2020

ANNUAL REPORT

CARMABI FOUNDATION

PISCADERABAAI z/n, P.O. Box 2090
Willemstad, CURAÇAO
+599 9 462 42 42

www.carmabi.org
info@carmabi.org

Annual report 2020

FROM THE DIRECTOR

2020 was the year the world was hit by a pandemic. Worldwide borders were closed, international traveling came to a stop and countries went into lockdowns to keep the Covid-19 virus from spreading. Curacao too closed its borders and went into lockdown from March till May.

Because we greatly depend on visiting tourists and the sale of admission tickets for our parks for our income, the pandemic has impacted the organization very much. During the lockdown and thereafter Carmabi's income has decreased a lot since the number of tourists visiting the parks has dropped steeply.

Thanks to financial support from the government, we have survived up to this point. We have paused all investments and maintenance of Carmabi property and the parks and have focused on keeping our personnel employed. So far, we have managed to do so. Thankfully, no personnel have been laid off.

We want to thank the government, other NGO's, volunteers, donors, and private persons, who assisted us during these difficult times. Without all of you it would not have been feasible to continue our work.

Despite local and international travel restrictions, a total of 48 scientists visited Carmabi to conduct a wide variety of research projects. In addition, 118 students participated in various courses that were taught at Carmabi bringing the total number of visitors to our science center to 166. In total 32 scientific publications were published based on work done at Carmabi in 2020.

A total of 33.667 visitors were welcomed in the Christoffel National Park in 2020. This is a decrease of 36% compared to 2019. A total of 41.147 visitors visited the Shete Boka National Park in 2020. This is a decrease of 55% compared to 2019. In 2020, 35.401 people visited the Hato Caves, a decrease of 61% compared to the year before.

The education department welcomed (until the lockdown due to Covid-19) a total of 4.315 primary school students. After the Covid-19 lockdown, all extracurricular activities (excursions) were cancelled by the school boards. We developed new school visit programs for all grades as an alternative for the excursions. This way guides from the education department were able to offer a program for 3.089 elementary school students. New education activities and collaborations with other organizations were started such as Greenkidz.

The consultancy department conducted more consultancies in 2020 compared to previous years, resulting in much needed revenue to compensate the loss of income in the parks.
In 2020 Carmabi existed 65 years. We had planned a lot of festivities which were largely cancelled due to the pandemic.

Annual report 2020

FROM THE DIRECTOR

There is also good news. Three new parks are in the making! On the 27th of November we signed an agreement with the government to manage Curacao's new Marine Park at East Point. This park will be financed for 5 years by the Curaçao Ports Authority (CPA). The park is 20 kilometers long and extends 100 meters into the sea.

The Mangrove Park in Otrobanda next to the Mega Pier is steadily progressing. The Minister of Traffic, Transport and Urban Planning has announced that Carmabi will be asked to manage this park.

Refineria di Korsou (RdK) has requested Carmabi to manage the Rif St. Marie area, which is owned by RdK, as a nature park. To improve access to this area we requested the government to let Carmabi also manage the adjacent Hermanus area. We have prepared a financing proposal to find the funds to establish this new nature park.

Thankfully, people worldwide are now being vaccinated against Covid-19. According to government information the Curacao population will be vaccinated in the first half of 2021. We sincerely hope that visitors to our parks as well as researchers and students studying Curacao's ecosystems will increase again in the second half of 2021.

Paul Stokkermans
Director Carmabi

scientific research (marine)

VISITING SCIENTISTS

48 scientists visited Carmabi in 2020. In addition, 118 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 2020 was much lower compared to previous years due to the COVID-19 outbreak and subsequent restrictions limiting international travel (Figure 1).

Approximately 130 researchers and students had to cancel previously booked trip to come conduct research at Carmabi. Most visitors in 2020 were from Curaçao (37%, because of the Summer Camps), followed by the Netherlands (32 %) and the United States (28%). Almost all the scientists and students that worked at Carmabi stayed at the facilities at Piscadera. The occupation of Carmabi's science center in 2020 was historically low due to Covid-19, i.e., 26% (2019: 56.2%, 2018: 67%2017: 53%, 2016: 58%, 2015: 54%, 2014: 47%, 2013: 28%).

An overview of the areas in which researchers were active that visited or worked at Carmabi in 2020 is shown in Figure 2.

An overview of visiting scientists (PI name and home institute) is attached in annex 1.

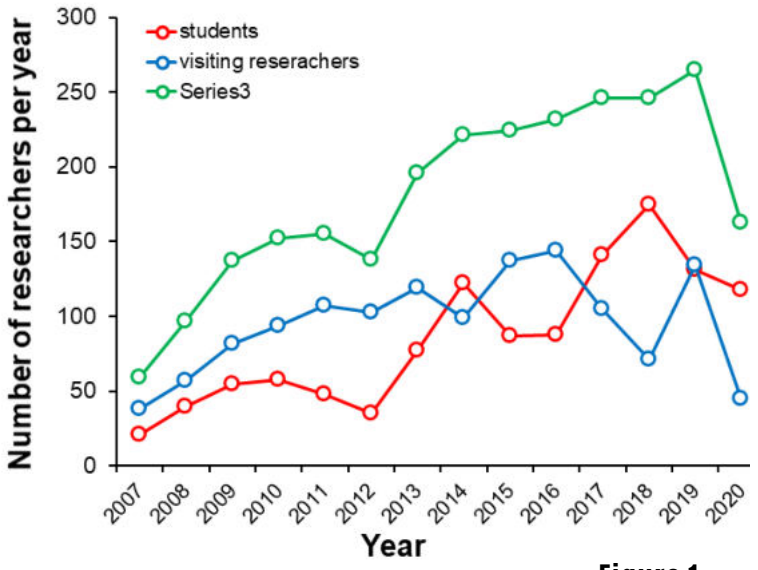


Figure 1

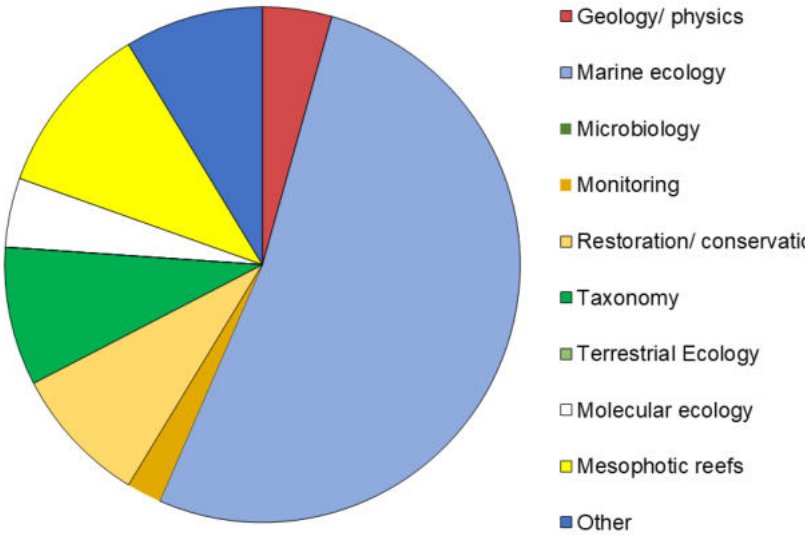


Figure 2

scientific research (marine)

PEER REVIEWED PUBLICATIONS

Thirty-two publications appeared in peer reviewed scientific journals based on work that was conducted at Carmabi making 2020 a productive year 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, 12 reports were produced by MSc students that did their master's thesis' project at Carmabi.

An overview of all peer reviewed scientific publications published in 2020 is shown in annex 2.

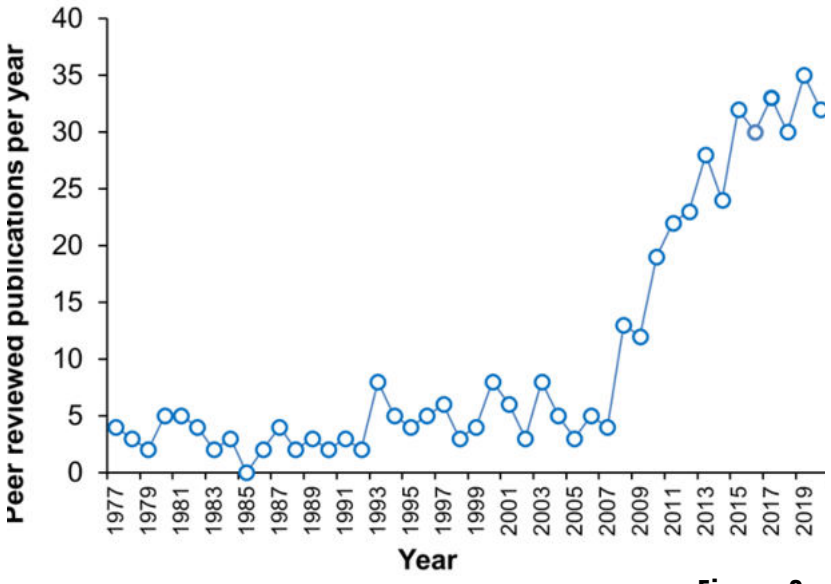
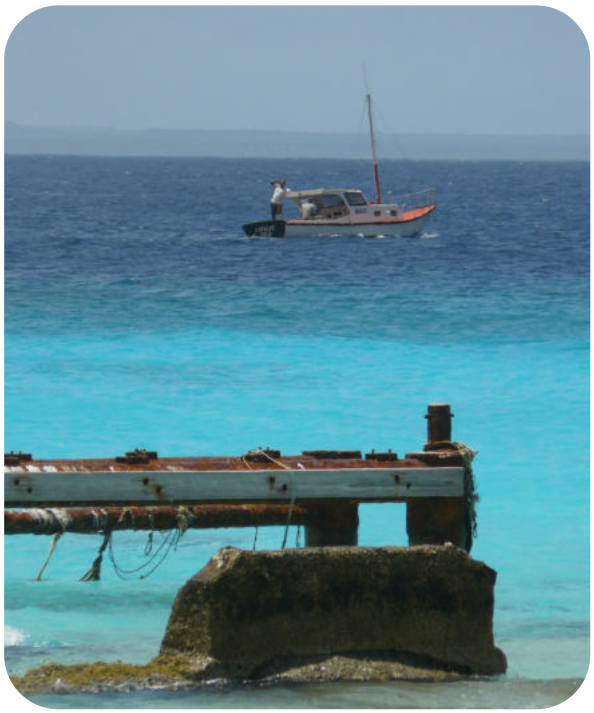


Figure 3

FREE ADVICE, OUTREACH, AND CONSULTATION



Several organizations, government departments, the press and others received free advice and information from the Carmabi Science Department during the year.

We assisted in 71 cases, both oral and written. In 2020 the Carmabi Science Department was featured/ interviewed in 94 items for international and local TV, radio, and newspapers.

scientific research (marine)

SELECTED PROJECTS 2020

Coral Live 2020

The Coral Live expedition team engaged students around the world with the wonders of the coral reefs and the human impact on these fragile ecosystems through a series of live broadcasts from 9 to 19 November 2020 (Figure 4). Covering less than 1 percent of the marine environment, coral reefs are home to 25 percent of marine species and important nursery habitats to edible fish. It is estimated that 1 billion people depend on food from the reefs. Exploring this fascinating topic, Jamie Buchanan-Dunlop, educator and expedition leader, and Ellie Mackay, science communicator, brought corals to life for classrooms around the world.

Working with researchers at the Caribbean Research and Management of Biodiversity (CARMABI) research station, Jamie and Ellie hosted thirty interactive education broadcasts for teachers keen to bring science, geography, and primary school learning to their classroom. Running on Digital Explorer's YouTube Live Channel, teachers were able to introduce their students to any of the five topics: an introduction to coral, coral ecosystems, corals and climate change, the deep reef, and the coral adaptation. Each day of broadcasts was dedicated to one of these themes and classes could choose from three different live broadcast formats running twice daily, live investigations, interviews with experts and Ask-Me-Anything sessions. The program won the Education Technology industry's biggest award (BETT award) in 2019. The Coral Live program from CARMABI reached 30 thousand students (7 thousand more than in 2019) from 14 countries.

Figure 4

scientific research (marine)

SELECTED PROJECTS 2020

Caribbean Research program receives boost of more than 7 million euros

During the annual consultation with the Caribbean part of the Kingdom, Ingrid van Engelshoven, the Minister of Education, Culture and Science, has announced that more than 7 million euros has been awarded to two projects within the NWO program Caribbean Research: A Multidisciplinary Approach. In this funding round, the emphasis is on the structural strengthening of the knowledge system and the embedding of scientific research in the Caribbean part of the Kingdom of the Netherlands. NWO wants to realize that objective by means of these two large multidisciplinary research programs that will be realized and embedded in the Caribbean region. 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.

The two awarded projects are: (1) SEALINK with program chair: Prof dr Mark Vermeij (University of Amsterdam, CARMABI Curaçao). The SEALINK Program will create the first comprehensive understanding of ocean pollution and coral reef health in the Dutch Caribbean. They will follow water and pollutants (including sewage, fertilizer, and human pathogens) from land to sea, and track how water motion and marine organisms move and change these substances. This information will be used in computer simulations to create new conservation scenarios with community input. SEALINK will also study how community members use scientific information, which will help improve coral reef education and conservation globally.

The second program is “Island(er)s at the Helm” with program chair Dr Francio Guadeloupe (Royal Netherlands Institute of Southeast Asian and Caribbean Studies KITLV; University of Amsterdam). Since the first occupation of the islands, hurricanes and the devastation of coastal areas have significant ecological and social implications for the (Dutch) Caribbean. These are deeply impacting the basic living conditions (water, food, shelter) and heritage of the island inhabitants. This requires immediate action! Island(er)s at the Helm brings together researchers and societal partners to combine technical, traditional, and contemporary knowledge practices to co-create sustainable and inclusive strategies for social adaptation to these climatic challenges. In parallel, a trans-Atlantic academic platform and regional expertise center, will be developed fostering research-based education on climate challenges for the islands.

Source: NWO

scientific research (marine)

SELECTED PROJECTS 2020

Movie on coral rearing research on Curacao wins prize

Genetic diversity is critical for wildlife health, especially for animals that are impacted by a changing environment. A biodiverse population of coral is better equipped to endure environmental pressures, like warming waters, because it is more likely that some individuals will have genetic variations to help them adapt and survive. Maintaining genetic diversity among corals can be challenging. The adults are attached to a sea bottom, while the floating larvae are restricted by ocean currents and the space available to settle. This limits the number of genes that can be shared among corals. For example, the eastern population of elkhorn coral in Curaçao would not naturally meet and reproduce with the western population in Florida. One population might have advantageous traits that could help corals survive warming waters, so how can two separate populations come together?

Scientists are creating these long-distance romances by taking coral sperm from one area and introducing it to coral eggs from another area. This process is called assisted gene flow. However, corals from the same species that live far apart do not always spawn at the same time.

To overcome this obstacle, Smithsonian scientists developed an advanced reproductive technique, called sperm cryopreservation.

They first collect and freeze coral sperm to preserve it. Then, they can transport the cryopreserved sperm, thaw it and introduce it to fresh eggs when the time is right. For the first time, the researchers tested assisted gene flow on corals using frozen sperm to match for example the Curaçaoan and Florida populations of elkhorn corals. The young elkhorns that resulted are currently thriving under human care in Florida. The success of this first trial introduces a brand-new tool for coral restoration and the future survival of the ocean's reefs. This project took place on Curacao and was lucky enough to be filmed by Roshan Patel who won the International Wildlife Film Festival 2020 (Figure 5) with his short film that can be found through: https://youtu.be/3Bko2bhQgG0

Source: Smithsonian's National Zoo

Figure 5

scientific research (marine)

SELECTED PROJECTS 2020

Curaçao might become the home of an underwater research facility

Ocean explorer and environmentalist Fabien Cousteau--grandson of Jacques-Yves Cousteau--announced his vision for PROTEUS™, the world's most advanced underwater scientific research station (Figure 6) and habitat to address humanity's most critical concerns: medicinal discoveries, food sustainability, and the impacts of climate change. PROTEUS™ is conceived as the underwater version of the International Space Station and provides a platform for global collaboration amongst the world's leading researchers, academics, government agencies, and corporations to advance science to benefit the future of the planet. Proposed as the largest and most technologically advanced underwater station ever built, PROTEUS™ will grant scientists and aquanauts the time to conduct continuous night and day diving and data collection.

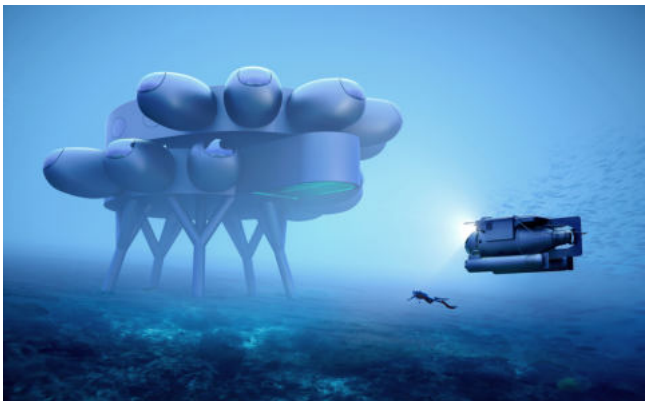


Figure 6

PROTEUS™ will enable the discovery of new species of marine life, create a better understanding of how climate change affects the Ocean, and allow for testing of advanced technologies for green power, aquaculture, and robotic exploration. PROTEUS™ will be located off Curaçao, at a depth of 60 feet (3 atmospheres), in richly biodiverse marine-protected water. Dr. I.S (Steven) Martina, Minister of Economic Development for Curacao, stated: "We are delighted to be home to PROTEUS™. Our incredible Caribbean Sea holds immense riches yet to be fully discovered. The economic potential of having the first underwater space station located in Curacao's waters is enormous, from job creation to tourism." PROTEUS™'s strategic partners include Northeastern University, Rutgers University, and CARMABI.

Source: The Curacao Chronicle

scientific research (terrestrial)

SELECTED PROJECTS 2020

Evaluation of vegetation development on the Dutch Caribbean islands

Vegetation scientists from Wageningen Environmental Research and Carmabi visited Bonaire to study the succession of the vegetation. Several plots that were described 20 years ago were resurveyed.

The study is part of a project in which quantitative historical data on the terrestrial habitats of the Dutch Caribbean islands are brought together and historical inventories are repeated. The evaluation of the conservation status of the terrestrial habitat types of the Dutch Caribbean islands clearly showed the poor status of many terrestrial plant communities, because of overgrazing and urban development. Repeating vegetation maps and vegetation plot descriptions (so-called vegetation relevés) provide insight in the vegetation succession under different environmental conditions.

A similar study in the Christoffel National Park on Curaçao showed the quick development of evergreen wooded plants once goats have been removed. On Bonaire, relict populations of the rare and most endangered wooden species were mainly seen on the middle and high limestone terraces, in areas that are seriously threatened by urban development plans. Wageningen Environmental Research and Carmabi are digitizing historical vegetation descriptions and maps and have started to resurvey plots on the Dutch Caribbean islands. Vegetation relevés are stored in a digital database that will be made available through the Dutch Caribbean Biodiversity Database website (www.dcbd.nl).

Source: The Curacao Chronicle

WUR and CARMABI researchers studying Bonaire's vegetation; visible on the right is the Bonaire palm (Sabal lougheediana).

scientific research (terrestrial)

SELECTED PROJECTS 2020

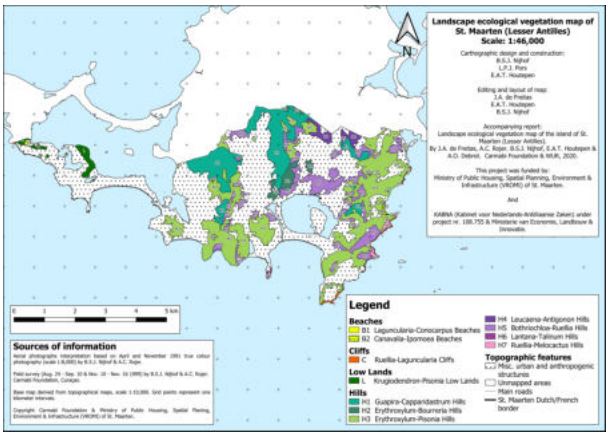
Landscape ecological vegetation map of St. Maarten

The landscape ecological vegetation map of the island of St. Maarten (figure 7) was published as part of the vegetation report series for the six Dutch Caribbean islands. The report describes the distribution of main vegetation types and serve as an essential tool in future biodiversity science, conservation, management, monitoring and land-use planning on St. Maarten.

Based on 56 vegetation plots sampled in 1999, a total of four main and eleven sub-landscape types were distinguished. The most dominant landscape type was the hilly landscape type (seven sub-landscapes). Compared to the 1950's the total vegetated surface of St. Maarten has declined severely from 67% to 42%, and five vegetation types have disappeared alltogether. Goat grazing is high, especially in a "new" vegetation type that has developed and is largely comprised of the invasive plants Leucaena leucocephala (jumbie bean, lead tree) and Antigonon leptopus (coral vine).

Urbanization and touristic development, uncontrolled livestock grazing, invasive plant species and hurricane impacts mostly contributed to the degradation of natural landscapes and vegetation. To halt such declines, it is recommended to implement land-use planning and designate protected areas, limit and control roaming livestock, legally protect endangered and ecologically critical plant species, connect protected areas through ecological corridors, implement measures to control and limit invasive species and implement long-term vegetation monitoring to determine the effectiveness of such measures.

Figure 7



Landscape ecological vegetation map St. Maarten.

scientific research (terrestrial)

SELECTED PROJECTS 2020

Digital herbarium and plant distribution

Curaçao's rich flora has been extensively studied in 2020 as to expand Carmabi's herbarium with new species. Herbaria are essential to correctly identify different plant species. To increase the accessibility to this collection, a digital herbarium was created. The digital herbarium provides readily available and accurate pictures of the native plant species of Curaçao (figure 8), including pictures of all different parts and life stages (e.g., leaves, fruits, seeds, seedlings) of each species. In 2021 the digitizing of the physical herbarium will continue and made available for research purposes.

Figure 8

Flower of Sophora tomentosa.

The creation of the digital herbarium is strongly related to the research on the distribution of flora of the Dutch Caribbean, a collaborative research between Carmabi and Wageningen University and Research (WUR). This project will provide distribution maps for all plant species in the Dutch Caribbean based on historic and recently collected plant distribution data. All data is currently stored in the Carmabi GIS library and will be made available through the Global Biodiversity Information Facility (GBIF) and the vegetation database for the Dutch Caribbean ('CACTUS') that is managed by Carmabi and WUR. This project will continue in 2021.

Savonet and Christoffel mountain.

scientific research (terrestrial)

NATIVE PLANT NURSERY

Vegetation Mapping of the Christoffel Park

Carmabi promotes the use of native plants for gardens and landscaping purposes as an alternative to frequently used non-native plants. Compared to imported, non-native plants, native plants have lower water and pesticide requirements and provide habitat and food to Curacao's wildlife. To promote the use of native plants Carmabi has upgraded its native plant nursery at Savonet (figure 9) and increased both the number of species and the number of plants in the nursery. The nursery program also provides plants to actively restore degraded natural areas on Curaçao and serves as a location to study the conditions for successful seed germination of native plant species. Over 80 native plant species (of total 541 plant species occurring on Curaçao) including endemic and endangered species, are currently being cultivated in the native plant nursery.

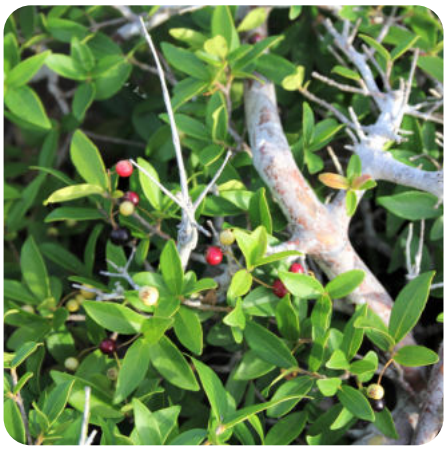
Figure 9

Construction of the updated native plant nursery at Savonet.

Highlights of the native plant nursery activities are the germination of the for Curaçao and Bonaire endemic plant species *Myrcia currassavica* (figure 10), for Curaçao endemic palm species *Sabal antillensis* and internationally protected *Guaiacum sanctum*.

Also, the beautiful *shrubs Lantana* camara and *Erithalis fruticosa* were successfully germinated. More common species like *Acaciella glauca*, *Bourreria succulenta*, *Cordia dentata*, *Guapira fragrans* (figure 11), *Handroanthus billbergii*, *Ruprechtia coriacea* and *Caesalpinia coriaria* were successfully cultivated from seeds in large numbers.

Figure 10



Fruits of Myrcia currassavica.

Figure 11

Fruits of Guapira fragrans.

Native plant nursery

SELECTED PROJECTS 2020

Native plant sales increased in 2020 and many projects bought Carmabi's native plants (e.g., Tiny Forest Klein College (figure 12, Uniek Curaçao and Greening the desert) or consulted Carmabi for advice on the use of native plants.

The cultivated native plants were also highlighted during the sale of the plant box: 'Christoffelpark den chiki' (figure 13), a collection of 5 different native plant species. The plant box provides people with a selection of beautiful and ecologically important native plant species for use in their garden to recreate a mini Christoffel Park at home. The plant box sale was well received and successfully promoted the use of native plants; request have come in for additional plant boxes and for this reason the sale of the plant boxes will again take place in 2021.

Figure 12

Planting of tiny forest at primary school Klein College.

Figure 13

Plant boxes 'Christoffelpark den chiki'.

consultancy department

RESEARCH & SERVICES

The consultancy department provides ecological advice, conducts biological inventories, formulates conservation priorities and management plans of natural areas, National Parks and ecological reforestation practices.

Throughout the year the department was consulted on numerous occasions for information, assistance, or advice on different topics, including species identification, information on protective status of flora and fauna and invasive species.

Figure 14

Mangrovepark Rif I and II.

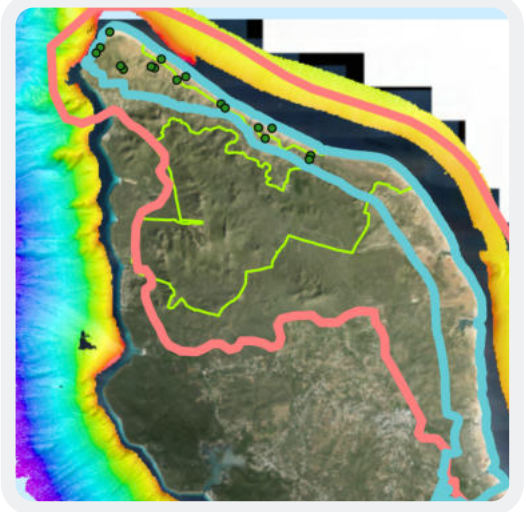
Figure 15

View on Seru Largu, Rif St. Marie.

The consultancy department assisted the National Parks with general management advice. The department also helped to prepare management agreements and plans of the National Parks currently in development such as the 'Mangrovepark Rif I and II' (figure 14) and the 'Rif St. Marie - Hermanus National Park' (figure 15).

The department invested time and efforts to digitize historic data into usable formats as part of the digital CARMABI library. The library includes a dedicated geographic information system (GIS) section for the Dutch Caribbean, focusing on all aspects of the natural world of Aruba, Bonaire, Curaçao and Saba, St. Eustatius, and St. Maarten, and includes for example information on geology, soil, vegetation, protected areas, Digital Elevation Models, and benthic maps as well as historic maps and aerial imagery (figure 16).

Figure 16



Smartphone application for infield use of Carmabi's GIS library.

Consultacy department

SELECTED PROJECTS 2020

Biological inventory of military practice and firing range Wacawa, Curaçao

CARMABI's consultancy department was requested by Dutch Ministry of the Interior and Kingdom Relations (BZK) to conduct a biological inventory of selected areas of the former plantation and current military practice and firing range Wacawa (figure 17). Surveys were conducted to assess the current state of vegetation, avifauna and the Curaçao white-tailed deer.

The results of the inventory have indicated the suitability of one of the designated bivouac areas for development, but not the other due to the presence of a large and ecologically important seasonal gully (locally known as rooi) and the presence of multiple deer. A follow-up study is already approved by the ministry of BZK for the period 2021-2022. This study will focus on the state of vegetation and deer population of the former plantation and current military practice and firing range Wacawa and will be a collaboration of Carmabi and Wageningen University and Research

Figure 17

View on military practice and firing range Wacawa.

consultancy department

SELECTED PROJECTS 2020

Inventory of vegetation of Bolivia, Bonaire

As part of the planning phase for the future development of Bolivia, Bonaire, Carmabi's consultancy department was requested by Plantage Bolivia N.V. to conduct an inventory of vegetation of the former plantation (figure 18). Bolivia measures around 3000 hectares and comprises a significant part of Bonaire's natural areas.

Results of the inventory have indicated that the vegetation of Bolivia is, and has been, severely impacted by past and current anthropogenic pressures and the grazing of introduced herbivorous animals (i.e., goats and donkeys) and the felling of trees to produce charcoal or lumber. However, areas of more developed vegetation have been identified and marked as conservation priorities for the preservation and conservation of Bolivia and Bonaire in general.

Figure 18

View on the lower terrace of former plantation Bolivia, Bonaire.

consultancy department

MONITORING ACTIVITIES

Turtle monitoring

The activities of nesting turtles were monitored in the Shete Boka National Park and at Boka Grandi in the Christoffel Park. Four visits of the sandy beaches of the Shete Boka National Park were made per week during the nesting season (May to December). Almost all nests were encountered early in the season in 2020 as mainly Green turtles (*Chelonia mydas*) were observed nesting, a species that lays eggs earlier in the year compared to other species such as Hawksbill turtles (*Eretmochelys imbricata*).

Track of Green turtle in the Shete Boka National Park.

Figure 19

Wildlife camera image of Curaçao White-tailed deer (Odocoileus virginianus curassavicus).

Curaçao White-tailed deer

The Curaçao White-tailed deer (*Odocoileus virginianus curassavicus*) population was monitored in the Christoffel Park using wildlife cameras during the first half of 2020 (figure 19). Different locations with high occurrence of deer have been identified, such as the rooi systems of the Christoffel Park. There is evidence for the seasonal movement of the deer from and to these locations, most likely linked to seasonal changes in food availability.

Figure 20

Vegatation Shete Boka

The vegetation of the Shete Boka National Park (figure 20) was semi-quantitively described similar to the landscape ecological vegetation maps of the Dutch Caribbean islands. Based on historic survey locations from the Curaçao vegetation map (Beers et al., 1997) this survey provides information on the changes in vegetation types and abundance through time at this location.

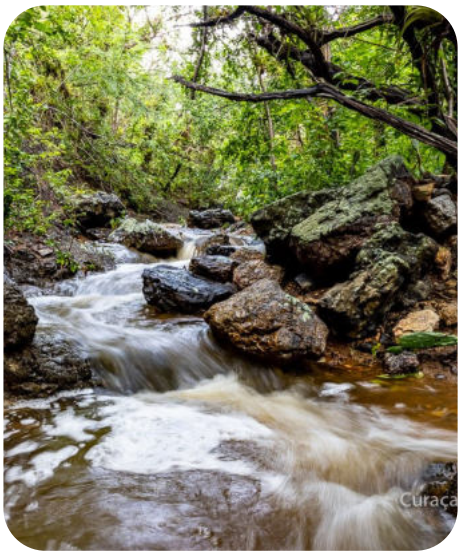
The vegetation of the Shete Boka National Park was semi-quantitively described.

parkmanagement

CHRISTOFFELPARK & SHETE BOKA

The Parks Department of Carmabi is responsible for the management of the Christoffel National Park (which includes the Savonet Museum) and Shete Boka National Park. The management of the Hato Caves is outsourced to Indian Caves BV.

The parks are among the most popular attractions on the island for locals and tourists. The Christoffel National Park compromises ~ 2300 ha. of protected land and has the highest biodiversity in the ABC islands, including several endemic species.



Waterfall due to heavy rain in Christoffel National Park. Picture: Hubert de Palm.

The Shete Boka National Park is a coastal stretch of land consisting of 7 large bokas inlets and covers 175 ha. Aside from its importance as a turtle nesting site, the Shete Boka National Park offers spectacular views of the incoming waves and rock formations along the island's northern coast.

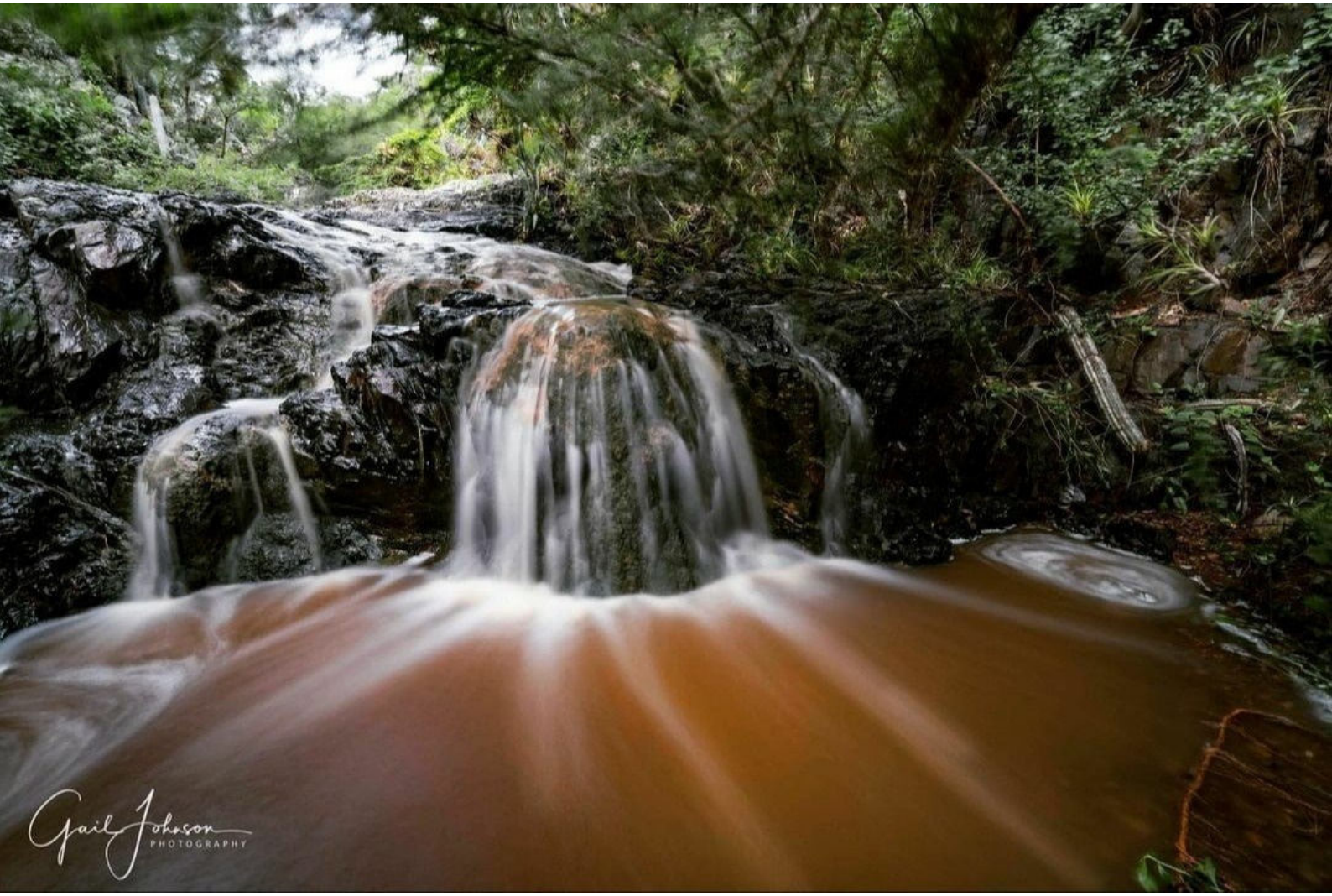
The Hato Cave is the biggest and most prominent cave on the island. Alongside its eminent beauty the Hato Caves offers a glimpse into the rich history of Curaçao, from the remains of petroglyphs to its importance as former sanctuary for runaway slaves.

Boka Grandi during sunset at the Christoffel National Park. Picture: Gail Johnson.

parkmanagement

OVERALL VISITOR STATISTICS

The global pandemic and the (precautionary) measures taken with regards to the crisis had major consequences for Curaçao and for the Parks Department of CARMABI. The Christoffel National Park, the Shete Boka National Park as well as the Hato Caves were forced to close their doors during the total lockdown period between March 28th and May 11th. The subsequent reopening of the borders and the restart of 'business as usual' in the new normal have had a positive effect on the visitor numbers. Although the visitor numbers have not (yet) reached their former extent, the Parks Department remains hopeful for improvements in 2021.



One of the submitted pictures for the Photo Contest taken in the Christoffel National Park. Picture by Gail Johnson.

parkmanagement

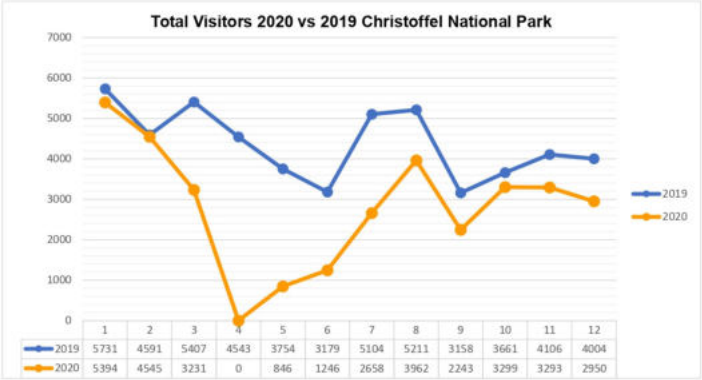
OVERALL VISITOR STATISTICS

Christoffel Park

The Christoffel National 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 2020 the Christoffel National park welcomed 33.667 visitors which is a decrease of 36% compared to 2019 in which 52.449 visitors visited the park. (Figure 21)

After the lockdown the Christoffel National park introduced different special activities and special reduced rates to attract more local visitors to the park.

FIGURE 21

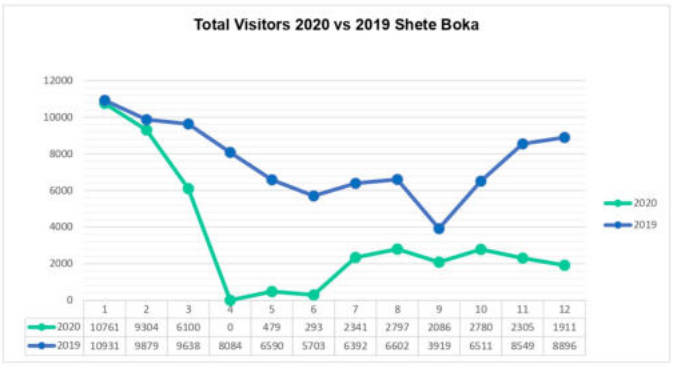


	1	2	3	4	5	6	7	8	9	10	11	12
2019	5731	4591	5407	4543	3754	3179	5104	5211	3158	3661	4106	4004
2020	5394	4545	3231	0	846	1246	2658	3962	2243	3299	3293	2950

Shete Boka Park

National park Shete Boka welcomed 41.147 visitors in 2020. This is a decrease of 55% compared to 2019 in which 91.694 visitors visited the park. (Figure 22)

FIGURE 22

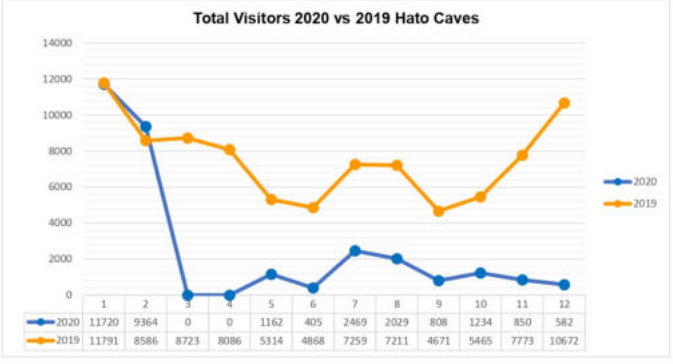


	1	2	3	4	5	6	7	8	9	10	11	12
2020	10761	9304	6100	0	479	293	2341	2797	2086	2780	2305	1911
2019	10931	9879	9638	8084	6590	5703	6392	6602	3919	6511	8549	8896

Hato Caves

35.401 visitors visited the Hato Caves in 2020. This is a decrease of 61% compared to 2019 in which the Hato caves welcomed 90.419 visitors. Projects. (Figure 23)

FIGURE 23



	1	2	3	4	5	6	7	8	9	10	11	12
2020	11720	9364	0	0	1162	405	2469	2029	808	1234	850	582
2019	11791	8586	8723	8086	5314	4868	7259	7211	4671	5465	7773	10672

parkmanagement

PROJECTS

Manganese Mine Project

The Manganese mine trail will be a new guided tour option in the Christoffel National Park. The tour will constitute of a guided hike through the manganese mine and the ruins of the Newtown Mine Buildings built by entrepreneur John Godden in the 19th century.

The New Town Ruins which will be part of the new Manganese Mine trail.

Our student-worker at the Children's playground Mahokkenbos.

Children's Playground

A children's playground has been added to the picnic area in the Christoffel National Park known as the 'Mahokkenbos'. The Parks Department used the help of students who have volunteered to help build the playground.

parkmanagement

PROJECTS

Donkey carriage restored - Open air museum

The wooden donkey carriage which is part of the Savonet Museum's open-air exhibition has been restored by the Dutch army. The carriage is now on show next to the horse stalls at Savonet.

The restored horse carriage.

The first user of the new charging station.

Electric car charging station Savonet

A charging station has been installed on the parking lot of Savonet. The charging station is open to the public.

parkmanagement

DONATIONS

Savonet Museum

An antique sewing Machine was donated to the Savonet Museum. The sewing machine is on display in the 'workers' section of the Savonet Museum.

Mr. en Mrs. Martes and Kenneth Tromp.

The new Landcruiser.

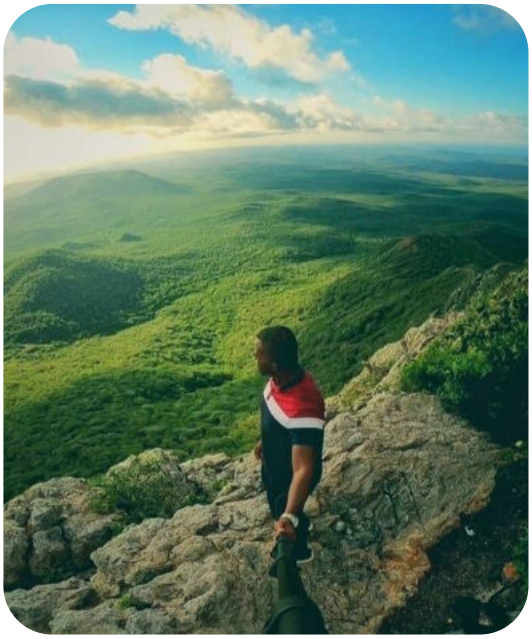
Landcruiser

A second hand landcruiser was donated to Carmabi by the Royal Navy of the Dutch Kingdom (Koninklijke Marine). The landcruiser will be used for safari tours in the parks. This extra touring car makes it possible to organize more tours.

parkmanagement

EVENTS

All 2020 events had to be cancelled or postponed due to Covid-19 measures. As a result, all planned park events such as the yearly Savonet Race, open Museum day, open Christoffel day, 'Vierdaagse' Curaçao and Rayla Scavenger Hunt had to be cancelled.



View from Christoffel Mountain. Picture: Benji Saxx.

New Tour: 'Car Safari'

As part of the 'new normal' the Christoffel national park has introduced a new Safari tour: the bring-your-own-car safari. Participants can enjoy a safari tour from the comfort of their own car.

This way participants get to enjoy a guided tour through the park with their friends and families while also staying safe and minding the Covid-19 hygiene practices.

parkmanagement

MAINTENANCE

Restorations in Christoffel Park

Despite the Covid-19 measures the Parks Department has continued to carry out its regular park maintenance. This includes the maintenance of hiking trails, car routes, park signs, platforms etc.

A lake formed in the park due to the heavy rain.

The restored protective fence at the Indian drawings .

Restoration protective fence Indian drawings

The Indian drawings in the Christoffel National Park are part of the national heritage. The preservation hereof is of great importance. The protective fence that protects the drawings from vandalism was in poor condition and needed to be replaced. Restoration works were initiated in November 2020.

Removal of Tower wreckage Seru Gracia

The wreck of a signal tower has been removed from the hill drop of Seru Gracia. The wreckage has been fully removed by the Dutch Army who have cut, lifted, and transported the wreckage to a local scrapyard.

View at the Christoffel Mountain.

parkmanagement

MAINTAINANCE

Restoration of Shete Boka Platform

The Platform at Boka Tabla has been completely restored as part of the periodical maintenance schedule. Shete Boka guests can once again enjoy the spectacular view of the northern coast and incoming waves on a safe distance on the platform.

The restored platform at Shete Boka (Boka Tabla).

The new spotlights in the Savonet Museum

Adjustment Museum lighting

The halogen spotlights in the museum have been replaced by more modern and energy-efficient LED spotlights. The museum now features better illumination for the museum's objects on display.

Painting job restaurant and bar Christoffel National Park

The restaurant and bar building have been painted (indoor and outdoor) as part of the preparatory work for the reopening of the restaurant at the Christoffel National Park, the dining (picnic) tables have been cleaned and restored and the patio covering has been cleaned and varnished.

The freshly painted bar, ready to be used.

nature & environment education department

EDUCATIONAL PROGRAMS

Our Nature and Environment Education Department (NME) is responsible for educational programs for primary school children and high school 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 high school 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, such as Shark Week, Full Moon Walks, Marine Education Center Open House and participating in school projects and interviews.

NME school visit.

NME vacation plan.

nature & environment education

PARTICIPATION

Education Program

As a result of the restrictions in connection with the COVID pandemic, all extracurricular activities (bus transport and excursions) have been cancelled by the school boards as from March 16, 2020. The restrictions were later extended till the end of 2020. Instead of excursions, we developed a school visiting program as an alternative. In 2020 in total 7404 elementary school enjoyed an educational program. For 4315 children (before the COVID restrictions) we did offer an excursion on location and during the COVID restrictions 3089 children attended a school visit program.

As a result of the lock-down, several activities have been canceled, but the special situation has also resulted in new activities and collaboration with other organizations.

NME Guides at Berg Carmel College.

nature & environment education

PARTICIPATION

Terrestrial Education Program

The Christoffel Park was visited by students from class/ group 1 to group 8 of our primary school system (ages 4 till 12).

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

Group 4 students visited the Christoffel Park to learn about local birds by educational games and observing birds in the park. Group 5 students visited the Christoffel park to learn more about trees and plants and how to recognize them. Lessons on wells, agriculture, and ruins around Savonet & Zorgvlied (both in the Christoffel Park) are the topic of lessons for groups 6 and 7, whereas students from group 8 are taught specific lessons in the general nature/ ecology of islands. Lessons for groups 4 up to 8 are followed by a small exam that can be made part of students' school report.

A total of 3777 students followed a terrestrial educational program on location and because of the Corona regulations 2322 students followed an alternative program at school. 7 guides are conducting the Terrestrial Education Program.

Education Program at Shete Boka.

nature & environment education

PARTICIPATION

Marine Education Program

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

Students in group 6 (9-year-old) follow a program on Turtles and plastic waste whereas students of group 8 (11-year-old) learn about the importance of marine life and especially corals. The purpose of the MEC is to convey the beauty of Curacao's underwater world.

In 2020, a total of 1305 elementary students were offered a marine education program. At the Piscadera location (before the COVID restrictions) 538 students followed the program and 767 students at the school location (as an alternative during the restrictions). Seven guides are conducting the Marine Education Program.

School Visit in Corona-style.

In January 2020 we opened a new classroom at Piscadera. Our guides now have ideal facilities with this new classroom, covered patio, and Marine Education Center to run the programs in an interactive and modern way.

A new 'mangroves' program has been developed for group 7, which will be carried out in the new Mangrove Park Otrobanda. In 2020, the program was conducted as a pilot for a total of 85 students' group 7 elementary school (10-year-olds).

Skol St. Paulus in front of new classroom at Piscadera.

nature & environment education

PARTICIPATION

School Visitation Program

By 2020, 333 students participated in the "microworld" program, where children learn to work with microscopes and get acquainted with the wonderful micro world.

School visit 'microworld'.

Plantbox donated at Curacaos Museum.

Christoffelpark den chikí

In July, 100 boxes of "Christoffelpark den chiki" with five locally grown native trees were assembled. Several boxes were donated to friends of Carmabi (Children's Museum, Curacaos Museum, UniekCuraçao, Hofi Pastor and Dinah Veeris) and the remainder were sold.

Other activities

Full-moon walks, vacation plans and movie nights were successful events until they had to be stopped due to the lock-down in March

Moonwalk at Shete Boka.

nature & environment education

SELECTED PROJECTS

Summer Camp

In July, a Summer Camp was organized in collaboration with TheDiveShop. A total of 60 children (11-14 years) followed a 5-day program focused on marine biology. At the end of the Summer Camp, students received a "Youth Ranger" certificate.

Summer Camp.

nature & environment education

OTHER ACTIVITIES

SharkArt contest 2020

During this year's shark art competition, children could transform a wooden shark model into a work of art at home. Visitors of our Facebook determined the winners by voting.

SharkArt winner 2020.

TV-show shoot at CARMABI

In July CARMABI location Piscadera was the filmset for ‘Brugklas’ (freshmen secondary education), a popular Dutch TV-program for 10–14-year-olds. In these episodes’ students acted being volunteers at CARMABI. The episodes at CARMABI will be broadcasted in the first week of February 2021.

Making of TV-serie 'Brugklas'.

nature & environment education

OTHER ACTIVITIES

'Trees-are-special'.

Collaboration GreenKidz

In 2020 year, we started working intensively with the GreenKidz. This collaboration has resulted in the following activities:

The 'trees-are-special-project' has been created for children in elementary education. This interactive program with many practical assignments introduces children to the special world of trees. The program is taught at school location or at Carmabi.

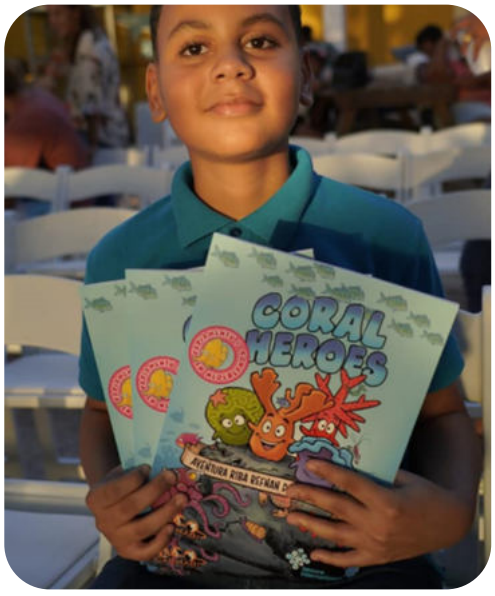
Coral poster.

Coral-lesson-box

All group 7's of primary education will receive a 'coral-lesson box' for free. The teaching package contains PowerPoint presentations, educational assignments and games, teacher's manual, videos, and a poster for the classroom. The program can be carried out by the teacher or by a guide from CARMABI Education or GreenKidz.

Comic book 'Coral Heroes'

At the beginning of 2020, CARMABI Education translated the comic book "Coral Heroes" by Secore International into Papiamentu and Dutch. The bilingual comic books are sold in bookstores and become part of the coral lesson package for the schools. Thanks to donations during the Christmas donation campaign of CARMABI Education, all schools receive the comic books with the coral-lesson box'.



Coral Heroes Comic Book.

marketing & communications

EXPOSURE OF OUR WORK

Website & Online presence

CARMABI decided in 2019 to renew and update the old website. Three completely new websites were built in 2020. A completely new website for the CARMABI Foundation, a new website for the Christoffel National Park and one for Shete Boka National Park.

Screen shot of the new Christoffel Park website.

Entree of the photo contest made by Timmy Harms.

Social media

With the parks being closed for during the lockdown in 2020 and measures taken locally that prohibited groups larger dan 4 people gathering, the marketing & communications department focused more on the visibility and engagement of the parks on social media. An Instagram-profile was made for the Christoffel National park. Instagram has becoming more and more the number one social media platform worldwide used (by tourists and residents) to connect and engage. To fill this page up with high quality pictures, a photo contest was organized in the Christoffel National Park.

Review

In 2020 the marketing department continued to seek engagement on platforms such as Facebook, Instagram, Tripadvisor and Google. As a result, the Christoffel National park was able to retain its 4.5. review on Google and Shete Boka its 4.7. review.

marketing & communications

EXPOSURE OF OUR WORK

Photo Contest Christoffel National Park 2020

During the photo contest contestants could participate by taking pictures in the park and posting these on social media with the tag #christoffelparkphotocontest2020. The overall theme for the pictures was 'nature'. The contest was well received on the island and got a lot of exposure in several newspapers and interviews on radio stations.

A total of 31 photo's entered the competition. The winning photo was taken by Zarja Garmers-Rojer and featured the Christoffel Mountain during the heavy rainfall at the end of the year. Due to the heavy rainfall waterfalls formed on several places in the park.

The picture of Zarja Garmes-Rojer that won the photo contest.

Entree of the photo contest taken by Hubert de Palm.

Celebration 65-years CARMABI

Unfortunately, all plans for the celebration had to be canceled because of the measures taken locally. CARMABI did changed the regular logo to a celebration logo and we had a spread about the celebration of 4 pages in a local newspaper. All departments featured an interview about the development of their department in the past 65 years.

Carmabi
GENERAL

Underwater Park

The government selected Carmabi to manage the newly designated SPAW-area and CARMABI signed an agreement with the Curacao Ports Authority (CPA) to cover all the expenses related to the management of the area for the first 5 years.

New national park Rif St. Marie – Hermanus

Refineria di Korsou (RdK) owns the Rif St. Marie headland near Willibrordus. In 2020, RdK asked CARMABI to manage the Rif St. Marie headland on behalf of RdK as a nature park. Carmabi has agreed to this. To make the area accessible to visitors, CARMABI has asked the government to also manage the old plantation Hermanus as part of this nature park. CARMABI has also asked the foundation 'Monumentenzorg' to manage the salt pans of Jan Kok on their behalf as part of the park. The joint management of the above three areas has the advantage that Carmabi in this way manages most of the Ramsar area Rif St. Marie. The management agreement with RdK was signed in early February 2021. The park will open to visitors. Activities such as hiking, cycling, kayaking, diving, rock climbing, and camping will be possible in this new park. Many of these activities will be outsourced by CARMABI to small businesses. The staff working in the park will be recruited in the vicinity of the park as much as possible.

Five trails are currently planned in the park, which largely already exist: the Saliña Trail, the Rif St. Marie Kust Trail, the Seru Largu Trail, the Hermanus Trail, and the Rooi Katuna Trail. A top attraction in the park is the view from Seru Largu of the saliña and Willibrordus.

RDK and Carmabi inspect Rif St. Marie

carmabi

GENERAL

Mangrove Park Rif

The government of Curacao has decided to establish a nature park in the mangrove area in Otrobanda, opposite the Megapier. At this moment, the park infrastructure is being build.

The infrastructure will consist of a network of channels for kayaking, a network of paths on poles for walking, a tower bird watching and a visitor center. The Minister of the Ministry of Traffic, Transport and Urban Planning has announced that CARMABI will be asked to manage the park once the construction of the infrastructure has been completed.

Visit of minister Zita Jesus-Leito to the Mangrove Park.

Visit

The 'Vertegenwoordiging van Nederland in Willemstad' (VNW) visited CARMABI at the Piscadera location in January 2020. The VNW contacted CARMABI after a presentation director Paul Stokkermans gave regarding CARMABI.

After a general presentation about the work CARMABI conducts and the tasks of Stokkermans himself, Dr. Mark Vermeij also gave the group a presentation about the research of corals. In the lab Dr. Valerie Chamberland and Kelly Latijnhouwers informed the group about coral larfs. The day ended with a tour around the property of CARMABI.

During the tour in the dry lab with the representatives of the VNW.

general

DCNA MEETINGS

MEETINGS DCNA 2020

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. In 2020 the meetings were planned to be held on Statia and Curacao. Because of the global pandemic both meetings were held online. The first meeting was held on the 30th and 31st of March and the second meeting was held on the 16th and 17th of November. Both meetings were attended by CARMABI Director Paul Stokkermans.

The board of DCNA last year on Bonaire.

general

ANNUAL FINANCIAL STATEMENT

CARIBBEAN RESEARCH MANAGEMENT OF BIODIVERSITY (CARMABI FOUNDATION)

STATEMENT OF OPERATIONS FOR THE YEAR 2020

	2020	Budget 2020	2019
	ANG	ANG	ANG
Income			
Grants (13)	974,131	616,000	600,267
Earmarked grants (14)	26,631	279,000	493,425
Admission fees (15)	922,907	1,621,000	1,897,004
Rental income (16)	141,970	214,000	264,454
Other income (17)	317,105	481,000	494,132
	2,382,744	3,211,000	3,749,282
Expenses			
Personnel expenses (18)	1,672,280	1,792,000	1,687,819
Depreciation expenses (19)	133,994	125,000	115,056
Other operating expenses (20)	1,053,756	1,505,000	1,618,704
	2,860,030	3,422,000	3,421,579
Operational result for the year	(477,286)	(211,000)	327,703
Interest income	8,203	17,000	17,145
Result for the year	(469,083)	(194,000)	344,848
Appropriation of the result for the year			
Retained earnings	(469,083)		344,848
	(469,083)		344,848

general

ANNUAL FINANCIAL STATEMENT

Carmabi Foundation

BALANCE SHEET AS OF DECEMBER 31, 2020
(after proposal of result appropration)

	2020 ANG	2019 ANG
Assets		
Non-current assets		
Plantations and Buildings (1)	867,373	920,719
Tangible fixed assets (2)	350,405	369,698
	1,217,778	1,290,417
Current Assets		
Receivables (3)	151,959	356,910
Pension contribution receivable (10)	5,547	-
Stock (4)	3,735	5,052
Cash and cash equivalents (5)	910,408	1,094,081
	1,071,649	1,456,043
Total assets	2,289,427	2,746,460

general

ANNUAL FINANCIAL STATEMENT

CARIBBEAN RESEARCH MANAGEMENT OF BIODIVERSITY (CARMABI FOUNDATION)

Equity and liabilities

	2020 ANG	2019 ANG
Equity (6)		
Capital	106	106
Retained earnings	1,371,378	1,840,461
	1,371,484	1,840,567
Non-current liabilities		
Provision write down balance Girobank	-	38,535
Non interest bearing loans and borrowings (7)	154,000	154,000
Deferred income investment grants (8)	172,292	189,509
	326,292	382,044
Current Liabilities		
Deferred income project grants (9)	456,211	247,961
Pension contribution payable (10)	-	34,882
Taxes and social security payable (11)	50,012	53,278
Other liabilities (12)	85,428	187,728
	591,651	523,849
Total equity and liabilities	2,289,427	2,746,460

general

BOARD & STAFF PER APRIL 2020

Board
Odette Doest, President
Pieter van Baren, Secretary
Pieter van den Berg, Treasurer
Edwin Flameling, Board Member
Karel van Haren, Board Member

Patron
Professor Jaime Saleh, Former General Governor of the Netherlands Antilles

Carmabi ambassador in the Netherlands
André Cohen Henriquez

Management
Paul Stokkermans M. Sc., Director
Mark Vermeij PhD, Deputy Director

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

Parks Management Department
Kenneth Tromp, Head of Department
Sue-Shantely Lourens, Management Assistant
Cyrill Kooistra, Head Ranger
Briand Victorina, Head Ranger
Edwords Alberto, Head Ranger
Melvin Martinez-Estevez, Ranger
Damian Poulo, Ranger
Ergelijn Cijntje, Cash register and administration
Roengelo Doran, Ranger
Cheandel Maria, Ranger
Araceli Ersilia, 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)

Nature and Environment Education (NME)
Cor Hameete, M.Sc., Head Department

Advice and Consultancy Department
Erik Houtepen, M.Sc. Head of Department
Tatiana van Steveninck, Consultant and researcher

Administration Department
Ethline Isenia, Head Administration Department
Shahaira Martina, Assistant Financial Administration
Nancy Provacia, Administrative Assistant
Rosemary Olivo Busto, Janitor
Magda Inees, Janitor
Carlos Winterdaal, Technician

Communication and Marketing
Kim Hendriksen

Security Piscadera is outsourced to:
Megory Security

Security Shete Boka is outsourced to:
Hawks Eye Security

Left the organization
Ingrid van 't Hul, Coworker Facilities Management
Cindy Eman, Consultant and researcher

general

ON CALL STAFF

ON CALL STAFF

Savonet
Richard Davelaar (Cleaning Shete Boka),
Daisy Lourens
Clayna Stella (Management Assistant)

Junior Rangers
Adrion Plantijn
Jeremy Cijntje

Terrestrial Education Program (TEP)
Clarette (Retty) Schoop (Coordinator)
Ruthline (Ruth) Bernadina
Sonaly (Naly) Rijnschot
Charetty Jansen
Arien Liberia
Ruthsella Statius
Pietje Rosaria
Joycerette Bartholomeus

Marine Education Program (MEP) and Marine Education Center (MEC)
Ruthsella Statius (Coordinator)
Jonathan Estanista
Lisney Maria
Sabrine Tapoka
Huub van der Zande
Ruthson Cecilia
Padsy Elsevijf

general

DONATIONS 2020

Organizations
Active Chance Foundation
AH Zeelandia
BDO Consultants
Broadreach
Budget Marine
Grant Thornton
Greening the Desert
HNO Vastgoed en Beheer NV
Maduro & Curiels Bank
Nederlandse Marine (Landmacht-Genie)
NME Fonds Nederland
Prins Bernhard Cultuurfonds Caribisch Gebied
Rotary Club Willemstad
Stichting Uniek Curaçao
The Diveshop
Uitgeverij SWP
Uniek Curaçao
Vertegenwoordiging van Nederland
Waitt Institute (USA)

Personal
Carel de Haseth
F.E. Perret Gentil
Familie Martes
Helma Peeman
Jacintha Bergish
Jan van Zon
Johanna Caldera Wicherts
Johannes Jonker
John de Freitas
Jolanda Caldera
M. E. Vieira
Maries Felipa
Olav de Haseth
Shira de Koning
Sonja Meeuwsen
Walter Bakhuis

scientific research

VISITING SCIENTISTS

Dr. Valerie Chamberland (SECORE International, U.S.A.)
Dr. Petra Visser (University of Amsterdam, The Netherlands)
Dr. Gerard Muijzer (University of Amsterdam, The Netherlands)
Dr. Aschwin Engelen (University of the Algarve, Portugal)
Dr. Pim Bongaerts (California Academy of Sciences, U.S.A.)
Dr. Kristen Marhaver (Marhaverlab, Curacao)
Dr. Thomas Keggin (ETH Zurich, Switzerland)
Dr. Esther Serrao (University of the Algarve, Portugal)
Dr. Christina Egger (Stazione Zoologica Anton Dohrn, Italy)
Dr, Javier Diaz (University of Groningen, The Netherlands)
Dr. Michelle Achlatis (University of Amsterdam, The Netherlands)
Dr. Rebecca Varney (University of Alabama, U.S.A.)
Dr. Verena Schoepf (University of Amsterdam, The Netherlands)
Dr. Gustav Paulay (University of Florida, U.S.A.)
Drs. Laurent Delvoye (Vlissingen, The Netherlands)
Dr. Andy Haas (Netherlands Institute for Sea Research, The Netherlands)
Dr. Ben Martin (University of Amsterdam, The Netherlands)
Drs. Shareena Dwarka (Wageningen University, The Netherlands)
Dr. Fee Smulders (University of Groningen, The Netherlands)
Drs. Nik Kornder (University of Amsterdam, The Netherlands)
Dr. Ronald Osinga (Wageningen University, The Netherlands)
Dr. Mischa Streekstra (Wageningen University, The Netherlands)
Dr. Jasper de Goeij (University of Amsterdam, The Netherlands)
Dr. Ben Mueller (University of Amsterdam, The Netherlands)
Ad Hovestadt – Research on the terrestrial snails of Curaçao.

PEER REVIEWED PUBLICATIONS

An overview of all peer reviewed scientific publications published in 2020 is shown below:

1. Cacho NI, José-Zacatula D. Geographic patterns in pollen production in the plant ring species Euphorbia tithymaloides in the Caribbean (2020) Systematic Botany 45(4): 845-53.
2. Calhoun SK, Haas AF, Takeshita Y, Johnson MD, Fox MD, Kelly EL, Mueller B, Vermeij MJA, Kelly LW, Nelson CE, Price NN (2020) Evidence for a biological source of widespread, reproducible nighttime oxygen spikes in tropical reef ecosystems has implications for coral health. bioRxiv. 2020 Jan 1.
3. Debrot AO, Madden H, Becking LE, Rojer A, Miller JY (2020) The butterflies of St. Eustatius with faunal comparisons among the adjacent islands of the Lesser Antilles. Caribbean Journal of Science 50: 91–106.
4. De Freitas JA, Rojer AC, Nijhof BS, Houtepen EA, Debrot AO (2020) Landscape ecological vegetation map of St. Maarten (Lesser Antilles).
5. De Gier W, Fransen CH, Ozten Low A, Hoeksema BW (2020) Reef fishes stalking box crabs in the southern Caribbean. Ecology 30:e03068.
6. González-Rivero M, Beijbom O, Rodriguez-Ramirez A, Bryant DE, Ganase A, Gonzalez-Marrero Y, Herrera-Reveles A, Kennedy EV, Kim CJ, Lopez-Marcano S, Markey K (2020) Monitoring of coral reefs using artificial intelligence: A feasible and cost-effective approach. Remote Sensing, 12(3).
7. Hoeksema BW, García-Hernández JE, van Moorsel GWNM, Olthof G, ten Hove HA (2020) Extension of the recorded host range of Caribbean christmas tree worms (Spirobranchus spp.) with two Scleractinians, a Zoantharian, and an Ascidian. Diversity 12:115.
8. Hoeksema BW, García-Hernández JE (2020) Host-related morphological variation of dwellings inhabited by the crab Domecia acanthophora in the corals Acropora palmata and Millepora complanata (Southern Caribbean). Diversity, 12(4): 143.
9. Kitchen SA, Von Kuster G, Kuntz KLV, Reich HG, Miller W, Griffin S, Fogarty ND, Baums I (2020) STAGdb: a 30K SNP genotyping array and Science Gateway for Acropora corals and their dinoflagellate symbionts. Scientific Reports 10, 12488.
10. Kwong WK, Irwin NT, Mathur V, Na I, Okomoto N, Vermeij MJA, Keeling PJ (2020) Taxonomy of the apicomplexan symbionts of coral, including Corallicolida ord. nov., reassignment of the genus Gemmocystis, and description of new species Corallicola aquarius gen. nov. sp. nov. and Anthozoaphila gnarlus gen. nov. sp. nov. bioRxiv. 2020 Jan 1.
11. Lamb AD, Lippi CA, Watkins-Colwell GJ, Jones A, Warren D, Iglesias TL, Brandley M, Neagle C, Dornburg A (2020) What makes Hemidactylus invasions successful? A case study on the island of Curaçao. BioRxiv. 2020 Jan 1.
12. Lax G, Simpson A (2020) The molecular diversity of phagotrophic Euglenids examined using single-cell methods. Protist. 2020 Aug 16:125757.
13. Lesser MP, Mueller B, Pankey MS, Macartney KJ, Slattery M, de Goeij JM (2020) Depth-dependent detritus production in the sponge, Halisarca caerulea. Limnology and Oceanography 65(6):1200-1216.
14. Loureiro LO, Engstrom MD, Lim BK (2020) Does evolution of echolocation calls and morphology in Molossus result from convergence or stasis? PLoS ONE 15(9): e0238261.
15. MacRae D, De Meyer K (2020) A new approach to monitoring Marine Protected Area Management Success in the Dutch Caribbean. In: Marine Protected Areas (pp. 379-409). Elsevier.
16. Montenegro J, Hoeksema BW, Santos ME, Kise H, Reimer JD (2020) Zoantharia (Cnidaria: Hexacorallia) of the Dutch Caribbean and one new species of Parazoanthus. Diversity 12(5):190.
17. Montano S, Maggioni D, Liguori G, Arrigoni R, Berumen ML, Seveso D, Galli P, Hoeksema BW (2020) Morpho-molecular traits of Indo-Pacific and Caribbean Halofolliculina ciliate infections. Coral Reefs: 1-12.
18. Neely KL, Lewis CL, Macaulay KA (2020). Disparities in spawning times between in situ and ex situ Pillar Corals. Frontiers in Marine Science; 7:643.
19. Prokina KI, Keeling PJ, Tikhonenkov DV (2020) Heterotrophic flagellates and centrohelid heliozoans from marine waters of Curacao. BioRxiv. 2020 Jan 1.
20. Rashid AR, Chennu A (2020) A trillion coral reef colors: Deeply annotated underwater hyperspectral images for automated classification and habitat mapping. Data, 5(1): 19.

scientific research
PEER REVIEWED PUBLICATIONS

21. Ritger AL, Fountain CT, Bourne K, Martín-Fernández JA, Pierotti MER (2020) Diet choice in a generalist predator, the invasive lionfish (Pterois volitans/miles). Journal of Experimental Marine Biology and Ecology 524: 151311.
22. Rivera-Milán FF, Nava M, Schut K, Simal F. Green and hawksbill turtle abundance and population dynamics at foraging grounds in Bonaire, Caribbean Netherlands. Endangered Species Research 40:243-256.
23. Roach TN, Little M, Arts MG, Huckeba J, Haas AF, George EE, Quinn RA, Cobián-Güemes AG, Naliboff DS, Silveira CB, Vermeij MJA, Wegley Kelly L, Dorrestein PC, Rohwer FL (2020) Multiomic analysis of in situ coral–turf algal interactions. Proceedings of the National Academy of Sciences.1915455117.
24. Rodriguez-Ramirez A, González-Rivero M, Beijbom O, Bailhache C, Bongaerts P, Brown KT, Bryant DE, Dalton P, Dove S, Ganase A, Kennedy EV (2020) A contemporary baseline record of the world's coral reefs. Scientific Data 7(1):1-5.
25. Simal F, Vallarinob A, Beukenboom E, Paula R, Beaumont H, Zaragoza G, Wolfs E, Holian P, Albers E (2020) Brown Boobies (Sula leucogaster) roosting at Washington-Slagbaai National Park, Bonaire, Caribbean Netherlands. Journal of Caribbean Ornithology 33: 78–81.
26. Stampar SN, Reimer JD, Maronna MM, Lopes CS, Ceriello H, Santos TB, Acuña FH, Morandini AC (2020) Ceriantharia (Cnidaria) of the World: an annotated catalogue and key to species. ZooKeys 23: 952:1.
27. Strong EE, Bouchet P (2020) Hidden in plain sight: two co-occurring cryptic species of Supplanaxis in the Caribbean (Cerithioidea, Planaxidae). ZooKeys: 991:85.
28. Vasquez-Kuntz KL, Kitchen SA, Conn TL, Vohsen SA, Chan AN, Vermeij MJA, Page C, Marhaver KL, Baums IB (2020) Juvenile corals inherit mutations acquired during the parent's lifespan. BioRxiv. 2020 Jan 1.
29. Vieira C, Morrow K, D'Hondt S, Camacho O, Engelen AH, Payri CE, De Clerck O (2020) Diversity, ecology, biogeography and evolution of the prevalent brown algal genus Lobophora in the greater Caribbean Sea, including the description of five new species. Journal of Phycology 2020 Mar 11.
30. Vohsen SA, Anderson KE, Gade AM, Gruber-Vodicka HR, Dannenberg RP, Osman EO, Dubilier N, Fisher CR, Baums IB (2020) Deep-sea corals provide new insight into the ecology, evolution, and the role of plastids in widespread apicomplexan symbionts of anthozoans. Microbiome 8(1):1-5.
31. Wysokowski M, Machałowski T, Petrenko I, Schimpf C, Rafaja D, Galli R, Ziętek J, Pantović S, Voronkina A, Kovalchuk V, Ivanenko VN (2020) 3D chitin scaffolds of marine demosponge origin for biomimetic mollusk hemolymph-associated biomineralization ex-vivo. Marine Drugs 18(2):123.
32. Zamengo HB, Gaglioti AL, Chamorro D, Mogni V, Oakley L, Prado D, Torres RB, de Mattos L, Da-Silva PR, Romaniuc-Neto S (2020) Nomenclatural novelties in Celtis (Cannabaceae) and a preliminary phylogeny of the genus with emphasis on the South American species. Brazilian Journal of Botany 43(4):947-960.

marketing & communications

PRESS RELEASES

16 January 2020 - In memoriam of Nobert Chaclin

16 January 2020 - New classroom NME

30 January 2020 - Visit Carmabi to 'Vertegenwoordiging van Nederland Willemstad'

5 February 2020 - Climb the mountain during Full Moon

7 February 2020 - Encounter Edu BETT Award

13 February 2020 - Comic book 'Coral Heroes' donated to local Library

14 February 2020 - Launch Comic book 'Coral Heroes'

13 March 2020 - New electric vehicle added to Carmabi vehicle park

13 March 2020 - Opening 'green area' in Christoffel Park

7 May 2020 - Reopening National Parks for visitors

3 June 2020 - Hofi Chiki plants 'Tiny' Forest at Klein College

7 July 2020 - Celebration 65 years Carmabi

21 July 2020 - No economic progress without nature protection

24 July 2020 - Nature protection needs to be included in 'Landenpaketten'

30 July 2020 - Plant box sale at Carmabi 'Christoffelpark den chikí'

13 October 2020 - Youth show filmed at Carmabi

13 October 2020 - Lake at Christoffel National Park due to heavy rains