDUCATION IN A BALANCED WAY

CNSI WORKS ON KNOWLEDGE DEVELOPMENT TO THE BENEFIT OF THE CARIBBEAN NETHERLANDS AND CARIBBEAN SOCIETIES IN GENERAL FOSTERING RESILIENT SOCIETIES, EQUAL OPPORTUNITIES AND SCIENTIFIC CURIOUSITY

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CNSI on ST EUSTATIUS

The main building of CNSI at the L.E. Saddlerweg is the former hotel 'Talk of the Town'. This building houses CNSI's laboratories, workshop, offices, meeting rooms and accommodation for 22 guests

CNSI's second location across from the main building houses its library and offers another meeting / video conferencing room and accommodation for six more guests

The third location down at the Fisheries building in Lower Town offers an outdoor mesocosm facility with running sea water

INTRODUCTION

With six Caribbean islands within the Kingdom, The Netherlands is a major player in the region and has a responsibility to address knowledge needs related to the sustainable socio-economic development of these territories. The Netherlands' science sector has substantial knowledge about and experience in the Caribbean region and an excellent reputation in fundamental and practice inspired scientific research in search of evidence-based answers and functional applicability of its results, and therefore plays a pivotal role in addressing sustainability challenges.

Small island states and territories in the Caribbean face specific vulnerabilities inherent to their geographic size and location, population size and density, and the scale of their economies. Similarities and differences of these islands in constitutional and developing status, knowledge and innovation policies, and in addressing sustainability challenges with respect to environmental, economic, socio-cultural and public health issues offer unique possibilities for cooperation and comparative research and sharing of best practices.

The transdisciplinary nature of sustainability challenges in the internationally highly fragmented Antillean landscape demands an inclusive multi-lateral and cross-sectoral articulation of knowledge needs with a strong *People-Planet-Prosperity* approach.

It is within this setting that CNSI details its function as the Netherlands' national Caribbean knowledge facility: providing a home base, accommodation and logistical and infrastructural support for the Netherlands' knowledge sector with interest in the Caribbean region, especially with respect to the Leeward Lesser Antilles where CNSI is located, and to:

(i) Develop a recognised knowledge institute, positioned at the intersection of research, science, education, governance and management;

(ii) Realise a permanent scientific infrastructure in the Leeward Caribbean Netherlands (St Eustatius), fostering a fertile basis for scientific curiosity and the development of an academic culture;

(iii) Strengthen scientific cooperation between the Caribbean and European Netherlands, and contribute to cooperation between Leeward Lesser Antillean islands.

STRATEGY

CNSI was positively evaluated in 2016. Based on recommendations from the evaluation report, the Minister of Education, Culture and Science (MinOCW) approved continuation of the institute's funding for another five years, starting January 2018. This decision was announced just before the start of 2017.

Preconditions for continued funding were to address the recommendations from the evaluation report and to elucidate funding for CNSI beyond 2022.

Together with Royal NIOZ and the Netherlands Organisation for Scientific Research (NWO), as of January 2018 the 'owner' of CNSI, 2017 was spent developing a strategy for 2018 – 2022 leading to a (financial) sustainable position of the institute post-2022.

The new strategy for CNSI builds on the mission and ambitions from 2013 – 2017, the realisation of which is well on track, but sharpens its geographic and thematic focus. To realise a sustainable institute beyond 2022, within NWO, CNSI must demonstrate an outstanding position and scientific output. Although facilitating third-party scientific output was and continues to be an important part of CNSI's mission, producing its own scientific output was not formally part of its first five year mission. This will change with the new strategy, to which extent CNSI will concentrate its financial, human and infrastructural resources on distinct and complementary activities, facilities, services and output with respect to knowledge questions related to sustainable socio-economic development of the Leeward Lesser Antillean islands in a changing environment.

DEVELOPMENTS

2017 saw an increase in externally funded projects and concomitant increase in staff and sub-contracted labour. In 2017 CNSI's budget was 859 k€, which is 72% more than the basic funding from MinOCW. Although a large part of the externally funded projects focus on supporting activities, it is expected that it will lead to a respectful number of CNSI scientific publications.

CNSI continued working on its outreach and education agenda, which is reflected by e.g. the organisation of (vocational) workshops, Science Cafes and Youth Science Cafes, taking part in the Kids Council (Missing Chapter Foundation), starting with CNSI's Science Kids, local radio appearances, press releases and newspaper articles. 'Invasive Species' appeared to be a common thread in CNSI's 2017 activities. The subject of invasive species has a strong component of social – natural science interaction. Public opinion, culture, legislation, management, development policies and ethical considerations interact with natural, technical and medical sciences. A true example of a transdisciplinary and cross-sectoral scientific approach.

Another achievement is that CNSI joined the 'Association of European Marine

Biological Laboratories Expanded' (ASSEMBLE+), an EU-funded programme facilitating access for European institutions to make use of each other's marine biology research facilities. It is expected that this will help increase the visibility of CNSI beyond the Netherlands' borders.

NEAR MISS

Incontestable for 2017 major events were the two near misses of disaster. In the early morning of September 6, category 5+ hurricane Irma passed north of St Eustatius as the strongest recorded hurricane in this region of the world. Although St Eustatius was not hit as hard as other islands to the north, the hurricane considerably disrupted the normal day-to-day routine of Statian society, including CNSI.

CNSI was affected in different ways. Outdoor experiments were dismantled prior to the arrival of Irma, the underwater part of CNSI's mesocosm sea water system was damaged considerably, CNSI's main building suffered some damage, and water, power and internet were off for about a week. CNSI's hurricane protocol acted accordingly, and thankfully none of CNSI's staff or guests were injured.

Two weeks later in the afternoon of September 20, a second category 5 hurricane, Maria, passed south of St Eustatius. Restarted outdoor experiments had to be dismantled again and the just-repaired mesocosm sea water system again suffered considerable damage.

The financial damage for CNSI caused by both hurricanes, including direct loss of labour time, was estimated to be around USD 35,000, in addition to potential loss of scientific data, time and investments. Moreover, travel to and from the island was seriously hindered until well into November, resulting in numerous guests' cancellations and loss of revenue. It took until the end of November before things started to return to normal for CNSI.

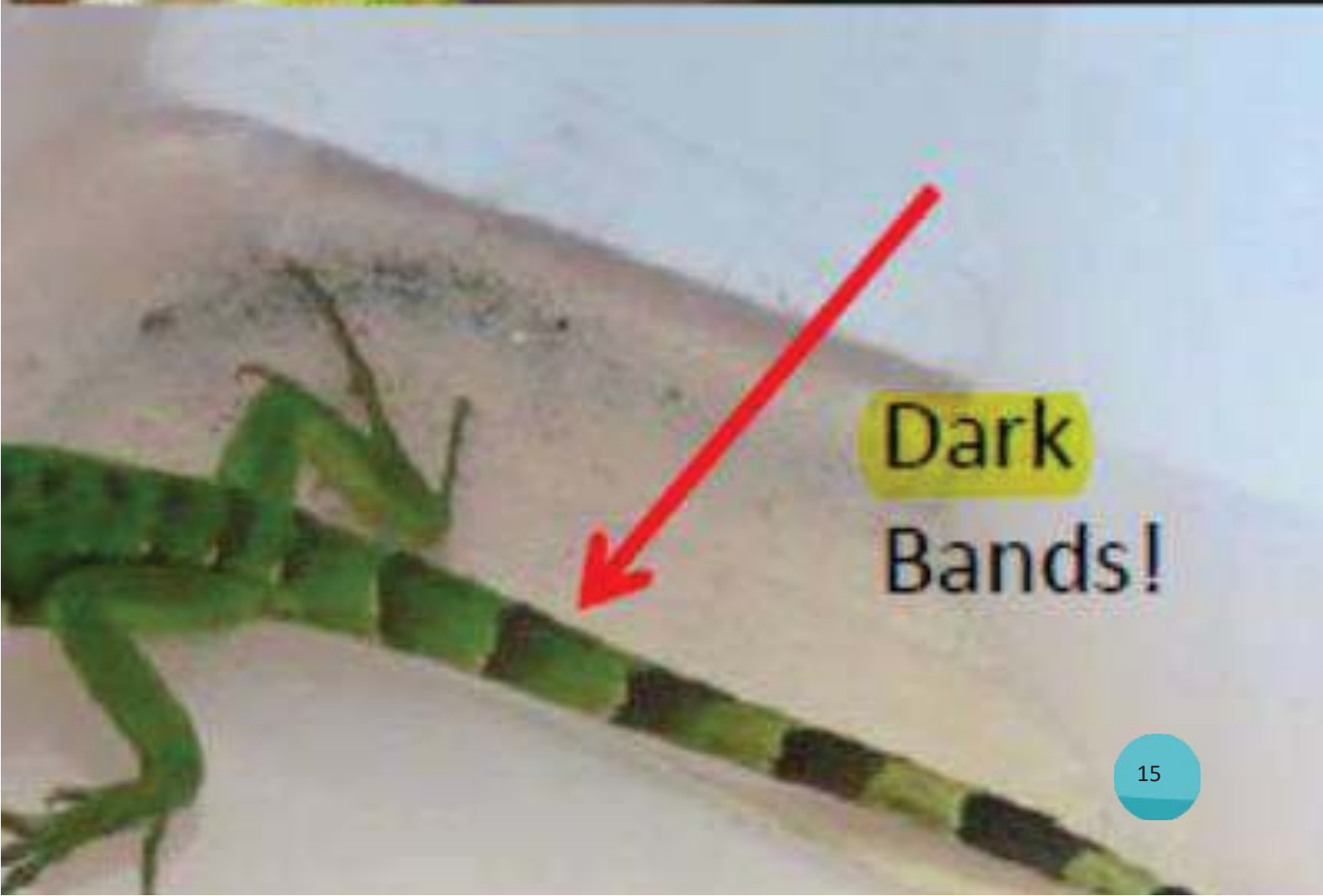
In the aftermath of both hurricanes CNSI, together with STENAPA, estimated the economic damage for St Eustatius as a result of the damage incurred to nature (temporary or permanent loss of ecosystem services) at between 4.5 to 5 million USD for the coming two to three years. This estimate was based on data provided by the Bureau of Statistics, using the results of the Economic Valuation of Nature workshop held at CNSI in April 2017.

The passing of the hurricanes was an unmistakable reminder of the vulnerability of Caribbean societies. In addition to local destruction it also showed the fragile dependence on limited communication and supply routes which may easily be cut off in a hurricane's path. It is not without reason that scientific priorities in this part of the world focus on the sustainability of small-island economies in the wake of climate change, not only predicting an increase in occurrences of major hurricanes, but also possible ecological disruption with potentially serious consequences for public health, food security, biodiversity and ecosystem services.

HIGHLIGHTS


Invasive Green Iguana
STATIAN
Large round scale on chin.

INVASIONS

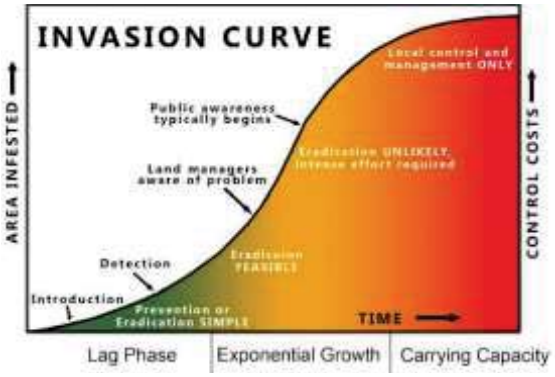


STATIAN INVASIONS

Introduced predators such as cats, dogs, and rats are found all over St. Eustatius and are a primary threat to the island's biodiversity. Rats, which are not limited to urban areas and can be found all the way up the Quill, have become an especially challenging issue as they not only threaten the survival of native plant and animal species but also pose a potential health risk to the island’s inhabitants.

WORKSHOP

Islands like St. Eustatius are particularly vulnerable to invasive species due to their relatively small size and isolated location, together covering just 5% of the Earth's land mass. Yet, islands represent the greatest concentration of biodiversity and species extinctions (40% of fauna at risk of extinction; 80% known extinctions since 1500).



Once an invasive species arrives on an island, early detection is crucial to avoid excessive eradication costs and negative side-effects once it becomes established. Actions that can be implemented include species alert lists, action plans, effective border controls, public awareness, invasive species management teams, government policy (and enforcement), and quarantine import documents.

Invasive fauna species can impact human health, native wildlife and ecosystems, and the local economy. The green iguana (*Iguana iguana*) is a perfect example of an invasive species that has spiraled out of control on many Caribbean islands. The potential severity of this situation on Statia was addressed in November through an invasive species workshop tailored specifically for relevant port of entry staff, civil servants, and public health and park management staff. CNSI hosted the workshop under the Nature Awareness project, which is funded by the Ministry of Economic Affairs.

The workshop was facilitated by three marine and terrestrial biologists from Naturalis Biodiversity Center in the Netherlands (Dr. Bert Hoeksema, Dr. André van Proosdij, and MSc. Niels Schrieken).

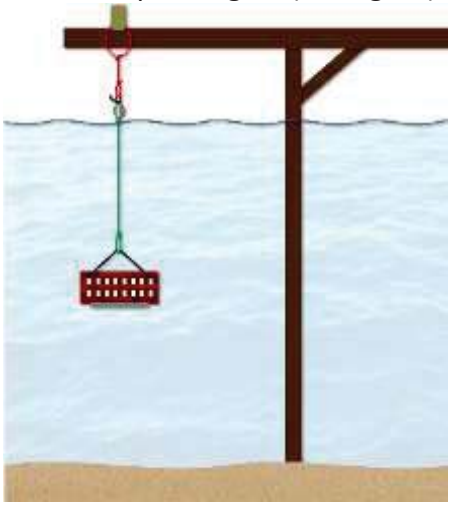
The arrival of the green iguana is terrible news for islands that house the regionally endemic lesser Antillean iguana (*Iguana delicatissima*), and unfortunately, Statia has recently fallen victim to this. Following the discovery of an adult female green iguana in 2016, six hybrids were captured during intensive search efforts. This is an ongoing cause for concern on the island.

In 2000, the first lionfish were spotted in Bermuda and have since spread across the Caribbean Region. With their voracious appetites and rapid reproductive rates, lionfish pose a severe threat to native fish species. On Statia they are harpooned and brought back to shore where their stomach contents are analyzed, and the flesh can safely be eaten once the poisonous spines are cut off.

Invasive plants like Corallita, which covers around 30% of the island's surface, grow quickly and aggressively, spreading and displacing other plant species.

SELT

The SETL-project is a community study which monitors the diversity of species living on a hard surface. This project was launched in 2006 in the Netherlands by GiMaRIS, in close collaboration with the Smithsonian Marine Invasions Laboratory, and is still run by them. The SETL-project is also run locally in the USA by the Salem Sound Coastwatch and is project-based in other European countries and throughout the Ponto-Caspian region (see figure).



The plate design has been deployed along both coastlines of northern America and in Hawaii to facilitate comprehensive comparisons. Within the Caribbean Basin, there are sites in Central America but none on the Atlantic side. Thus in November, St. Eustatius became the first SETL-location for the Caribbean Basin on the Atlantic side.

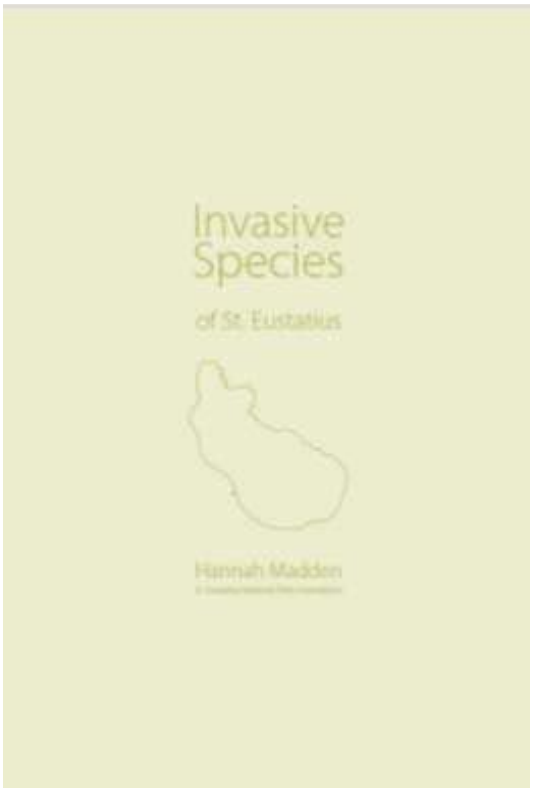
A SETL-plate consists of a 14x14x0.5 cm PVC plate, hanging from a plastic line with a metal core in the water column and deployed under the water line. Monitoring the plates is best done repetitively. Pictures taken of the plates are divided on an overview photo into 25 grids, and the presence of species is scored for each grid. Six SETL plates have been installed on St. Eustatius, and if data is collected quarterly for ten years, the presence/absence of some 450,000 records of species can be documented.

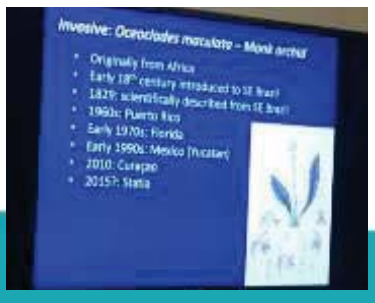
FOLLOW-UP

The invasive species workshop encompassed interactive sessions and discussions that led to extensive knowledge sharing and development at all levels. A recommendation/discussion document was created based on particular issues flagged for importance, including inspections/border control, customs, and capacity-building.

CNSI will organize a follow-up session to promote further discussion and to formalize specific action points between key island stakeholders. It will encourage those who could not attend the workshop to become involved, and will focus on the creation of a task force and/or training if necessary. The responsibility of various stakeholders for e.g. detection of invasive species will also be discussed.

A booklet highlighting the threat of existing and potential invasive species on St. Eustatius was given to all participants of the workshop.





RODENT CONTROL

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, has firmly established itself on the island but is having devastating impacts on its biodiversity. Rats consume everything from native plants, flowers and fruits to agricultural products, which could very well result in a reduction of the number of different plants and animals found on St. Eustatius, which has been document on other rat-infested islands.

Rats also like to eat eggs, and for this reason are one of the most serious threats to island seabird populations worldwide. On St. Eustatius camera traps have documented egg predation by rats at Red-billed Tropicbird nesting cavities. This is of significant concern as St. Eustatius, along with Saba, is an important breeding habitat for Red-billed Tropicbirds, with estimates of 300-500 tropicbirds breeding and nesting each year in Statia's coastal areas. Not only are the nests easily accessible by rats, but the species is especially vulnerable to egg predation due to its single egg clutch size.

It is also likely that rats negatively affect St. Eustatius's only native snake species, the red-bellied racer (*Alsophis rufiventris*), as well as the Lesser Antillean Iguana (*Iguana delicatissima*).

Single egg clutch. Vulnerable red-billed tropic bird chick

Endangered Red-bellied racer.

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. The bacterial disease leptospirosis, which is often associated with rats, poses a serious threat in the Caribbean and is not

adequately documented. Rats are especially a threat in communities where standards of environmental and personal hygiene are not maintained.

Hannah Madden, who is spearheading the project's efforts to protect St. Eustatius's biodiversity from rats, spent time this July2017 with Elizabeth Bell, senior ecologist from New Zealand's Wildlife Management International Ltd. and a leading expert in 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 relative abundance, whereby 60% of the tunnels documented rat prints.

Tracking rats. Inspection of rat prints from tracking tunnels

Relative abundance. Rat (left) and mouse (right) prints on tracking cards

Dr. Teresa Leslie, who is spearheading the project's investigation into the public health threat of rats, is collaborating with Ross University School of Veterinary Medicine in St. Kitts to gather data on what pathogens the rats might be carrying. A team of nine scientists, led by Dr. Sree Rajeev, visited St. Eustatius earlier this year and carried out a "dissection marathon" on caught rats.

Dissection. Researchers from Ross University, St Kitts, working in the vet's lab on St Eustatius removing kidneys from rats for analysis of pathogens

The collected kidney samples were tested for the presence of the *spirochaete* bacteria that cause Leptospirosis, which is spread by rat urine.

Baited programs have had great success in eradicating rat populations, and rodenticide has been used to eradicate rats on more than 20 other Caribbean islands without harming native wildlife.

A major component of CNSI's strategy in implementing the rat control program is to consistently involve and cooperate with government departments, community members and local stakeholders. Their involvement will not only help ensure the success of the program 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.

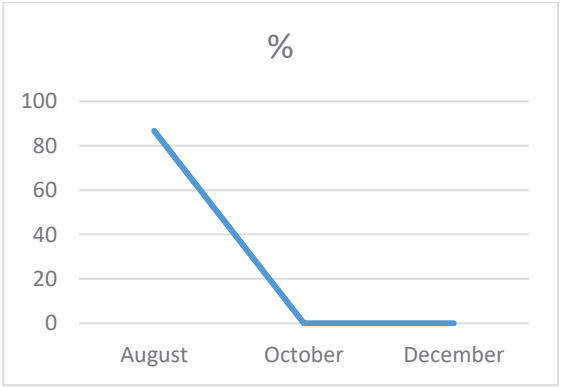
Ongoing outreach activities include lectures and seminars for the public. The key message: rats are a culprit for decreasing biodiversity, and biodiversity is vital for island and population (human) health.

CNSI's baiting program on St. Eustatius began in September in the Pilot Hill area, a known nesting site for red-billed tropicbirds. Twenty-four bait stations are installed in a grid at 25-meter intervals, and these are checked/replenished weekly to ensure uptake of bait remains consistent.

CNSI is being assisted with this component of the rodent control project by Kevin Verdel, a Master's student at the University of Utrecht. The reproductive success of tropicbirds is being monitored and will be compared with previous seasons to measure the effectiveness of control.

Reproductive success. Nesting red-billed tropicbirds

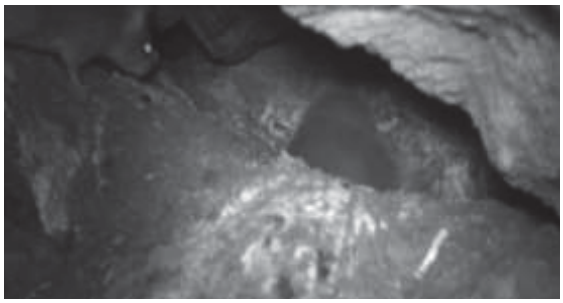
Tracking tunnels placed at the site in August (prior to baiting) demonstrated a rat relative abundance of 86.7% over three consecutive nights. Following the commencement of baiting since September, rodent relative abundance has dropped to 0%.



Baiting. Rodent relative abundance Aug - Dec

Despite apparently significantly reducing rodent abundance at the site, camera traps placed inside nesting cavities are still documenting rat activity.

Fieldwork is ongoing, and the results of this research will be made available next year.



Top left. Rat inside tropicbird nest

Predation. Rat attempting to steal tropicbird egg

Predation. Land crab eating tropicbird egg

Field assistance. Zoe Keogh from Terminal School in the Quill

Bait stations. Locked to prevent tampering

CONCH

CHRONICLES

CONCH CHRONICLES

How does the invasion of a non-native seagrass in the Caribbean affect the second most important benthic fishery in the region? Trying to answer that question, researchers from CNSI, NIOZ, Wageningen Marine Research and Wageningen University, as well as local NGOs worked together to find out more about the diet of juvenile queen conch (*Lobatus gigas*), a species primarily associated with native seagrass beds in many parts of the Caribbean.

Native seagrass: *Syringodium filiforme* was still commonly present at St. Eustatius in 2016. The native seagrass beds were also habitat for numerous macro algae

The invasive seagrass *Halophila stipulacea* was first spotted in Grenada (Easter Caribbean) in 2002 and has since spread rapidly throughout the eastern Caribbean. It has shown an alarming capacity to replace native seagrass species on a large scale. Little is known about the potential consequences of this take-over for species such as queen conch currently living in and potentially depending on the ecology of native seagrass meadows.

Researchers assessed the trophic relation of juvenile queen conch with (i) invasive seagrass meadows, (ii) mixed native and invasive seagrass meadows, and (iii) native seagrass meadows from three locations in the eastern Caribbean (St Eustatius, St Maarten, and St Barthélemy).

Juvenile conch tissue and most of the potential food sources in the three different types of seagrass ecosystems were sampled and analysed for δ^{15}N and δ^{13}C at NIOZ (Texel). Preliminary findings suggest that the sediment organic material is an important food source for juvenile conch irrespectively of the species composition of the seagrass meadow (seagrasses or other potential food sources such as macro algae, or its detritus). The juvenile queen conch stable isotope signature suggests a predominant (benthic) diatom diet.

Further research will focus on the relative availability of diatoms in the invasive *Halophila stipulacea* seagrass meadows versus the native *Thalassia testudinum, Syringodium filiforme* and *Halodule wrightii* meadows.

Invasive seagrass: *Halophila stipulacea* dominates St. Eustatius' seagrass ecosystems in 2017. Little of the native seagrass beds remained and there is limited space for macro algae

OUTREACH

AND EDUCATION

OUTREACH AND EDUCATION

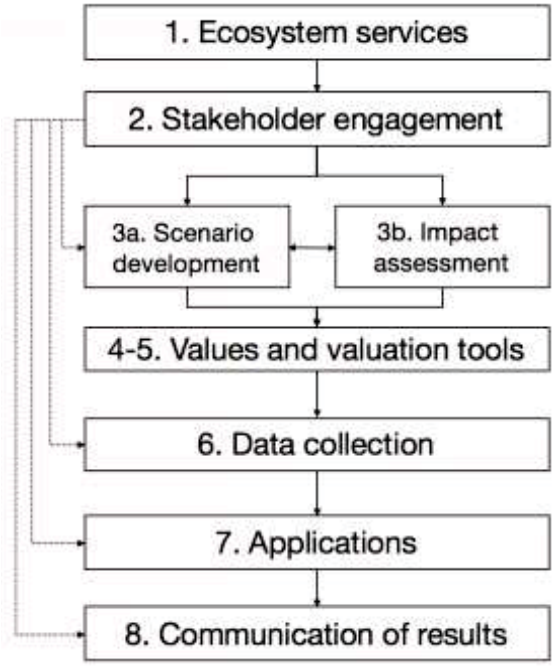
Healthy ecosystems such as the island's coral reef patches and the forests on the hillsides of Boven and the Quill are essential to human well-being on St Eustatius. The St Eustatius Strategic Development Plan also acknowledges the importance of the island's natural attractions e.g. to the growth of the tourism sector. Raising awareness leads to an increase in local knowledge of the importance of nature

ECONOMIC VALUE OF NATURE

Local and global developments have led to an increase in serious threats to these fragile ecosystems, jeopardizing the foundations of the island's economy. To make well-founded decisions that affect the natural environment on the island, it is key that nature's contribution to St. Eustatius' economy and well-being is well understood and highlighted.

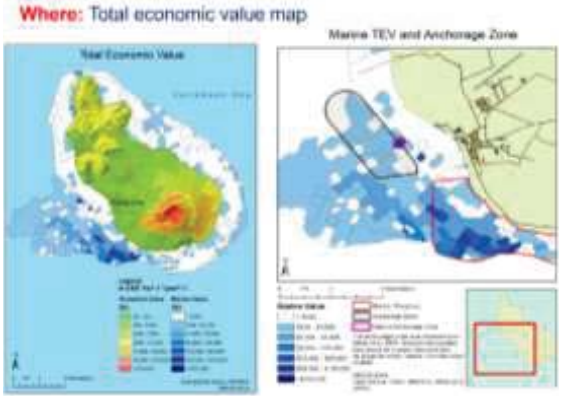
Economic valuation of Statia's main ecosystem services has drawn attention to the economic benefits of biodiversity and has highlighted the growing costs of biodiversity loss and ecosystem degradation. The results of the TEEB St Eustatius study are presented in four reports on the value of Statia's nature by Wolfs Company and the VU University in Amsterdam.

As a part of this study, a survey, which involved over 1,000 respondents including tourists, residents, and citizens of the European Netherlands, demonstrated that natural capital strongly contributes to the island's economy and the well-being of its residents.



Above - "backbone" of economic analysis of ecosystem services

Estimates put the total economic value (TEV)[1] of the ecosystem services provided by the marine and terrestrial ecosystems of St Eustatius in 2014 at $25.2 million per year[2]. This TEV and its underlying components can be used to evaluate strategies for effective conservation measures and sustainable development on St Eustatius.



[1] *For all reports on the ecosystem service valuation study see http://www.wolfscompany.com/teeb-st-eustatius/*

[2] *Calculations made with currency value in 2014*

After analyzing the impact of different development scenarios on the value of future ecosystem services, it becomes apparent that there are indeed opportunities to develop the tourism industry. However, expanding the tourism sector beyond levels of sustainable use will cause pressures that the local ecosystems cannot endure. Consequently, degradation of the natural environment will result in fewer tourists coming to St Eustatius.

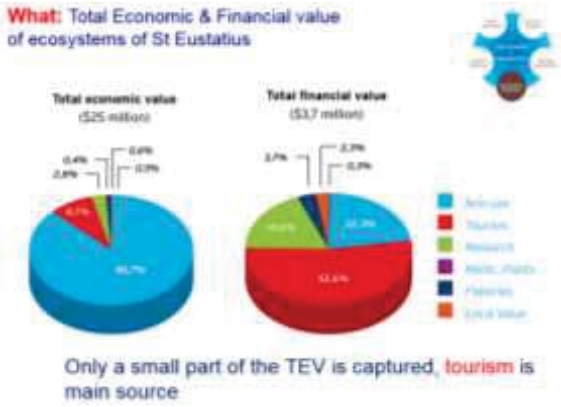
The current demand on the ecosystems of St Eustatius and unsustainable development practices is predicted to decrease the TEV of the island's natural environment from $25.2 million today to around $18.5 million in 30 years.

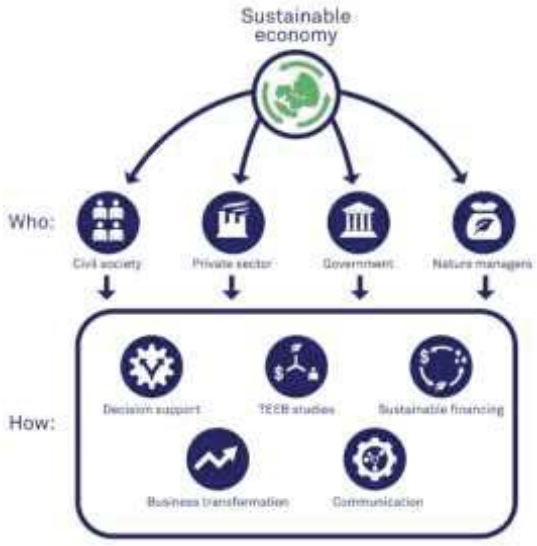
To that end, CNSI hosted two "Economic Value of Nature" workshops on St. Eustatius from 3-6 April 2017.

The workshops were led by experts from Wolfs Company and Wageningen University who have visited the island numerous times to conduct research projects.

The one-day private sector workshop was attended by representatives from NuStar Terminals, St. Eustatius National Parks Foundation, St. Eustatius Tourism Development Foundation, Scubaqua, and the Chamber of Commerce.

The goal of the one-day workshop was to improve the participants' understanding of how the private sector depends on ecosystem services and how they impact these services. During the workshop, participants used the Ecology Scan tool developed by Wolfs Company to identify these impacts and dependencies. Subsequently, company strategies were discussed to maximize opportunities and minimize threats related to the natural environment.





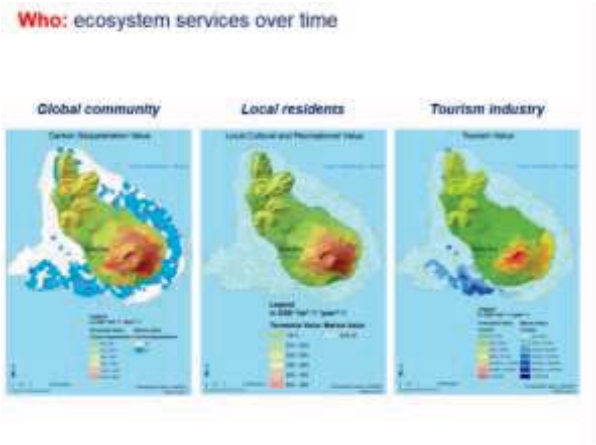
The three-day public sector workshop was attended by civil servants from various departments such as the Department of Agriculture and Fisheries, public works,

public health, infrastructure and economy, and the licensing unit.

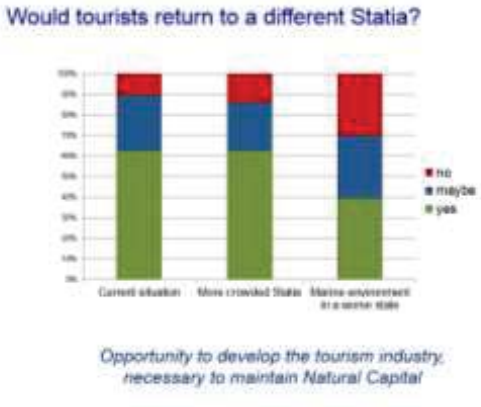
The goal of this workshop was for nature managers and civil servants to develop an understanding of why valuing ecosystem services is useful for St Eustatius, and how to use the valuation results in day-to-day operations. Special emphasis was placed on how this information can be used to develop financial and regulatory policy measures that will improve nature management, support the development of a sustainable island economy and maximize the future well-being of Statia's citizens.

Both workshops consisted of theoretical sessions combined with interactive discussions and exercises. Working groups were asked to develop cases based on identified policy questions or business operations. The results of the assignments give an insight into how the results of the TEEB St Eustatius study can be used and lead to recommendations for further research.

The objective of both workshops was to raise awareness of the interdependency of nature and socioeconomic prosperity, as well as to build capacity to incorporate this knowledge into policy and business operations on St Eustatius. In the public sector workshop, this mainly related to the economy of St Eustatius as a whole, while the private sector workshop focused on the operations of specific companies.



Participants learned to identify different ecosystems on St. Eustatius and were trained in ecosystem valuation methods and techniques, using specific Statian cases. They also learned about the valuation of ecosystem goods and services studies that have taken place in the Caribbean, as well as their influence on nature conservation, management, investments and policies in the region.



The workshop also saw the discussion of factors that increase the effectiveness of a valuation study, as well as the presentation of socio-economic benefits resulting from

influencing nature conservation, management investments, and policies. Additionally, the effects of natural resource conflicts and their relation to ecosystem services were demonstrated.

During both workshops, participants extensively discussed how the results of TEEB St Eustatius study can be used to inform policymakers on the island. The most important issues that were identified are:

- Spatial planning
- Damage assessment
- Managing erosion and roaming cattle
- Biosecurity
- Including ecosystem services in investment decisions

To follow up on the workshop and continue to raise awareness about the value of natural capital on St Eustatius, Wolfs Company developed a toolkit for St Eustatius that can be used by e.g. CNSI and STENAPA to reach out to stakeholders.

The kit includes a tailor-made version of the ecology scan (used in the private sector workshop) to evaluate the interaction of businesses on St Eustatius with their natural surroundings. The tool is based on locally relevant ecosystem services and can be used to assess risks and opportunities for businesses related to these services.

Furthermore, a tool for the public sector was developed to map out the effects of government interventions (e.g. goat management, erosion control) on ecosystem services.

This tool is also based on locally relevant ecosystems, services, and stakeholders on St Eustatius. The set-up of the tool is a multiple criteria analysis which qualitatively assesses ecosystem changes.

A repository of relevant reports related to natural capital on St Eustatius has also been created. CNSI staff are trained to use the toolbox and will continue the training on ecosystem services on St Eustatius.

YOUTH AMBASSADORS

One of the expected results of the nature awareness project is to increase local knowledge of the importance of nature by the youth and educators through workshops, school presentations and projects, educational material and environmental clubs for youth.

The role of the youth ambassador is to stimulate students on St. Eustatius aged 4-18 about nature-related topics.

CNSI's first youth ambassador, **Gavin Palmer** from Jamaica, visited the island from 16-26 April. Gavin is an MSc student at the University of the West Indies, Jamaica, studying renewable energy management.

Many activities were organized, including visits to the elementary schools with STENAPA and a tour of the solar park for students of the Gwendoline van Putten high school in cooperation with St. Eustatius Utilities Company (STUCO).

A variety of interactive sessions was developed for elementary and high school students of all ages. Gavin prepared a role-playing activity about agritourism that ensured students actively participated in the session while learning about the topic. He also developed a presentation about renewable energy, which he gave at the schools.

To coincide with Gavin's visit, CNSI organized its first ever Youth Science Café which featured speakers from Terminal School as well as a presentation by the youth ambassador.

Gavin also met with Anthony Reid (Agriculture, Fisheries & Animal Husbandry) and Charles Lindo (St. Eustatius Tourism Development Foundation) to discuss the development of agritourism on Statia.

An article about Gavin's visit was published in the Daily Herald, and he also appeared on CTC radio. An excellent motivational speaker, Gavin was able to reach out to almost all youth across the island in an effective and inspirational way.

Gavin is a member of the Caribbean Youth Environment Network (CYEN), who were happy to assist with finding future ambassadors. As a result, Ms. **Sade Deane** from Barbados was nominated by CYEN and accepted our invitation to be the next youth ambassador in October.

Sade visited Statia from 15 - 21 October; CNSI coordinated with the schools and after-school clubs in order for Sade to be able to engage with as many students as possible.

This was another successful week of activities with an inspirational young person from the region, to which the schools and students responded positively.

In particular Gwendoline van Putten high school science teacher Froukje Spoelma facilitated three separate visits: two in-school lessons and one field trip.

Sade's topic focused on marine debris, microplastics and recycling, therefore we requested a tour of Statia Waste Solutions' recycling facility and incinerator to culminate the week of lessons.

The manager of the facility, Jeffrey Lewis, organized an interactive and informative visit for around 70 students. The field trip was well received by all students and even allowed some to work on the sorting belt.

An International Coastal Cleanup event was organized at Zeelandia beach on October 21st. Letters were distributed to all school students informing them of the event, with 21 volunteers participating on the day (excluding CNSI staff and the youth ambassador).

Zeelandia Beach was chosen as the site of the cleanup due to its importance for nesting sea turtles and its RAMSAR designated status. Over 193 pounds of debris was collected in less than two hours.

Sade was one of the presenters at CNSI's Science Café where she continued the week's theme of man-made marine debris. Feedback from the schools and after-school clubs was positive, such as: "She brought across the message step by step on the girls' level, giving examples and interacting with them, having a two-way conversation" (Elaine Cuvalay, Director of Daughters of the King Foundation).

Sade also featured on STDF's FYI radio show, and an article about her visit was published in the Daily Herald.

CNSI will bring two more youth ambassadors to Statia in 2018, continuing an essential and rewarding outreach component of the nature awareness project among the local community.

HEALTH IS WEALTH

The future of St Eustatius can only be sustainable if the island population is healthy. Research within the framework of the Maastricht Global Health Course is increasing our understanding of diseases, their cures and improving our way of life.

Since 2013, The Eastern Caribbean Public Health Foundation has hosted Masters students from the Global Health Program, University of Maastricht. Every year since its inception, the number of students has steadily increased. In the last few years, CNSI has hosted the students during their stay on Sint Eustatius. During the summer of 2017, 14 students visited Sint Eustatius under the direction of Dr. Teresa E. Leslie to conduct research for their master theses.

The majority of students that conduct research on the island have biology or medical backgrounds but are interested in incorporating analyses of the social determinants of health into their dossier. These researchers come from all over the world to the Global Health Field School on St Eustatius.

All their investigative work is noticed since it involves a wide range of health issues. The two major 2017 themes included:

1) Attitude and Perception
   - On nutrition, nutritional knowledge and diabetes
   - Towards vaccination programmes (Yellow Fever)
   - On risk of Zika virus in pregnancy among women of childbearing age
   - Towards and experiences with teen pregnancy
   - Waste management and associations with contagious disease
   - On dementia in elderly people on St Eustatius
   - On knowledge towards rodent-borne infectious diseases in St Eustatius

2) Environment
   - Sustainable agriculture
   - Relationship between biodiversity and vector-borne diseases
   - Implementation of in2care mosquito trap through citizen science approach

Other subjects included:

- Burden and under-reporting of foodborne illness
- Chinese emigrants and restaurant business in St. Eustatius
- Antibiotic use and resistance in the Caribbean

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ORIGINAL ARTICLE

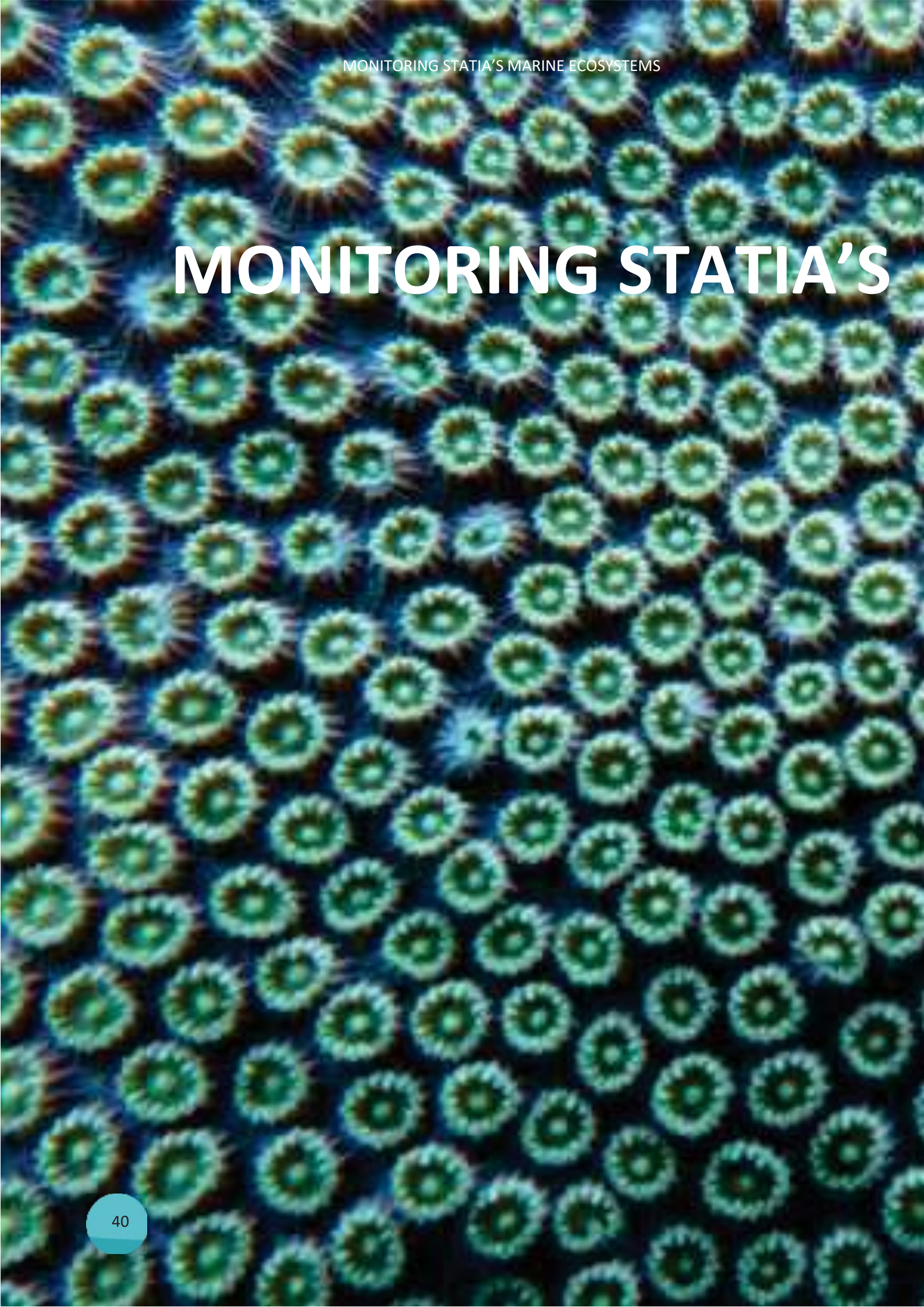
OPEN ACCESS Check for updates

An analysis of community perceptions of mosquito-borne disease control and prevention in Sint Eustatius, Caribbean Netherlands

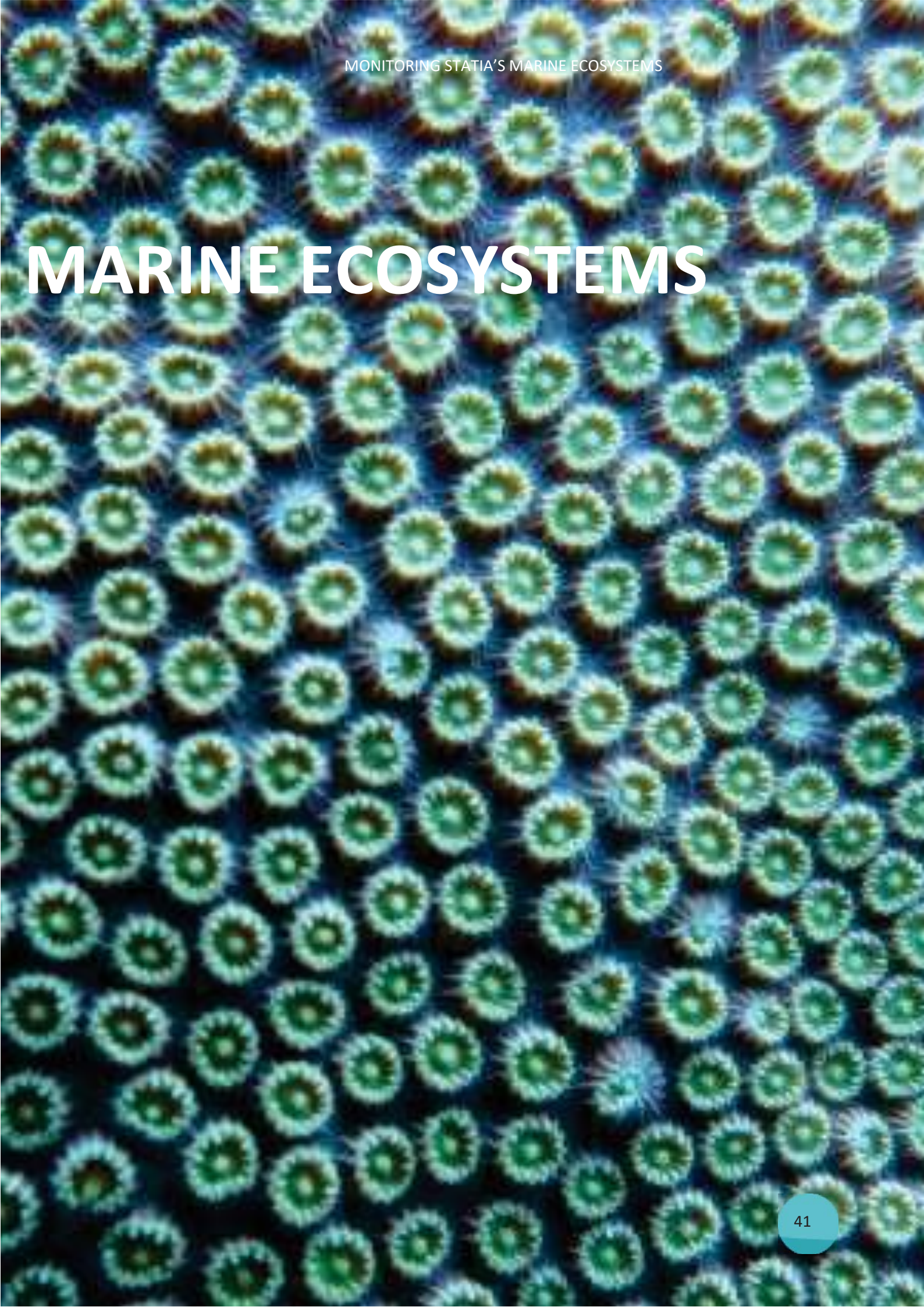
Teresa E. Leslie[a], Marianne Carson[b], Els van Coeverden[c], Kirsten De Klein[c], Marieta Braks[d] and Anja Krumeich[e]

[a]Eastern Caribbean Public Health Foundation, Sint Eustaitus, Caribbean Netherlands; [b]Pathobiology and Population Studies, Royal Veterinary College, London, UK; [c]Department of Social Sciences, Wageningen University, Netherlands; [d]RIVM, Bilthoven, Netherlands; [e]Health Medicine and Life Science, University of Maastricht, Maastricht, Netherlands

MONITORING STATIA'S



MARINE ECOSYSTEMS



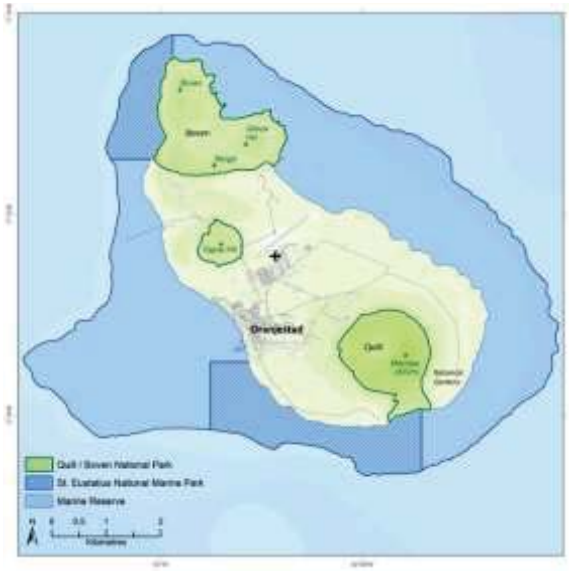
MONITORING STATIA'S MARINE ECOSYSTEMS

CNSI continues to monitor the vulnerable ecosystems of St. Eustatius coordinated by our Data Monitoring Officer (DMO). Coral reef surveys are conducted in collaboration with St. Eustatius National Parks (STENAPA) using the Global Coral Reef Monitoring Network (GCRMN) Protocol. Data on the island's fisheries are collected and assessed by the DMO with plans to automate data collection using a mobile application under the Statia Blue Project. The aim is to create sustainable practices for Statia's fisheries while putting the fish buyers in touch with the suppliers on a "real-time" basis.

GLOBAL CORAL REEF MONITORING NETWORK

St. Eustatius' coral reefs like many others in the Caribbean are under threat from the impact of climate change and other anthropogenic stresses. In an effort to assess the response of these fragile ecosystems, the Global Coral Reef Monitoring Network (GCRMN) supported by the International Union for Conservation of Nature and other international partners developed a standard coral reef monitoring protocol to strengthen coral reef ecosystem management in the region. This is to ensure that useful data is collected for efficient comparison across Caribbean territories.

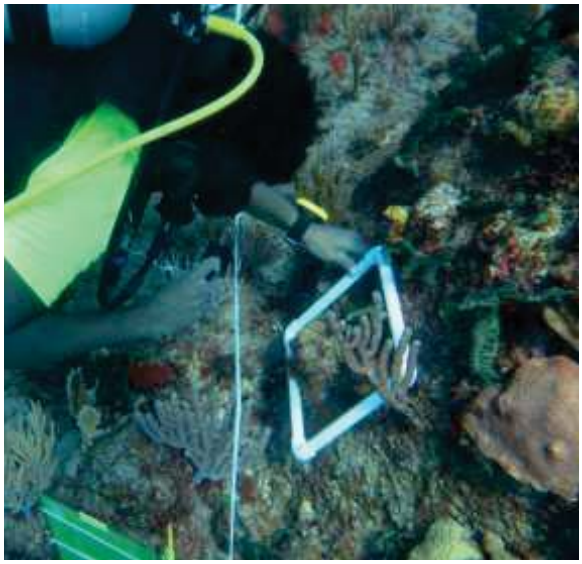
The GCRMN protocol utilizes eight criteria for data collection on coral reef ecosystems: abundance and biomass of reef fish taxa, relative cover of hard corals and their dominant competitors, health assessment of hard corals, coral recruitment, abundance of key macro-invertebrates (lobsters, queen conch, sea urchins, sea cucumbers), water quality and three-dimensional reef structure. Data within these categories are collected at 20 sites across four monitoring zones. Two of which are marine reserves where it is prohibited to fish with all types of fishing gear except handlines.



According to the Reef Health Index, the coral reef ecosystem of St. Eustatius is in a critical condition. Statia's coral reefs have been on the decline over the last 20 years, due to the impact of hurricanes and in particular the massive bleaching event of 2005 which reduced our coral abundance by 50 %. In 2017, corals were found to occupy 4.94% of the benthos with macroalgae continuing to dominate. The species composition of corals has also changed. Researchers studying the reefs in 1999 observed an abundance of reef-building boulder corals such as *Orbicella annularis, O. faveolata, O. franksi, Montastrea cavernosa and Psuedodiploria strigosa*. These accounted for 54 % of the species assemblage. Eighteen years later,

they represent 34 % of the assemblage, with *O. annularis* not being observed during our survey. Only *M. cavernosa* maintained its abundance since 1999 however, multiple colonies were observed to be experiencing some degree of bleaching. The impact on Statia's reefs due to the reduction of these reef-building species is still unclear.

Herbivorous fish (parrotfish/surgeonfish) biomass which aid in keeping macroalgal biomass in check, has suffered a 58% reduction over the last 18 years with no clear indication for this decrease. Fishing pressure on the island has remained relatively the same during this time. The impact of this reduction is observed in the increased macroalgal cover suggesting that parrotfish were the dominant algal grazers in the past since the black urchin (*Diadema antillarium*) die off across the region in the 1980's. Reports on coral reef surveys done on the island in 1999 described low macroalgal cover in the presence of very high parrotfish/surgeonfish biomass. Grouper/snapper biomass is also poor with no large grouper species being observed on any of our survey dives. Even though these species were observed in relatively frequent numbers in 1999 at similar survey sites.



These annual surveys continue to provide insight into the state of Statia's marine ecosystems. Bringing to our attention the need for further research into the anthropogenic drivers of coral reef degradation on the island and the development of mitigative measures.

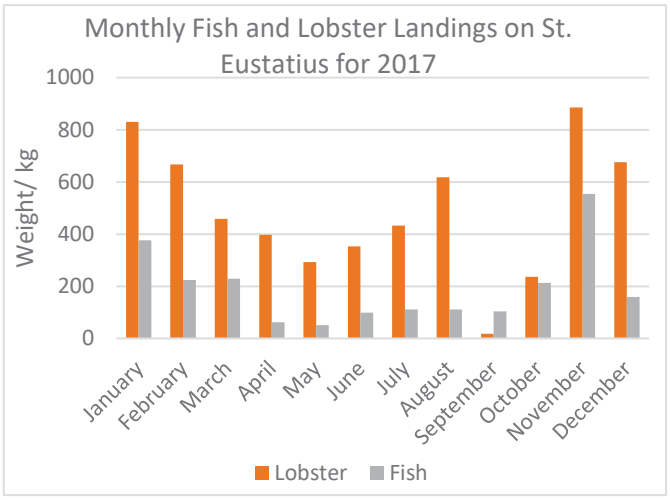
STATIAN FISHERIES

The marine ecosystems of St. Eustatius have supported a small artisanal fishery for over 30 years with fishing effort being relatively the same during this time. In 2017, there was an average of < 1 fishing trip per day. Lobster traps are the most common gear type used followed by spearguns with SCUBA. Caribbean spiny lobster is the primary product but fish (reef and pelagic) and conch are also caught. Landed lobster are normally exported to St. Maarten but exports declined in the last quarter of 2017 due to the collapse of the

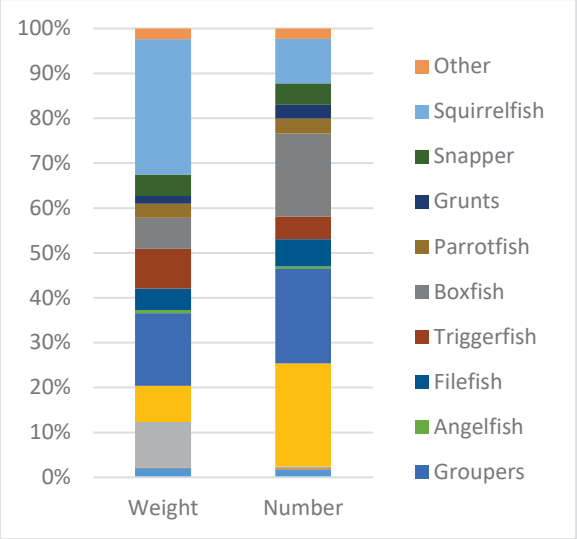
tourism market on surrounding islands by Hurricanes Irma and Maria. Landed reef/pelagic fish are sold locally. Morphometric data for all catch types are collected for 20-30 % of fishing trips throughout the year. This is done to assess Statia's fishable stocks for signs of overexploitation.

For 2017, a total of 5864 kg of lobster and 2293 kg of fish (mixed reef and pelagics) were landed on St. Eustatius. Monthly landings of lobster for ranged from 17.6 – 885.5 kg while those for fish ranged from 50.8 – 553.6 kg. Fishing effort and catch were significantly reduced for the month of September due to Hurricanes Irma and Maria.

A morphometric assessment of the Caribbean spiny lobster landings (9 % of fishing trips) revealed that 28 % of males and 41 % of females were undersized. The average carapace length of females (97 mm) was close to the size limit (95 mm), which is concerning. Length frequency data of mixed reef fish was collected for 26 % of trips. Surgeonfish and small groupers accounted for 44% of the sampled catch by number of individuals while squirrelfish and small groupers accounted for 46 % by weight. Parrotfish in both weight and number accounted for 3 %.

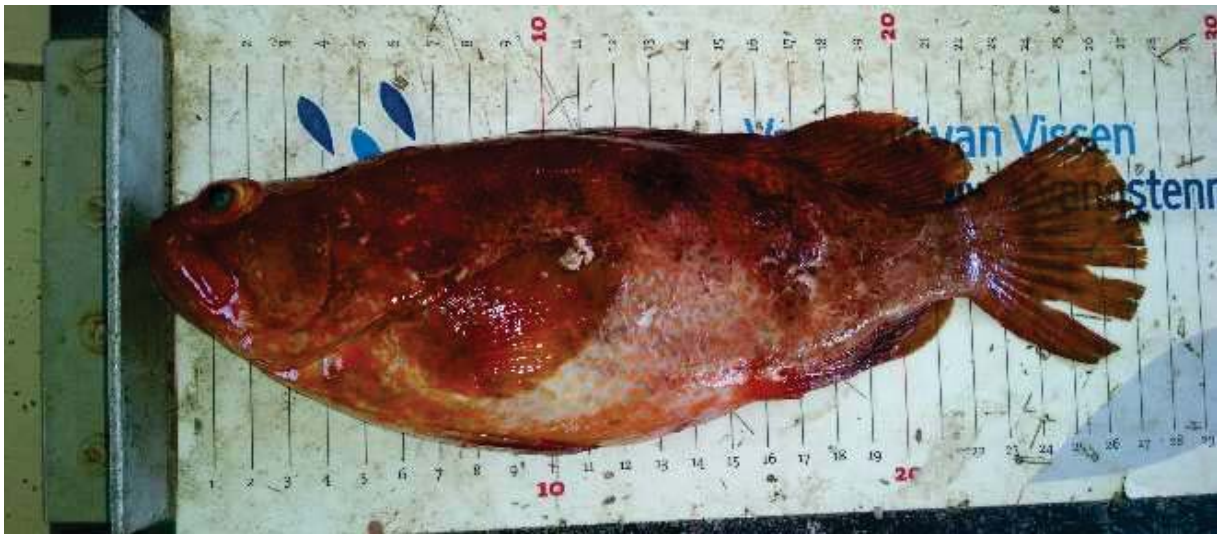


Parrotfish are an important species to monitor as it has a significant impact on reef health by keeping macroalgae in check. The species is caught by both lobster traps as by-catch and intentionally using spearguns with SCUBA. Four species (princess, redband, redtail and stoplight parrotfish) were landed by traps but only the stoplight parrotfish was recorded as being landed by SCUBA. The average length of stoplight parrotfish landed by pots (33 cm) was larger than those landed by SCUBA (29 cm). The average length of landed princess parrotfish was 27 cm, redband parrotfish 22 cm and redtail parrotfish 26 cm. According to Fishbase.org, the common size of the stoplight parrotfish is 38 cm which indicates that mature individuals are present but are smaller than commonly seen throughout the region. The other parrotfish species are slightly larger (by ≤ 2 cm) when compared to those in the region.



Morphometric data was collected for 39 % of the queen conch landings for 2017 (1831 individuals harvested). Analysis of the data revealed that Statia's conch populations are sustainably harvested with no indication of overexploitation. It is currently illegal to export queen conch but local consumption is allowed. The National government is in the process of assessing the feasibility of exporting the resource which would bring increased earnings for the island. This is being done in consultation with the Convention on International Trade in Endangered Species (CITES), the regulatory body responsible for the international trade of queen conch.

St. Eustatius' fishable resources are currently harvested at a sustainable level due to limited fishing effort. Keeping this fishing effort in check will reduce the pressure on the island's limited fishing grounds. This will aid in securing the resource for future generations as well as maintaining marine biodiversity. Fisheries data will continue to be collected with the support of the Ministry of Economic Affairs.



STATIA BLUE

A key component of Statia Blue is to ensure that fishermen increase compliance with the principles of sustainable fisheries and thereby play an active role as stewards of the protected reefs, parks and species which form the fragile natural endowments of the island and its people.

Together with its local partner Sint Eustatius Foundation (SEF), CNSI initiated an, even for global standards, highly innovative project for developing sustainable fisheries, particularly for Sint Eustatius and (small) Caribbean islands.

Statia Blue is funded by the EU-EDF Innovation programme and involves the support and engagement of fisher-folk in education on pricing and the market mechanism using mobile application technology for creating a real-time market place for fish and seafood. The application will be used for ongoing research and education, supporting market clearing prices and monitoring and evaluation of catches to encourage sustainable practices, such as fishing a safe distance from protected zones and management of invasive species.

Working with a group of Statian fishermen, the project develops a mobile app ("Statia Blue") and provides fishermen with waterproof mobile phones. As fish are caught, the fish is identified and described and reported back to a central database. At the central database the price of that fish and the total catch is estimated based upon the fish caught by all fishermen on that day. Prices are reported back to the fishermen so that they can make informed decisions about the harvesting of those fish. Fishermen can continue or stop fishing depending upon their satisfaction with the price estimated on the market. A pricing mechanism will be used to signal to fishermen which fish are in demand. The app will also have an educational element, administered by Sint Eustatius National Park (STENAPA) who will also raise the credit lines on fishermen's access to the 'STENAPA credit card' as an incentive for participating in the pilot project.

Statia Blue will also have a consumer interface, reporting on which fish are advisable for eating during the season based upon data on the stock of fish in Statian waters. The pricing element will also help reduce adverse selection.

The project is expected to benefit fishermen primarily in St Eustatius as well as Saba and St. Maarten and the closest off shore markets for fish, St Kitts and hoteliers in St Maarten, and other Caribbean islands. The successful deployment of this project in Sint Eustatius may benefit fisheries on neighbouring islands and can serve as best practice for all Overseas Countries and Territories trying to innovate and enhance the sustainability of their fisheries.

THE ALWAYS

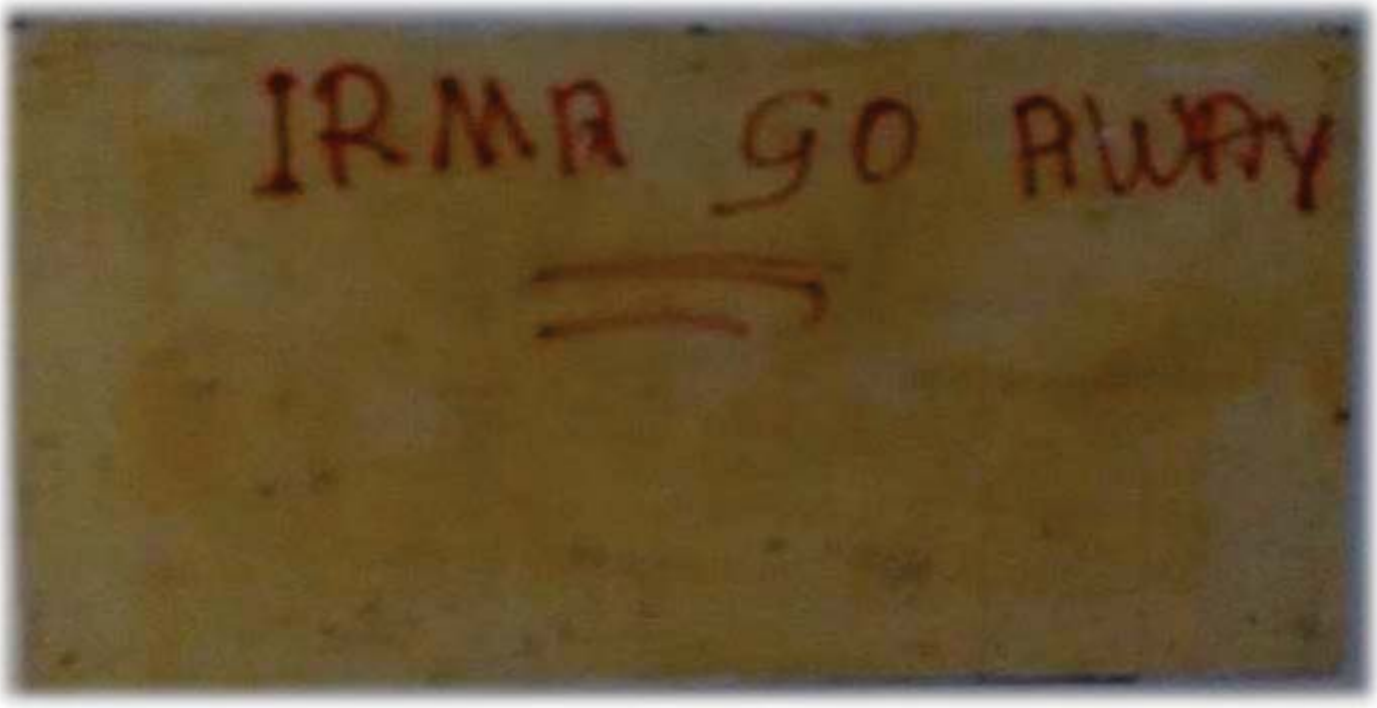
IRMA ...

LURKING THREAT

and MARIA

THE ALWAYS LURKING THREAT

On September 6, 2017, record-breaking Category 5 Hurricane Irma pummeled the northern Lesser Antilles, leaving a trail of destruction in her wake. While St. Eustatius was spared extensive infrastructural damage and power was restored to most homes within just a few days, forest cover in the Quill National Park did not fare so well.



BOLDING THE QUILL

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.

An initial exploration of the Quill on September 9th 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 Silk Cotton and other large trees that once dominated the canopy; instead the crater wall that was once covered in towering trees was almost bare.

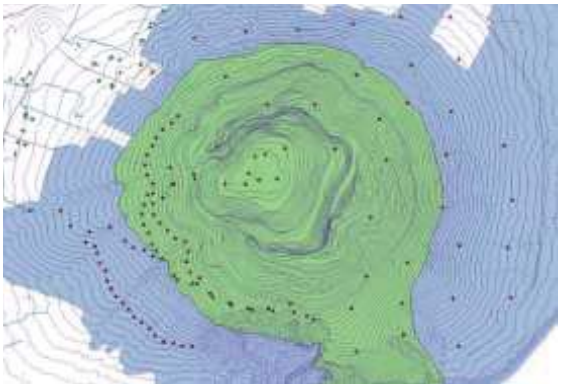
Two weeks later, Hurricane Maria passed to the south of St. Eustatius and brought over 100mm of rain but less severe winds. Again, residents of St. Eustatius breathed a sigh of relief, but our thoughts were with those who suffered in St. Maarten, Anguilla, Dominica and other affected islands.

Thankfully Maria's 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 provide food for wildlife were lost.

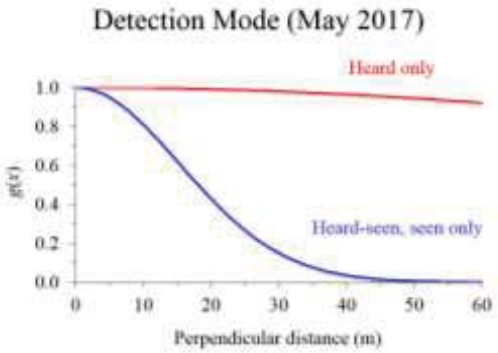
Immediate concern fell to the Bridled Quail-dove, a species that forages for fruits and seeds on the forest floor. The Quill is the only habitat on Statia that supports the quail-dove, and a population assessment was conducted in May 2017 in connection with the rodent control project.

Initial results were encouraging, with an estimated 1,030 (standard error [SE] = 275, 95% confidence interval [CI] = 561–1,621) quail-doves across its local habitat of 440 hectares, possibly the highest known density in the region. With fears for the population post-hurricane, the surveys were repeated in November

The team consisted of Dr. Frank Rivera-Milan (US Fish & Wildlife Service), Hannah Madden (CNSI) and Kevin Verdel (student from University of Utrecht).

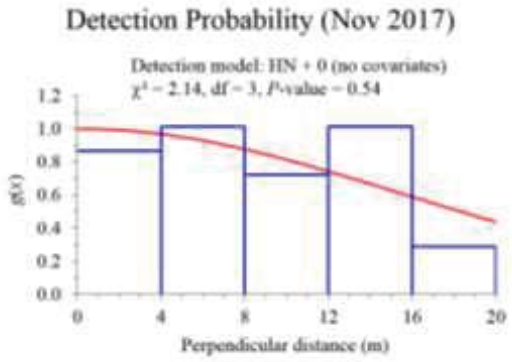


Surveys consisted of repeated transects, also using a playback of the Key West Quail Dove's call, given that fieldwork took place outside the breeding season. Unfortunately the quail-doves did not respond to the playback, which meant that all the detections during November's surveys were by sight only. The perpendicular distance of the quail-dove from the transect was measured, and the data collected were brought into program Distance to give a total population size.



After completing all the surveys and analyzing the data, a decrease in the Bridled Quail-Dove mean population size estimate of around 230 (from 1,030 in May to 803 (SE = 208, 95% CI = 451–1,229) was recorded in November, a drop of around 22% (SE = 8.2%).

Nevertheless, statistical tests indicate that this decrease in the population is not significant (Z score = 0.66, P value = 0.51).



During the dry season (December to April), food availability is reduced due to vegetation damage and will reduce further, which will likely affect survival and reproductive rates. The 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 original evergreen seasonal forest has been heavily impacted by Hurricane Irma. This will also have a negative effect on the quail-dove and other bird species that rely on this unique habitat for their survival and reproduction.

Population Decline

Survey Date	*N*	SE
May 2017	1,030	275
Nov 2017	803	208
R	0.780	0.290
$(R-1)\times 100$	−22%	8.2%
Z score	0.66	
P value	0.51	

Following initial surveys in May, the density of Bridled Quail-doves on Statia was encouraging, and was possibly the highest density in the region at the time (although many islands that support the dove have not conducted population assessments).

However, there is now concern for the species given its very restricted range (only found in the Quill National Park on Statia, at elevations of around 200 meters and above) and the fact that parts of its natural habitat suffered extensive damage from Hurricane Irma. Removing predators and domestic animals above 250m is recommended to help the species recover and enhance its prospects for long-term survival on Statia.

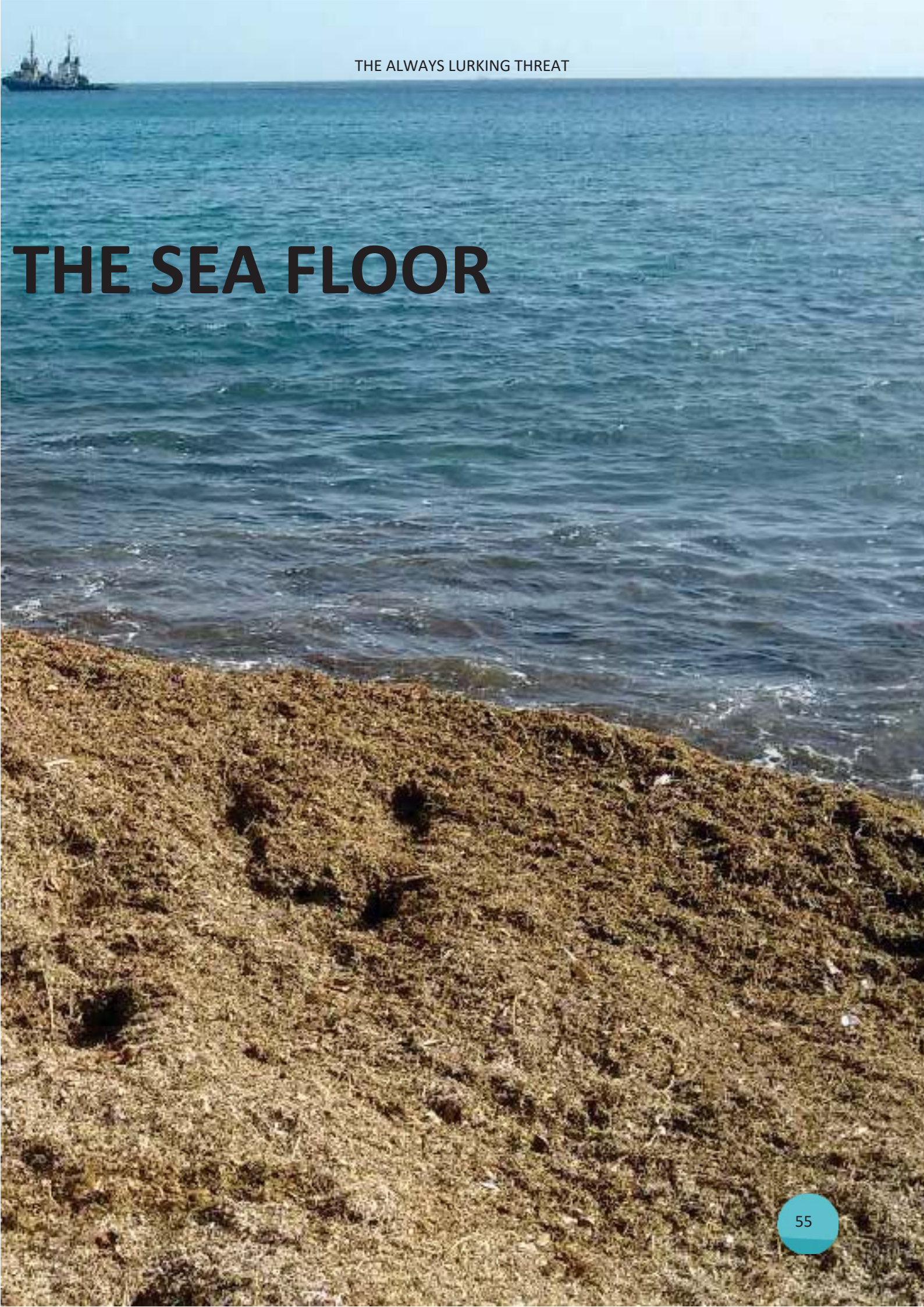
Rat and other invasive predator species may increase in density and become more

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).

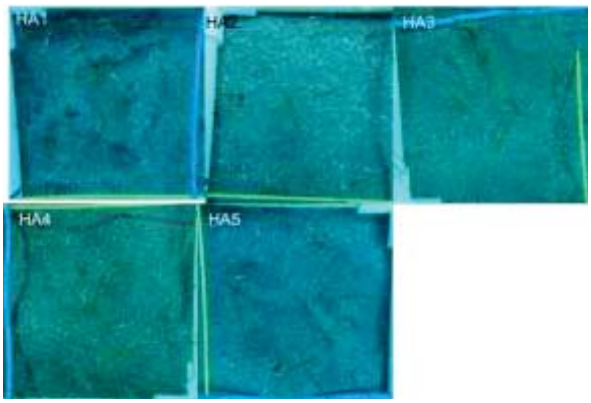
An increase in rat density can therefore be bad news for Quail-dove survival and reproduction. With this in mind, CNSI's rodent control project has great relevance for the Bridled Quail-dove and could produce important conservation results. Baiting will begin in the Quill from January 2018 and the results will be made available later in the year

SWEEPING

THE SEA FLOOR



SWEEPING THE SEA FLOOR

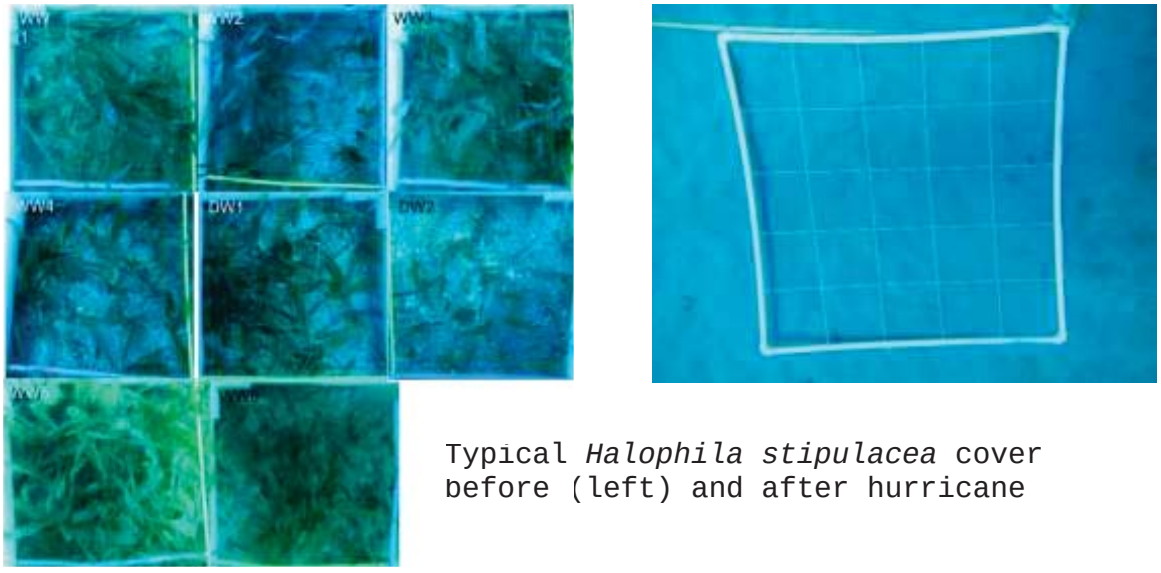


Halodule wrightii cover after hurricane

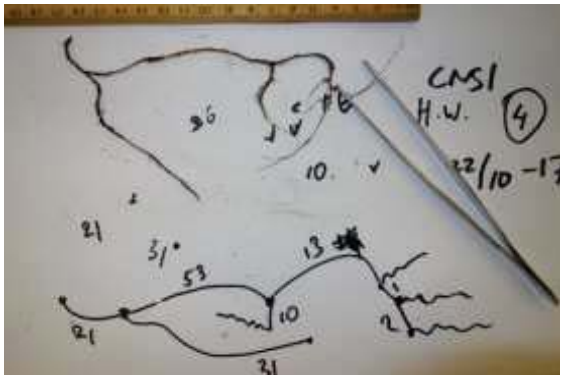
While Irma mainly affected the terrestrial area of St Eustatius, resulting in infrastructural damage and considerable damage to trees, Maria mainly impacted the underwater environment and the Lower Town coastal area on the south west side of the island. Inspection of underwater ecosystems revealed considerable damage to the coral reef systems, but also the complete eradication of large areas that were covered with invasive seagrass meadows (*Halophila stipulacea*) before the hurricanes.

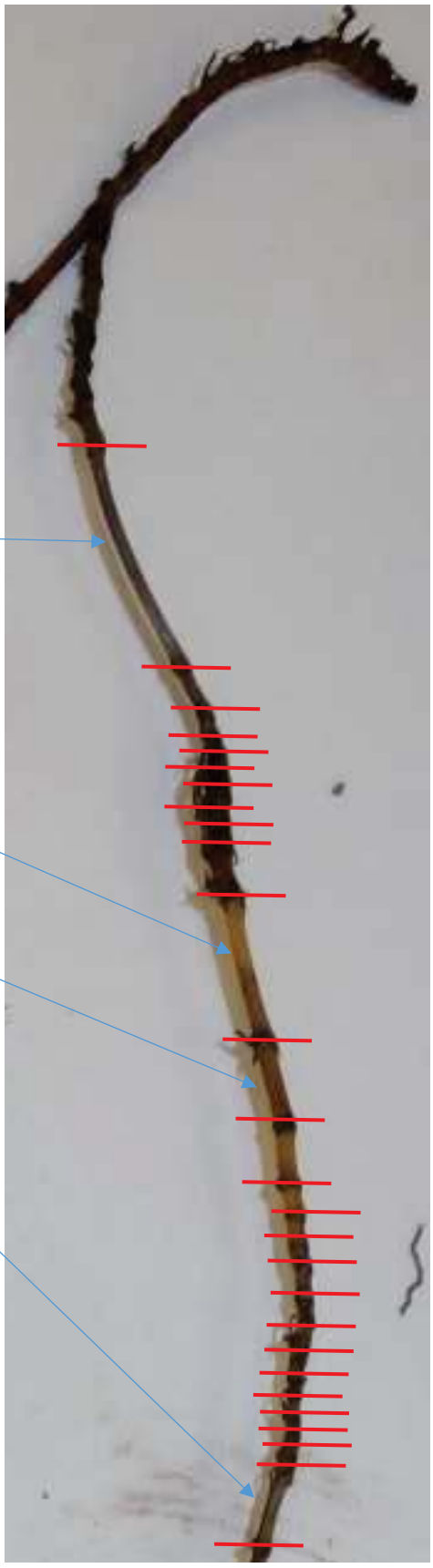
While *Halophila stipulacea*, at St Eustatius mainly occuring below 20m depth, was completely wiped out of impacted areas, the native seagrass *Halodule wrightii* withstood the impact of the hurricanes. For this reason, CNSI began investigating in more detail the functioning of both seagrass species.

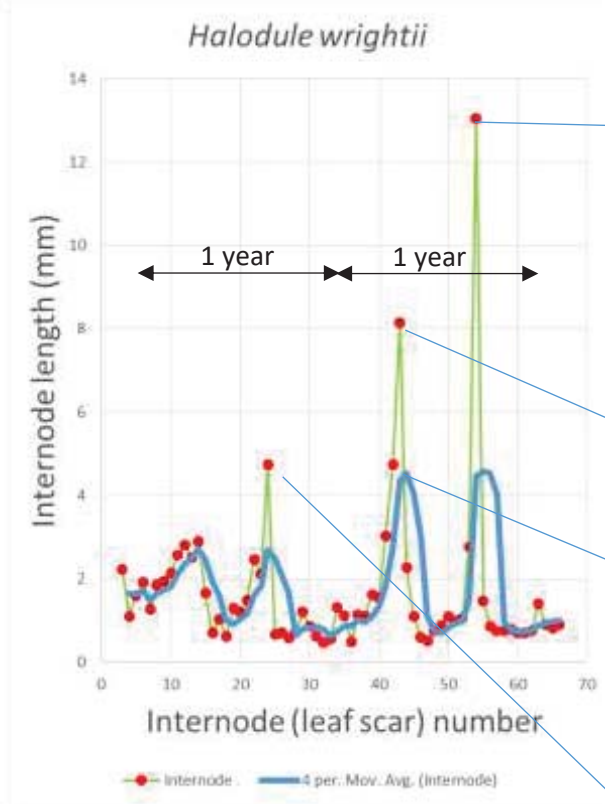
Halodule wrightii, sampled just after Maria passed and analysed using a leaf scar (internode) counting technique, revealed living shoot ages of more than 2 years. The native *Halodule wrightii* proved 'hurricane proof', while the invasive *Halophila stipulacea* seems not adapted to these dynamic conditions. To prevent *Halophila stipulacea* from taking over native seagrass systems, a good storm every once in a while restores the ecological equilibrium.



Typical *Halophila stipulacea* cover before (left) and after hurricane







Consequitive internode lengths of one *Halodule wrightii* shoot reveales a seasonal growth pattern from which an age of more than two years can be concluded.

FIGURES 2017

TURNOVER 2017

CNSI realised a total turnover of 685 k€. 241 k€ was associated with funding received through EU and other national and international acquired projects in addition to basic funding from the Ministry of Education, Culture and Science (Min OCW). The support mission of CNSI contributed another 28 k€ to its turnover.

Turnover 2017	k€
Min OCW	416
Min EZ	228
Min I&M	2
EU	4
NuStar	2
RAAK	4
Support	28
	685

STAFF 2017

CNSI employed a staff of six employees and worked with one intern and two sub-contractors. Together they represented an average full-time equivalent (FTE) of 5.9 and 5 different nationalities. Staff, sub-contractors and interns increased by 2.5 FTE compared to 2016. Scientific activities accounted for about 2.4 FTE (2016: 0.4), management for 2.1 FTE (2016: 1.8) and support for 1.4 FTE (2016: 1.2).

Labour 2017	FTE
Scientific	2.4
Management	2.1
Support	1.4
	5.9

Of which	FTE
PhD	1.5
MSc	1.6

SUPPORT 2017

CNSI counted 2000 (2016: 2661) overnight stays (5 to 6 guests per day), despite the hurricanes. A total of 4 courses and workshops were organised in addition to 15 meetings for external organisations. CNSI's research vessel was used 25 days by third parties.

Support 2017	#
Overnight stays	2000
Courses and workshops	4
Other meetings	15
Boat use (days)	25

OUTPUT 2017

CNSI staff produced one peer-reviewed paper in 2017. In addition, CNSI-supported projects and activities resulted in 16 peer-reviewed papers (2016: 10). CNSI produced 12 professional publications. Apart from progress reports these include workshop proceedings / results and hurricane nature damage assessments. CNSI organised 20 presentations for the general public (2016: 33), including Science Café presentations and presentations by pupils of Statian schools (Youth Science Café in association with Youth Ambassadors for Nature and 'Missing Chapter - Kids Council' presentations). Alone or together with its partners CNSI issued 16 press releases. Together with press coverage at science cafés this led to 17 newspaper articles (2016: 21) in addition to 5 radio interviews. CNSI staff was present at 6 conferences and expeditions. In 2017 CNSI received 6 new subsidies. CNSI staff are members of 5 scientific organisations.

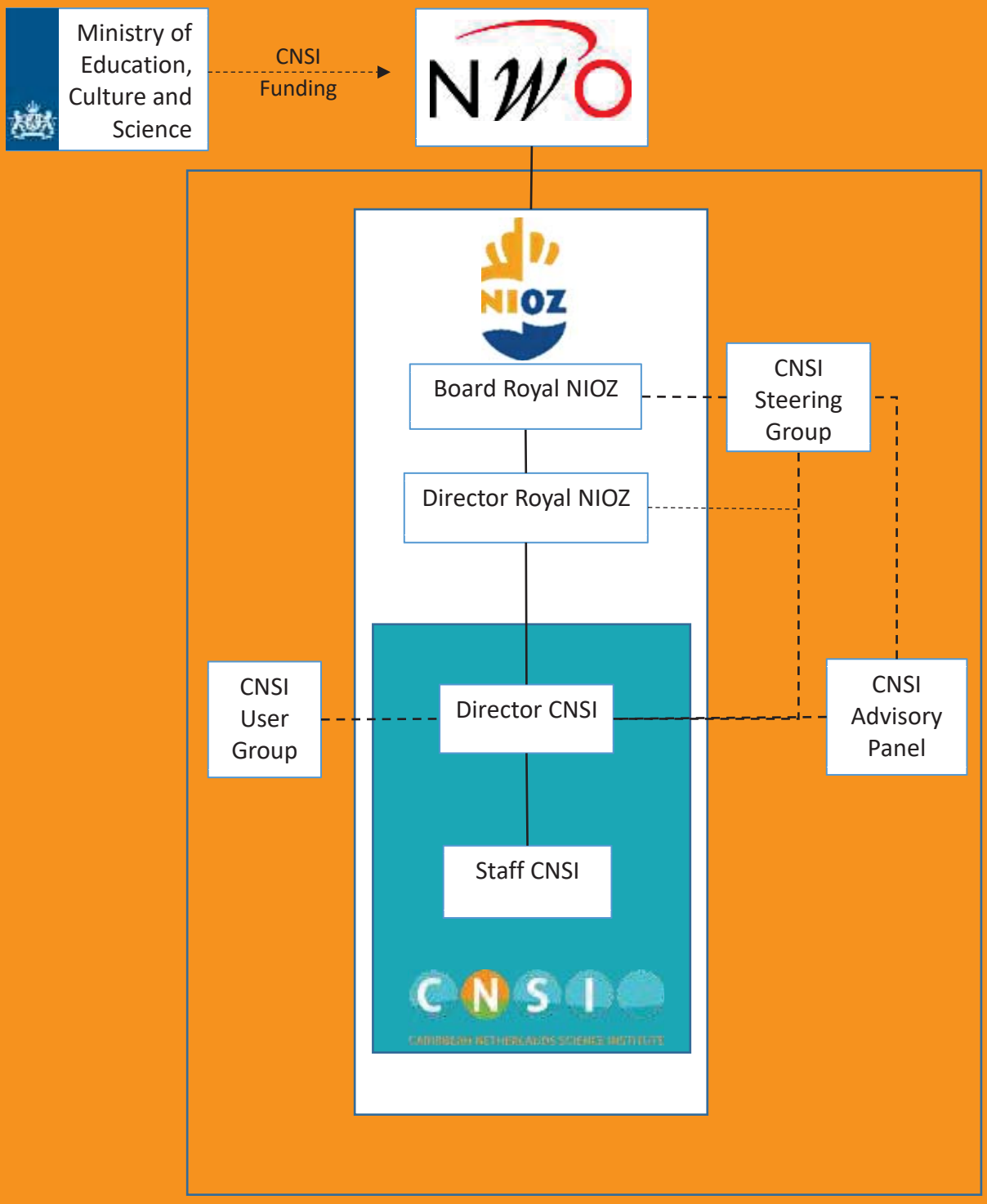
Output 2017	#
Peer reviewed scientific papers	
CNSI staff	1
CNSI-supported projects/activities	16
Professional publications	10
In-house presentation	20
Press releases/Newspaper articles	17
Radio interviews	5
Presentations, (guest) lectures, conferences, expeditions	6
Subsidies, grants, assignments	6
Memberships science platforms, organisations and committees	5

COLLABORATION 2017

CNSI maintained contacts with more than 70 local, regional and international organisations. With the organisations listed in the table the collaboration started or intensified in 2017, mainly as a result of mutual projects.

Collaboration 2017
Directorate Economy and Infrastructure
St Eustatius National Parks (STENAPA)
St Eustatius Center for Archaeological Research (SECAR)
St. Eustatius Foundation (SEF)
Eastern Caribbean Public Health Foundation (ECPHF)
EcoProfessionals
Golden Rock Dive Center
BirdsCaribbean
International Reptile Conservation Foundation
Iguana Specialist Group
Wildlife Management International Ltd
The GLOBE programme
The Missing Chapter Foundation
Ross University St Kitts
Van Hall Larenstein University of Applied Sciences
Maastricht University Global Health
Erasmus University Medical Center
Leiden University Faculty of Archaeology
Vrije Universiteit Amsterdam Earth Sciences
TNO / Utrecht University Earth Sciences
NATURALIS (NBC)
RAVON
Wageningen University and Research Centre (WUR)
Ministry of Economic Affairs

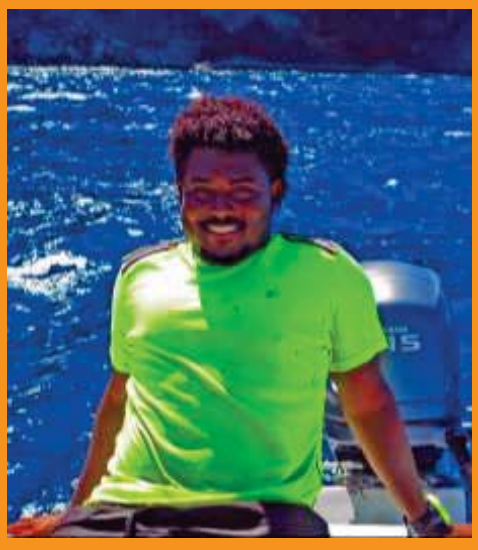
ORGANISATION 2017



PICTURE BOOK 2017

10 March: Kick-off CNSI Science Kids. Fostering scientific curiosity among Statia's youth

18 April: Substation Curacao visits St Eustatius. Researchers from the Smithsonian Institution Washington, the University of Washington and Sirenas explore the biodiversity of the deep waters of St Eustatius



April: Kimani Kitson-Walters strengthened the CNSI team as Data Monitoring Officer for fisheries, coral reefs, seagrasses and Statian key species (e.g. red-billed tropic bird, Lesser Antillean iguana, red-bellied racer snake), funded by the Netherlands Ministry of Economic Affairs.

June: Lyshandra Schmidt was an intern at CNSI from June until December. She assisted CNSI staff with administration, reception and outreach activities

<u>September / October:</u> Strange birds visit St Eustatius after hurricanes. Right: the rarely on Statia observed white-crowned pigeon invaded Lower Town in search for food. Sea grape was one of the few trees on Statia left still carrying leaves and fruit after the hurricanes bolded the island.

Left: the American golden plover probably caught in one of the hurricanes during its southbound migration from the Arctic tundra to Patagonia lead to the first official observation of this species on St Eustatius by CNSI

<u>7 September</u>: Hurricane Irma knocked the fruits out of the trees. This not only led to a sudden increase in (unripe) mangos, but also caused a decline in food availability for e.g. fruit eating birds

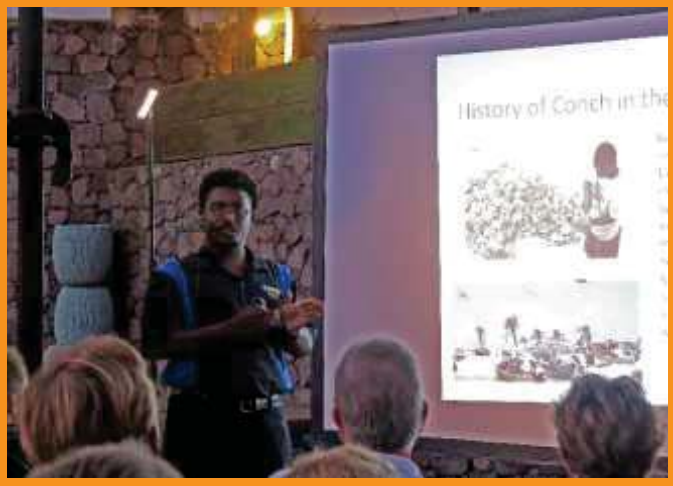
<u>7 September</u>: CNSI's electricity pole blown over by hurricane Irma was the reason that the institute was without power for almost a week.

<u>February – September:</u> In February CNSI joint the coral restoration activities of St Eustatius National Parks in the EU – BEST 2.0 funded programme 'Restoration of Ecosystem Services and Coral Reef Quality' (RESCQ) lead by Wageningen Marine Research. CNSI's contribution is funded by the Ministry of Economic Affairs. Unfortunately, hurricanes Irma and Maria destroyed the coral nurseries. Work will be restarted in 2018

<u>8 September</u>: Hannah Madden MSc '*With Distinction*' from the University of the West Indies

<u>5 October</u>: Better late than never. CNSI's research vessel christened '*CARYBDEA*'. The name refers to the Caribbean (*CARYB*) and Goddess (*DEA*): the Caribbean Goddess. *Carybdea* is a genus of venomous box jellyfish in the family *Carybdeidae*. The common name of some species in this genus, *Sea Wasp*, refers to the sound of the outboard engine

<u>21 October</u>: Stephanie van der Heide strengthened the CNSI team as of September for Outreach and Education. Here Stephanie stands in between Lyshandra Schmidt and Hannah Madden, together with Sade Deane, our Youth Ambassador from Barbados, to join the International Coastal Clean-up



October: Kimani Kitson-Walters lecturing about conch at the yearly 'Sea and Learn' event at Saba, for tourists, the general public and at the school

12 November – 3 December: In the framework of 'CNSI – HVHL (Van Hall University of Applied Sciences) Partners in Research' ten students and two teachers visited St Eustatius. This excursion, first organised in 2016, is part of the minor 'Sustainable Island Management'. During the excursion students gain experience with doing (terrestrial and marine) research and visit different organisations. As part of their training students carry out field work for local parties

4 – 10 December: Kimani Kitson-Walters joins a WAITT Institute team for a post-hurricane Global Coral Reef Monitoring Network assessment at the heavily hit islands of Antigua and Barbuda

6 / 7 December: A team of researchers from the NWO-funded DUCAMID project (Dutch Caribbean preparedness for mosquito-borne infectious diseases) of which CNSI is part, presented the project during the St Eustatius Sustainability Conference (SSC) co-organised by CNSI. Behind the table are Dr Teresa Leslie, her colleague Mr Javier Gomez, PhD student Ms Delia Goilo and Dr. Sharon Viera, Statia's Chief Veterinary Officer. Professor Han Lindeboom was one of the key-note speakers during the conference and led a workshop on management and conservation of the Dutch Caribbean coral reefs in a Climate Change session convened by CNSI. Others involved were Mr George Works, Statia's local weather amateur, Dr Cédric van Meerbeeck, Barbados from the Caribbean Institute for Meteorology and Hydrology and Ms Jetske Vaas, PhD student in the NWO-funded project 'Exotic plant species in the Caribbean: foreign foes or alien allies?'

14 December: CNSI staff Christmas Dinner. From left to right: Pepita Cannegieter, Lyshandra Schmidt, Masru Spanner, Johan Stapel, Hannah Madden, Lalia Madden and Stephanie van der Heide. Not in the picture: Kimani Kitson-Walters

COLOFON

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Visiting address:

L.E. Saddlerweg 5
St Eustatius
Caribbean Netherlands
Telephone: +599 318 2040

Postal address:

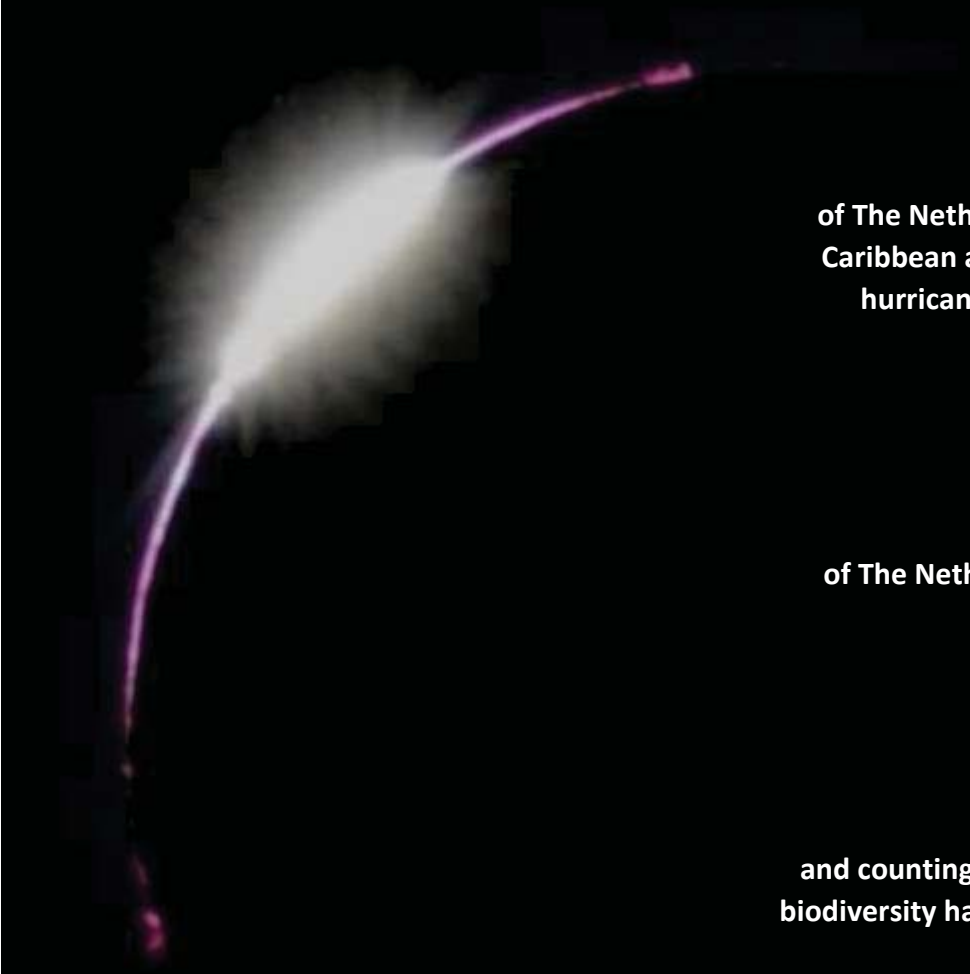
P.O. Box 65
St Eustatius
Caribbean Netherlands

Editors:

Johan Stapel
Hannah Madden
Kimani Kitson-Walters

www.cnsi.nl

Illuminating science on the Caribbean Netherlands



0.1%

of The Netherlands population lives in the Caribbean and is under constant threat of hurricanes, earthquakes, tsunamis and volcanic eruptions

0.8%

of The Netherlands land area is located in the Caribbean

10%

and counting of The Netherlands terrestrial biodiversity has been found in the Caribbean

30%

of the Netherlands sea area is located in the Caribbean

50%

and counting of the Netherlands marine biodiversity has been found in the Caribbean

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