2023

ANNUAL REPORT

CARMABI FOUNDATION

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Annual report 2023

FROM THE DIRECTOR

The year 2023 was my last year as the director of Carmabi. I started working at Carmabi the first of April 2010. Looking back, I have seen Carmabi grow from 25 members of staff to 50 members of staff, from 5 departments to 8 departments, from 3 parks to 6 parks. The budget doubled in size. The number of students and publications grew to a great extent. The education program expanded a lot. The number of consultancies increased. All of this has been made possible through the combined efforts of all personnel over the years and the support of the various boards.

Last but not least our stakeholders contributed a lot towards our organizational growth. Carmabi, and myself personally, would therefore like to thank the government, other NGO's, volunteers, donors, and private persons, who assisted us. Without all of you it would not have been feasible to achieve our objectives.

A total of 171 scientists visited Carmabi in 2023, to conduct a wide variety of research projects. In addition, 133 students participated in various courses that were taught at Carmabi bringing the total number of visitors to our science center to 304. In total 40 scientific publications were published based on work done at Carmabi. The occupancy rate of our Science Center was 70%.

The Terrestrial Parks Department has done well. A total number of 54.587 visitors were welcomed in the Christoffel National Park in 2023. This is a decrease of 28% compared to 2022. A total number of 112.739 visitors visited the Shete Boka National Park in 2023. This is an increase of 9% compared to 2022 and an overall record. In 2022 a total of 111.977 visitors visited the Hato Caves in 2023. This is an increase of 26% compared to 2022 in which the Hato caves welcomed 89.047 visitors. The Open Day of the Christoffel National Park took place this year on the 3rd of September.

In 2023, the Marine Parks Department diligently patrolled the entire Marine Park at Oostpunt, ensured the regular maintenance of the 8 buoys, and actively worked on the design and production of additional buoys. Ongoing efforts involve the installation of new buoy[Mv1] tailored for fishing vessels, marking substantial progress in enhancing the park's facilities and accessibility. Furthermore, in 2023, the Curaçao Rif Mangrove Park continued its operations with a dedicated team comprising of 5 rangers and 2 cashiers. Throughout the year, the park warmly welcomed a total of 17,766 visitors.

Annual report 2023

FROM THE DIRECTOR

This year was a record for the number of children from primary schools (Funderend Onderwijs) visiting Carmabi Education. More than 14,000 children in primary education took part in one or more programs of our Marine and Terrestrial Education programs this year. In addition to the existing program on 'wastewater', for secondary education we developed a new program on bats, carried out at the Hato Caves. In total, approximately 500 students from secondary education (vsbo, havo, vwo) participated. And with the Marine Youth Rangers we have a dedicated group of teens doing year-round activities to learn and raise awareness about our marine and wetlands ecosystems. We also offer various outreach and awareness activities for different target groups.
The Advice and Consultancy department advised on numerous requests for information and conducted terrestrial research in 2023 on Curacao as well as on Aruba and St. Eustatius.

During 2023 we received important visitors to Carmabi. On the 7th of November we received Her Royal Highness Princess Beatrix on Savonet. and on the 8th of November at Rif St. Marie-Hermanus. Several ministers visited Carmabi. Minister Silvania from the Ministry of Health, Environment and Nature visited us twice. In the beginning of 2023, we received a visit from Minister Robbert Dijkgraaf from the Dutch Ministry of Education, Culture and Science. In May we received a visit from Minister Jetten from the Dutch Ministry of Climate and Energy.

This being my last year as director of Carmabi I would like to express my gratitude to everybody who supported me during these years. Your support has been invaluable! It has been an honor for me to serve the almost past 14 years as your director of Carmabi. I wish my successor all the best!

Paul Stokkermans
Outgoing Director Carmabi

Annual report 2023

FROM THE NEW DIRECTOR

When I commenced my tenure at Carmabi as a Ph.D. student affiliated with the University of Amsterdam back in 1990, I could hardly have foreseen that 33 years down the line, on November 1st, 2023, I would assume the role of its Director, guiding Carmabi into its next chapter. The year 2024 heralds a period of significant transformation, during which we will fortify our organization to navigate the swiftly evolving landscape, replete with challenges for both our ecosystems and humanity. In response to the burgeoning demands humans place on nature, we are committed to elevating the maturity level of our organization, ensuring its sustainable growth and the preservation of nature in Curacao and the broader Caribbean region.

A pivotal change in our trajectory involves transitioning into a Two-Tier organization, aligning with the Code of Corporate Governance, wherein we establish both a Board of Directors and a Supervisory Board. This statutory amendment will enhance our agility, expedite decision-making processes, and foster transparency by delineating the organization's policy and strategic vision for the next six years, supplemented by an updated vision and a detailed annual plan for 2024.

Our endeavors will be increasingly geared towards facilitation, encompassing not only the preservation of our natural environments, including biodiverse ecosystems such as coral reefs, mangrove forests, and the local semi-arid tropical forest teeming with endemic species, but also the empowerment of stakeholders involved in nature conservation and scientific endeavors. We aim to facilitate their understanding of nature and disseminate this knowledge throughout the broader community.

Furthermore, a heightened focus on tourism and local cultural heritage is anticipated to augment Carmabi's revenue streams, thereby enabling us to bolster our conservation efforts and invest in the education of key stakeholders pivotal to sustainable development, ultimately benefiting future generations and the diverse life forms inhabiting both terrestrial and aquatic ecosystems.

We extend our heartfelt gratitude to all our predecessors since 1955, whose contributions have shaped Carmabi into its present stature. Thanks to their efforts, we have garnered support from our local government, international experts, and forward-thinking organizations like the 'Proteus Ocean Group,' with whom we are embarking on an exciting new chapter in our storied history. As we forge ahead, we eagerly anticipate the collaborative endeavors of visiting scientists, local partners, and our esteemed staff, collectively charting a course towards a promising future.

Dr. Manfred van Veghel
Incoming director Carmabi

scientific research (marine)

VISITING SCIENTISTS

171 scientists visited Carmabi in 2022. In addition, 133 students participated in Coral Reef Ecology courses and workshops that were taught by Carmabi and various universities and organizations from the Netherlands and the United States. The number of visiting scientists and students in 2023 was the highest ever in Carmabi's history (Figure 1).

Most visitors in 2023 were from the United States (61%) followed by the Netherlands (31%). Almost all the scientists and students that worked at Carmabi stayed at the facilities at Piscadera. The occupation of Carmabi's science center in 2023 was 70% which is also an improvement compared to the preceding (COVID) years (i.e., in 2022: 66%, in 2021: 53%, 2020: 26%, 2019: 56.2%, 2018: 67%, 2017: 53%).

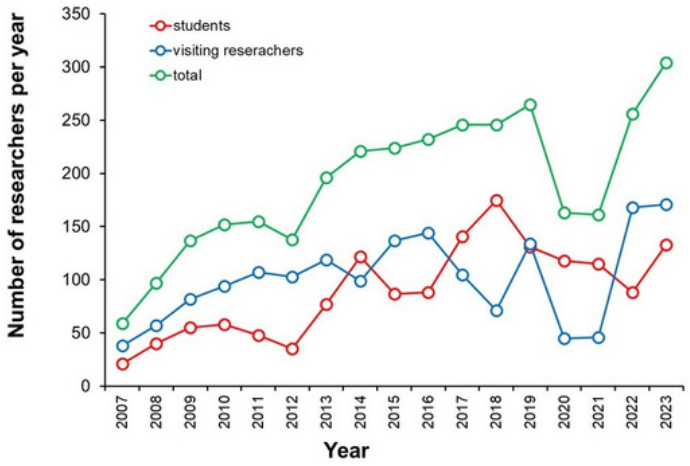


Figure 1

An overview of the areas in which researchers were active that visited or worked at Carmabi in 2023 is shown in Figure 2 .

An overview of visiting scientists (PI name, home institute and topic of research conducted in Curaçao) is attached in Annex 1. Many of these researchers visited Carmabi multiple times in 2023.

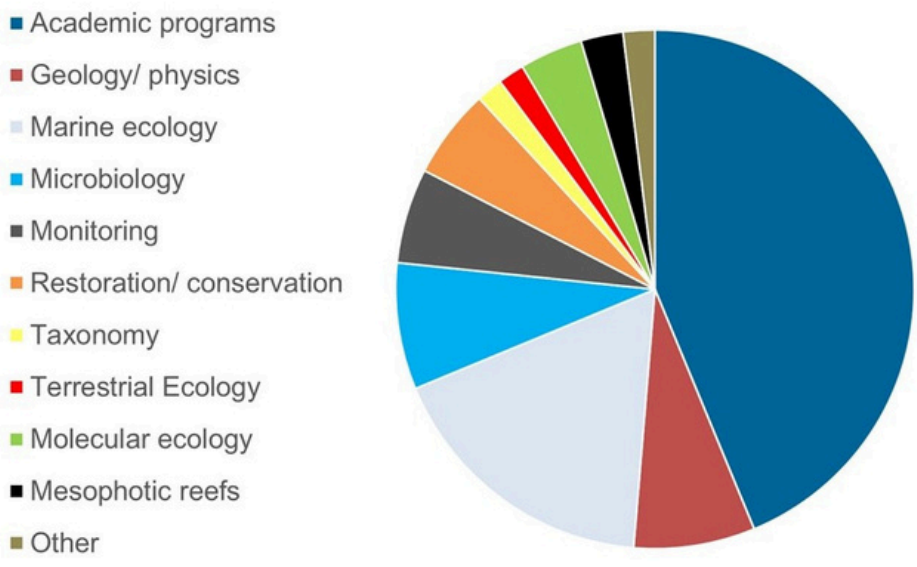


Figure 2

scientific research (marine)

PEER REVIEWED PUBLICATIONS

Forty publications appeared in peer reviewed scientific journals based on work that was conducted at Carmabi making 2023 one of the most productive years ever in terms of Carmabi's scientific output (Figure 3).

The results of some of these studies have been featured in magazines, news programs and educational websites around the world. Furthermore, 19 reports were produced by MSc students that did their master's thesis' project at Carmabi.

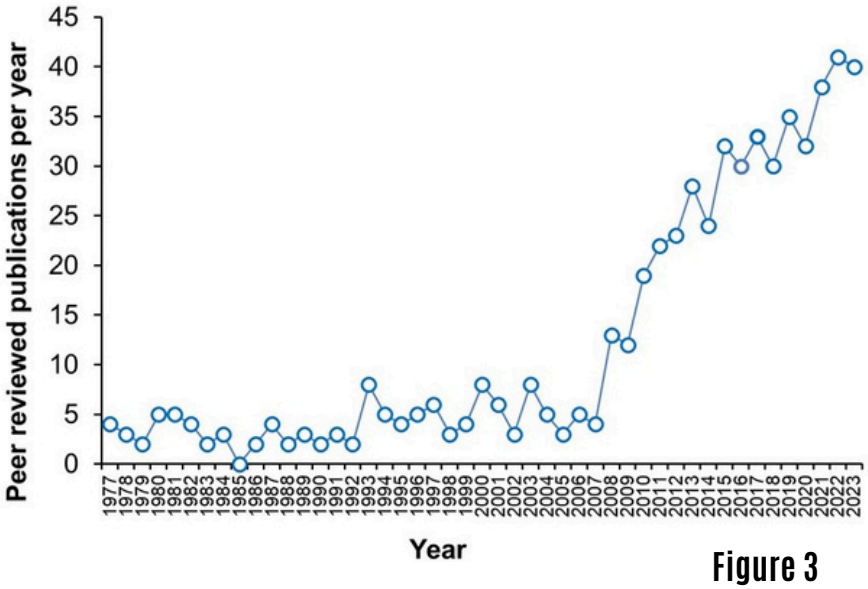


Figure 3

FREE ADVICE, OUTREACH, AND CONSULTATION

Several organizations, government departments (Curacao, Aruba and The Netherlands), the press and others received free advice and information from the Carmabi Science Department during the year.

We assisted in 42 cases, both oral and written. In 2023 the Carmabi Science Department was featured/ interviewed in 59 items for international and local TV, radio and newspapers. Two documentaries on (marine) biology were filmed at Carmabi in 2023.

scientific research (marine)

SELECTED PROJECTS 2023

Young corals are unaffected by bleaching

The Caribbean Research and Management of Biodiversity (CARMABI) Foundation reports that young coral, cultivated from wild-caught gametes (reproductive material of corals), did not bleach despite the unprecedented and prolonged heatwave that hit Curaçao this year. In other parts of the Caribbean, this heatwave caused a significant loss of corals in many species, and in Curaçao, the situation is closely monitored with a considerable number of corals currently showing advanced signs of bleaching. Now that the seawater temperature has been below the bleaching threshold since late November, CARMABI is hopeful that many corals experiencing heat stress will soon recover their symbiotic algae from the surrounding waters and survive this extremely stressful period, but only time will tell.

Meanwhile, scientists from SECORE International, CARMABI's partner specializing in coral reef restoration, conducted research to monitor the health of young brain corals, which they have been cultivating from coral reproductive material in recent years. Surprisingly, the young brain corals, between 1 and 4 years old, show no signs of bleaching, while many adult colonies in their vicinity have lost their symbiotic algae, putting them at risk of starvation. These observations came shortly after similar reports from SECORE colleagues in Mexico who witnessed laboratory-cultivated staghorn corals withstand extreme temperatures, while many adults of the same species bleached and died. So far, reports have been received for a total of five coral species that show a similar pattern at various locations: Curaçao, Mexico, the Dominican Republic, and Cuba. SECORE and partners are currently collecting and analyzing data from these and multiple locations to quantify the significance of this pattern.

Source: Curacao Chronicle

scientific research (marine)

SELECTED PROJECTS 2023

SEALINK Project continues on Curaçao.

In 2020, Minister of Education, Culture and Science, has announced that more than 7 million euros had been awarded to two projects within the NWO program Caribbean Research to strengthen the knowledge system and the embedding of scientific research in the Caribbean part of the Kingdom of the Netherlands. The research programs focus on issues that are of great societal and scientific importance for the Caribbean region and facilitate the transfer of knowledge via education and outreach. This is the first time that NWO has funded programs of this size in the Dutch Caribbean. One of these two awarded projects is the SEALINK with program chair Prof Dr Mark Vermeij (University of Amsterdam, CARMABI Curaçao).

The project kicked off in the fall of 2021 when ~30 researchers involved in the project visited Curacao. The SEALINK Program will establish an integrative, transdisciplinary research program merging geology, hydrology, ecology, and sociology. This program will bring together a diverse consortium of scientists to create a new tradition of integrative, transdisciplinary science in the Dutch and wider Caribbean. The program will leverage the remarkable scientific value that exists across the six islands of the Dutch Caribbean due to their existing differences in geology, coastal morphology, freshwater abundance, erosion, coastal development, and sewage infrastructure. By bridging multiple fields of research, SEALINK will reveal how natural processes and human influences along the land-sea continuum interactively shape the future of coral reef communities, and how this in turn affects the ability of coral reef systems to provide valuable benefits back to the human communities that live, work, and play just steps away (Figure 4).

For more information: https://www.sealinkcaribbean.net/

Figure 4

scientific research (marine)

SELECTED PROJECTS 2023

More and more oxygen depleted areas on reefs

One mechanism giving fleshy algae a competitive advantage over corals during reef degradation is algal-induced and microbially-mediated hypoxia. During hypoxic conditions oxygen availability becomes insufficient to sustain aerobic respiration in most metazoans. Algae are more tolerant of low oxygen conditions and may outcompete corals weakened by hypoxia. A key question remains unanswered: How extensive are local hypoxic zones in highly turbulent aquatic environments, continuously flushed by currents and wave surge?

To better understand the concert of biological, chemical, and physical factors that determine the abundance and distribution of oxygen, we combined 3D imagery, flow measurements, macro- and micro-organismal abundance estimates, and experimentally determined biogenic oxygen and carbon fluxes as input values for a 3D bio-physical model. We then developed a three-dimensional numerical model of an existing coral reef plot off the coast of Curaçao where oxygen concentrations for comparison were collected in a small-scale grid using fiberoptic oxygen optodes. Oxygen distribution patterns given by the model were a good predictor for in situ concentrations and indicate widespread localized differences exceeding 50 µmol L-1 over distances less than a decimeter (Figure 5). This suggests that small-scale hypoxic zones can persist for an extended period of time in the turbulent environment of a wave- and surge- exposed coral reef. This work highlights how the combination of three-dimensional imagery, biogenic fluxes, and fluid dynamic modeling can provide a powerful tool to illustrate and predict the distribution of analytes (e.g., oxygen or other bioactive substances) in a highly complex system.

Source: https://www.frontiersin.org/articles/10.3389/fmars.2023.1135686/full

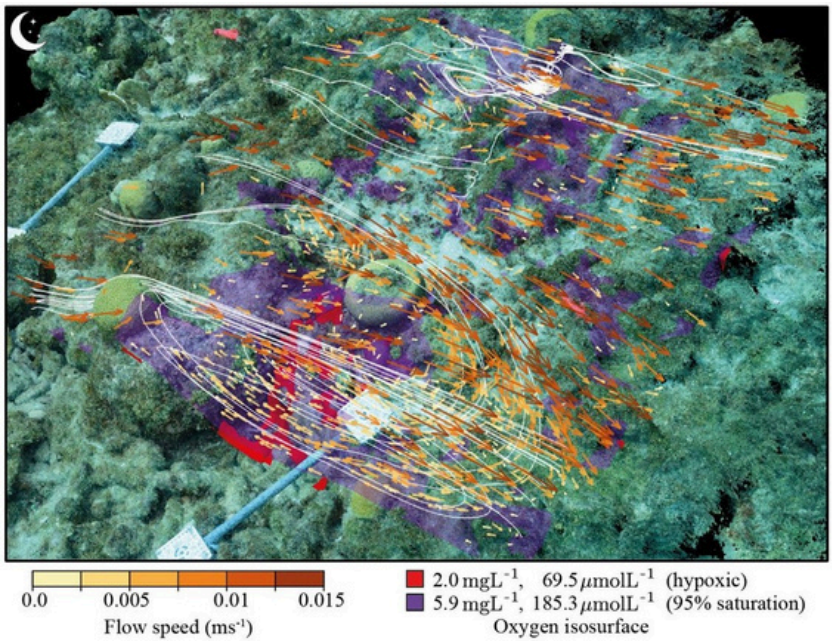


Figure 5

scientific research (marine)

SELECTED PROJECTS 2023

Deadly coral disease reaches Curacao.

Stony Coral Tissue Loss Disease is a highly infectious coral disease that has spread rapidly from Florida throughout the Caribbean region since 2014. This disease affects more than 20 species of stony corals, including important reef builders like pillar coral, brain coral, and star coral. Within the Dutch Caribbean, Stony Coral Tissue Loss Disease (SCTLD) has been confirmed now on five of the six islands, starting on St. Maarten in 2018, St. Eustatius in 2019, Saba in 2021 and most recently in Bonaire and Curaçao (March/April 2023). The outbreak of this coral disease may have significant ecological, economic, and social impacts within the Dutch Caribbean (Figure 6) as coral reefs are home to many marine life including sponges, crabs, sea turtles, and many species of fish. The loss of corals due to this coral disease has significant ecological impacts on the region's marine ecosystem, shoreline protection, tourism, and fisheries. The disease can cause extensive damage to corals with a negative impact to the entire reef ecosystems. The mortality of corals can lead amongst others to the decline of important fish populations and impact the attraction for recreational tourism. The disease spreads rapidly amongst hard corals but does not affect human health directly.

Source: Nature Today

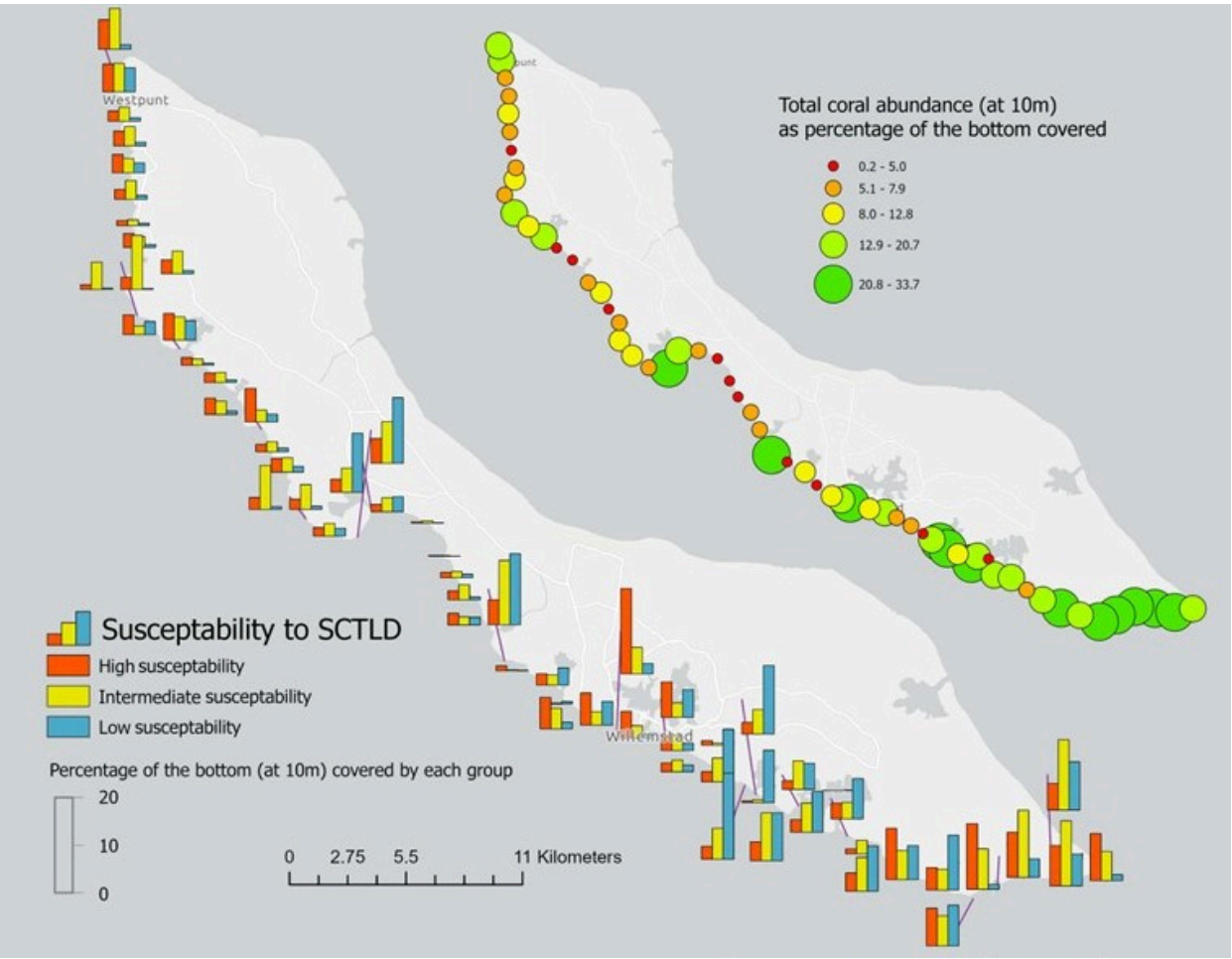


Figure 6

scientific research (marine)

SELECTED PROJECTS 2023

Curacaoan reefs harbor more coral species that previously thought.

Mesophotic coral communities are increasingly gaining attention for the unique and distinct biological species they host, exemplified by the numerous mesophotic fish species that continue to be discovered. In contrast, many of the photosynthetic scleractinian corals observed at mesophotic depths are assumed to be depth-generalists, with very few species characterized as mesophotic-specialists. This presumed lack of a specialized community remains largely untested, as phylogenetic studies rarely include mesophotic samples, and have long suffered from resolution issues associated with traditional sequence markers. Here, we used reduced-representation genome sequencing to provide a phylogenomic assessment of two dominant mesophotic genera of plating corals in the Indo-Pacific and Western Atlantic, respectively, Leptoseris and Agaricia.

While these genome-wide phylogenies broadly corroborated the morphological taxonomy, they also exposed substantial undescribed diversity (at least 24 “new species” across the 8 traditionally defined species). The repeated observation of genetically divergent clades associated with mesophotic depths highlights that there are many more mesophotic-specialist coral species than currently acknowledged, and that an urgent assessment of this largely unstudied biological diversity is warranted. (Figure 7).

Source: BMC Biology

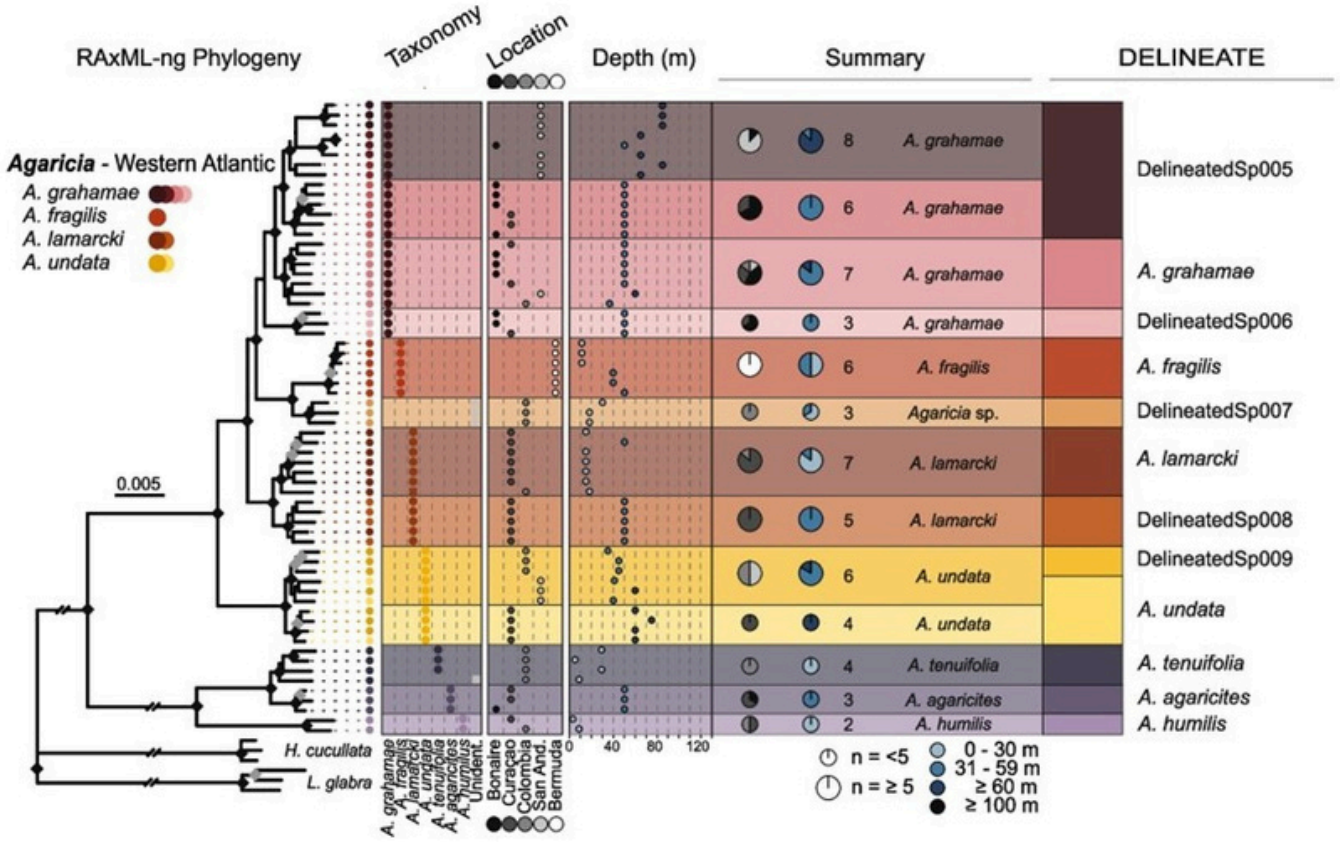


Figure 7

scientific research (marine)

SELECTED PROJECTS 2023

Oil platforms in Boka full of invasive species

A coral community was examined on a semi-submersible platform that was moored at the leeward side of Curaçao, in the southern Caribbean, from August 2016 until August 2017. This community included several non-native or cryptogenic species. Among them were two scleractinian corals (Tubastraea coccinea and T. tagusensis, (Figure 8) and two octocorals (Chromonephthea sp. and an unidentified Nephtheidae sp.). This is the first reported presence of T. tagusensis in the southern Caribbean, and the genus Chromonephthea in the Caribbean region.

An ascidian, Perophora cf. regina, is also reported from the southern Caribbean for the first time, as well as a coral-associated vermetid gastropod, Petaloconchus sp., first recorded in the Caribbean in 2014. Lack of biofouling management could potentially harm indigenous marine fauna through the introduction of non-native species. Therefore, monitoring communities associated with semi-submersible platforms is essential to track the presence and dispersal of non-native, potentially invasive species.

Source: Marine Pollution Bulletin

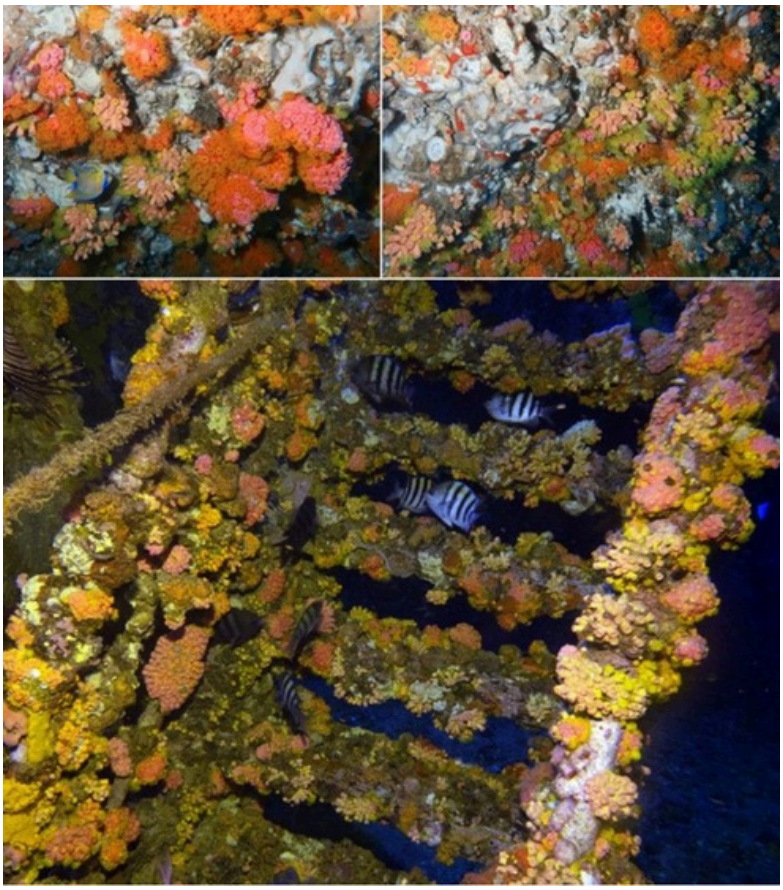


Figure 8

scientific research (terrestrial)

SELECTED PROJECTS 2023

Resurvey of forest stand structure Christoffelpark

The final four of eight forest stand structure plots in the Christoffelpark have been resurveyed in 2023 after the initial survey in 1997. The original protocol tagged trees using aluminium numbered tags and measured diameter of all trees bigger than 1cm diameter in eight permanent 50m x 50m survey plots. The research remeasured all trees still present after the 1997 survey, often still having the original tags, and tagged and measured all new grown trees in similar fashion. The research was conducted together with students of Wageningen University and Research.

Preliminary results indicate a two-fold increase in the number of trees in the survey plots, while the basal area (i.e. the sum of stem surface area of trees) increased by 1.3 times. The number of species also increased in all plots, with especially more rare species present in the plots, although often in low relative abundance. These results indicate a changing forest stand, with more young trees allowing for a more robust forest stand. The results are in line with the recovering vegetation following the resurvey of vegetation plots and are indicative of a recovering vegetation following the removal of introduced herbivores (goats) in the early '90s.

View on the Quill from Boven National Park, St. Eustatius

Landscape ecology and vegetation research St. Eustatius

Following the 2022 scouting visit to the island of St. Eustatius. The research team of Wageningen Environmental Research (WEnR, part of Wageningen University and Research) and the Carmabi Foundation visited the island of St. Eustatius to resurvey the 85 historic survey locations for landscape ecology and vegetation.

Surveying the 85 historic survey locations proved a challenging task within the two-week visit. The rough terrain, with large differences in elevation and steep slopes, and the flora of over 600 species also proved challenging. Results of the survey are currently being analysed and reported by WEnR, preliminary results however indicate a reduced species diversity, potentially caused by continued high grazing pressure from introduced herbivores (goats).

scientific research (terrestrial)

MONITORING ACTIVITIES 2023

Population size and density of the Curaçao White-tailed deer (Odocoileus virginianus curassavicus) in the Christoffelpark

The Curaçao White-tailed deer (*Odocoileus virginianus curassavicus*) is the largest and one of the most unique land animals of the island of Curaçao. Research was conducted by Carmabi staff researchers to gain insight in the population size and density of the animal in the Christoffelpark and compare this with the historic survey of the late '80s.

The shy and evasive Curaçao White-tailed deer is found mostly in the less developed Northwestern part of the island. The animal is only found on Curaçao and Isla Margarita (Venezuela). The Christoffelpark is known from historic research to provide important habitat to the animal, but trends in population status were unknown. Following intensive research by use of motion detection wildlife cameras running for over one year, population size and density has been estimated for the Christoffelpark was estimated. The research showed that population size has increased compared to the late '80s research and several hotspots were identified. It is possible that the increased in population size can be explained by the recovering vegetation following the removal of introduced herbivores (goats), but potentially also the continued development and increase of the urban area is 'pushing' the population more and more into the direction of the Northwestern part of the island (including the Christoffelpark). Follow up research will be necessary to provide insight into the island-wide population status of the animal.

Wetland of Saliña Druif, Aruba

Floristic diversity and vegetation research Aruba

For the third year in a row Wageningen Environmental Research (WEnR) and Carmabi visited Aruba to survey the landscape ecology and vegetation of the island.

This year the research was focused on surveying the vegetation of the final unmapped habitats, including the mangrove and beach vegetation of the Reef islands located offshore from the Southern coast of Aruba and the remaining wetlands. Several new plant species were again found during the survey, totaling ten new species in 2023.

scientific research (terrestrial)

NATIVE PLANT NURSERY

New plant species

New native plant species were germinated in the nursery in 2023, including *Psidium sartorianum* (Guyaba bé), a very rare tree only found in the Christoffelpark, and P*eltophorum acutifolium* (Kurahout). Other species, like *Crossopetalum rhacoma* (Plaka chikitu) and *Annona glabra* (Kayuda) were germinated in larger numbers in 2024, where before only small numbers were available due to difficulties in germination.

Psidium sartorianum flowers and developing fruits

Planting the new Hòfi chikí at the University of Curaçao

Hòfi chikí at University of Curaçao

The plants from the nursery were used to plant the second Hòfi Chikí or Tiny forest on Curaçao by the Hòfi Chikí foundation at the University of Curaçao.

Over 600 plants from 55 species from the Carmabi native plant nursery were outplanted in high density with 3 plants per m2 and different soil improvements were implemented. The plants were cared for by students of the University of Curaçao and volunteers of the Hòfi Chikí foundation. The tiny forest has clearly rooted well and currently shows great growth, indicating the great potential of the tiny forest methodology for quick establishment of native plant species.

consultancy department

RESEARCH & SERVICES

The Carmabi Consultancy department was consulted on nine occasions, either as part of developments or to assist with different scientific surveys, and many smaller requests for biological information came in.

Biological inventories were conducted to provide information on the natural values of different areas on Curaçao and terrestrial research was conducted on landscape ecology and vegetation and wildlife on Curaçao, Aruba and St. Eustatius. The department also assisted different Carmabi departments, for example with the development of information materials for the Carmabi managed national parks.

SELECTED PROJECTS 2023

Biological inventory of Daniel

The former plantation of Daniel, in between Grote Berg and Tera Kora, was surveyed for landscape and vegetation in 2024. Some historic survey locations from the Curaçao landscape ecology and vegetation study (Beers et al. 1997) were resurveyed.

The limestone vegetation of the Middle terrace was found to be well developed and very diverse overall, both compared to similar areas on Curaçao as well as to the historical survey locations located in the area. Many rare plant species were found, including the trees *Adelia ricinella* and *Guaiacum sanctum* (Wayaka shimaron). Most strikingly was however the discovery of a large and previously unknown population of the very rare *Chiococca alba*, a small Caribbean shrub discovered on Curaçao in 2000 and only known from the parts of the Christoffelpark and St. Hyronimus (de Freitas and Rojer, 2000).

Overview of the vegetation of the Middle terrace of former plantation Daniel

Consultacy department

SELECTED PROJECTS 2023

The Klein Curaçao development plan

2023 saw the start of the Klein Curaçao development plan project, a project conducted by the Klein Curaçao consortium for the Curaçao Ministry of Health, Environment and Nature (GMN) to formulate the development plan for the Ramsar area Klein Curaçao. The consortium consists of EcoSense, Caribbean Legal Consultancy, MarkStra Caribbean, Newton Heritage consulting, Profound, Sea Turtle Conservation Curaçao, ICTAS and Carmabi.

The Ramsar area Klein Curaçao is characterized by different natural and historical values. The strongly recovering bird rookery, important turtle nesting habitat, the coral reef, the Klein Curaçao lighthouse, listed as national monument, and the rich history of the island all add to these values. The island is also economically important as a tourist destination, with many tourists visiting the island. This growing and unregulated tourism is marked as the biggest risk for preserving the current state of the island for which reason the Klein Curaçao Management Plan was approved by local government. This management plan is now to be translated in a development plan, carefully balancing all values (i.e. natural, historical and economical) from the site, aiming to preserve the future of the island.

The project started in April 2023 and many explorative stakeholder sessions were held in the second half of 2023, also the Volunteering plan and Research and Monitoring plan were submitted to the project board. The project will continue in 2024 on the Legal plan, Carrying Capacity Study, Financial plan and Development plan.

Aerial photo of Klein Curaçao

consultancy department

SELECTED PROJECTS 2023

Biological inventory Jeremi

A small area close to Jeremi was surveyed in 2024 for landscape and vegetation, avifauna and deer presence in relation to the development of an ecolodge. The area was characterised by a well-developed vegetation showing good recovery following human impacts based on historic aerial imagery analysis. Especially the large number of *Handroanthus billbergii* (Kibrahachi) was striking. One deer was observed, browsing vegetation in the area and throughout the area deer pellets were found.

Handroanthus billbergii (Kibrahacha) at Jeremi

park management

FOUR TERRESTRIAL PARKS

Taking pictures in the Curaçao Rif Mangrove Park

One of Carmabi's primary focuses is nature management and conservation. The Parks Department oversees the management of four national parks: Christoffel National Park (which includes the Savonet Museum), Shete Boka National Park, the operation of Hato Caves which is outsourced to Indian Caves BV, and the Seru Largu National Park (former known as the National Park Rif St. Marie Hermanus). These parks rank among the island's top attractions, drawing both locals and tourists alike.

The Christoffel National Park

Christoffel National Park encompasses over 2300 hectares of protected land and boasts the highest biodiversity among the ABC islands. It is home to a diverse array of animals and plants, including several endemic species.

The Shete Boka National Park

Shete Boka National Park features a coastal expanse with 13 inlets. Besides serving as a vital turtle nesting site, the park offers stunning vistas of crashing waves and unique rock formations along the island's northern coast.

Hato Caves

Hato Caves, the largest and most prominent cave on the island, formed over 200,000 years ago below sea level. Today, it stands as one of the island's most captivating natural wonders. In addition to its remarkable beauty, Hato Caves provides insights into Curaçao's rich history, from ancient petroglyphs to its role as a sanctuary for runaway slaves.

Seru Largu National Park

Carmabi is establishing Curaçao's newest national park, Seru Largu National Park (formerly known as Rif St. Marie-Hermanus). In 2023, we explored our options to set up a ticket office at the entrance of the park within the Sportcomplex Willibrordus. And also, the team convened to develop the park approach and activation planning for this park. Also our new park logo was developed.

View Point Seru Largu National Park

park management

TWO MARINE PARKS

Yaru on his way to the Marine Park

Besides the four terrestrial parks, two marine parks are also managed by Carmabi; The Curaçao Rif Mangrove Park and the Curaçao Marine Park. The Mangrove Park has opened its doors to the public in July 2022 and is already starting to become one of the most popular attractions for visiting tourists and the local public.

The Curacao Marine Park

The Curacao Marine Park is located off Curacao's southeast coast. It stretches from Lijhoek (12.070692°N, -68.873258°W) at Jan Thiel along 21.7 kilometer (13.5 miles) of shoreline from the low-water mark (of the openings of inland bays) to a distance of 100 meters from shore, to and around the most eastern tip of the island at Oostpunt to a location with coordinates 12.070692°N, -68.873258°W. The SPAW Area 1 includes 217 hectares of pristine fringing reefs.

Ranger during a guided tour in the Curacao Rif Mangrove Park

park management

OVERALL VISITOR STATISTICS

Christoffel National Park

Christoffel National Park

The Christoffel National Park was opened to the public in 1978, consisting of three former plantations acquired by the government: Savonet, Zorgvlied and Zevenbergen. The park offers a variety of recreational activities to its visitors such as hiking, mountain climbing, camping and guided tours such as jeep safaris, bird watching and deer watching.

In 2023, the Christoffel National Park welcomed 54.587 visitors, which is a decrease of 28% compared to 2022 in which 75.556 visitors visited the park. (Figure 9).

There were 7.327 local visitors and 41.600 tourist visitors in the park in 2023. (Figure 10). 2.236 visitors visited our parks through the tour operators and 2.105 visited the museum Savonet only.

Figure 9

	1	2	3	4	5	6	7	8	9	10	11	12
2023	6178	5082	5547	4965	4601	3185	4737	3963	3499	3499	4660	4671
2022	14654	6371	6793	6094	5985	5432	6978	6151	3990	4360	4194	4554

Figure 10

	1	2	3	4	5	6	7	8	9	10	11	12
Locaal 2023	826	755	615	895	585	381	973	633	371	461	408	424
Toerist 2023	4756	3819	4336	3532	3533	2389	3313	2908	2595	2765	3790	3864

park management

OVERALL VISITOR STATISTICS

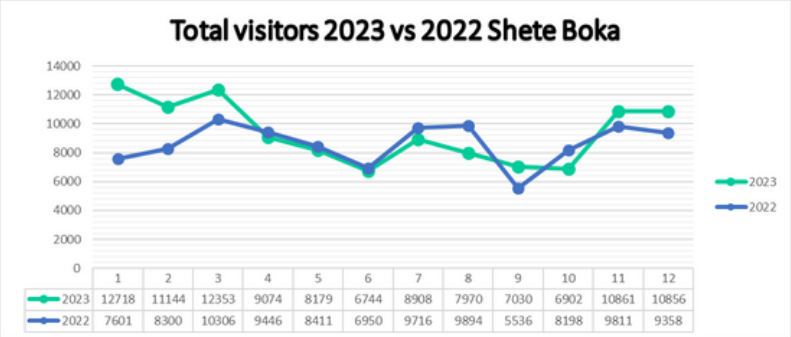
Shete Boka National Park

Shete Boka Park

The Shete Boka National Park welcomed 112.739 visitors in 2023. This is an increase of 9% compared to 2022 in which 103.527 visitors visited the park. The aforementioned visitor numbers include local visitors, tour operators as well as cruise operators bringing passengers by touring cars and buses. (Figure 11)

There were 7.351 local visitors and 63.820 tourist visitors in the park in 2023. (Figure 12) 41.568 visitors visited our park through the tour operators.

Figure 11



	1	2	3	4	5	6	7	8	9	10	11	12
2023	12718	11144	12353	9074	8179	6744	8908	7970	7030	6902	10861	10856
2022	7601	8300	10306	9446	8411	6950	9716	9894	5536	8198	9811	9358

Figure 12

	1	2	3	4	5	6	7	8	9	10	11	12
Toerist 2023	6335	5789	6247	5408	5114	3927	5478	5385	4330	4513	5914	5380
Locaal 2023	582	612	609	660	623	431	1367	792	387	492	402	394

Landhuis Savonet

park management

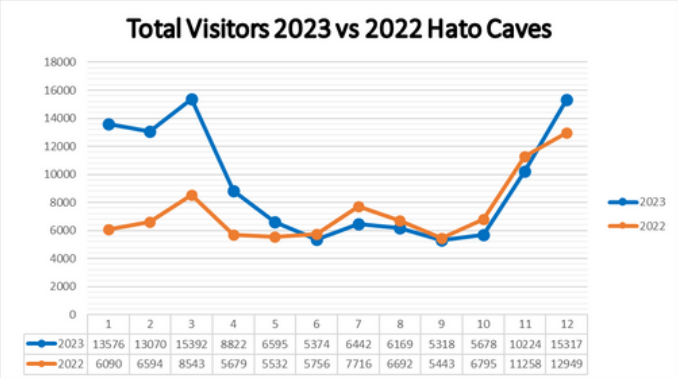
OVERALL VISITOR STATISTICS

Hato Caves

Hato Caves

A total of 111.977 visitors visited the Hato Caves in 2023. This is an increase of 26% compared to 2022 in which the Hato caves welcomed 89.047 visitors. (Figure 13)

Figure 13



	1	2	3	4	5	6	7	8	9	10	11	12
2023	13576	13070	15392	8822	6595	5374	6442	6169	5318	5678	10224	15317
2022	6090	6594	8543	5679	5532	5756	7716	6692	5443	6795	11258	12949

View from inside the Hato Caves

park management

OVERALL VISITOR STATISTICS

Curaçao Rif Mangrove Park

Curaçao Rif Mangrove Park

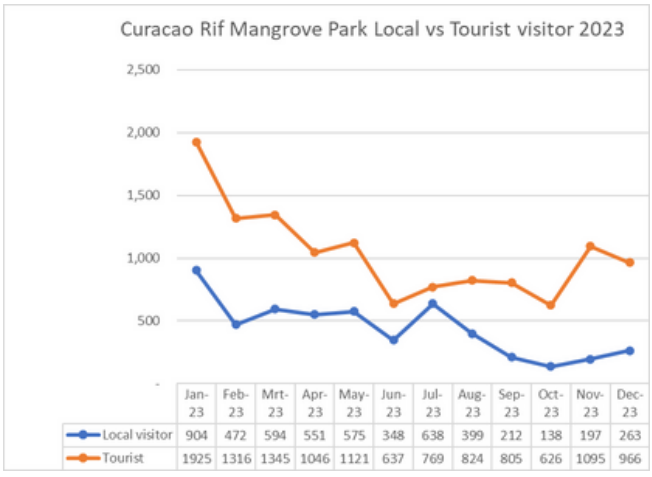
In 2023, the Curacao Rif Mangrove Park experienced a substantial increase in visitors compared to the previous year.

The total number of visitors reached 17,766, marking a significant growth from the 2022 (Figure 14) of 14,687. The detailed breakdown includes 5,291 local visitors and 12,475 tourists. This represents a percentage increase of approximately 21.05%. (Figure 15). The growth observed can be attributed to the park's inaugural year, operations commenced midway through the preceding year, allowing for only six months of activity.

During the Art Festival, the mangroves were painted by the artists

	Jan-23	Feb-23	Mrt-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23
Total Visitors 2023	2,829	1,788	1939	1597	1696	985	1407	1223	1017	764	1292	1229
Total Visitors 2022							4354	4170	1575	1656	1544	1388

Figure 14



	Jan-23	Feb-23	Mrt-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23
Local visitor	904	472	594	551	575	348	638	399	212	138	197	263
Tourist	1925	1316	1345	1046	1121	637	769	824	805	626	1095	966

Figure 15

Collaborating with CTB for the Curaçao island ambassador.

park management

SELECTED PROJECTS

Christoffel National Park

Throughout the year, Carmabi has initiated several projects for the Christoffel National Park to manage the trails, the museum, the security, and to ensure a safe an pleasant visit to the parks by visiting tourists and locals.

A selection of our projects in the park:

Deer spotting tour in the Christoffel National Park

The History Tour was created by Naomi

Open-air museum history tour started

For the events of the open museum weekend, the Open day Christoffelpark/ Dia di Sabaneta and the visit of princes Beatrix, Management Assistant Naomi developed and gave the Open-Air Museum History tour for the first time.

New Uniforms

For the Open day Christoffelpark/ Dia di Sabaneta 2023 we tested new uniforms for the park rangers including T-shirts and trousers.

Rangers Briand and Ergelyn showing off their uniforms

park management

SELECTED PROJECTS

Christoffel National Park

Selected projects and other activities

Picnic tables makeover

The picnic tables around the park (Including the ones around the Savonet Plantation and those at Shete Boka) were all either replaced, repainted or repaired.

Picnic Tables all painted another color

Michael Newton at the Zevenbergen Landhouse giving an explanation to stakeholders about consolidation

Consolidation at Zevenbergen

The organizations Caribbean Research and Management of Biodiversity (Carmabi), Curaçao Monument Fund Foundation, National Archaeological and Anthropological Memory Management Foundation (NAAM), S.A.L. (Mongui) Maduro Foundation, and the technical faculty of the University of Curaçao Dr. Moises Da Costa Gomez are collaborating on the project 'Awa pa Kòrsou' to gain more knowledge and understanding of the drying out, heat stress, and flooding of the Curaçao landscape. The project is part of the Heritage Deal, where funding from the Dutch government and the Curaçao Monument Fund Foundation is used to create a valuable living environment where heritage, in the form of historical waterworks, plays a significant role.

Donation to Savonet Museum

In 2023 Wim Grit donated 3 tables originating from the Savonet Land house which his mother bought in 1965.

Tables donated by Wim Grit

park management

EVENTS

Christoffel National Park

Easter climb

On Monday, April the 10th, we organized an Easter climb including a prize for everyone who found an Easter egg.

View at the Christoffel Mountain

Launch of the 'Tourist Bandabou' stamp series on the Terrace of the Savonet Landhouse

Launch Tourist Bándabou stamp

The launch of Cpost International's 'Tourist Bándabou,' stamp series dedicated to the beautiful landscapes that Bándabou has to offer took place in the Savonet Land house in May of 2023.

Open Day Christoffelpark

The Open Christoffel Park Day has once again been held in combination with the celebration of the Savonet neighborhood (Dia di Sabaneta) on the 3rd of September 2023. Not only did we offer more activities this year with more vendors than the year before, but we also welcomed more visitors this year.

Looking through an insect magnifying box

park management

SELECTED PROJECTS

Shete Boka National Park

Selected projects and other activities

Restoration Complete: Access Path to Boka Tabla Reopened for Visitors

Completion of repairs on the pathway leading to and from the Boka Tabla platform. This pathway, a crucial access point to the awe-inspiring Boka Tabla cave within Shete Boka National Park, has undergone meticulous restoration to ensure visitor safety and continued enjoyment of this natural wonder.

Paths fixed by Boka Tabla

WatchTower Boka Pistol

Watch tower Boka Pistol

In Shete Boka, at Boka Pistol, the construction of a new watchtower has been successfully completed. This tower serves as a lookout point for tourists and visitors, offering breathtaking views of the Salinja and the iconic flamingos in the nearby area. The completion of this tower not only enhances visitors' experience but also improves the safety of the area. It enhances visibility of potential security issues and hazardous situations, such as rock climbers, allowing for better protection of both visitors and the natural environment.

park management

SELECTED PROJECTS

Seru Largu National Park

Selected projects and other activities

In 2023, Seru Largu National Park witnessed a multitude of activities. A community meeting, organized by the Project 'Salt' Slavery Memory Year, convened in January, fostering engagement within the park.

November marked a significant visit by Princess Beatrix to the park, underscoring its importance. Additionally, December saw the announcement of vacancies for Park Rangers and Guides, coinciding with a Terrestrial Ecological Survey.

Throughout the year, various community initiatives enriched the park experience.

Guided Tour by guide Naomi through Seru Largu National Park

The church of Wilibrordus

In March, a privately initiated community hike offered a unique exploration opportunity.

Curadoet orchestrated a volunteer project at Centro Deportivo Willibrordus in the same month, further strengthening community ties.

April witnessed the Greenkidz Tree Project, contributing to the park's environmental conservation efforts.

In May, we celebrated Dia di Guia with the Next Step KLM Nature Walk and Hike, fostering appreciation for the park's natural wonders. July saw engaging activities organized on Dia di Bandera by Fundashon Desaroyo di Willibrordus, enhancing community participation.

November showcased the park's versatility with the hosting of an Extreme Biking event organized by Coral Estate Classic, attracting adventure enthusiasts. Additionally, December marked a notable inclusion as Seru Largu National Park was featured in the new book, "Curaçao Konosé bo Isla (Bándabou)", authored by Uniek Curacao, further elevating its profile.

park management

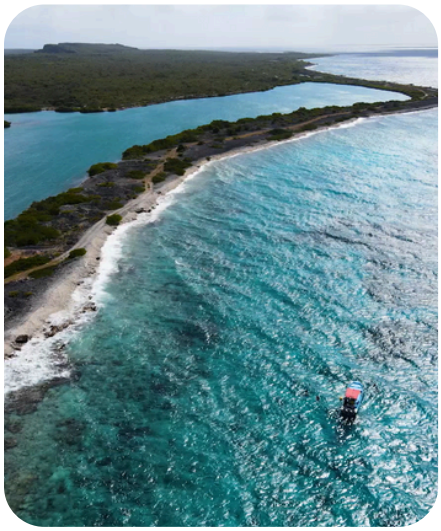
SELECTED PROJECTS

Curaçao Marine Park

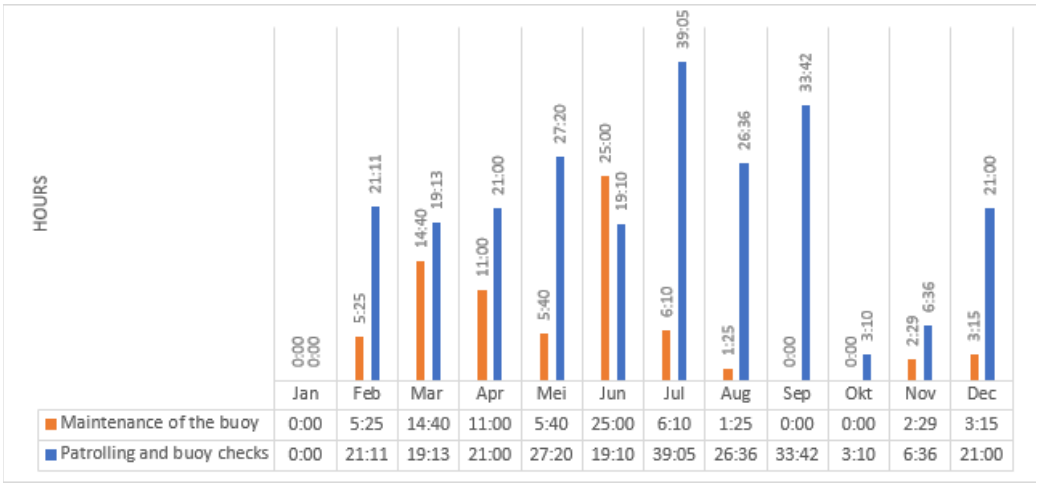
Selected projects and other activities

SPAW-Area 1

In the year 2023, the Marine Parks Department undertook a steadfast commitment to safeguarding the Specially Protected Areas and Wildlife (SPAW) of 'Area 1', exemplifying a dedication to marine conservation. Through rigorous patrols, meticulous maintenance of existing buoys, and dynamic initiatives in designing and producing new ones, the department propelled its mission to preserve and sustain the delicate ecosystems within its jurisdiction with more than 500 sailing hours.

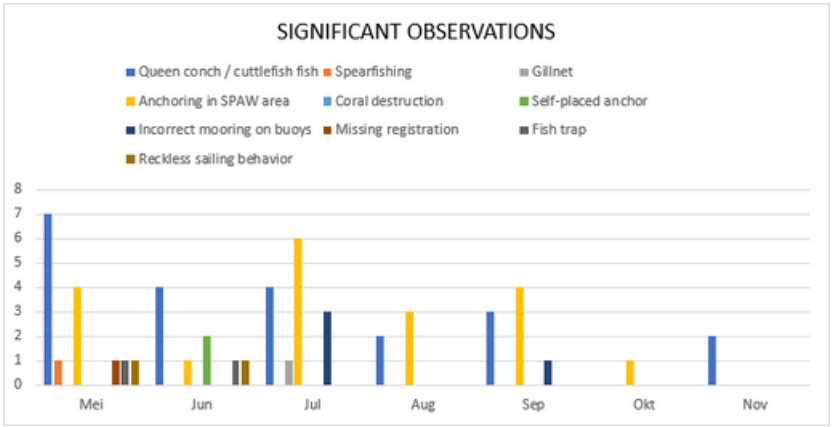


Yaru patrolling in the Curacao Marine Park



	Jan	Feb	Mar	Apr	Mei	Jun	Jul	Aug	Sep	Okt	Nov	Dec
Maintenance of the buoy	0:00	5:25	14:40	11:00	5:40	25:00	6:10	1:25	0:00	0:00	2:29	3:15
Patrolling and buoy checks	0:00	21:11	19:13	21:00	27:20	19:10	39:05	26:36	33:42	3:10	6:36	21:00

Time spend in the Curaçao Marine Park



Significant observations in the Curacao Marine Park

park management

SELECTED PROJECTS

Curaçao Marine Park

Selected projects and other activities

Stakeholders

Throughout 2023, the Marine Parks Department remained committed to fostering collaboration by engaging in ongoing consultations with a diverse array of stakeholders.

This inclusive approach extended beyond the borders of Curaçao, with fruitful exchanges involving counterparts from Bonaire. These consultations served as invaluable platforms for sharing insights, discussing ongoing projects, and emphasizing the mutual significance of concerted efforts in marine conservation. The department's dedication to open dialogue underscores its commitment to creating a unified front for the preservation of our shared marine ecosystems.

Meeting with KUP, PISKABON and STINAPA

Collaborating with CTB for the Curaçao island ambassador

Marine Park video

The Marine Park has forged a strategic collaboration with the Curaçao Tourist Board (CTB) to participate in the Curacao Island Ambassador initiative. This initiative aims to promote sustainable tourism and environmental awareness by engaging individuals passionate about preserving the natural beauty of the island.

park management

SELECTED PROJECTS

Curaçao Marine Park

Selected projects and other activities

Training

Marine Rangers Roland and Kevin, dedicated members of our Marine Park team, achieved a significant milestone this year by successfully graduating from the Practical Professional Boat License Exam.

This accomplishment marks a commendable level of expertise and competence in the operation and management of marine vessels, further enhancing the capabilities of our marine conservation efforts.

Roland and Kevin graduating for the practical professional boat license exam

Ranger exchange in Bonaire learning at STINAPA

Ranger Exchange

The Marine Park Ranger exchange program between Curaçao's Marine Park and STINAPA (Stichting Nationale Parken) in Bonaire stands as a testament to the commitment to collaboration, knowledge exchange, and marine conservation within the Dutch Caribbean.

This initiative, generously sponsored by the Dutch Caribbean Nature Alliance (DCNA), brings Rangers from both regions together to share insights, expertise, and best practices in the stewardship of marine ecosystems.

park management

SELECTED PROJECTS

Curaçao Marine Park

Selected projects and other activities

Small oil spill

Collaboration

The Marine Park Department plays a pivotal role in preserving and protecting the delicate marine ecosystems within its jurisdiction. In addition to its primary responsibilities such as patrolling, buoy maintenance, and supporting marine research, the department actively collaborates with local authorities to address and mitigate threats faced by the marine park.

The Marine Park collaborated with the Art Foundation Curaçao, in the Plein Air Curacao International Art Festival. The Marine Park not only enriches the cultural landscape but also pioneers a creative approach to marine conservation, inviting everyone to witness the hidden beauty beneath the surface through the lens of art.

Collaborating with Art Foundation Curacao, Painted by the artist Carlos Hiller

This year Carmabi was delighted to welcome two experienced Marine Park rangers, Deangelo and Delany, from our esteemed partner organization, STINAPA, as part of a dynamic ranger exchange program. This initiative is a testament to the strong collaborative ties between Carmabi and STINAPA, emphasizing the mutual commitment to marine conservation and expertise exchange.

Illegal buoys in the Curacao Marine Park

park management

SELECTED PROJECTS

Curaçao Marine Park

Selected projects and other activities

Maintenance of our vessel

The Yaru, a vital asset for Marine Park operations, undergoes meticulous annual maintenance to ensure optimal performance, safety, and longevity. This comprehensive maintenance regimen covers various aspects, ranging from engine service to hull protection and small-scale electrical upkeep.

Yaru yearly maintenance

New Lift bag and new helix anchors for the installation of the buoys

Marine Park Buoys

The successful purchase of helix anchors and lifting bags was made possible through a collaboration with the Blue Marine Foundation.

This collaboration underlines the importance of alliances between conservation organizations and foundations committed to marine sustainability.

The Blue Marine Foundation's support played a critical role in fulfilling the department's order for essential equipment. This support not only helps with the installation of buoys, but also aligns with broader conservation objectives, promoting a shared commitment to protecting marine ecosystems.

Buoys deployed

Throughout the year, the Marine Park Department has remained steadfast in its commitment to the maintenance and improvement of buoy systems within the marine parks. Key highlights of the year's buoy-related initiatives include the ongoing maintenance of eight buoys dedicated to supporting dive tourism and the deployment of a specialized fisherman buoy.

New prototype buoy and new Fisherman buoy

park management

SELECTED PROJECTS

Curaçao Marine Park

Selected projects and other activities

Marine Park Awareness

In a proactive initiative to engage and educate the younger generation about the crucial importance of environmental conservation, Ranger Kevin from the Marine Park Department, in collaboration with the education staff, participated in a dedicated event at Nilda Pinto SBO focused on climate change awareness.

Empowering future stewards

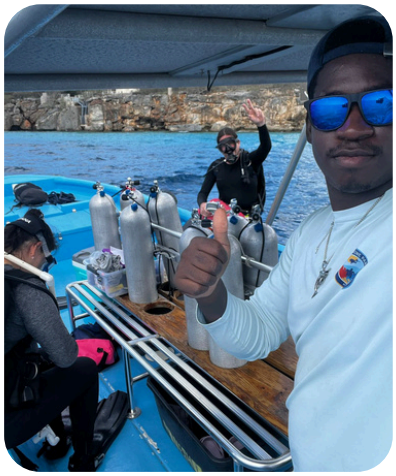
Fixing mooring blocks.

Patrolling and checking buoys

Patrolling is one of the department's crucial functions, by serving as an informative bridge between the marine park and local authorities. By consistently updating and communicating with relevant agencies, the department ensures that authorities are well-informed about potential threats. Through routine inspections of the buoys, the department can identify signs of wear, degradation or damage to mooring blocks and ropes. This proactive approach enables the timely replacement of components, reducing the risk of failures.

Assisting the Research department

Throughout the year, the Marine Park Department remained dedicated to supporting the endeavors of the research department, fostering collaborative efforts to advance scientific knowledge and environmental conservation. One of the key initiatives involved accompanying students on multiple occasions to collect essential data, contributing to comprehensive research on various marine parameters.



Research team ready to collect data

park management

SELECTED PROJECTS

Curaçao Rif Mangrove Park

The temporary facilities with the new sun shade.

Selected projects and other activities

In the dynamic landscape of 2023, the Curaçao Rif Mangrove Park maintained its vibrant operations, sustained by a passionate team of 5 rangers and 2 cashiers. This dedicated ensemble worked tirelessly to ensure the park's smooth functioning, welcoming a remarkable total of 17,766 visitors over the course of the year.

The steady influx of visitors stands as a testament to the park's allure and the tireless efforts of the team in fostering awareness and appreciation for the vital mangrove ecosystem.

The whole team graduating for the course customer service

Learning and training

In our unwavering commitment to safeguarding, enhancing, and amplifying the natural, educational, and recreational essence of the Curacao Rif Mangrove Park, the strength lies in the unity of our exceptional team.

Throughout 2023, our team not only imbibed valuable insights from the experienced Laurent but also collectively embarked on a journey of growth and refinement. A significant milestone was achieved as the entire team successfully graduated from a comprehensive Customer Service course, equipping us with the skills to elevate visitor experiences and uphold the park's standing as a beacon of environmental preservation and education.

New Sunshades Sail

In response to the frequent visits by school children to the park and the lack of shaded areas, the Curacao Rif Mangrove Park initiated a project to install sunshades sail. We are delighted to share that, in collaboration with Sandals Resort, four new sunshades sail have been generously donated to the park. These shades aim to create comfortable learning environments for school children, allowing them to engage in educational activities without concerns about sun exposure or rain.

Thanks two Sandals resort for donating for the 4 new sun shades in the park.

park management

SELECTED PROJECTS

Curaçao Rif Mangrove Park

Selected projects and other activities

Mangrove park ranger exchange

The Curacao Rif Mangrove Park continues to prioritize knowledge exchange and collaborative learning. In a recent ranger exchange program at Bonaire, our Mangrove Park rangers had the valuable opportunity to learn from the Mangrove Maniacs.

Mangrove park ranger at Bonaire

Learning from the Mangrove Maniacs

This exchange allowed our team to gain insights into their methodologies, practices, and experiences in mangrove conservation and management. The exchange not only enhances the skills of our rangers but also fosters a network of collaboration for the betterment of mangrove ecosystems in the region. We extend our gratitude to the Mangrove Maniacs and express appreciation to DCNA for sponsoring this enriching exchange initiative.

Mangrove park rangers and Mangrove Maniacs

park management

SELECTED PROJECTS

Curaçao Rif Mangrove Park

Selected projects and other activities

Collaboration

Plein Air Curacao International Art Festival

During the Plein Air Curacao International Art Festival week, the Curacao Rif Mangrove Park organized a park cleanup with the assistance of the youth rangers. We successfully cleaned the outer part of the park. In collaboration with the Art Foundation Curaçao, two sculptures were created from the collected trash – a turtle and a seahorse.

Cleaning up the park with the Youth rangers

The new kayaks

Blue Marine Foundation

The successful purchase of new kayak was made possible through a collaboration with the Blue Marine Foundation.

This addition offers visitors a unique opportunity to connect with nature, fostering learning about its significance and the need for protection. Our collaborative efforts symbolize meaningful strides toward the common objectives of marine sustainability and environmental stewardship

Collaboration with the Ryan de Jongh Foundation

We are pleased to announce our collaboration with the Ryan de Jongh Foundation for mangrove reforestation in Curaçao. This partnership involves providing them access to propagules within the Curacao Rif Mangrove Park.

Also, during this week, we received different groups, providing them with a beautiful mangrove background to work on their canvases.

Collaborating with Ryan de Jongh Foundation for mangrove

Curaçao Tourist Board

The Curacao Rif Mangrove Park has also established a collaboration with the Curaçao Tourist Board (CTB) to participate in the Curacao Island Ambassador program. This initiative aims to promote sustainable tourism and environmental awareness by involving individuals passionate about preserving the natural beauty of the Curaçao.

park management

SELECTED PROJECTS

Curaçao Rif Mangrove Park

Selected projects and other activities

First Open day

In a resounding triumph, the Curacao Rif Mangrove Park hosted its inaugural Open Day, welcoming an impressive turnout of over 800 visitors. This momentous occasion served as a vibrant celebration of our commitment to environmental education, community engagement, and the preservation of our precious mangrove ecosystem.

Educational materials from Education Department

Local plant sale from the Green House of Carmabi

Throughout the day, attendees were treated to a diverse array of educational painting activities, interactive board games, face painting, a local plant sale from the Carmabi greenhouse, and rangers providing information about the park's rich biodiversity.

The overwhelming response from the community underscores the growing awareness and appreciation for the invaluable ecological treasures housed within the Curacao Rif Mangrove Park.

The first Open Day was visited by a lot of families

nature & environment education department

EDUCATIONAL PROGRAMS

Our Nature and Environment Education Department (NME) carries out educational programs for primary school children and secundary education students.

The activities of Carmabi's education program include:

- Terrestrial Education Program: tours to teach children about terrestrial nature at Savonet, Christoffel Park and the areas of Daaibooi & Shete Boka.
- Marine Education Program: tours to teach children about Curacao's marine nature at the Marine Education Center at Piscadera.
- School visits supporting education. For primary education we have lessons with microscopes ('microworld') and the program 'environmental challenges' for secundary education.
- Providing teaching materials to primary schools (FO) and high schools (VO).
- Support high school students with thesis/ paper/ practical assignments on topics related to (marine) biology.
- Various other activities to increase general awareness.

Study and career fair at WTC

MSGR Willem Ellis class 7 Mangrove Park

nature & environment education

PARTICIPATION

Primary Education

The programs for primary education consist of a Terrestrial Education Program (TEP) which includes guided tours within the parks and a Marine Education Program (MEP) which includes educational programs in the Marine Education Center (MEC) at Piscadera and a program on wetlands in the Curacao Rif Mangrove Park.

SDK fakansiplan

Secondary Education havo 4 MIL Bat Program at Hato Caves

nature & environment education

PARTICIPATION

Terrestrial Education Program

Savonet, Christoffel Park, Shete Boka and Daaibooi were visited by schoolchildren divided from group 1 to group 8 of our primary school system (ages 4 till 12).

The younger children (group 1 and 2) visited Savonet as part of a program aimed at introducing them to the nature around them, i.e., the 'Mondi Misterioso' program. The aim of this program is to learn how to better take care of our nature in a playful way by identifying varied species of flora and fauna. In our program 'reptiles', the children (group 3) learn about reptiles, their habitats, niches and role within the wider Curacao ecosystem.

Schoolchildren group 4 visited Christoffel Park to learn about birds. The bird lessons involve lessons on our local birds in theory and by observing birds in the park. The focus of Group 5 is on trees and plants and how to recognize them. Lessons on wells, agriculture, and ruins around Savonet & Zorgvlied are the topic of lessons for groups 6 and 7, whereas children from group 8 are taught specific lessons in the general nature/ ecology of islands at Shete Boka and Daaibooi. All the lessons for the groups 4 up to 8 are followed by a small exam that can be made part of the school report.

The tours are arranged and conducted by a total of 6 guides, specialized in our terrestrial programs.

A total of 11,323 children followed an educational program.

See Figure 16 for a total overview of reached children in terrestrial education for elementary education.

1. Terrestrial Education Program (TEP) children participation

Christoffelpark (Mondi Misterioso/ Nos Mondi) Group 1 & 2	2375
Christoffelpark (reptiles, reptilnan) Group 3	1613
Christoffelpark (birds, paranan) Group 4	1391
Christoffelpark (plants, palunan) Group 5	1488
Christoffelpark (Savonet, wells, agriculture and ruins) Group 6	1649
Christoffelpark (Zorgvliet, wells, agriculture and ruins) Group 7	1239
Daaibooi (ecology of an island) Group 8	503
Shete Boka (ecology of an island) Group 8	1065
Total	**11323**

FIGURE 16

School kids in the Mangrove Park

nature & environment education

PARTICIPATION

Marine Education Program

The Marine Education Program provides a program for schoolchildren in group 6 and 8. Both programs involve excursions to Carmabi Piscadera where they receive an interactive program with presentations and a visit to the Marine Education Center (MEC).

Schoolchildren group 6 (9-year-old) follow a program on Turtles and plastic waste, group 7 (10-year-old) a program about the importance of wetlands, whereas children of group 8 (11-year-old) focus on the importance of marine life and especially corals.

A total of 2838 students followed an educational program at our Marine Education Center at Piscadera and the Curacao Rif Mangrove Park. A total of 5 guides use the facilities as a classroom, covered patio and Marine Education Center to run the programs in an interactive modern way.

MSGR Willem Ellis class 7 Mangrove Park

2. Marien Education Program (MEP) children participation

Group 6: Our turtles	974
Group 7: Our mangroves	1039
Group 8: Our coral reef	825
Total:	**2838**

MSGR. Willem Ellis class 8 MEP

Secondary Education

The existing marine program on waste water is expanded in August 2023 with the terrestrial program 'bats'. With these programs we conduct 3-hour programs for pre-exam classes (vsbo 3/ havo 4/ vwo 5) where we offer a combination of theory and practical assessments. At the school location we carry out the marine part, where we test the quality of various water samples and teach students more about the coral reef and the influence of our sewer waste and overfishing. The terrestrial part is carried out at the Hato caves and shows the vulnerability of bats and their role in nature.

3. Secondary Education Program student participation

Pre-exam classes (3 vsbo/ 4 havo/ 5 vwo)	300
Total:	**300**

nature & environment education

SELECTED PROJECTS

Marine Youth Rangers (MaYoR)

Besides the regular Nature and Environmental school education programs, Carmabi education offers a more extensive and profound nature awareness program.

These 12–15-year-olds undertake activities twice a month on Saturdays such as snorkeling, diving, kayaking, theory lessons, clean ups to increase their knowledge and awareness of our marine environment.

Marine Youth Rangers planting mangroves with met Ryan de Jongh

4. Marine Youth Rangers (MaYoR) teen participation

youngsters (11-15 year old) doing year round activities	
January – June	31
August - December	14
Total:	**45**

Working with the identification sheets

Other activities

Identification sheets of our local nature has been made for Secondary Education. These have been printed / laminated and given to the schools, together with practice assignments.

Also, in 2023 we had several ‘student days’ for secondary education students. They get to know students (marine) biology at Carmabi, get to know their motivation and field of interest.

5. Special awareness programs participation

Foundations (i.e. Pro Bista, Verriet), summer schools (fakansiplan)	300
Total:	**300**

nature & environment education

OTHER ACTIVITIES

Nos Medio Ambiente

Every year, the students at the University of Curacao's lofo (pabo) teacher training course receive lessons about local nature and visit our parks. This way, the teachers in training are well prepared to provide nature and environmental education.

Lofo (teacher FO training UoC) teach the teacher

CTB week Goilo school class 5

Partnerships

Carmabi Education is also a partner for various local initiatives. For example, as part of the Curacao Tourist Board (CTB) tourism week, many children primary education visited our parks with the focus on eco-tourism. We also were a partner at the SDK fakansiplan weeks at the SDK Sports center.

Nos naturalesa ta interesante

Every month an article is written for the newspapers Extra and Antilliaans Dagblad to inform a wide audience. Alternately written by the education and consultancy department. Carmabi Education is also part of the broadcast 'humans & animals' on radio Hoyer 2, broadcasted every Saturday.

Achtergrond

Nos naturalesa ta interesante sigur

Elke diepte een eigen koraalecosysteem

A PDF of the articles of Nos naturalesa ta interessante

Romerschool at Savonet during raining season

Group activities to Carmabi

In addition to the focus on schoolchildren, the education department also offers activities for other groups. For example, clients of the Verriet foundation with the mentally handicapped like to visit one of our parks or the Marien Education Center. For each group we make a program that fits the target group.

marketing & communications

EXPOSURE OF OUR WORK

Online presence

The marketing and communications department remained focused on enhancing engagement with (future) visitors, stakeholders, and the population of Curacao through social media. We shared a variety of photos, videos, and content across our social media platforms. An overview of our media coverage can be found in Annex 3.

Here's an overview of the pages currently under management:

Facebook Pages:
- Carmabi Foundation
- Carmabi NME Educatie
- Carmabi Marien Research
- Christoffel National Park
- Savonet Museum
- Shete Boka National Park
- Curaçao Rif Mangrove Park
- Curaçao Marine Park

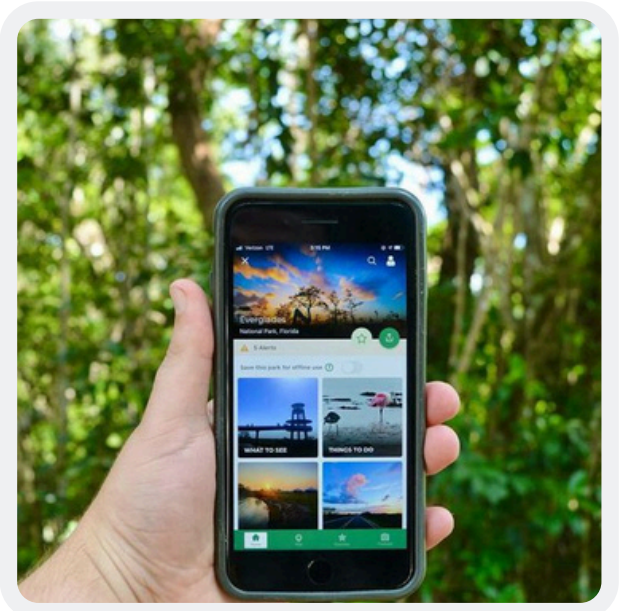
Instagram Pages:
- Carmabi NME Educatie
- Carmabi Marien Research
- Christoffel National Park
- Shete Boka National Park
- Curaçao Rif Mangrove Park
- Curaçao Marine Park

Tripadvisor Pages:
- Christoffel National Park
- Shete Boka National Park
- Curaçao Rif Mangrove Park

LinkedIn Page:
- Carmabi Foundation

Youtube Page:
- Carmabi Foundation

Google Pages:
- Carmabi Foundation
- Christoffel National Park
- Shete Boka National Park
- Curaçao Rif Mangrove Park



Our departments and parks, guided by our marketing team, aim to connect with our audience on various levels

Insights Facebook & Instagram Pages

We maintain a vibrant presence on our Facebook and Instagram pages, sharing a wide array of content. Our departments and parks contribute engaging posts, under the guidance of our marketing department.

marketing & communications

EXPOSURE OF OUR WORK

Audience and statistics Insights Christoffel National Park

An overview of our social media (Facebook & Instagram) statistics for the Christoffel National Park in 2023. (See below in Figure 17 and 19).

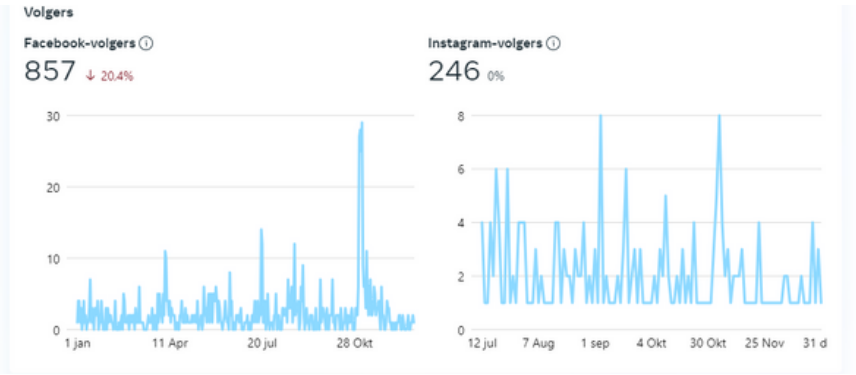


FIGURE 17

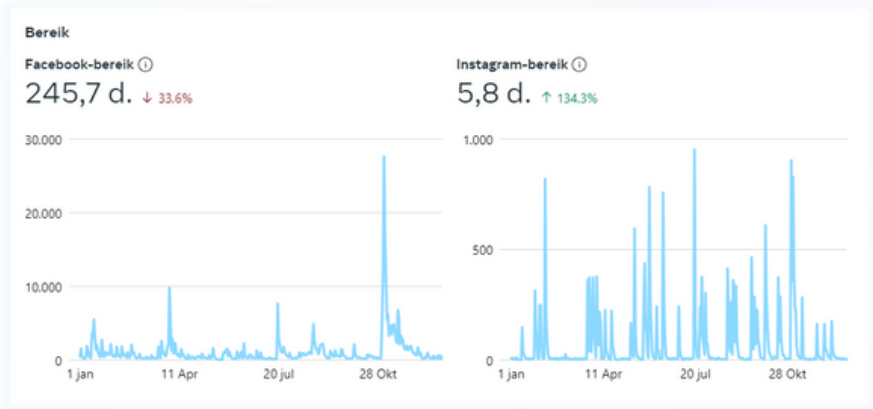


FIGURE 18

Top Three Best Performing Posts on Christoffel National Park:

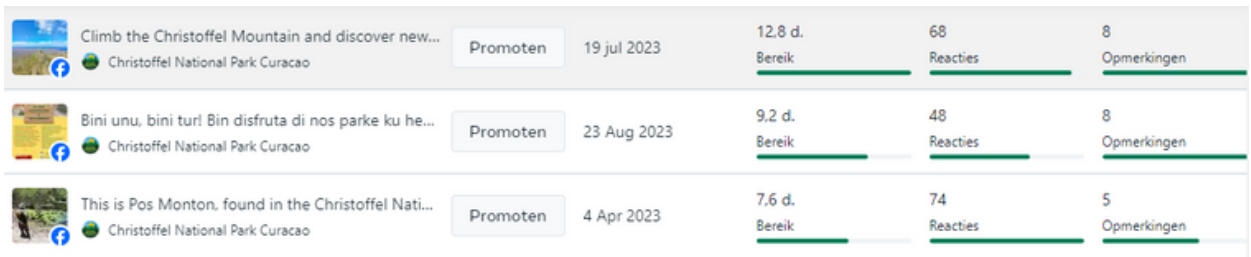


FIGURE 19

marketing & communications

EXPOSURE OF OUR WORK

Audience and statistics Insights Shete Boka National Park

An overview of our social media (Facebook & Instagram) statistics for Shete Boka in 2023. (See below in Figure 20 and 22).

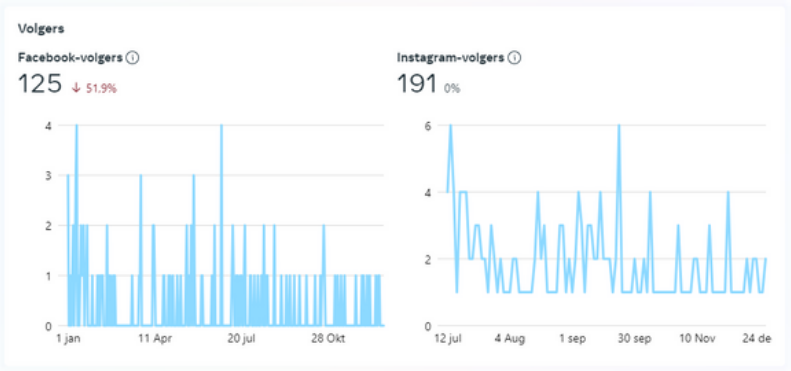


FIGURE 20

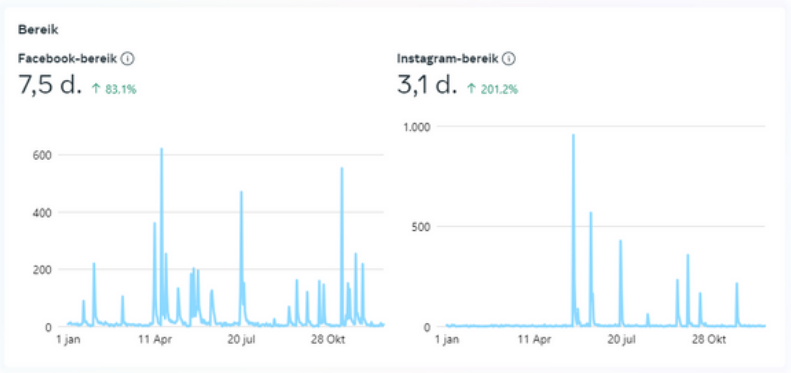


FIGURE 21

Top Three Best Performing Posts on Shete Boka National Park:

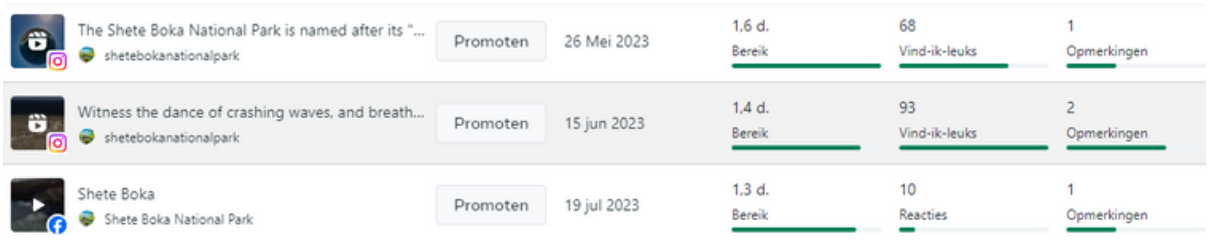


FIGURE 22

marketing & communications

EXPOSURE OF OUR WORK

Audience and statistics Insights Curaçao Rif Mangrove Park

An overview of our social media (Facebook & Instagram) statistics for the Curaçao Rif Mangrove Park in 2023. (See below in Figure 23 and 25).

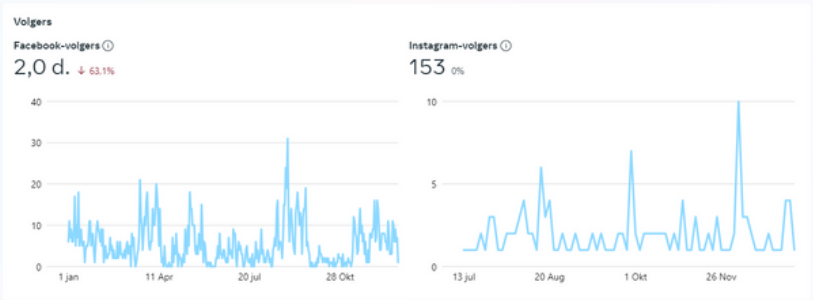


FIGURE 23

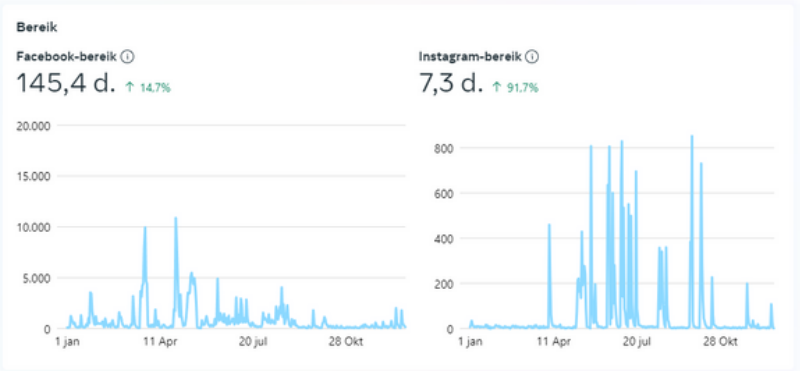


FIGURE 24

Top Three Best Performing Posts on Curaçao Rif Mangrove Park:

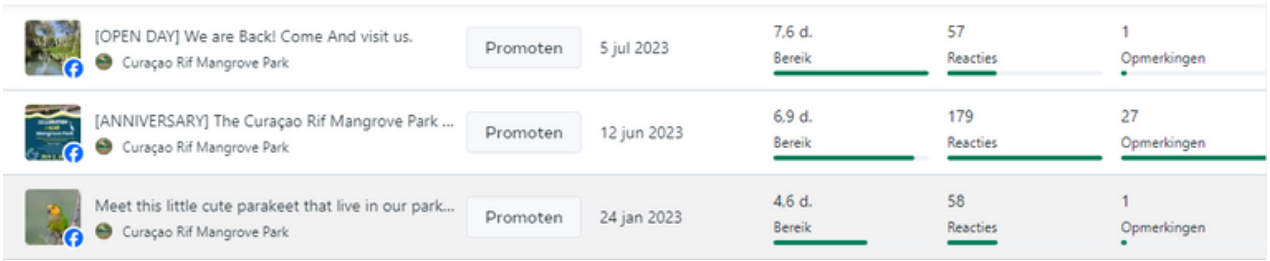


FIGURE 25

marketing & communications

EXPOSURE OF OUR WORK

Audience and statistics Insights Curacao Marine Park

An overview of our social media (Facebook & Instagram) statistics for the Marine Park in 2023. (See below in Figure 26 and 28).

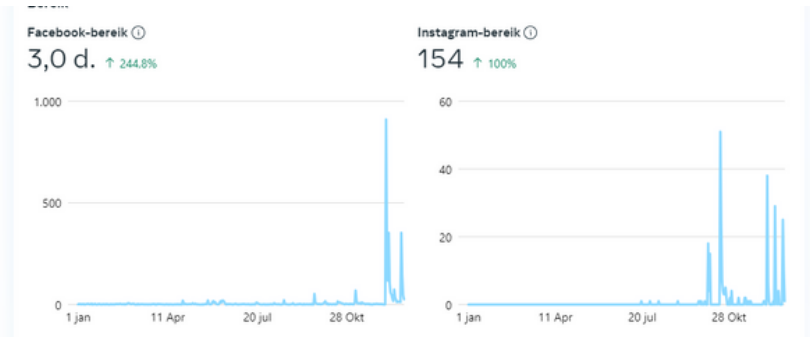


FIGURE 26

FIGURE 27

Top Three Best Performing Posts on Curaçao Marine Park:

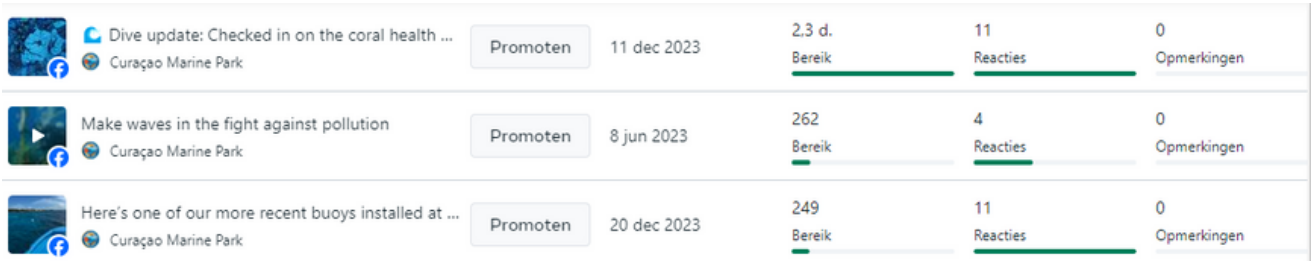


FIGURE 28

marketing & communications

EXPOSURE OF OUR WORK

Audience and statistics Insights Carmabi Foundation

An overview of our social media (Facebook) statistics for Carmabi. (See below in Figure 29, 30 and 31).

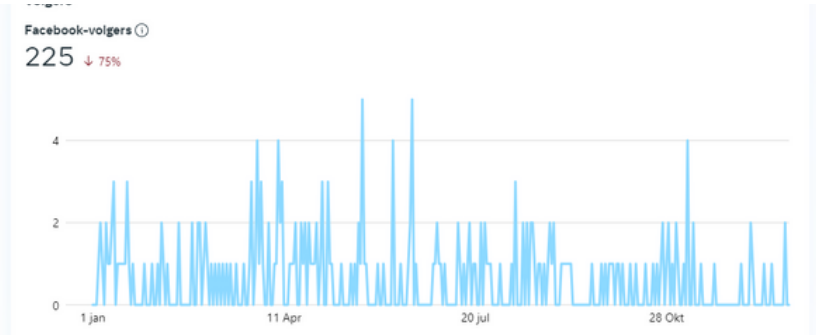


FIGURE 29

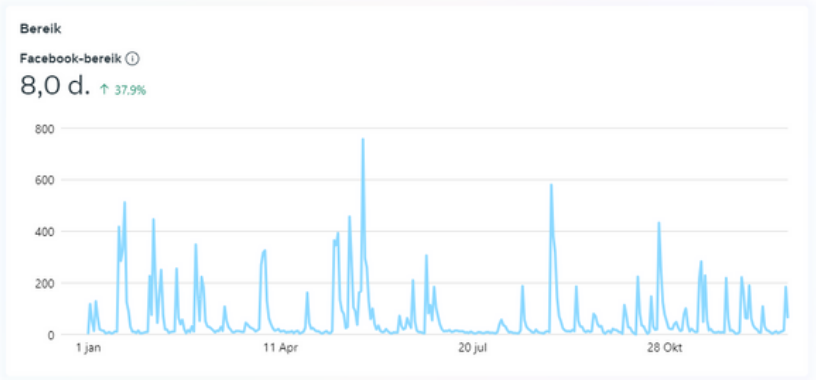


FIGURE 30

Top Three Best Performing Posts on Carmabi Foundation:

De Marine Youth Rangers van Carmabi Educatie ... Carmabi Foundation	Promoten	17 jan 2023	2,1 d. Bereik	22 Reacties	0 Opmerkingen
Carmabi Foundation heeft de omslagfo... Carmabi Foundation	Advertentie maken	22 Mei 2023	1,8 d. Bereik	13 Vind-ik-leuks en reacties	0 Opmerkingen
Today in the Netherlands, they celebrate the Day... Carmabi Foundation	Promoten	24 Mei 2023	1,7 d. Bereik	16 Reacties	0 Opmerkingen

FIGURE 31

marketing & communications

EXPOSURE OF OUR WORK

Highlights in the press and visits

The Marketing and Communications Department distributes press releases throughout the year to enhance exposure for all Carmabi departments. However, due to maternity leave, a part of the department was outsourced during the first five months of 2023 and partially closed from October through December. For a comprehensive list of our media covered issued in 2023, please refer to Annex 3.

Ranger Briand and Chairman Oddette Doest with Princess Beatrix at Boka Pistol

Visit Queen Beatrix

Her Royal Highness Princess Beatrix of the Netherlands visited Carmabi on November 7th, 2023, as part of her exploration of the Savonet plantation complex. Received by Carmabi's chair Odette Doest, outgoing director Paul Stokkermans and incoming director Manfred van Veghel, Princess Beatrix toured the site, engaging with students during a nature education lesson and discussing the historical significance of Savonet with outgoing director Paul Stokkermans. Inside the Landhuis, she learned about the museum's exhibits and renovation efforts.

Royal visit of the nursery - Her royal highness Princess Beatrix visiting the Carmabi native plant and tree nursery

Princess Beatrix then visited the native tree nursery, where she received insights into Carmabi's conservation work. Biologist and head of Consultancy department Erik Houtepen explained native tree cultivation, emphasizing its role in reforestation. The visit concluded with a trip to Shete Boka National Park, where she learned about conservation efforts and visited the newly constructed watchtower at Boka Pistol. The next day, on the 7th of November the Princess visited also Seru Largu National Park where se was received by incoming director Manfred and Head of Consultancy Department Erik.

Her visit highlighted Carmabi's commitment to environmental conservation and historical preservation, reinforcing the importance of such endeavors.

Princes Beatrix visits the Turtle Magasina at Savonet

Carmabi

EXPOSURE OF OUR WORK

Highlights in the press and visits

Introductory visit Minister Robbert Dijkgraaf

Minister Robbert Dijkgraaf from the Dutch Ministry of Education, Culture and Science visited Carmabi on the 16th of January 2023 for an introduction to the work done by Carmabi. A presentation on the scientific work done by Carmabi was held by Dr. Mark Vermeij, Head of the Research Department of Carmabi. Carmabi's director, Paul Stokkermans, showed the Minister around the institute.

The Minister showed great interest in the work done by the foreign students who were present and by the Curacao schoolchildren who were visiting Carmabi as part of Carmabi's education program.

Minister Dijkgraaf in the wet lab with Dr. Vermeij

Director Paul Stokkermans greeting Minister Silvania

Visit Minister Javier Silvania of the Ministries of Finance and Health, Environment and Nature

On the 12th of May 2023 Minister Javier Silvania of the Ministry of Finance and the Ministry of Health, Environment and Nature visited Carmabi. He requested specific information on Carmabi's finances. Director Paul Stokkermans elaborated on the financial relation between Carmabi and the Curacao Government and specific problems in this relation.

The visit was shown live on Facebook. The Minister also received a tour of the Carmabi institute and was impressed by the work done by Carmabi.

Introductory visit Minister Rob Jetten

Minister Rob Jetten from the Dutch Ministry of Climate and Energy visited Carmabi on the 16th of May 2023 for an introduction to the work done by Carmabi. He received a presentation by Carmabi Director Paul Stokkermans and Cor Hameete, the Head of the Carmabi Department for Education.

He was shown around the institute and showed great interest in the experiences of the local schoolchildren visiting the Marine Education Center of Carmabi.

Dutch Minister Rob Jetten with students St Famia school

Carmabi

EXPOSURE OF OUR WORK

Highlights in the press and visits

Visit Minister Silvania Curacao Rif Mangrove Park

On the 17th of October 2023 Minister Silvania of the Ministry of Health, Environment and Nature has made a working visit to the Curacao Rif Mangrove Park. He was accompanied by top officials from his ministry, including Secretary-General Melfor and Inspector-General Keli. He was shown around by Carmabi director Paul Stokkermans.

The most important question was whether the Pseudomas aeruginosa bacterium, that was found in the park almost a year ago is, or is not, antibiotic resistant. This bacterium had come most likely from the outside. The presence of the bacterium was reported to the Ministry of Traffic, Transport and Spatial Planning because Carmabi has a management agreement with this ministry. As a precaution the kayak tours were stopped. Minister Silvania promised to investigate the matter.

Director Paul Stokkermans also handed over several letters to the minister which were directed to the Ministry of Traffic, Transport and Spatial Planning. Research by the ministry is still ongoing. In the letters, questions were asked about the Pseudomas bacterium, about the four times sewage water was dumped into the park since the opening of the park and measures to prevent this, the access to the mangrove area west of Corendon that is still lacking and the visitor center that has not been built yet.

Minister Silvania accompanied by Carmabi director Paul Stokkermans embarked on a guided tour of the Mangrove Park.

general

DCNA MEETINGS

MEETINGS DCNA 2023

Carmabi is a member of the Dutch Caribbean Nature Alliance (DCNA). The directors of the park organizations on the 6 Dutch Caribbean islands are board members of the DCNA. The office of the DCNA is on Bonaire. The objective of the DCNA is to safeguard the biodiversity and promote the sustainable management of the natural resources of the islands of the Dutch Caribbean, both on land and in the water, for the benefit of present and future generations, by supporting and assisting the protected area management organizations and nature conservation activities in the Dutch Caribbean.

The DCNA also manages a trust fund. This trust fund is funded by donors such as the Dutch Postcode Lottery. The purpose of the trust fund is to provide core funding to cover the operational costs of the designated marine protected area (marine nature park) and the designated terrestrial protected area (land nature park) on each of the islands of the Dutch Caribbean.

The DCNA holds two board meetings every calendar year. The first meeting in 2023 was held from the 12th till the 16th of April in St. Eustatius. During the Statia meeting the participants went on a field trip to both the Quill and Boven. The second meeting in 2023 was held in Aruba from the 7th till the 13th of November. The Aruba meeting was important for two reasons. Firstly, the meeting was attended by the patron of the DCNA, her Royal Highness Princess Beatrix. She also attended the Symposium on Nature Based Solutions. Secondly, it was during this meeting that the decision was taken to make the change from a one-tier to a two-tier governance structure. Both meetings were attended by Carmabi Director Paul Stokkermans.

The new director, was introduced to the DCNA members and will take a seat in the new Advisory Board, representing Carmabi and Curaçao.

Participants Board Meeting Statia

general

ANNUAL FINANCIAL STATEMENT

general

ANNUAL FINANCIAL STATEMENT

general

ANNUAL FINANCIAL STATEMENT

general

BOARD & STAFF PER MARCH 2023

Board
-Odette Doest, President
-Edwin Flameling, Secretary
-Pieter van den Berg RA, Treasurer
-Karel van Haren, Board Member
-Manuel Boot, Board Member

-Marjolijn van Schaik, Board Member, stepped down on the 29th of June 2023
-Robin Corsen joined the Board on the 2nd of November 2023

Carmabi ambassador in the Netherlands
-André Cohen Henriquez

Management
-Manfred van Veghel PhD, Director as from 1st of November 2023
-Paul Stokkermans M.Sc., Director, leaving as from 31st of December 2023
-Mark Vermeij PhD, Deputy Director

Research Department
-Mark Vermeij PhD, Head of Department
-Valerie Chamberland, PhD, Researcher
-Kelly Latijnhouwers, M.Sc., Restoration Technician

Terrestrial Parks Department
-Nina Philip-Balentin, Head of Department
-Cyrill Kooistra, Deputy Head of Department and head ranger
-Ercandace Naomi Cijntje, Management Assistant
-Briand Victorina, Head Ranger
-Edwords Alberto, Head Ranger
-Melvin Martinez-Estevez, Ranger
-Ergelijn Cijntje, Ranger, Front Desk Savonet, Marketing and Administration
-Roengelo Doran, Ranger
-Cheandel Maria, Ranger
-Dennert Doran, Ranger
-Araceli Martinez, Front Desk Officer (Savonet)
-Merelyn Albertoe, Front Desk Officer (Shete Boka)
-Brenda Jantji, Front Desk Officer (Shete Boka)
-Janiska Spek, Janitor

Hato Caves
Contracted to Indian Caves N.V. (Monica Vrolijk)

Marine Parks Department (Marine Park)
-Duvan Rios, Head of Department
-Roland de Cuba, Ranger
-Kevin Philbert, Ranger

Marine Parks Department (Mangrove Park)
-Juan Wyatt, Head Ranger
-Oswald Fleming, Ranger
-Germain Cristina, Ranger
-Serlon St. Jago, Ranger
-Elisha Janga, Ranger
-Erla Hernandez, Front Desk Officer
-Mirari Hodge, Front Desk Officer

Nature and Environment Education (NME)
- Cornelis Hameete M.Sc., Head of NME department

Advice and Consultancy Department
-Erik Houtepen, M.Sc., Head of Department
-Tatiana van Stevenick, M.Sc., Terrestrial research and consultant

Administration Department
-Ethline Isenia, Head Administration Department
-Shahaira Martina, Assistant Financial Administration
-Nancy Provacia, Administrative Assistant

Communication and Marketing
- Kim Hendriksen

Afdeling Technische Dienst
-Urgenello Louisa, Hoofd Afdeling Technische Dienst
-Carlos Winterdaal, Technician

Security Piscadera is outsourced to:
-Megory Security

Cleaning Piscadera is outsourced to:
-Servisio na bo Ordu N.V.

general

ON CALL STAFF

Security Shete Boka is outsourced to:
-Hawks Eye Security

Left the organization
-Kenneth Tromp, Hoofd Afdeling Terrestrische Parken

ON CALL STAFF

Savonet
-Afiaretty Boelbaai (Cleaning Savonet)
-Richard Davelaar (Cleaning Shete Boka),
-Ingrid Doran (Cleaning Shete Boka)

Junior Rangers
- Adrion Plantijn

Baby Boom
We are pleased to announce that in 2023, there was a significant increase in new additions to our organization.

Several staff members, including three members of the management team and three employees, welcomed newborns into their families during the year.

general

DONATIONS 2023

Organizations
-Banco di Caribe (Contribution for purchase car)
-Blue Marine Foundation (Bus transport school children and Marine Youth Rangers)
-Curacao American Preparatory School (CAPS) (financial donation free to use)
-Dutch Army (Genie) (Guard Tower Boka Pistol and drain Hermanus)
-Dutch Caribbean Nature Alliance (Disbursement Trustfund and optical tools bird watching)
-Het Cultuurfonds (Bus transport school children, Poster Deep Sea, Lumpsum free to use and used for Bat Program Secondary Schools)
-MCB (Kompa Leon Green financial contribution)
-Rotary Club (Determination Cards for education purposes)
-Sandals (Four Shade Net Constructions Curacao Rif Mangrove Park)
-Securitas (Contribution for Management Curacao Rif Mangrove Park)
-Spaw Rac (measuring reefs around Curaçao)
-Vogelbescherming Nederland (Binocular bird watching)
-Waitt Institute (measuring reefs around Curaçao)

Persons
-Mr. and Mrs. Smith (Anchor chain)
-Mr. Wim Grit (Three antique tables Savonet)
-S.A. Daal (Financial contribution)

scientific research

VISITING SCIENTISTS

Dr. Alex Worden (Monterey Aquarium research Institute, U.S.A.) Ecology and evolution of ocean microbes (February 2023 – March 2023)
Dr. Andy Tan (University of Colorado, U.S.A.) Bivalve evolution (June 2023)
Dr. Aschwin Engelen (University of the Algarve, Portugal) Coral Reef Ecology Course (February 2023)
Dr. Bert Hoeksema (Naturalis Biodiversity Center, The Netherlands) Invertebrate taxonomy (March 2023 – April 2023)
Dr. Cassidy D'Aloia (University of Toronto Mississauga, Canada) Connectivity in cryptobenthic fishes (July 2023 - August 2023)
Dr. Dolfi Debrot (Wageningen University and Research, The Netherlands) Pelagic fisheries (July 2023)
Dr. Eleanor Caves (Duke University, U.S.A.) Shrimp ecology (September 2023)
Dr. Forest Rohwer (San Diego State University, U.S.A.) Coral microbiology and Reef restoration (February 2023 – September 2023)
Dr. Isaiah Bolden (Vanderbilt University, U.S.A.) Cave and climate research (February 2023)
Dr. Javier del Campo (University of Miami, U.S.A.) Coral microbiology (March 2023)
Dr. Joaquin Yus Dominguez (University of Illinois Urbana-Champaign, U.S.A.) Reef restoration technology (March 2023 – October 2023)
Dr. Kristen Marhaver (Marhaverlab, Curacao) Reproductive biology of corals (January 2023-December 2023)
Dr. Lennart de Nooijer (NIOZ, The Netherlands) Calfication processes (April 2023)
Dr. Marc Dantzker (Cornell University, U.S.A.) Underwater acoustics (June 2023)
Dr. Mariya Galochkina (WHOI, U.S.A.) Paleoclimates (August 2023)
Dr. Melanie Moses (University of New Mexico, U.S.A.) Complex biological systems (May 2023)
Dr. Michelle Achlatis (University of Amsterdam, The Netherlands) Sponge ecology (January 2023 – May 2023)
Dr. Mike Gill (University of Colorado, U.S.A.) Coral reef class (May 2023)
Dr. Mike Gill (University of Colorado, U.S.A.) Feeding ecology of fishes (May 2023 – July 2023)
Dr. Nicole King (University of California, Berkeley, U.S.A.) Marine molecular and cell biology (July 2023 - August 2023)
Dr. Nicole Voogd (Naturalis Biodiversity Center, The Netherlands) Sponge taxonomy and ecology (October 2023 - November 2023)
Dr. Pedro Frade (University of Vienna, Austria) Microbial ecology of reefs (October 2023 - December 2023)
Dr. Patrick Keeling (Canadian Institute for Advanced Research, Canada) Protist biology (February 2023-October 2023)
Dr. Paul Sikkel (University of Miami, U.S.A.) Fish parasites (February 2023 – March 2023)
Dr. Petra Visser (University of Amsterdam, The Netherlands) Coral Reef Ecology Course (January 2023 - February 2023)

scientific research

VISITING SCIENTISTS

Dr. Pieter Johnson (University of Colorado, U.S.A.) Coral Reef Ecology Course (January, December 2023)
Dr. Pieter Johnson (University of Colorado, U.S.A.) Fish parasites (June 2023 - July 2023)
Dr. Pim Bongaerts (California Academy of Sciences, U.S.A.) Mesophotic reefs (April 2023-December 2023)
Dr. Roger Portell (Florida Museum of Natural History, U.S.A.) Reef sediments (December 2023)
Dr. Sarah Davies (Boston University, U.S.A.) Cryptic coral species (June 2023)
Dr. Valerie Chamberland (SECORE International, U.S.A.) Postsettlement dynamics of Caribbean corals & Reef restoration (January 2023 -December 2023)
Dr. Verena Schoepf (University of Amsterdam, The Netherlands) Adaptation in Caribbean corals (May 2023 – July 2023)
Drs. Annika Vaksmaa (NIOZ, The Netherlands) Microplastics (January 2023)
Drs. Cornelia Osborne (Penn State University, U.S.A.) Genetics of Caribbean Acroporids (May 2023)
Drs. Emily Nixon (San Diego State University, U.S.A.) Coral holobiont symbioses (August 2023)
Drs. Michiel van Nierop (VNI, Curacao) Conch ecology and restoration (April 2023 – October 2023)
Drs. Roxanne Holmes (University of Cambridge, U.K.) Fish ecology (March 2023 - May 2023)
Drs. Will Barnes (NIOZ, The Netherlands) Marine oxygen dynamics (April 2023-November 2023)
Patrick Brydon (Broadreach College, U.S.A.) Course: coral reef ecology (June 2022- August 2023)

PEER REVIEWED PUBLICATIONS

An overview of all peer reviewed scientific publications published in 2021 is shown below:

1. Baer JL, Carilli J, Chadwick B, Hatay M, van der Geer A, Scholten Y, Barnes W, Aquino J, Ballard A, Little M, Brzenski J. Coral Reef Arks: An In Situ Mesocosm and Toolkit for Assembling Reef Communities. JoVE (Journal of Visualized Experiments). 2023 Jan 6(191): e64778.
2. Banaszak AT, Marhaver KL, Miller MW, Hartmann AC, Albright R, Hagedorn M, Harrison PL, Latijnhouwers KR, Mendoza Quiroz S, Pizarro V, Chamberland VF. Applying coral breeding to reef restoration: best practices, knowledge gaps, and priority actions in a rapidly evolving field. Restoration Ecology.:e13913.
3. Behm JE, Ellers J, Jesse WA, Tran TJ, Helmus MR. Predicting and quantifying coexistence outcomes between resident and invading species using trait and abundance data. bioRxiv. 2023:2023-01.
4. Brown T, Sonett D, McMinds R, Pollock FJ, Medina M, Zaneveld JR. Anatomically-specific coupling between innate immune gene repertoire and microbiome structure during coral evolution. bioRxiv. 2023:2023-04.
5. Candy AS, Taylor Parkins SK, Van Duyl FC, Mueller B, Arts MG, Barnes W, Carstensen M, Scholten YJ, El-Khaled YC, Wild C, Kelly LW, Nelson CE, Sandin SA, Vermeij MJA, Rohwer FL, Picioreanu C, Stocchi P, Haas AF. Small-scale oxygen distribution patterns in a coral reef. Frontiers in Marine Science. 2023 10:463.
6. Debrot AO, Wellens RM, de Vries HE, Da Costa Gomez M, Rusch-de Lijster CANF, Cijntje QND, Houtepen E, Schets PPP. A case study of sea and shorebird breeding recovery following goat and cat eradication on Klein Curaçao, southern Caribbean. Journal of Field Ornithology. 2023 94(3):18.
7. Defourneaux É, Herranz M, Armenteros M, Sørensen MV, Norenburg J, Park T, Worsaae K. Circumtropical distribution and cryptic species of the meiofaunal enteropneust Meioglossus (Harrimaniidae, Hemichordata). Researchsquare.
8. de Jong C, van Os I, Sepulveda-Rodriguez G, de Baat ML, Schoepf V. Sentinels for future coral reef conditions: assessment of environmental variability and water quality in semi-enclosed inland bays in the southern Caribbean. bioRxiv. 2023:2023-10.
9. Eckmann CA, Eberle JS, Wittmers F, Wilken S, Bergauer K, Poirier C, Blum M, Makareviciute-Fichtner K, Jimenez V, Bachy C, Vermeij MJA, Worden AZ. Eukaryotic algal community composition in tropical environments from solar salterns to the open sea. Frontiers in Marine Science. 2023 Jun 30.
10. Epstein HE, Brown T, Akinrinade AO, McMinds R, Pollock FJ, Sonett D, Smith S, Bourne DG, Carpenter CS, Knight R, Willis BL. Evidence for microbially-mediated tradeoffs between growth and defense throughout coral evolution. bioRxiv. 2023:2023-04.
11. Fransen CH. The marine palaemonid shrimps (Crustacea, Deapoda, Caridea) of the Dutch Caribbean. Zootaxa. 2023 Dec 15;5387(1):1-27. .
12. Geertsma RC, Kamermans P, Murk AJ, Wijgerde T. Real-time high-resolution tracking of coral and oyster larvae. Journal of Experimental Marine Biology and Ecology. 2023 Aug 1;565:151910.
13. Gijsbers JC, Englebert N, Prata KE, Pichon M, Dinesen Z, Brunner R, Eyal G, González-Zapata FL, Kahng SE, Latijnhouwers KR, Muir P, Radice VZ, Sanchez JA, Vermeij MJA, Hoegh-Guldberg O, Jacobs SJ, Bongaerts P. Global phylogenomic assessment of Leptoseris and Agaricia reveals substantial undescribed diversity at mesophotic depths. BMC Biology. 2023 Dec;21(1):1-5.
14. Gigeroff AS, Eglit Y, Simpson AG. Characterisation and cultivation of new lineages of Colponemids, a critical assemblage for inferring alveolate evolution. Protist. 2023 Mar 18:125949.
15. Goodheart JA, Collins AG, Cummings MP, Egger B, Rawlinson KA. A phylogenomic approach to resolving interrelationships of polyclad flatworms, with implications for life-history evolution. Royal Society Open Science. 2023 Mar 29;10(3):220939.
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scientific research

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All these publications can be freely downloaded at https://www.researchstationcarmabi.org/scientific-publications/

marketing & communications

MEDIA COVERAGE

17-Jan-23	Our nature is certainly interesting: Veeteelt op Savonet
16-Mar-23	Carmabi in search of a new director
14-Apr-23	World Earth Day at MC Piar school
17-Apr-23	Dutch Minister Rob Jetten visits Carmabi
20-May-23	Memorandum of Understanding signed for Proteus Underwater Research Station
3-Jul-23	Sewage overflow in Mangrove Park
4-Jul-23	It's better if the government fixes the sewage system issue
11-Jul-23	More sewage problems: Mangrove Park must close again!
13-Jul-23	Mangrove Park reopened
14-Jul-23	Second letter in the works regarding sewage overflow
15-Jul-23	Rennox Carmes (TPK): Why is Mangrove Park partially accessible?
17-Jul-23	Odor problems at Mangrove Park cannot continue
20-Jul-23	VVRP questioned by PAR about Mangrove Park
7-Aug-23	2021 was a good year for Carmabi despite Covid-19
16-Aug-23	Open day at Mangrove Park
21-Aug-23	Open day at Mangrove Park draws over 800 visitors
22-Aug-23	Results of bacteria research at Mangrove Park expected soon
24-Aug-23	Our history is certainly interesting: Savonet Plantation and its residents
24-Aug-23	New pump at SVB on generators Courtyard Marriott to prevent outages
24-Aug-23	Open day at Mangrove Park was a great success
19-Sep-23	Adjusted opening hours for Christoffelberg due to persistent heat
5-Oct-23	Temporary closure of Mangrove Park
6-Oct-23	Mangrove Park reopened to the public
13-Oct-23	Completion of diver in Hermanus and watchtower in Shete Boka at Boka Pistol by the Army Engineers
18-Oct-23	Minister Silvania visits Mangrove Park
27-Oct-23	Dr. Manfred van Veghel new director of Carmabi
23-Nov-23	Coral bleaching this year is shocking
24-Nov-23	Carmabi adjusts access prices for nature parks: local visitor rates reduced

marketing & communications

MEDIA COVERAGE

28-Nov-23	Carmabi observes coral bleaching around Curaçao. Damage appears to be minimal so far
28-Nov-23	Research on water quality at Mangrove Park to be completed by early December. Damage
2 -Dec-23	seems to be minimal for now.
8-Dec-23	Little coral loss due to coral bleaching.
7-Dec-23	Scientists at CARMABI discovered that young coral fish are not affected by bleaching like many older and larger corals.
16-Dec-23	Fisherman rescued from rough sea at Shete Boka.
27-Dec-23	Hidden population of Curaçao's Kabanapalms discovered.
27-Dec-23	End-of-year interview with Manfred van Veghel: "The circle is complete."
29-Dec-23	Men rescued and detained from water at Shete Boka