2019

ANNUAL REPORT

CARMABI FOUNDATION

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Annual report 2019

FROM THE DIRECTOR

2019 was a successful year!

We all worked very hard towards our statutory goals. All Carmabi's departments (Research, nature management, advice, and education) have all seen substantial growth. We want to thank the government, other NGO's, volunteers, donors, and private persons, who helped to make this possible.

In 2019 in total 134 scientists visited Carmabi to conduct a wide variety of research projects. In addition, 131 students participated in various courses that were taught at Carmabi bringing the total number of visitors to 265. A total of 35 scientific publications were published based on work done at Carmabi in 2019.

The Christoffel National Park welcomed 52.449 visitors in 2019, an increase of 11,4% compared to 2018. The total number of visitors to the Shete Boka National Park rose to 91.694, an increase of 2,6% compared to 2018. In 2019 a total of 90,419 people visited the Hato Caves, an increase of 4.7% compared to the year before.

In 2019, 7,300 children participated in our terrestrial education program and 1,322 in our marine education program. We also visited schools ourselves for our program 'microworld' which was taught to 414 students. Furthermore, to further improve our outreach and awareness program, Carmabi's Education department produced a large number of teaching materials and organized several workshops and movie nights.

Carmabi's advice and consultancy department was consulted in 2019 on numerous occasions for a wide range of nature and nature management related topics, ranging from biological inventories of the marine and terrestrial environments of Curacao and the Caribbean region to the development of nature management plans.

In 2020, Carmabi Foundation will exist 65 years. Carmabi was founded on the 21st of May 1955 as the Caribbean Marine Biological Institute (Caraïbisch Marien-Biologisch Instituut). During its first decades Carmabi foremost conducted marine biological research focused on coral reefs. In 1996 the acronym changed to "Caribbean Research and Management of Biodiversity Foundation" because of the merger with STINAPA, the National Parks Foundation of the Netherlands Antilles (Stichting Nationale Parken Nederlandse Antillen). The new foundation broadened is focus to terrestrial research, the management of nature areas and education in addition to marine research.

Annual report 2019

FROM THE DIRECTOR

A new nature park is currently in the making. The government has officially partnered with Carmabi to prepare the establishment of the Mangrove Park in Otrobanda. Sanitation work in the area where the park will be established has already started and canals are being dug to make kayak tours possible.

In 2020, we will also start with the implementation of the cooperation agreement between Carmabi, the Curacao Marine Research Center (CMRC) and the government of Curacao. The purpose of this collaboration is to broaden the facilities to conduct marine research on the island. Funds will be made available for the renovation of the old Carmabi building, the construction of a new research pier, the renovation of the wet laboratory (building with aquaria for research purposes), the purchase of a boat and 2 vehicles and the purchase of laboratory equipment. This project will also have a positive economic impact as the growing number of visiting students and researchers to Curacao account for a unique tourism niche market (scientific tourism) that generates substantial income for the island.

The year 2019 has seen much progress which you can read about in this annual report. Next year we will strive to continue this positive trend regarding science, park management and education.

Paul Stokkermans
Director Carmabi

scientific research

VISITING SCIENTISTS

134 scientists visited Carmabi in 2019. In addition, 131 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 2019 illustrates a continued positive trend of increasing visitors after the official opening of the new Science Center in 2013 (Figure 1).

Most scientists in 2019 were from the United States (57%) followed by the Netherlands (24%). Almost all the scientists and students that worked at Carmabi stayed at the newly constructed laboratory/ dormitory facilities.

The occupation of the new science center in 2019 was 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 2018 is shown in Figure 2.

An overview of visiting scientists (PI name and home institute) is provided on the next page.

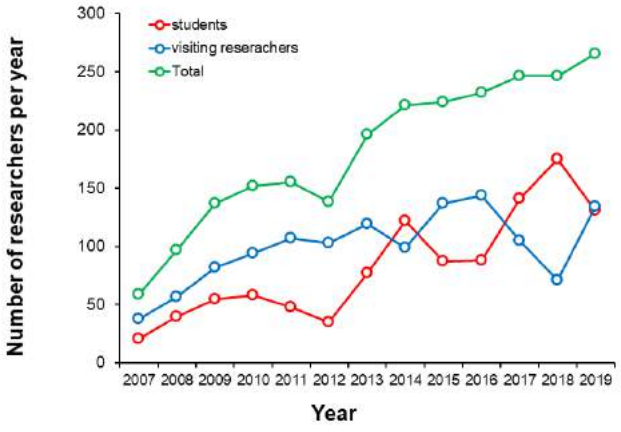

Fig. 1

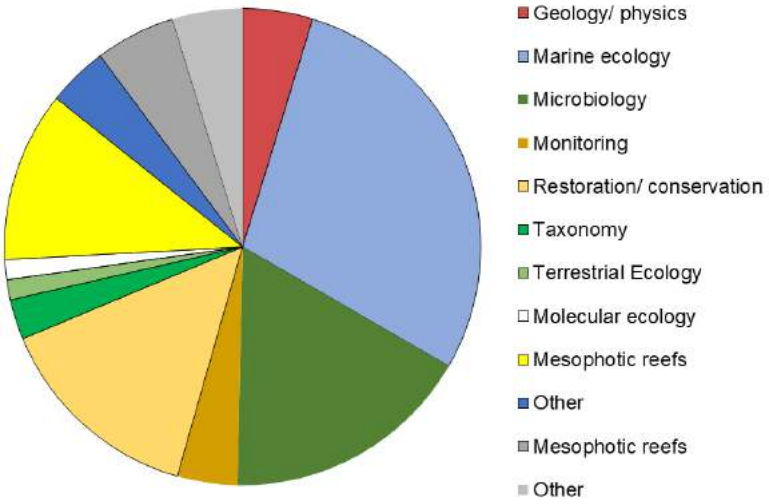

Fig. 2

scientific research

VISITING SCIENTISTS

Dr. Stuart Sandin (Scripps Institution of Oceanography, U.S.A.)
Dr. Amy Ringwood (University of North Carolina at Charlotte, U.S.A.)
Drs. Nik Kornder (University of Amsterdam, The Netherlands)
Dr. Jasper de Goeij (University of Amsterdam, The Netherlands)
Dr. Erik Meesters (IMARES, The Netherlands)
Dr. Pim Bongaerts (California Academy of Sciences, U.S.A.)
Drs. Meggie Hudspith (University of Amsterdam, The Netherlands)
Drs. Milou Arts (Netherlands Institute for Sea Research, The Netherlands)
Dr. Nadege Guiglielmoni (Université libre de Bruxelles, Belgium)
Drs. Adriana Sarmiento (Universidad de los Andes, Colombia)
Dr. Rita Mehta (University of California St Cruz, U.S.A.)
Drs. Mischa Streekstra (Wageningen University, The Netherlands)
Dr. Andy Haas (Netherlands Institute for Sea Research, The Netherlands)
Dr. Paolo Stocchi (Netherlands Institute for Sea Research, The Netherlands)
Dr. Fleur van Duyl (Netherlands Institute for Sea Research, The Netherlands)
Drs. Zach Quinlan (San Diego State University, U.S.A.)
Dr. Didier de Bakker (NIOZ & Wageningen University, The Netherlands)
Dr. Alice Webb (NIOZ, The Netherlands)
Dr. Rene van der Zande (Curacao)
Dr. Michelle Achlatis (Curacao)
Drs. Michiel van Nierop (Curacao)
Dr. Christopher O'Brien (University of New Haven, U.S.A.)
Drs. Jo Lee (Grandview Heights High School, U.S.A.)
Dr. Mark Levenstein (University of Illinois Urbana-Champaign, U.S.A.)
Dr. Michele Pierotti (Smithsonian Tropical Research Institute, Panama)
Dr. Amy Wagoner (University of Illinois Urbana-Champaign, U.S.A.)
Dr. Linda Wegley Kelly (San Diego State University, U.S.A.)
Dr. Gabriel Juarez (ETH Zürich, Switzerland)
Dr. C. Begin (Florida State University, U.S.A.)
Drs. Skylar Snowden (SeaLife Arizona, U.S.A.)
Dr. Forest Rohwer (San Diego State University, U.S.A.)
Dr. Patrick Keeling (Canadian Institute for Advanced Research, Canada)
Dr. Tom Richards (University of Exeter, United Kingdom)
Dr. Alex Worden (Monterey Aquarium research Institute, U.S.A.)
Dr. Nicole King (University of California, Berkeley, U.S.A.)
Dr. Benjamin Mueller (University of Amsterdam, The Netherlands)
Dr. Bert Hoeksema (Naturalis Biodiversity Center, The Netherlands)
Dr. Tom Wood (George Mason University, U.S.A.)
Dr. Bruce Fouke (University of Illinois Urbana-Champaign, U.S.A.)
Patrick Brydon (Broadreach College, U.S.A.)
Dr. Kristen Marhaver (Marhaverlab, Curacao)
Dr. Aschwin Engelen (University of the Algarve, Portugal)
Dr. Gerard Muijzer (University of Amsterdam, The Netherlands)
Dr. Petra Visser (University of Amsterdam, The Netherlands)
Dr. Valerie Chamberland (SECORE International, U.S.A.)
Dr. Jocelyn Behm (Temple University, USA)
Dr. Adeljean Ho (Bethune-Cookman University, USA)
Drs. Sylvia van Leeuwen (Anemoon foundation, The Netherlands)

scientific research

PEER REVIEWED PUBLICATIONS

Thirty-five publications appeared in peer reviewed scientific journals based on work that was conducted at Carmabi making 2019 the most productive year in terms of Carmabi's scientific output ever (Figure 3).

The results of some of these studies have been featured in magazines, news programs and educational websites around the world. Furthermore, 37 reports were produced by MSc students that did their master's thesis' project at Carmabi.

An overview of all peer reviewed scientific publications accepted for publication or published in 2019 is shown below:

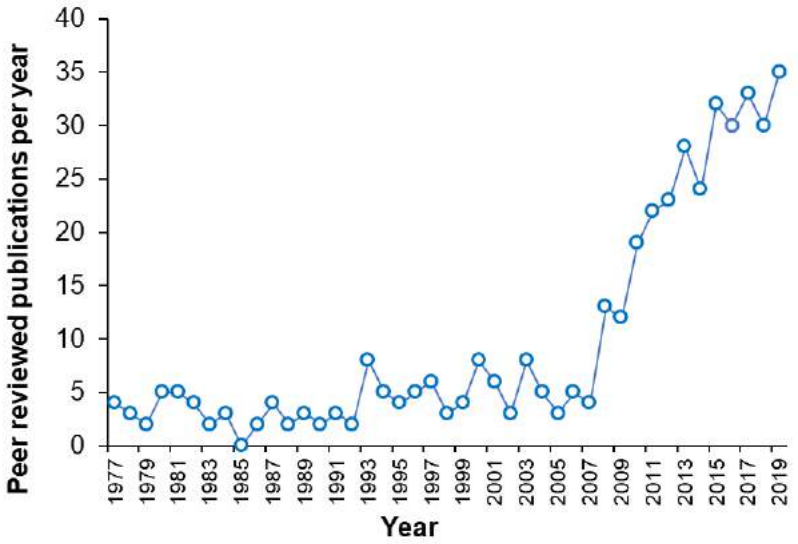

Fig. 3

1. Almaliti J, Miller B, Pietraszkiewicz H, Glukhov E, Naman CB, Kline T, Hanson J, Li X, Zhou S, Valeriote FA, Gerwick WH (2019) Exploration of the carmaphycins as payloads in antibody drug conjugate anticancer agents. European Journal of Medicinal Chemistry 161: 416-432.
2. Assour HR, Behm JE (2019) First occurrence of Cheilomenes sexmaculata (Coleoptera: Coccinellidae) on the Caribbean island of Curacao. Neotropical Entomology 28:1-3.
3. Behm JE, van Buurt G, DiMarco BM, Ellers J, Irian CG, Langhans KE, McGrath K, Tran TJ, Helmus MR (2019). First records of the mourning gecko (Lepidodactyluslugubris Duméril & Bibron, 1836), common house gecko (Hemidactylus frenatus in Duméril, 1836), and Tokay gecko (Gekko gecko Linnaeus, 1758) on Curacao, Dutch Antilles, and remarks on their Caribbean distributions. BioInvasions Records 8: 34-44.
4. Brito-Millán M, Vermeij MJA, Alcantar EA, Sandin SA (2019) Coral reef assessments based on cover alone mask active dynamics of coral communities. Marine Ecology Progress Series 630: 55-68.
5. Brunet T, Larson BT, Linden TA, Vermeij MJA, McDonald K, King N (2019) Light-regulated collective contractility in a multicellular choanoflagellate. Science 6463: 326-334.
6. Cortés J, Ogden JC, Oxenford HA, van Tussenbroek BI, Jordán-Dahlgren E, Cróquer A, Bastidas C (2019). The CARICOMP Network of Caribbean Marine Laboratories (1985-2007): History, key Findings and lessons learned. Frontiers in Marine Science 5: 519.
7. Crews SC, Debrot AO, van Hoorn G, Galvis W, Esposito LA. The arachnids (Arachnida) of Aruba, Bonaire, and Curacao. Caribbean Journal of Science 49: 125-40.
8. Freitas J, Camilleri J, Van Eijk S, Posno V, Valdes I, Coolen Q, van Blerk J, Grffith MP (2019) Sabalpalm (Sabal antillensis) recovery over 40 years: Lessons for successful palm conservation. PALMS 63: 57–68.
9. Dornburg A, Lamb AD, Warren D, Watkins-Colwell GJ, Lewbart GA, Flowers J (2019). Are geckos paratenic hosts for Caribbean island Acanthocephalans? Evidence from Gonatodes antillensis and a global review of squamate reptiles acting as transport hosts. Bulletin of the Peabody Museum of Natural History 60: 55-79. Click here for pdf.
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11. Frade PR, Bongaerts P, Baldwin CC, Trembanis AC, Bak RP, Vermeij MJA (2019) Bonaire and Curacao. In: Mesophotic Coral Ecosystems 2019 (pp. 149-162). Springer, Cham.
12. Haines LJ, Côté IM (2019) Homing decisions reveal lack of risk perception by Caribbean damselfish of invasive lionfish. Biological Invasions: 1-12.
13. Hartmann AC, Marhaver KL, Klueter A, Lovci M, Closek CJ, Diaz E, Chamberland VF, Archer FI, Deheyn DD, Vermeij MJA, Medina M (2019) Acquisition of obligate mutualist symbionts during the larval stage is not beneficial for a coral host. Molecularecology 28: 141-155.

scientific research
PEER REVIEWED PUBLICATIONS

14. Hoeksema BW, Wels D, van der Schoot, RJ, Ten Hove HA (2019) Coral injuries caused by Spirobranchus opercula with and without epibiotic turf algae at Curacao. Marine Biology 166: 60.
15. Hoeksema BW, Hiemstra AF, Vermeij MJA (2019) The rise of a native sun coral species on southern Caribbean coral reefs. Ecosphere 10: 11.
16. Iacarella JC, Saheed D, Dunham A, Ban NC (2019) Non-native species are a global issue for marine protected areas. Frontiers in Ecology and the Environment 17: 495-501.
17. Indraningrat AA, Micheller S, Runderkamp M, Sauerland I, Becking LE, Smidt H, Sipkema D (2019) Cultivation of sponge-associated bacteria from Agelas sventres and Xestospongia muta collected from different depths. Marine Drugs 10: 578.
18. Kelly LW, Nelson CE, Haas AF, Naliboff DS, Calhoun S, Carlson CA, Edwards RA, Fox MD, Hatay M, Johnson MD, Kelly EL, Lim YW, Macherla S, Quinlan, Silva GGZ, Vermeij MJA, Zgliczynski B, Sandin SA, Smith JE, Rohwer FL (2019) Diel population and functional synchrony of microbial communities on coral reefs. Nature communications 10: 1691
19. Klinger C, Żółtowska-Aksamitowska S, Wysokowski M, Tsurkan MV, Galli R, Petrenko I, Machałowski T, Ereskovsky A, Martinović R, Muzychka L, Smolii OB (2019). Express method for isolation of ready-to-use 3D chitin scaffolds from Aplysina archeri (Aplysineidae: Verongiida) demosponge. Marine drugs 17: 131. 20. Korzhavina OA, Hoeksema BW, Ivanenko VN (2019) A review of Caribbean Copepoda associated with reef-dwelling cnidarians, echinoderms and sponges, Contributions to Zoology 88: 297–349.
21. Kwong WK, del Campo J, Mathur V, Vermeij MJA, Keeling PJ (2019) A widespread coral-infecting apicomplexan with chlorophyll biosynthesis genes. Nature 568: 103–107.
22. Lax G, Lee WJ, Eglit Y, Simpson A (2019) Ploeotids represent much of the phylogenetic diversity of Euglenids. Protist 170: 233-257.
23. Lesser MP, Morrow KM, Pankey MS (2019) N2 fixation, and the relative contribution of fixed N in corals from Curacao and Hawaii. Coral Reefs 38: 1145–1158.
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25. Lewis AM, Chan AN, LaJeunesse TC (2019) New species of closely related endosymbiotic dinoflagellates in the greater Caribbean have niches corresponding to host coral phylogeny. Journal of Eukaryotic Microbiology 66: 469-82.
26. Li MS van der Zande R, Hernández-Agreda A, Bongaerts P, Stuart HS (2019) Gripper design with rotation-constrained teeth for mobile manipulation of hard, plating corals with human-portable ROVs. OCEANS 17: 1-6.
27. Linden B, Vermeij MJA, Rinkevich B (2019) The coral settlement box: A simple device to produce coral stock from brooded coral larvae entirely in situ. Ecological Engineering 132: 115-119.
28. Mollica NR, Cohen AL, Alpert AE, Barkley HC, Brainard RE, Carilli JE, DeCarlo TM, Drenkard EJ, Lohmann P, Mangubhai S, Pietro KR (2019) Skeletal records of bleaching reveal different thermal thresholds of Pacific coral reef assemblages. Coral Reefs 38: 743–757.
29. Rivera-Milán FR, Nava M, Simal F (2019) Green and hawksbill turtle abundance and population dynamics at foraging grounds in Bonaire and Klein Bonaire, Caribbean Netherlands. Endangered Species Research 40: 243–256.
30. Silveira CB, Luque A, Roach TN, Villela H, Barno , Green K, Reyes B, Rubio-Portillo E, Le T, Mead S, Hatay M, Vermeij MJA, Takeshita Y, Haas A, Bailey B, Rohwer R (2019). Biophysical and physiological processes causing oxygen loss from coral reefs. eLife 8: e49114.
31. Sully S, Burkepile DE, Donovan MK, Hodgson G, van Woesik R (2019). A global analysis of coral bleaching over the past two decades. Nature Communications 10: 1264.
32. Titus BM, Blischak PD, Daly M (2019) Genomic signatures of sympatric speciation with historical and contemporary gene flow in a tropical anthozoan (Hexacorallia: Actiniaria). Molecular Ecology 28: 3572-3586.
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35. Wittman KJ, Wirtz P (2019) Revision of the amphiamerican genus Mysidium Dana, 1852 (Crustacea: Mysida: Mysidae), with descriptions of two new species and the establishment of two new subgenera. European Journal of Taxonomy 495: 1–48.

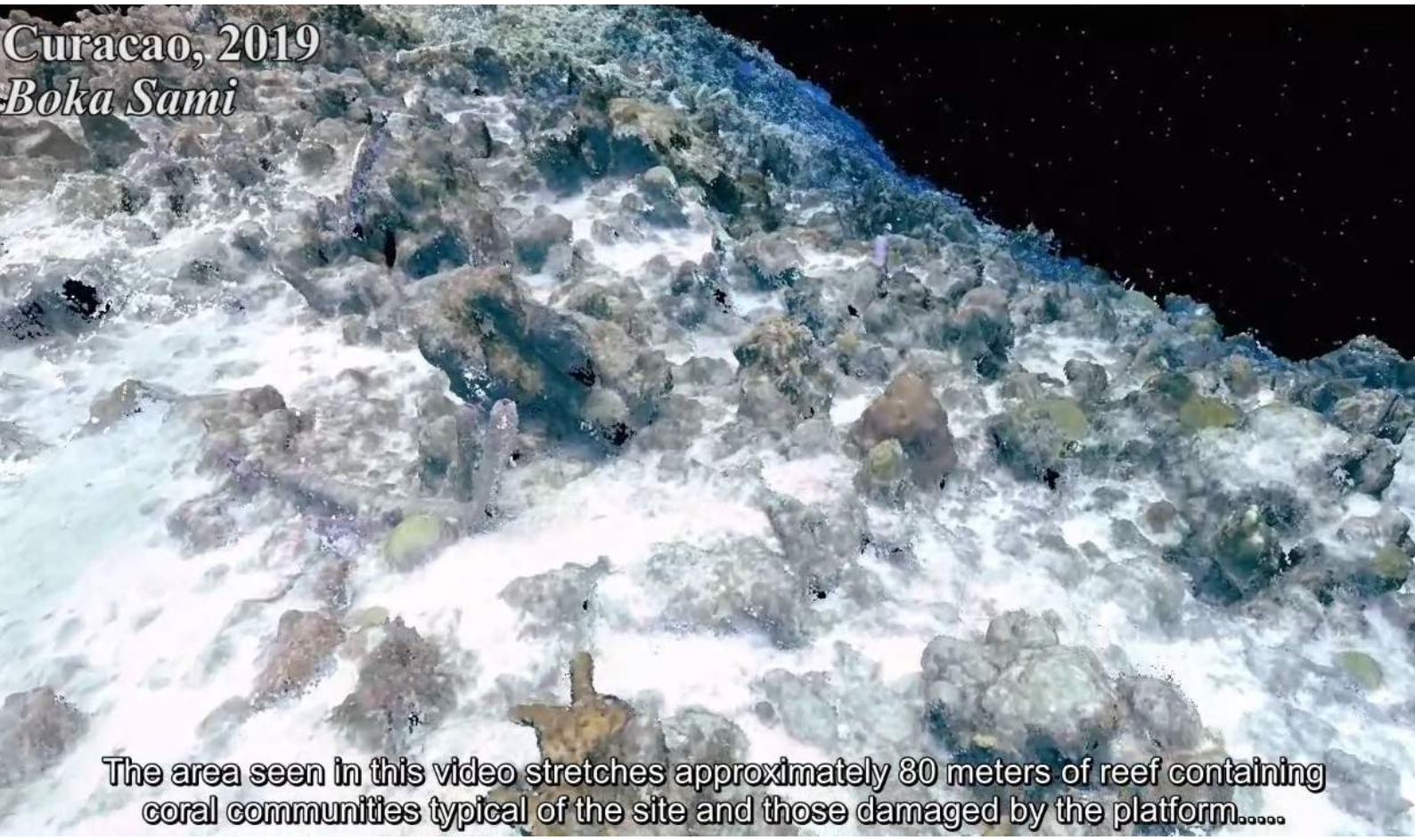
scientific research

SELECTED PROJECTS 2019

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 62 cases, both oral and written.

In 2019 the Carmabi Science Department was featured/ interviewed in 134 items for international and local TV, radio, and newspapers.



During a storm in september 2019 a platform damaged the coral reef at Boka Sami. The Government of Curacao asked the Marine Research Department to investigate how much was damaged. Picture is a still from the movie showing the impact, made by Carmabi.

scientific research

SELECTED PROJECTS 2019

Study on the degree of over-fishing on Curacao since 1905

Effective assessments of the status of Caribbean fish communities require historical baselines to adequately understand how much fish communities have changed through time. To identify such changes and their causes, we compiled a historical overview using data collected at the beginning (1905–1908), middle (1958–1965) and end (1984–2016) of the 20th century, of the artisanale fishing practices and their effects on fish populations around Curacao, a small island in the southern Caribbean.

We documented historical trends in total catch, species composition, and catch sizes per fisher per month for different types of fisheries and related these to technological and environmental changes affecting the island's fisheries and fish communities. We found that since 1905, fishers targeted species increasingly farther from shore after species occurring closer to shore had become rare. This resulted in surprisingly similar catches in terms of weight, but not composition. Large predatory reef fishes living close to shore (e.g., large Epinephelid species) had virtually disappeared from catches around the mid-20th century, questioning the use of data from this period as baseline data for modern day fish assessments.

Secondly, we compared fish landings to in-situ counts from 1969 to estimate the relative contributions of habitat destruction and over-fishing to the changes in fish abundance around Curacao. The decline in coral dominated reef communities corresponded to a concurrent decrease in the abundance and diversity of smaller reef fish species not targeted by fishers, suggesting habitat loss, in addition to fishing, caused the observed declines in reef fish abundance around Curacao.

Source: https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0217589

Local fishing boats waiting to go out to sea again. Picture :Antilliaans Dagblad

scientific research

SELECTED PROJECTS 2019

New study on the deep reefs around Bonaire and Curacao

Bonaire and Curacao are oceanic islands surrounded by coral reefs on their leeward sides extending steeply down to mesophotic depths (30–150 m, Figure 4).

Easy access from shore, as well as the geopolitical context of the two islands, has made the mesophotic coral ecosystems MCEs) of Bonaire and Curacao among the most well studied in the world. MCE research has been conducted in the region since the 1970s, and ongoing research employs state-of-the-art exploration technologies such as manned submersibles, autonomous underwater vehicles, and mixed-gas, rebreather technology.

Mesophotic coral communities in Bonaire and Curacao are typically dominated by agariciids, with *Agaricia lamarcki* and A. *grahamae* covering a substantial proportion of the substrate at upper mesophotic depths (30–60m), while the lower mesophotic (>60m) consists predominantly of A. *grahamae* and A. *undata*. Although much of the habitat is dominated by sediment with only patchy coral growth, in some locations coral assemblages can cover up to 100% of the seafloor down to depths of 70–85m.

Recent biodiversity studies, mostly focusing on fishes, sponges, and corals, documented only limited overlap between shallow and mesophotic reef communities, and that MCE biodiversity is strongly structured by depth. Since MCEs in Bonaire and Curacao harbor highly specialized communities facing specific threats deriving from their proximity to urbanized land, these ecosystems warrant new management policies and conservation measures. These measures should protect the whole extent of these reefs, which rank among the healthiest in the Caribbean region.

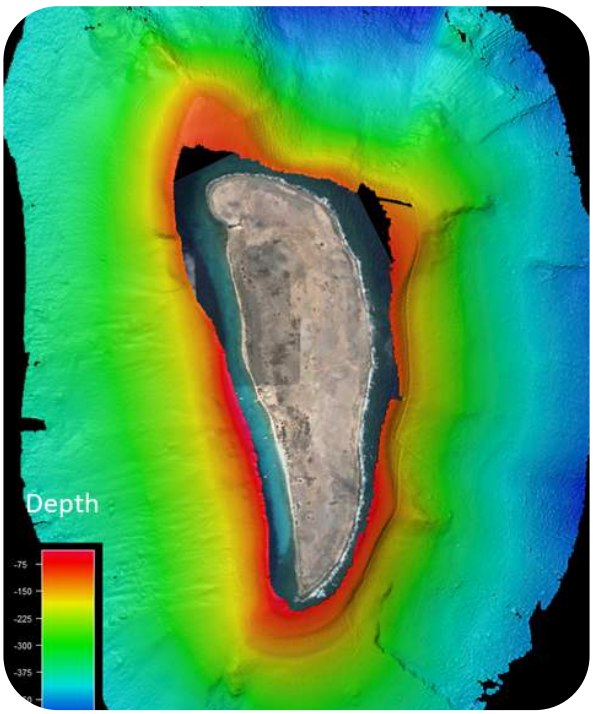


Fig. 4

scientific research

SELECTED PROJECTS 2019

Scientists discover first organism with chlorophyll genes that does not photosynthesize on Curacao

For the first time scientists have found an organism that can produce chlorophyll but does not engage in photosynthesis. The peculiar organism is dubbed 'corallicolid' because it is found in 70 per cent of corals around the world and may provide clues as to how to protect coral reefs in the future. "This is the second most abundant cohabitant of coral on the planet and it hasn't been seen until now," says Patrick Keeling, a University of British Columbia botanist and senior researcher overseeing the study published in Nature. "This organism poses completely new biochemical questions. It looks like a parasite, and it is not photosynthetic. But it still makes chlorophyll."

Chlorophyll is the green pigment found in plants and algae that allows them to absorb energy from sunlight during photosynthesis. "Having chlorophyll without photosynthesis is actually very dangerous because chlorophyll is very good at capturing energy, but without photosynthesis to release the energy slowly it is like living with a bomb in your cells," Keeling says. Corallicolids live in the gastric cavity of a wide array of corals responsible for building reefs, as well as black corals, fan corals, mushroom corals, and anemones. They are an apicomplexan, part of a vast group of parasites that have a cellular compartment called a plastid, which is the part of plant and algal cells where photosynthesis takes place. The most famous apicomplexan is the parasite responsible for malaria. More than a decade ago, photosynthetic algae related to apicomplexans were discovered in healthy corals, indicating they might have evolved from benign photosynthesising organisms attached to corals before turning into the parasites we know today. Ecological data showed that coral reefs contain several apicomplexans, but corallicolids, the most common one, had not been studied until now. The organism has revealed a new puzzle: not only does it have a plastid, but it contains all four plastid genes used in chlorophyll production. "It's quite a head scratcher," says Waldan Kwong, a UBC postdoctoral research fellow and lead author of the study. "We don't know why these organisms are holding on to these photosynthesis genes. There is some novel biology going on here, something we have not seen before. “The researchers hope further research on corallicolids will provide a more sophisticated understanding of coral habitats and allow us to better preserve them.

Source: University of British Columbia (April 2019)

Corallicolids live in the gastric cavity of a wide array of corals responsible for building reefs, as well as mushroom corals, seen on this picture. Picture: Ocean Encounters Curacao

scientific research

SELECTED PROJECTS 2019

Coral Live 2019

Fig. 5

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 11 to 15 November 2019 (Figure 5). 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 would later win the Education Technology industry's biggest award (BETT award). The Coral Live program from CARMABI reached 23thousand students in 29 countries (Figure 6).

Fig. 6

scientific research

SELECTED PROJECTS 2019

Newly discovered microbes band together, 'flip out' on Curacao

When researchers in Nicole King's lab looked through a microscope at the strange organisms, they had collected in Curacao, they saw sheets of cells clustered together in a pattern that resembled skin. That was unusual enough, since these unicellular organisms are normally loners. But then they did something bizarre: The sheets "flipped" from a shallow cup shape into little ball-like structures and starting swimming around. "It was fantastic," says King, a Howard Hughes Medical Institute Investigator at the University of California, Berkeley. No one had ever seen such coordinated movements in these tiny aquatic microbes, known as choanoflagellates. The simple-looking organisms share a common ancestor with animals and may hold clues to how early animals evolved. King's team reports their discovery of the new species, *Choanoeca flexa*, and a detailed description of its acrobatic maneuvers October 17, 2019, in the journal Science (Figure 7).

Fig. 7

King and her team were in Curacao in 2018 as part of a program that brought laboratory scientists into the field to spur new ways to study microscopic life. The scientists were curious how C. *flexa* performed its "flips" and why. The first clue came when King's team tried switching the microscope light on and off. In the dark, the organisms inverted from cups into balls and started swimming around -- yet choanoflagellates were not known to be responsive to light. A series of experiments revealed that the organism reacts to light using a light-sensing protein and other molecules, some of which C. *flexa* must obtain from the bacteria they eat. Since animals and choanoflagellates evolved from a common ancestor, the capacity to respond to the environment through coordinated behavior is likely very old, shared in their common ancestor. And that makes choanoflagellates an interesting tool for understanding animal evolution.

Source: Howard Hughes Medical Institute (October 2019).

consultancy

RESEARCH & SERVICES

This department provides information, consultancy and advice on various projects. Whether it is governmental planning and development or information about endemic animal or plant species, this department will assist.

The following are part of the services Carmabi Environmental Consultancy Services can provide:

- Biological inventories and determination of conservation priorities
- Ecological research (terrestrial and marine)
- GIS mapping services
- Development of management plans and reviews
- Design of informational and educational products on nature (terrestrial and marine)
- Visitor surveys
- Geological surveys
- Reforestation with indigenous plant species

Visiting scientists from the Orchidee club

Carmabi provides consultancy on sustainable development. Also a start has been made to built our own greenhouse where we do research and grow endemic plant species.

Furthermore we make vegetation maps en execute sea turtle- and batmonitoring.

Research Visiting scientist

Free consultancies

Throughout the year Carmabi was regularly consulted for information or assistance on a range of different topics. Requests came in for advice for example on the identification of unknown species, sometimes in the light of potential invasive species, or the status of species protection under Curacao law.

Terrestrial Reseach

SELECTED PROJECTS 2019

Monitoring

Carmabi's monitoring program started in 2018 to obtain information on the state of nature of the Carmabi managed parks.

2019 saw the continuation and expansion of the sea turtle nesting program in the Shete Boka national park and several monitoring programs were started in the Christoffel Park to assess the distribution and habitat preference of our endemic deer (bina), the abundance and composition of bird communities are now monitored along a newly installed birding trail.

The composition of all plant communities throughout the Christoffel Park were reassessed in 2019 and compared to a similar study from 1985 so that the changes in vegetation composition in the park could be quantified over a ~ 40-year period.

Daily looking for new nests is part of the turtle-monitoring

Bird monitoring

The species composition and abundance of the bird population was assessed for the blue hiking trail in the Christoffel Park with the assistance of Aeres applied University.

A total of 43 bird species were identified, of which most were resident birds for Curacao. The research showed that the blue hiking trail area provides important habitats for resident birds evidenced by the large number of different nests and juvenile birds. Three juvenile American kestrels were observed for example in the area of the Mahok forest.

Due to this importance for resident birds, the blue hiking trail was officially registered as a Caribbean Birding trail, the second designated birding trail for Curacao. To celebrate the official registration of the trail, Carmabi staff attended the 2019 Birds Caribbean conference in Guadeloupe.

A total of 43 bird species were identified, of which most were resident birds for Curacao.

Terrestrial Research

SELECTED PROJECTS 2019

Deer Monitoring

In July of 2019, a pilot project was started over a period of nine weeks to study the deer population in the Christoffel Park also in collaboration with Aeres Applied University. The Curacao White-tailed deer (Odocoileus virginianus curassavicus) is an endemic subspecies whose population size was estimated at 442 individuals in 1986 of which half lived within the Christoffel park's boundaries.

From July to September, wildlife cameras were placed on strategic positions throughout the Christoffel Park. Preliminary analyses findings already shed new light on the movement of the deer in the Christoffel Park and deer were frequently observed by all cameras. The cameras also documented other species like donkeys, wild pigs, dogs, and cats. In total over 155.000 pictures were taken, of which 935 contained one or more deer. Based on these promising preliminary findings surveys will continue in 2020.

The Curacao White-tailed deer (Odocoileus virginianus curassavicus)

In total over 155.000 pictures were taken, of which 935 contained one or more deers.

Terrestrial Research

SELECTED PROJECTS 2019

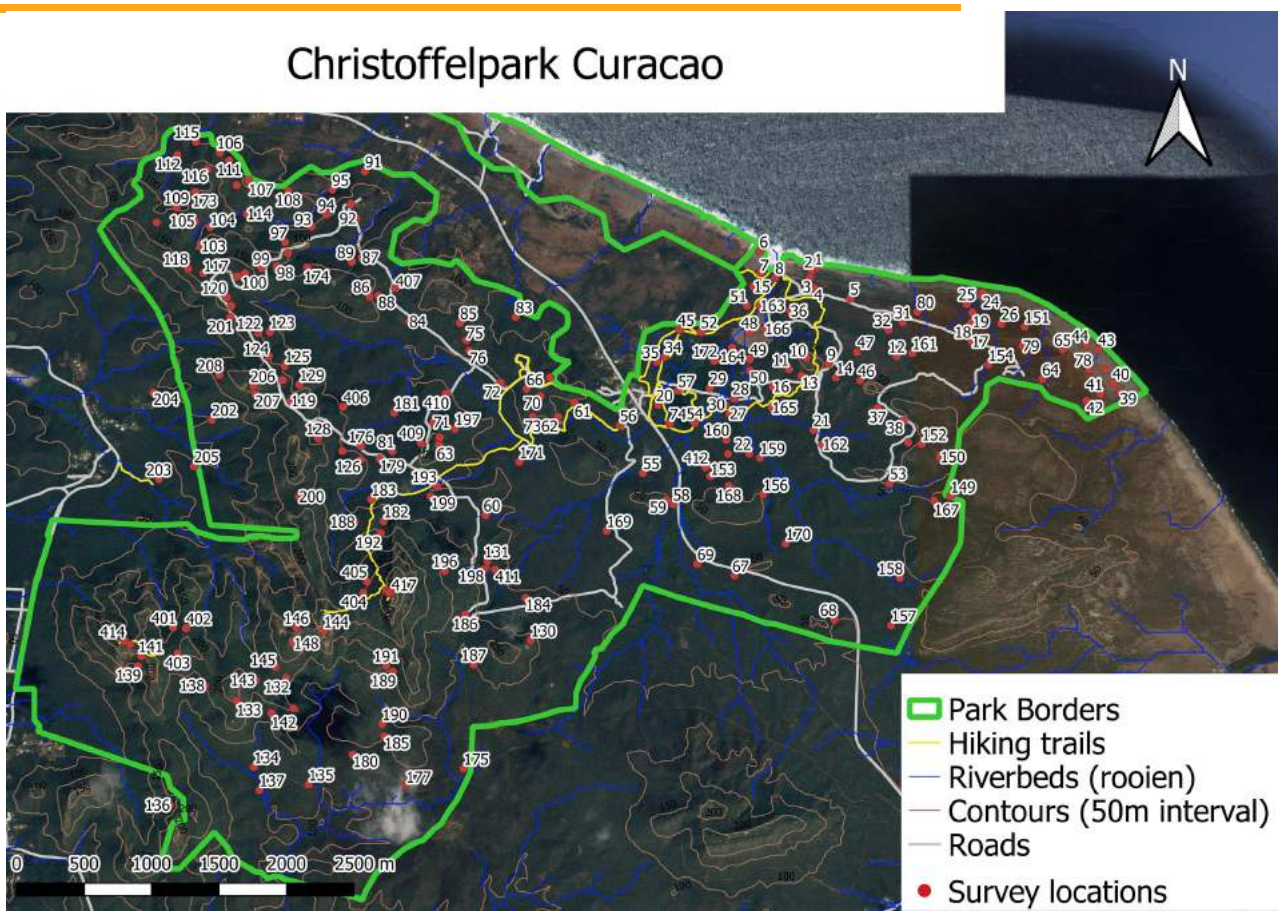
Vegetation Mapping of the Christoffel Park

Vegetation mapping of 220 survey locations in the Christoffel Park was continued in 2019 with the assistance of Wageningen University to update a similar map from 1985 and quantify changes in the Christoffel Park to inform park management, especially in the light of the removal of herbivores (mostly goats) from the park by park management throughout the early 1990's.

The Christoffel Park is the most biodiverse terrestrial park of the leeward island of the Dutch Caribbean (Aruba, Bonaire, and Curacao). Its ecological importance and conservation status are warranted by the many rare plant species that occur in the higher hills of the park, some of which are only found on Curacao or the leeward Antilles. Compared to 1985, the vegetation inside the park has changed considerably.

Many tree species, and especially Capperis odoratissima (Oliba) and Capperis indica (Palu pretu) have become more abundant, have increased in size and occur in more survey locations. The undergrowth of the forest increased and is now covered more by bromeliads (Teku) and tillandsias (Teku di palu).

These species reduce evaporation from the soil and undergrowth and also provide a source of water for birds and other animals. In short, the vegetation inside the park moves toward a climax state, whereas opportunistic grasses, herbs and shrubs decrease in abundance and cover.



Research Vegetation monitoring - Vegetation mapping Christoffelpark Survey locations

Terrestrial Research

SELECTED PROJECTS 2019

Sea turtles

Carmabi researchers, rangers and volunteers jointly monitored turtle nesting activity in the Shete Boka National Park from March to December.

Historically important nesting beaches were patrolled 3 days per week, and daily during the peak of nesting season. The research included monitoring of presence of turtle tracks, the number of nesting attempts and the number of actual nests. Nesting success, i.e., the proportion of eggs that hatched into juvenile sea turtles, was also monitored.

In 2019, two nests were confirmed, 8 attempts, i.e., where a sea turtle crawls on land but does not make a nest, were observed.

The two nests produced a total of 182 hawksbill turtles (Eretmochelys imbricate). Hawksbill turtlesmature around the age of 30 to 35 and return to the beach they were born, indicating the importance of the National Park Shete Boka beaches nest for the conservation of the species.

Research Turtles - track hawksbill

In 2019, the sea turtle program was used to train new rangers and NME volunteers to further increase Carmabi's monitoring capacity.

Research Turtles - 3 eggs in turtle nest

Research Turtles - Hawksbill hatchling

consultancy

SELECTED PROJECTS 2019

Changes in the consultancy department

Senior terrestrial researcher and head of the consultancy department John de Freitas retired from the Carmabi foundation in June 2019. John started working for Carmabi in 1982 and during his 37 years of working at Carmabi, led many of the terrestrial research projects and assisted visiting scientists in a wide range of topics.

Important contributions to the scientific community are found in the studies on vegetation communities resulting in landscape ecological vegetation maps produced for Curacao and the other Dutch Caribbean islands. Erik Houtepen, already working at the consultancy department of Carmabi, succeeded John and is now responsible for the consultancy department and for terrestrial research; Cindy Eman was hired as a researcher and consultant.

John de Freitas retired from the Carmabi foundation after 37 years

Scientific assessment of Aruba's coastal coral and fish populations

A recent three-week long scientific assessment requested by Aruba's Director Nature & Environment (DNM) surveyed 56 sites of Aruba's shallow water reef sites. The surveys revealed locally healthy coral and fish populations (Figure 8) around the island, particularly in the southern part of the island.

Two expert Caribbean marine biologists collaborated with two Carmabi researchers to conduct the survey. The survey included coral, fish, invertebrate, and water quality surveys every 700 meters along the island's south shore. In total, the
team accumulated 149 hours underwater surveying over 8.4 kilometers of Aruba's 35km long southern coast.

This assessment makes Aruba's reefs one of the best surveyed reefs of any country on the planet which is obviously crucial for the design of future management strategies. The aim of the scientific assessment is to produce a report on marine resources around Aruba. A map of coastal habitats will also be created. Combined, these documents can be used to support the creation of policies to manage the shallow waters around the island sustainably.

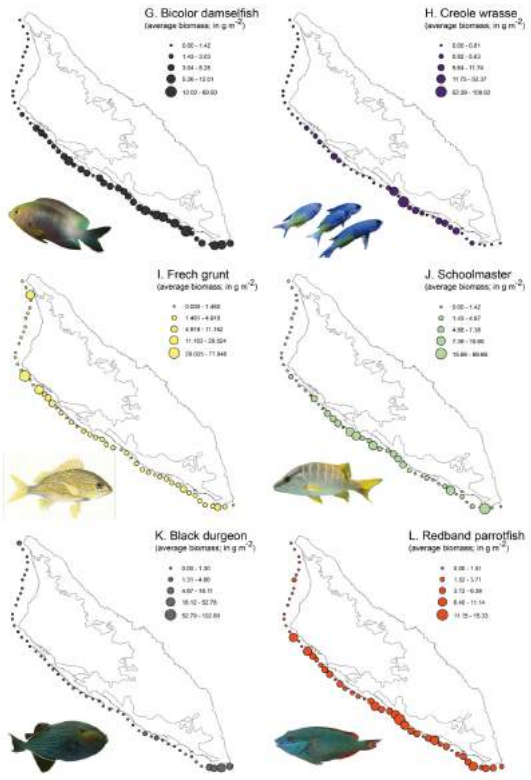


FIG. 8

consultancy

SELECTED PROJECTS 2019

Bullenbaai

Refineria di Korsou (RdK) requested Carmabi to assess reef health of the area in front one of the Jetties of the Bullenbaai facility. One SPAW protocol annex II species (i.e., high level of protection) was observed in low abundance (Orbicella annularis). Other coral species were present, that are protected under SPAW protocol annex III (i.e., low level of protection). Overall, the surveyed reef was found to be in a degraded state compared to nearby sites. The survey followed the Global Coral Reef Monitoring Network (GCRMN) protocol and included corals and other benthic components and reef fishes to provide a complete overview of the site's reef community.

Consultancy Bullenbaai marine assessment

Hofi Mango

Carmabi researchers were requested to assess the state of nature of the former plantation of Hofi Mango, located in Banda Abou. The plantation historically served as a sugar production facility, as is indicated by the presence of the sugar mill, and the need for arable land resulted in the complete removal of vegetation in order to grow crops. Due to increased competition with international producers of sugar, operations were discontinued early 1900's, providing vegetation a chance to regrow. Current owners have restored the plantation.

Hofi Mango

The area of Hofi Mango is characterized by the presence of large gullies or dry riverbeds (locally known as rooien). Rainwater flows from the large water catchment area, which includes parts of the Christoffel Park, through the Hofi Mango gullies seawards. Hofi Mango proved of high conservation value, based on the presence of a dense evergreen forest in the lower valleys and gullies and vegetation, consisting of range of different tree species of,for example, Bursera bonairensis, Bursera tomentosa and Casearia tremula, with a well-developed undergrowth of Bromelia humilis on the higher hills. A relict from the plantation days was found in the form of mango trees, hence the name of the plantation. Due to the natural availability of water, this forest successfully developed into its current lush state. A management plan was formulated for the potential exploitation of the area as apark and eco-resort.

consultancy

SELECTED PROJECTS 2019

Remapping vegetation Bonaire

Early 2019 Carmabi and Wageningen University (WUR) joined forces to collaboratively study change in vegetation for the Dutch Caribbean. WUR researchers Joop Schaminée and John Janssen and Carmabi researcher Erik Houtepen and retired Carmabi researcher John de Freitas visited Bonaire in November to resurvey locations from the 2005 publication 'Landscape ecological vegetation map of Bonaire' by John de Freitas. This initial visit did not cover the entirety of survey locations but provided a first glimpse on the current state of Bonaire's vegetation.

It became evident that the impacts of extensive herbivory and urban development, continues to negatively impact the island's vegetation in terms of species composition and abundance. Special emphasis must be placed on the low number of plant saplings, reducing the rejuvenation of vegetation. The state of Bonaire's terrestrial nature is worrisome as was not only stated by WUR and Carmabi researchers but also by National Park personnel and different NGO's. The visit was concluded with a presentation on the research findings at the DCNA office.

Consultancy Vegetation Bonaire with Wageningen University (WUR)

parkmanagement

CHRISTOFFELPARK & SHETE BOKA

Boka Pistol in the Shete Boka National Park

Carmabi manages the Christoffel National Park (which also includes the Savonet Museum), National Park Shete Boka and the Hato Caves.

The parks and museums are managed by Carmabi whereas the management of the Hato Caves is outsourced to Indian Caves BV.

The Christoffel and Shete Boka parks are among the most popular tourist attractions on the island.

The Christoffel National Park has the highest biodiversity in the ABC islands. Besides that, the parks house an array of animal species, plants, trees, and breeding spots for turtles. Carmabi conducts studies about these species and protects nature in the parks.

The Shete Boka National Park offers spectacular views of the incoming waves along the island's north shore.

The Hato Caves is a splendid example of a cave formation in the limestone terrace landscape and is a very nice tourist attraction.

View from Seru Gracia in the Christoffel National Park

parkmanagement

OVERALL VISITOR STATISTICS

Christoffel Park

In the Christoffel Park, visitors can join different activities, such as jeep safaris, hikes, bird, and deer watching tours. In 2019 a total of 52.449 people visited the Christoffel Park, which is an increase of 11.4% compared to 2018 when 47.090 tourists visited the park. in 2018.(Figure 9.)

In 2018 we aimed to increase the number of Curacaoans visiting the park and the measures to promote this (lower entrée fees) appeared to work as the number of Curacaoans visiting the park increased by 2.9% to a total of 13.528 locals compared to 2018.

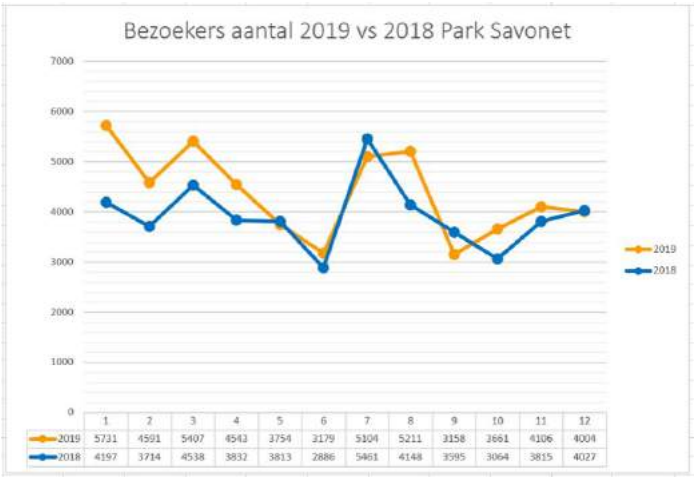
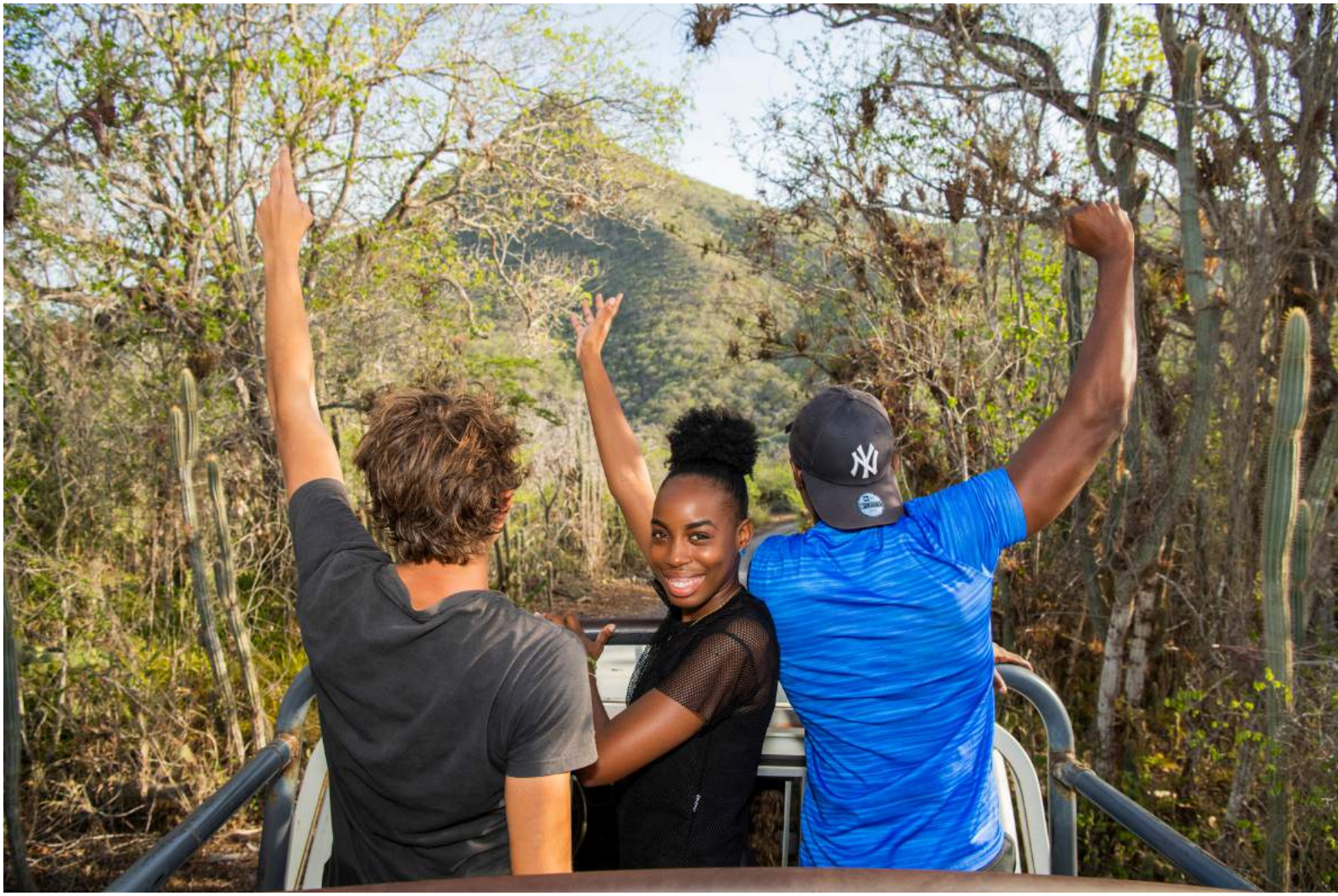


FIG. 9



Safari tour in the Christoffel Park

parkmanagement

OVERALL VISITOR STATISTICS

Shete Boka Park

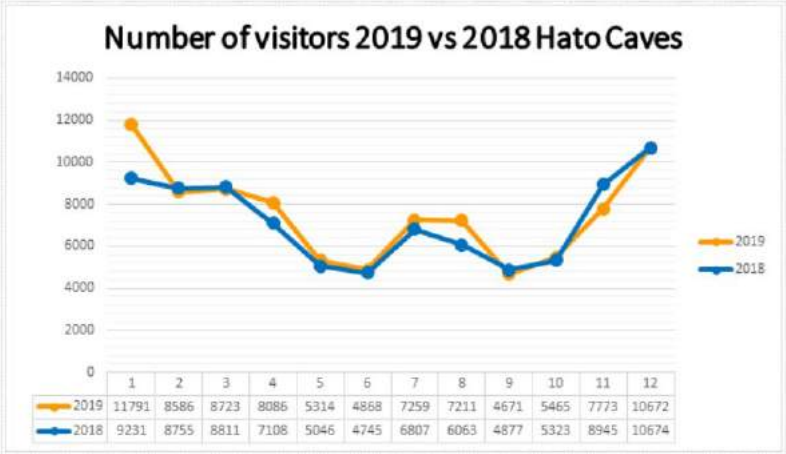
The National Park Shete Boka was visited by 91.694 people in 2019, an increase of 2.6% compared to 2018. This number includes local visitors, tour operators and cruise operators bringing passengers by touring car.

	1	2	3	4	5	6	7	8	9	10	11	12
2019	10931	9879	9638	8084	6590	5703	6392	6602	3919	6511	8549	8896
2018	9235	9155	9381	7635	6473	5460	6810	6523	6137	6285	7955	8334

FIG. 10

Hato Caves

In 2019 a total of 90.419 people visited the Hato Caves, an increase of 4.7% compared to 2018 when 86.385 people visited the caves.



	1	2	3	4	5	6	7	8	9	10	11	12
2019	11791	8586	8723	8086	5314	4868	7259	7211	4671	5465	7773	10672
2018	9231	8755	8811	7108	5046	4745	6807	6063	4877	5323	8945	10674

FIG. 11

parkmanagement

PROJECTS

Several projects were undertaken in the parks in 2019

Customer-service training

To improve the service to our visitors we provided a customer-service training for the entire staff of the parks.

Custumer-service training at Savonet

Carmabi represented Curacao at the Bird Caribbean Conference in Barbados

Birding Trail

In June, the blue route at the Christoffel Park was registered at Birds Caribbean as a birding trail. Various adjustments have been made to bring the trail to the attention of the visitor, i.e., clearer signage was installed in the form of “Amsterdammertjes”, information documents were produced, and guided hiking tours will be organized more often

Exhibition 'nos naturalesa'

New exhibits were installed in the Savonet Museum, e.g., the exhibition ‘Nos Naturalesa’ (Our Nature) now provides an excellent impression of the animals that live in and around the parks. Many schoolchildren make use of this exhibition and visitors also provided positive feedback and appreciation.

New exhibits in the Savonet Museum

parkmanagement

EVENTS

Several events were undertaken in the parks in 2019

New record

Randhy Cuevas set a record on October 6 by climbing the mountain for the 4444th time. Nobody has climbed the mountain so many times.

Randhy Cuevas climbed the mountain 4444 times.

Minister Zita Jesus-Leito, Rudy Rooi and Minister Hensley Koeiman

Open Day 'Dia di Sabaneta'

The 1st of September we celebrated a successful “Savonet Day”, which included free entrance to the park, local music and food, various safari tours and guided hiking tours for adults and children.

During the Open Day, we welcomed two ministers. Zita Jesus-Leito and Hensley Koeiman. They both got a tour over Savonet and they both gave a speech.

Christmas tree on Christoffel Mountain

In collaboration with Dynaf and Drones Inspire Curaçao we put an illuminated Christmas tree at the top of the Christoffel mountain that could be seen from afar. This Christmas tree was the highest illuminated Christmas Tree in the Kingdom of the Netherlands.

Dynaf carrying the big solar panel to the top

The solar panel was much heavier than the tree

The Christmas tree on the top of the mountain

parkmanagement

EVENTS

Several events were undertaken in the parks in 2019

Two race biking events were held. On 20th October local race bikers started a short and/or long course. The course led through the Christoffel area, the National Park Shete Boka and Watamula, i.e., the most western part of Curacao. On November 13th, there was a Downhill Mountain Bike Event. Participants (only professionals) descent down the highest mountain of the island by mountain bike.

Professional Mountain Biker during Downhill Mountain Bike Event

A lot of people walked our park for four days

Walking event

In July we opened our park for the four-day walking event. People walked through the beautiful nature areas on the mountainside and the Northside of the park.

Entrance Savonet Museum

Museum week

On May 20th, the Savonet Museum participated in the “open museum week” on Curacao organized by the Association of Museums Curacao. The event was well visited by many people.

Guided hikes during full moon

The “Sun Meets Moon” walk at the Northside of the park to Boca Grandi was visited by more than 150 participants. This event was held in June.

parkmanagement

MAINTAINANCE

Restorations in Christoffel Park

Due to serious erosion problems at the parking lot at the foot of the Christoffel mountain we asphalted the parking lot.

We leveled the area, protected its sides with big boulders and introduced a drainage system. A small artificial lake was created to collect water coming from the hills which will be very beneficial for both flora and fauna.

Asphalted the parking lot at the foot of the Christoffel Mountain

The new roof at the entrance of the Hato Caves

Restorations Hato Caves

We renovated the parking lot of the Hato Caves and a new entrance with parking places for taxis and passenger cars was created. Also we build a new roof at the entrance of the Hato Caves.

Restorations in Shete Boka

We started the renovation of the ticket office and restrooms of the National Park Shete Boka in 2018 and in 2019 the renovation was completed. Our ticket office got a more friendly and safer appearance.

Sargassum

We have experienced problems with Sargassum invading both the Christoffel National Park (Boka Grandi) and the Shete Boka National Park. Sargassum was cleaned up by park rangers.

Sargassum in the Shete Boka Baai

parkmanagement

DONATIONS

New bird watching tower

Renovation Bird Watchtower

The old birdwatching tower in the Christoffel Park was renovated by a special unit (engineers corps) of the Dutch Army. This tower is located near Boka Grandi in the Christoffel National Park. The Dutch army did a tremendous job and the tower is now ready to be used.

New tools for the Emergency Center

Donation Kooyman

The hardware store Kooyman donated the first tools needed for the opening of the Emergency Center at Savonet. The tools will be used in times of a crisis like a hurricane.

Donation vehicle MCB Bank

The Maduro & Curiëls Bank donated the money to buy this new SUV for Carmabi. The foundation is very pleased to add a new car to the organization. The car will be used for researchers from Carmabi in the Christoffel Park.

The vehicle donated by the MCB Bank

parkmanagement

NATURE MANAGEMENT

Communication and marketing

In the year 2017 we started (and we continued in 2018) to get more engagement on social media (e.g., TripAdvisor, Google).

As a result, the Christoffel Park received the certificate of excellence on TripAdvisor and a 4.5 out of 5.0 review on Google.

Promoting the Roi Berú hiking trail

To meet the goal of the Christoffel Park to decrease the number of vehicles at the foot of the Christoffel Mountain the marketing & communication department launched a campaign for visitors to leave their cars at the plantation of Savonet and promote walking to the foot of the Christoffel Mountain by hiking the hiking trail of 'Roi Berú'.

EHBO post

For the Christoffel Park to provide an EHBO-post and emergency-center for the area of Banda Abou, the marketing & communication department provided the park with artwork.

The new EHBO-post

nature & environment education

EDUCATIONAL PROGRAMS

Our Nature and Environment Education Department (NME) is responsible for educational programs for primary school children and secondary education students. The activities of Carmabi's education program include:

· Terrestrial Education Program: tours to teach children about our 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 secondary education
· Providing teaching materials for primary schools (FO) and high schools (VO).
· Support high school students with their thesis/ paper/ practical assignments on topics related to(marine) biology.
· Various other activities to increase general awareness, such as for example Shark Week, World Ocean Day movie night, Marine Education Center Open House and participating in school projects and interviews.

Little girl looking through our VR glasses in the Marine Education Center

Students from the Kennedy School during the Terrestrial Education Program at Daaibooi

nature & environment education

PARTICIPATION

Education Program

In 2019 a total of 9151 students participated in a Carmabi's educational programs (Figure 12). This is approximately 55% of all children (approx. 16500) attending Curacaoan elementary and special need schools.

Due to the smaller classes and a general decrease of the school population (as shown in the table below) we saw a small decline in the number of students participating in one of Carmabi's education program compared to 2018. This is compensated with other activities we developed, like an increase in the school visit programs, activities within the Marine education Center etc.

School year	Number of students Elementary Schools (Funderend Onderwijs FO)	Number of students Special Education (Speciaal Funderend Onderwijs SO)
2014-2015	16914	1280
2015-2016	16734	1257
2016-2017	16347	1258
2017-2018	15969	1109
2018-2019	Not available yet	Not available yet

FIG. 12

Nature and Marine Education Program at Piscadera

nature & environment education

PARTICIPATION

Terrestrial Education Program

The Christoffel Park was visited by students divided from class/ group 1 to group 8 of our primary school system (ages 4 till 12). The activities in the park focus on different themes such as local birds, trees/ plants, reptiles, agriculture/ wells & ruins.

Below (figure 13) an overview is shown of the number of students (per age group) that took part in each program:

1. Terrestrial Education Program (TEP)	
Christoffelpark (Mondi Misterioso/ Nos Mondi) Group 1 & 2	1544
Christoffelpark (reptiles, reptil) Group 3	971
Christoffelpark (birds, para) Group 4	791
Christoffelpark (plants, palu) Group 5	953
Christoffelpark (Savonet, wells, agriculture and ruins) Group 6	1142
Christoffelpark (Zorgvliet, wells, agriculture and ruins) Group 7	1000
Daaibooi (ecology of an island) Group 8	187
Shete Boka (ecology of an island) Group 8	712
Total	**7300**

FIG. 13

Younger students (group 1 and 2) visited the Christoffel Park as part of a program aimed at introducing them to the nature world 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 different species of flora and fauna. In our program 'reptiles', students (group 3) learn about reptiles, their habitats, niches and role within the wider Curacao ecosystem.

Group 4 students visited the Christoffel Park to learn about birds. The bird lessons involve lessons on our local birds in theory and by 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 in the area of Savonet & Zorgvlied 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. All the lessons for the groups 4 up to 8 are followed by a small exam that can be made part of students' school report.

Terrestrial Education Program

nature & environment education

PARTICIPATION

Marine Education Program

The Marine Education Program 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 where they learn how to become 'ambassadors of the ocean', whereas students of group 8 (11-year old) focus on the importance of marine life. The purpose of the Marine Education Center is to convey the beauty of Curacao's underwater world.

In December 2019 we finished building a new classroom with an outside terrace at Piscadera. The new classroom provide space for the growing number of students taking part in the Marine Education program.

Students from the Albert Sweitzer School

Due to this growing number of students the MEP program was expanded from 2 to 3 days a week in 2019-2020. In 2019 we started using Virtual Reality (VR) goggles for the MEC program. Students and visitors of the MEC can now swim over reefs in a VR environment. Another addition to the MEC is the mangrove aquarium where a cross section of a mangrove coastline can be seen.

Figure 14 shows an overview is shown of the number of students (per age group) that took part in each program:

FIG. 14

2. Marien Educati on Program (MEP)	
Group 6: Turtles and plastic waste	389
Group 8: Corals and sharks	933
Total:	**1322**

High School KAP visits the research lab at Piscadera

nature & environment education

PARTICIPATION

Looking through the microscope in the MEC

School Visitation Program

The education department visits the schools with microscopes for the 'microworld' program.

Below (figure 15) an overview is shown of the number of students (per age group) that took part in each program:

FIG. 15

3. School Visiting Program	
Group 5 & 6	414
Total:	**414**

Education Program 'environmental challenges' for secondary education students

In this program students get to see a list of local environmental problems (import of new species, sewage waste, plastic waste, etc.) by pictures and videos. Then the students have brainstorm sessions resulting in recommendations for the government.

Figure 16 shows an overview is shown of the number of students that took part in each program:

4. Program Environmental Challenges (secondary education)	
Local high schools (4/5 VWO) at Piscadera	85
VSBO Lauffer at Piscadera	30
Total:	**115**

FIG. 16

Students of the Römer School at Shete Boka

nature & environment education

SHARKWEEK

Shark week

“Shark week” in June has become a tradition at Carmabi and starts with a movie night on the beach at Carmabi on World Ocean Day (June 8th). The screening of the movie ‘Shark Water’ was a big success, with lots of visitors. Various other activities related to sharks take place this week, including a Shark Art contest between the secondary schools (vsbo, havo, vwo).

Movie night on the beach

OTHER ACTIVITIES

Students (secondary education/ high school) can make an appointment with our department for help with their exam projects, like the sector- of 'profielwerkstuk' (main thesis).

We also provide programs for extracurricular theme-weeks. We work together with partners, like Ryan de Jong (mangrove restoring) and GreenKids (info-sessions at the University of Curacao with students LOFO/ teacher training course).

In 2019 we worked together with schools and participated in clean-ups. Besides the trash we collect, it creates awareness among students of our environment and the problem of (plastic) waste.

With 6 visits and a total of 180 clients, the Foundation Verriet (organization for physical and/ or mental disability) visited the Marine Education Center (MEC) at Carmabi.

At Piscadera 150 children followed an educational program as part of an "educational birthday party" or after-school-projects.

In December, a group of almost 100 people joined us for a Moon Walk at Shete Boka. This walk is the start of more walks at Shete Boka in 2020.

The California Academy of Science provided the education department with a beamer and outside screen. In October and December, this equipment was used to organize several Movie Nights at the beach at Piscadera.

Terrestrial program at Savonet

Ready for a walk into nature at Savonet

The Carmabi movie debuted on the festival

Wildlife Conservation Film Festival in New York

From 17 till 27 October, the Carmabi movie 'Birds of Curaçao', debuted on the Wildlife Conservation Film Festival (WCFF) in New York. This International Film Festival took place at the Cinema Village Theater near Union Square. The Festival draws film producers and scientists from around the world to showcase their films and participate in panel discussions and Q&A's, representing countries including Australia, Brazil, China, England, Germany, India, Mexico, Nigeria, and Singapore. The movie had been sent in by the head Nature & Environment Education. Participation had been made possible by the sponsorship with the Curacao Tourist Board (CTB).

marketing & communications

EXPOSURE OF OUR WORK

General

As of July 2019 Carmabi, welcomed a new part time marketing & communications employee who is responsible for all press releases, branding, publications, social media, the new website, the annual report, events, and publications of Carmabi.

Website & Online presence

Carmabi decided to renew and update the old website. Three completely new websites are being built. The first one, the new website for the Carmabi Foundation is ready. A start had been made to build the two new websites. One for the Christoffel Park and one for Shete Boka. All three websites will be presented and go live in 2020.

Movie Night at the Beach with our new donated screen

Social media

In 2019 marketing & communications updated all social media channels for Carmabi, the Christoffel Park and Shete Boka. With the new social media guidelines, we can share fun and informative content more frequently.

In 2019 all preparations were finished for launching a big campaign to promote all the tours and activities in the Christoffel Park and Shete Boka through a specially made schedule. Artwork was created, agreements with newspapers, our partners and other media were made to promote the campaign starting the first week of 2020. Goal is to promote all activities and tours in our local community and for tourists.

At the end of the year Carmabi thanked all visitors and the local community of Curacao with a special Christmas video message. In corporation with Dynaf Curacao and Drones Inspire Curacao, Carmabi placed a Christmas tree on top of the Christoffel Mountain and shared a video with a special Christmas greeting. The campaign got a lot of exposure in the local media. Extra exposure was created in corporation with the airline TUI. Carmabi participated in a 'Christmas Giveaway' on social media. The winner won a free Safari Tour in the Christoffel Park.

marketing & communications

PRESS RELEASES

24 July 2019 Amigoe NL ‘Groeiakkoord of Groenakkoord?’

28 July 2019 AD / Amigoe / Extra Carmabi attends bird conference

30 July 2019 Antilliaans Dagblad / Amigoe New birding trail in Christoffel National Park

12 August 2019 Antilliaans Dagblad NL Biologist Carmabi retires

20 August 2019 Antillaans Dagblad ‘Savonet Day’ celebrated at Christoffel National Park

29 August 2019 Amigoe NL Research massive fish mortality at Piscadera

29 August 2019 Amigoe NL Celebration of ‘Dia di Sabaneta’ in the Christoffel National Park

31 August 2019 Amigoe NL ‘Dia di Sabaneta’ open day in Christoffel National Park

2 September 2019 Extra PAP Carmabi dal bai pa mas pronto

3 September 2019 Antilliaans Dagblad NL Carmabi is making progress Christoffel National Park

3 September 2019 Amigoe Successful day Dia di Sabaneta at Christoffel National Park

3 September 2019 Amigoe NL Project ‘Suits’ a shore at Carmabi

7 October 2019 Amigoe / AD Last climb Randy Cuevas at Christoffel Mountain after 4444 times

October 2019 Amigoe / Antilliaans Dagblad Downhill biking Christoffel Mountain

October 2019 Amigoe / AD CARMABI movie ‘Birds of Curacao’ at Film Festival New York

21 October 2019 Amigoe / AD / Extra / Vigilante Invasive coral around Curacao turns out native specie

13 November 2019 Amigoe / AD / Extra First turtle nest in Shete Boka

13 November 2019 Amigoe / AD / Extra TUI plants ten trees in Christoffel National Park

28 November 2019 Bird tower in Christoffel park renovated

9 December 2019 Highest Christmas tree at Christoffel mountain

December 2019 Maduro & Curiel’s Bank donates brand-new vehicle for Carmabi

December 2019 Donation Vertegenwoordiging van Nederland

general

VISITS

Dutch Minister Van Engelshoven visits Carmabi

In February 2019 the Dutch Minister of Education, Culture and Science (OCW), Ingrid van Engelshoven visited the Science Center of Carmabi. The visit was part of a working visit to the Dutch-Caribbean Islands.

Van Engelshoven decided during her visit to continue the financing of the Caribbean research programme with 10 million euros.

The whole delegation in front of the Carmabi building

Ruthson Cecilia (NME) , Cor Harmeete (NME), Nicole Maduro (host) and Paul Stokkermans (director)

Carmabi visited tv-show 'Mòru Bon Dia'

Carmabi received an invitation to visit the popular morning show on TeleCuraçao: Mòru Bon Dia. Carmabi visited the show three times in a row to talk about science, the national parks and the education departent.

Dominique Adriaens (Parks) , Sue-Shantely Lourens (Parks), Nicole Maduro (host) and Paul Stokkermans (director)

general
VISITS

Visit Fabien Cousteau to Carmabi

The grandson of the famous Jacques-Yves Cousteau visited the Carmabi Science Center earlier this year.

Jacques-Yves Cousteau was a famous French naval officer, explorer, conservationist, filmmaker, innovator, scientist, photographer, author and researcher who studied the sea and all forms of life in water.

His grandson Fabien enhanced his passion for the underwater life.

Paul Stokkermans, Cor Hameete and Erik Houtepen with Fabien Cousteau and his colleague

Paul Stokkermans, with some of the representatives of the VNW

Donation from the Vertegenwoordiging van Nederland

Carmabi received a donation from the Vertegenwoordiging van Nederland Willemstad (VNW).

On the third Tuesday of September 90 students from 6 high schools visited the VNW due to 'Prinsjesdag',

Prinsjesdag is the day on which the reigning monarch of the Netherlands addresses a joint session of the Dutch Senate and House of Representatives to give the speech from the throne (Troonrede); setting out the main features of government policy for the coming parliamentary session.

The students were given the assignment to make an annual budget for the county of Curaçao which they had to present to the prime minister of Curaçao, Eugene Rhuggenaath, Michèle Russel-Capriles, acting Governor and Erwin Arkenbout, representative of the Netherlands.

The best three presentations won and their suggested foundations received a real donation. Carmabi was one of the three selected foundations by the students.

general

MAINTANANCE

Severe weather at Curaçao

At September 25th an unexpected storm passed by Curaçao and left parts of the coastline destroyed.

Carmabi got damaged in this storm too. The pier was destroyed and a lot of debris washed to shore.

This was the event where the platform damaged the coral reef at Boka Sami. The Government of Curacao asked the Marine Research Department to investigate how much was damaged.

All the planks got washed away by the storm

Saving the coral babies who got washed out of the nursery to the bottom of the sea

The coral babies were brought back to the wet lab

general

MAINTANANCE

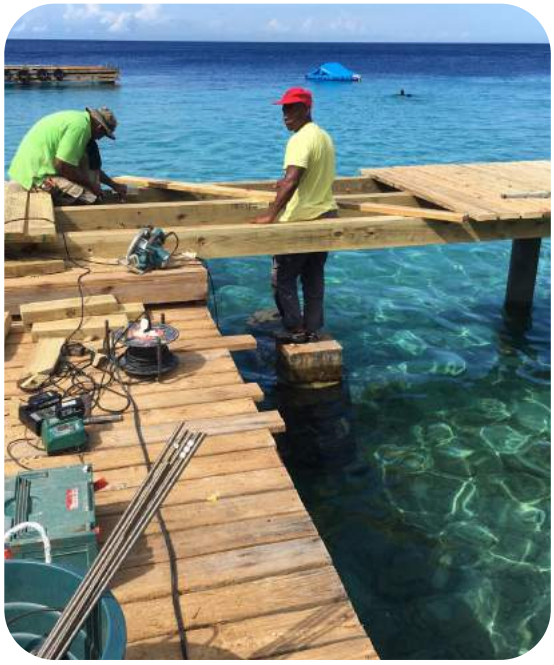
Maintanance new pier

After the storm we renewed the pier that is in front of the Carmabi building at Piscadera.

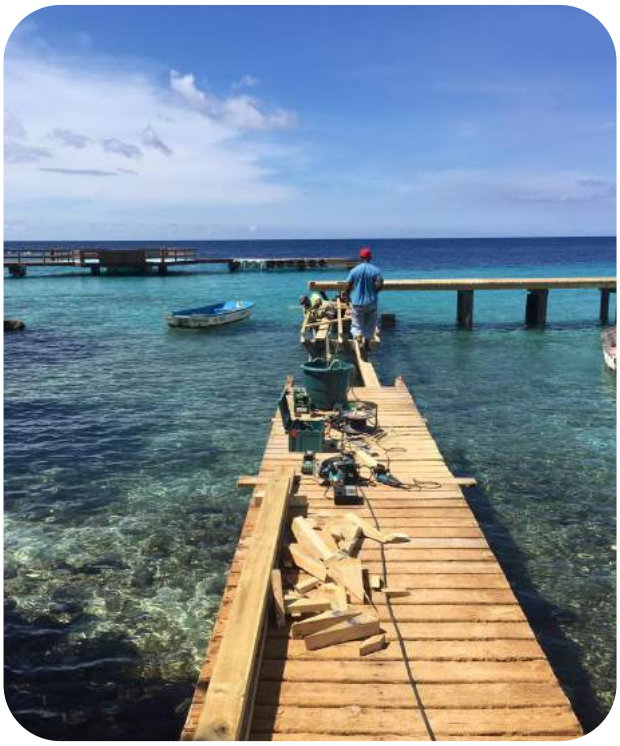
Interesting fact, in 2008 the pier was also totally destroyed by tropical storm Omar.

In 2009 with the help of sponsors the pier was renovated.

Now after a ten years, the pier was ready for another renovation.



It took the workers a full week to renew the pier



The whole deck has been renewed

The renovated pier

general

DCNA MEETINGS

MEETINGS DCNA 2019 ON ST. MAARTEN AND BONAIRE

Carmabi is a member of the Dutch Caribbean Nature Alliance (DCNA). The directors of the nature management 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 board of DCNA at Bonaire

The DCNA also manages a trust fund. This trust fund is funded by donors such as the Dutch Postcode Lottery and the Ministry of the Interior and Kingdom Relations. 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 2019 the meetings were held 1st – 2nd April on St. Maarten and 28th – 29th October on Bonaire. Both meetings were attended by Carmabi Director Paul Stokkermans

The Minister (third of the left) and the board members of DCNA

OPENING NEW DCNA OFFICE ON BONAIRE

On the 5th of September 2019 the new DCNA-office was officially opened by the Dutch Minister of Agriculture, Nature and Food Quality, Carola Schouten and the islands Governor Edison Rijna.

general

ANUAL FINANCIAL STATEMENT

BALANCE SHEET AS OF DECEMBER 31, 2019		
(after proposal of result appropration)		
	2019	2018
	ANG	ANG
Assets		
Non-current assets		
Plantations and Buildings (1)	920,719	885,242
Equipment and other fixed assets (2)	369,698	293,505
	1,290,417	1,178,747
Current Assets		
Receivables (3)	356,910	204,503
Stock (4)	5,052	8,456
Cash and cash equivalents (5)	1,094,081	1,034,543
	1,456,043	1,247,502
Total assets	2,746,460	2,426,249

general

ANUAL FINANCIAL STATEMENT

Equity and liabilities		
	2019	2018
	ANG	ANG
Equity (6)		
Capital	106	106
Retained earnings	1,840,461	1,495,613
	1,840,567	1,495,719
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)	189,509	206,725
	382,044	360,725
Current Liabilities		
Deferred income project grants (9)	247,961	420,520
Pension contribution payable (10)	34,882	10
Taxes and social security payable (11)	53,278	38,826
Other liabilities (12)	187,728	110,449
	523,849	569,805
Total equity and liabilities	2,746,460	2,426,249

general

ANUAL FINANCIAL STATEMENT

STATEMENT OF OPERATIONS FOR THE YEAR 2019	2019	Budget 2019	2018
	ANG	ANG	ANG
Income			
Grants (13)	600,267	566,664	511,954
Earmarked grants (14)	493,425	180,000	453,547
Admission fees (15)	1,897,004	1,705,400	1,732,492
Rental income (16)	264,454	305,546	286,714
Other income (17)	494,132	462,458	439,630
	3,749,282	3,220,068	3,424,337
Expenses			
Personnel expenses (18)	1,687,819	1,617,588	1,474,762
Depreciation expenses (19)	115,056	131,684	117,037
Other operating expenses (20)	1,618,704	1,506,234	1,584,317
	3,421,579	3,255,506	3,176,116
Operational result for the year	327,703	(35,438)	248,221
Interest income	17,145	6,600	12,157
Result for the year	344,848	(28,838)	260,378
Appropriation for the year			
Retained earnings	344,848		260,378
	344,848		260,378

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
Clementine Wallé resigned as board president on the 9th of July 2019.

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
Cyrill Kooistra, Deputy Head of Department/ Coordinator activities and Tours
Ingrid van 't Hul, Medewerker Facilitair Management
Sue-Shantely Lourens, Management Assistant
Briand Victorina, Head Ranger
Edwords Alberto, Head Ranger
Melvin Martinez-Estevez, 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)
Cornelis Hameete, M.Sc., Head Department

Advice and Consultancy Department
Erik Houtepen, M.Sc. Head of Department
Cindy Eman B. Sc., Researcher, and consultant

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
John de Freitas, Head of Advice and Consultancy Department
Dominique Adriaens, Head of Parks Management Department
Xiomara Concetion, Janitor Savonet
Angelique Kok, On call staf, Marine Education Program (MEP)

general

ON CALL STAFF

ON CALL STAFF

Savonet
Richard Davelaar (Cleaning Shete Boka),
Daisy Lourens

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

Advice and Consultancy
Miralda Panneflek (Digitizing documents)

VOLUNTEERS

Terrestrial Scientific Research
Ramphis Schoop
Rob Wellens
Fernando Simal

general

DONATIONS 2019

Active Chance Foundation
Baker Tilly Curacao
California Academy of Sciences (USA)
Central Dive Curacao
Coral Conservation Society (Canada)
Curacao Tourist Board (CTB)
Dijtham NV
Dynaf
European Union
Fietsvereniging Willemstad
Kooyman BV
Maduro & Curiels Bank
Nagelmakers Advocaten
Nederlandse Marine (Landmacht-Genie)
Prins Bernhard Cultuurfonds Caribisch Gebied
Scipps Institution of Oceanography (USA)
Vertegenwoordiging van Nederland Willemstad
Vulcan Inc. (USA)
Waitt Institute (USA)

Personal
Antonie van den Bos
Kevin Newton of Drones Inspire Curacao