Time goes by and once again we welcomed a new year. All Carmabi personnel wishes you all the best for this new year and we hope that everyone will have the chance to enjoy nature in all its beauty. We are in luck; we don’t have to go very far to be able to spot wildlife on our island. It flies right into our gardens.

2009 will be an interesting year for Carmabi. Savonet Museum will open (part) of its doors, Christoffelpark will introduce a new house style, and new activities will form part of our product at the park. And there is more to come.

But first we want to bring you the last news of the last couple of months of 2008. In this newsletter you will find updates on the Savonet Museum, but also pictures of the Kids and Adult Clear Water Challenge which took place at the end of October, pictures of the effects of tropical storm Omar on our coral reefs and much more.

Before we finish the editors note of this newsletter edition we want to thank our former intern miss Linda McCallum, who single handed edited and made the layout of this and the last newsletter we published. Linda finished her internship with us on Friday the 18th of January and is now back in Holland to finish her studies.

Thanks very much for all your help Linda and we wish you all the best with your goals in the future.

We hope you enjoy reading this newsletter and if you have any questions, please do not hesitate to contact us.

Happy 2009!

The editors
The Adult Clear Water Challenge took place on the 2nd of November. At 1.00 AM in the morning, Ryan de Jongh and Leon Pors started kayaking from the Marine Park Visitor Center at Carmabi Piscadera and paddled to Playa Piskado at Westpoint (40 km). From here Ryan continued his Challenge on a mountain bike and he biked from Playa Piskadó to the main entrance of the Christoffelpark (20 km). At the main entrance he left his bike behind and hiked all routes in the southern part of the park, including the green route, the orchid- and Zevenbergen trail. Last but not least: he climbed the mountain to collect a flag to celebrate the completion of the challenge (all hiking routes: 40 km).
The Kids Clear Water Challenge took place on the 25th of October. 3,000 kids, a large number of volunteers and Ryan the Jongh hiked the northern route of the Christoffelpark to give nature a voice and show everyone how important conservation is.
Carmabi held an “Open House” on Saturday November 29th to show the restyled Marine Park Visitors Center (MPVC) to the public. This former shop that opened last May will be expanded to a museum and the public got the opportunity to get acquainted with the progress and plans for the future.

When we arrived at Carmabi my heart started to pump faster; there were still things that needed to be done. Oops that’s right; I forgot to bring my jugs for the ice. So where can we put the ice, lets do some creative thinking. Well the ice ended up next to some dead fish back in the freezer of the lab. After solving that problem we got the Malibu bar from Hooks hut and we got the beer ready. At ten o’clock we welcomed the first guests; the boy and girl scouts, that were followed by numerous other people during the remainder of the day. Even a Belgium film crew showed up to shoot a piece on Carmabi! Mark gave lectures about reef ecology, Leon was in charge of the kayak tours, Karen entertained the kids, and Dolfi looked good in his wet suit leading the snorkel tours. And last but not least Tim and Robert (interns) took care of the most important seemingly location of the day; the bar. Another big success was the boat tour, during which people were taken out on the water to get a better impression of our coastline in all its beauty.

Looking back, we can tell we heard that everyone was very interested in the activities that Carmabi organized and the information we were able to give our visitors. Personally, I was very surprised to see the need that people have for activities like this, how they seem to crave information and someone to take care of their island. The day was closed with a cold beer and a good piece of meat. We got the BBQ warmed up, turned our party lights on, and finished the day with some nice salsa music.

Working with the enthusiast crew that day made me realize how lucky we all are being able to work with the same passion.

Hereby I want to thank everyone for their help during that day. I had a good time and I am sure our visitors did too.

Iris de Snaijer
(Semi-volunteer Marine Park Visitors Center)

About 60 persons visited the Open House of the Marine Park Visitor Center. All visitors got an introduction on the plans we have for the Visitor Center and all of them got the chance to give their first impressions and to make suggestions on possible activities and other items of interest for the Center. We collected this information by handing out evaluation forms. In general the basic impressions were good, although the lack of local food and/or snacks during the Open House definitely a disadvantage. All visitors expect the Center to become a center of information on the sea and its many riches and its endangerment. Activities like kayak trips, boat trips and snorkel trips were huge attractions which were regarded as a must do for everyone to get acquainted with the sea.
The signing of the first installment of Nafl. 265,900,- of the financing agreement for the SEI project: “Management Underwater park and Visitors center Curacao” took place in the Carmabi headquarters, on December 11th. Representatives of the government, USONA and Carmabi were present. The purpose of this project is to support Carmabi in the daily execution of activities that will benefit coral reef management and for the realization of a new management strategy for Curacao’s marine resources conform with the world-renowned model of Bonaire. The remainder of the amount (Nafl. 663,000,-) will be transferred after the authorities have implemented the preliminary design of the new law “Marine nature management and protection”.

Commissioner Anthony Godett, also commissioner of Carmabi, complimented Carmabi with the work done over the last few years and congratulated the foundation with this project. The damage storm Omar caused in the International Year of the Reef was a very prominent topic in his speech. The commissioner said that Omar has demonstrated once again how vulnerable our reefs are. Carmabi did a quick survey of the reefs after Omar, which indicated that there was a lot of damage. Unfortunately mankind has no control on damage by such natural disturbances, but could act in other areas to alleviate the impacts of natural disasters such as Omar. Considerable steps are thus required to limit detrimental human influences on Curacao’s reef systems and the new law will have to have the utmost priority with the authorities. Despite efforts of the Green Team, Carmabi and others, there is some delay in passing this law and we didn’t succeed to implement the law in 2008. Mr. Godett promised that in 2009 the case would be finished.

The board of Carmabi was represented by Mr. Erwin Koense, who is a member of the board on behalf of the islands’ authorities. In his speech he declared that he has known Carmabi very long and very well and he said that the foundation performs very well, is professional, honest and has been exemplary for decades. Moreover Carmabi takes the interests of the various stakeholders into good consideration, so there can be spoken of an actual balanced approach. Further he declared that Carmabi proved this in 2008 by standing up for the rights for the fishermen and by organizing a lot of activities for the public. Because of this Carmabi can count on a broad basis in the community and respect of the administrators. According to Koense, Carmabi is the undisputed trailblazer on the territory of coral reef management. The foundation must also get the formal role for the management “new style” on basis of the planned “dive tag”. The formula of the “dive tag”, which Carmabi helped to introduce on Bonaire with great success, must be “copy/paste” on Curacao. Participation of stakeholders is guaranteed by representation in the board and in commissions. He finished by emphasizing that implementation of the new law must be a priority for the
authorities. Koense said that he is certain about the fact that Carmabi would be the best choice for the execution of the coral reef management and that it will also be a guarantee for efficiency, effectiveness, professionalism, continuity and broad social participation in the management.

The budget of Carmabi was drastically shortened with more than Nafl. 670.000,- per year in 2006. According to a report of the ARNA 2007, the drastic reduction was totally contrary to proper administration. However under the present circumstances it is almost impossible for the foundation to function properly and execute the tasks is required to fullfill. The “dive tag” is therefore a crucial element for a productive way forward.

5 Important Bird Areas on Curacao

Together with regional experts, Carmabi compiled a list of ‘Important Bird Areas’ (IBA). 148 of the 770 bird species that appear in the Caribbean are endemic, meaning that they are only found at one location. Of these 148 endemics, 105 species are even limited to a single island. 54 species of the 148 endemic species are globally threatened, of which 12 very seriously. Most of these species are threatened because only 10% of their natural habitat still exists.

The book ‘Important Bird Areas of the Caribbean: key sites for conservation’, published by Birdlife International, is a milestone for bird protection in the region. Together with experts from the Caribbean region, the book describes 283 Important Bird Areas. These areas are important for protection and have been established based on international criteria and locally performed scientific studies. This Caribbean network remains threatened and 43% is not protected at all. Improved infrastructure and more personnel are needed to accomplish a higher level of protection of these areas. The number of IBAs varies from one in Bermuda and Saba, to 39 in the Bahamas. The variety in size ranges between 1 hectare and more then 500.000 hectare, like the Ciénaga de Zapata in Cuba.

Curacao currently harbors five Important Bird Areas: the North-East Curacao parks and coast IBA, Jan Thiel Lagoon IBA, Klein Curacao IBA, Malpais-Sint Michiel IBA and Muizenberg IBA.

Rotary Club Willemstad adopts rare trees

Members and fellows of the Rotary Club Willemstad planted fourteen rare trees in Pos Shimaron in the Christoffelpark on Sunday October 19th. This area has natural water holes that will provide the necessary moisture to ensure the survival of the new plants. With this generous contribution, the club supports the Carmabi “Adopt-a-Tree” project. The target of this project is to increase the abundance of rare and threatened trees and plants on Curacao and to restore them in protected areas. Establishing populations of rare trees and plants in different protected areas is one of the best strategies to ensure their survival for future generations. Carmabi is very grateful for Rotary Willemstad’s sponsoring of rare trees!
Waterfalls in Christoffelpark

The rainy season of 2008 started early, at the beginning of August, and the effect on the flora in the park was immediately visible. Many loyal park visitors were hoping for an ample amount of rainfall this year, to once again experience the wonders of waterfalls. It took a while, but finally, in November, it was waterfall time again. While not as spectacular as 4 years ago, but still the running water captivated visitors, locals and foreigners alike. It is not often that small rivers and waterfalls can be seen on the arid island of Curacao. The relatively short rainy season and high temperatures on the island make water drops evaporate, sometimes, even before they actually hit the ground. This season however the rains came with short intervals and often at night making it easier for the water to infuse the thirsty ground. All over the island so called rooi’s were filling up with water and the dams, especially on the West side of the island filled up to the maximum. Rooi Beroe, the largest dry riverbed in the park, fed by several smaller rooi’s in the proximity of Christoffel Mountain (375m), started running with a small flow of water by the end of October. And in the beginning of November finally the waterfalls at the foot of the mountain started falling.

Take a look at the pictures for an impression of the park during this rainy period.

Savonet Museum update

We are currently trying to focus our minds, but some of us are failing miserably. The reason? We are surrounded by the sounds of hammering, drilling and digging (and gossiping – those workers loudly discuss their entire lives and the ones of the neighbors), which can only be described as a good sign that work is progressing. Indeed, things are taking shape nicely. In the mean time progress has been made on the implementation of the “heart” of the museum itself. The implementation plan is on the table in its final form, so we know exactly what needs to be done to make it a reality. Naturally, Felix de Rooy and Rene Wissink have been contracted for the
implementation phase as well; one should not break up a perfect team! Another of our valuable contractors, Frank Fernando, is quite busy restoring the furniture, and is doing a wonderful job. He is quite an artist.

The next several months are destined for filming (both human history and nature), continuing work on the skeletal “show pieces”, tracing and collecting historical artifacts and documents, and the like.

Some interesting modifications and additions to the project have been planned as well. We got a green light for the implementation of a solar air conditioning system for the store house (magasina), in which the natural history part will be located. This system will be pretty innovative, right in line with the philosophy of the museum (educational, innovative, as green as possible). Unfortunately, at this time it will not be possible to invest in a complete “off the grid” system, using solar and wind energy, but this wish will not be forgotten.

Poor Alice has been kicked out of “her” front desk. In order to keep her happy, we build her a temporary dwelling. This strategy seems to have worked, because she is quite happy in her new environment. Everyone put effort in spicing up the place, and we all think it looks quite inviting. You can judge for yourself, either by taking a look at the picture, or even better: by just dropping in! Despite the restoration work the park is sparkling with activities. Don’t miss out!

Omar, the 15th tropical storm of the Atlantic season, passed Curacao on Tuesday 14 and Wednesday 15 October. Omar caused not only a lot of damage to the beaches and the beach infrastructure, but also to the coral reefs. Types of coral damage from the storm include sedimentation, scars from rolling rubble, breakage of colonies, tissue death and tissue bleaching. Any of these forms of stress may kill a coral.

A.O. Debrot dove and snorkeled on 17 October at eleven sites, up to 20 meters depth, between the Tula monument at Rif and Vaerssenbaai to make an initial assessment of the damage caused to the reef.

1. The damage to the reefs at depths up to 10 m amounts to an initial estimate of roughly 70% of colonies showing damage compared to 24% damage caused by Lenny.
2. The nature of the damage was more severe with ‘sandblasting’ of corals (removal of all tissue from the skeleton being the most prevalent of damage). With Lenny simple breakage and toppling were the principal damage forms. Most severely sandblasted reefs are for instance Vaerssenbaai and Boka St. Michiel where 100% were blasted at drop-off depths.
3. In the shallows principally the large head corals suffered toppling and rolling (Carmabi boei 2: west side Playa largu Klein Piscadera) and the plate and finger corals suffered massive

“Mustard Hill coral with sediment”
breakage (the wall, Blauwbaai: like a giant took a sledgehammer to all the colonies; like shattered glass). *Madracis mirabilis* finger corals which had recovered at the drop-off since Lenny have been totally scattered. Look like they have been bombed (Sonesta, Slangenbaai, Piscaderabaai).

4. Damage at depths beyond the drop-off was much less except at sites with artificial and replenished beaches. Here the damage included smothering of coral and benthic organisms along the reef slope due to sand originating from the artificial beaches (eg. West side of Blauw, Sonesta, Tula monument).

5. On the reef plateau sponges are almost absent sand gorgonians were absent or stripped of all tissue (entrance Piscaderabaai). At the east side of Blauwbaii dead sponges litter the sandblasted and smothered reef plateau near drop-off depths.

6. Piscivorous fishes such as *kalala*, *kapitan*, *bers*, *grastel*, *jaro* were unusually active in the second half of the morning (when they are generally resting) coming into the shallows to prey on small fishes that had lost their hiding places (all sites).

7. Predacious seabirds: pelicans, terns, boobies were very active during the height of the storm on Tuesday afternoon as the small fish living in the shallows were exhausted and disoriented by the pounding waves. Small dead reef fishes washed up on the beach of Carmabi.

8. In areas with coastal construction much fresh man-made material has been deposited on the reefs (e.g. litter, tires, bags, clothing building debris, e.g. mouth of Piscaderabaai, Monumento Tula).

9. Fortuitous sites with high live coral cover 80% were seen in the shallows (such as at Monumento Tula, Carmabi boei 3), where the high coverage of young head corals meant low abundance of loose material and few weak sandy spots. At these sites damage was much less. Ergo, the healthier the reef: the less damage.

In cooperation with three American universities (Smithsonian Marine Station at Fort Pierce, University of Maine and Florida State University) Carmabi recently published a paper that overviews all existing information on coral recruitment and the ecological processes that affect recruitment success. This rather lengthy paper will be published soon in the Proceedings from the Smithsonian’s Marine Science Symposium. The paper is titled “New perspectives on ecological mechanisms affecting coral recruitment on reefs”. Below follows a short overview of the main points of this paper.
Scientific Research

(recruitment) are processes that can control marine population dynamics. Although corals can reproduce clonally, recruitment resulting from sexual reproduction is the primary means of recolonization for most species and adds genetic variation to coral populations which may increase survival of a species. For this to occur, larval survival and recruitment is dependent on a sequence of three phases: 1) larval availability, which integrates gamete production, fertilization success and connectivity; 2) settlement ecology, which relates to larval condition and substrate selection behavior; and 3) post-settlement ecology including substrate-specific survival and growth. Larval supply to a reef depends on sequential processes of gamete production, fertilization success, and larval transport (i.e., larval dispersal and connectivity). Basic life history traits of corals can greatly influence the range of strategies that are used to ensure larval availability. Scleractinians have two main reproductive modes: brooding, where sperm are released into the water column and taken in by conspecifics for internal fertilization; and broadcast spawning, where both egg and sperm are released into the environment so that fertilization occurs externally, i.e. in the water column. A minority of reef building coral species worldwide are brooders, but brooding is the dominant reproductive mode found in the Caribbean. Brooders are typically smaller than spawning corals and have multiple planulating cycles per year as opposed to one or two cycles in broadcast spawners. Since broadcast spawners only have one or two planulating cycles a year, it is imperative that fertilization is successful. In any broadcast species, fertilization success is highly variable and largely depends upon the synchronization of gamete release and abundance of spawning adults. With increasing gamete age, fertilization success is reduced in conspecific crosses, but in the likelihood of interspecific fertilization increases. After gamete fertilization, developing planula larvae transport typically away from reproductive populations (called “dispersal”) and to reefs where they recruit (called “connectivity”). Larval survival during dispersal varies in response to a combination of hydrodynamic processes, larval energetics, predation pressure and water quality. Brooders generally settle within hours after release, while broadcast spawners have plank tonic period of 4-7 days before they are competent to settle and metamorphose. Recruitment rates must then equal or exceed rates of adult mortality to sustain a local population. As local and global threats continue to decrease coral cover it is likely that fewer coral larvae will be supplied to reefs that may or may not have appropriate settlement habitat. For corals the transitional stage from plank tonic planula larvae to sessile benthic juveniles involves a two step process of settlement and metamorphosis. Settlement is the behavioral response of a larva when it stops dispersal and selects substrate for recruitment. Metamorphosis includes the subsequent morphological and physiological changes that pelagic larvae undergo to become benthic juveniles. Settlement of coral larvae can be influenced by habitat qualities that facilitate or inhibit settlement and metamorphosis of larvae supplied to a reef. Experiences of early life stages

“Recruits of Acropora palmata surrounded by Dictyota sp.”

“A new recruit of Diploria sp. surrounded by Gelidiella, Jania, Dictyota, and the cyanobacterium Dichothrix sp.”

“Montastraea annularis overgrown by Halimeda sp.”
(i.e., depleted energy reserves, nutritional stress, environmental stressors, and pollutant exposure) have latent effects on later life stages in numerous marine larvae, including corals. Coral larvae possess a wide array of complex behaviors that allow them to enhance the likelihood of successful settlement, including but not limited to; sensitivity to light, depth and chemical cues. Coralline algae have been identified as a positive settlement cue for some corals, but it is unclear if the biofilms present on these algae or the algae themselves are responsible for the observed settlement behavior. Coral larval survival and settlement can be reduced by many environmental stresses such as elevated temperatures, variation in salinity, sedimentation, and UVB radiation.

Corals, and most benthic marine organisms, suffer high rates of mortality soon after settlement because they are small and vulnerable. Post-settlement processes from the time corals settle (i.e., attach to the benthos) to recruitment (i.e., survive to some later phase) determines much of coral demography. Coral recruits can die from a myriad of causes including chronic disturbances such as competition and predation and pulse disturbances such as bleaching and disease. However, the chronic disturbances probably drive most post-settlement mortality and thus are serious impediments to reef recovery. Caribbean reefs are a case in point, with incidences of recovery much lower than Indo-Pacific reefs as a result of setbacks from chronic disturbances. Algae, encrusting invertebrates, and sediment have all been shown to have deleterious effects on newly settled corals. Settling corals, with limited stores of energy to invest in competitive interactions, are particularly vulnerable when faced with a well-developed benthic community structure and limited space. In cryptic habitats, newly settled corals are likely to lose out by overgrowth of fast growing heterotrophic groups such as sponges, bryozoans, and bivalves. Areas of high algal biomass are known to be poor nursery habitats for settling corals. There are several mechanisms by which algae may be deleterious to corals. Algae may interfere with larval settlement by simply preempting available settlement space. More direct physical interactions including algal shading, abrasion, or basal encroachment can result in reduced coral growth or increased mortality, chemically induced mortality or the increased biomass of fleshy algae actually functioning as a reservoir for coral pathogens. Most recently, enhanced microbial activity caused by algal exudates has been proposed as a mechanism of competition. Several authors have now shown that elevated levels of dissolved organic carbon, which can occur in areas of high algal biomass, increased the growth rate of microbes living on the outer layer of corals.

In conclusion, coral mortality has increased in recent decades making coral recruitment more important than ever before in sustaining coral reef ecosystems and contributing to their resilience. Larval availability, settlement and post-settlement ecology are necessary for coral recruitment and ultimately maintenance or recovery of coral reef ecosystems. Most coral planulae available for recruitment are probably from relatively...
local reproduction and relatively short-distance connectivity. As adult coral abundance declines, both fertilization success and the effective dispersal distance of corals will decline as well. Physiological stress on reproducing corals might also result in fewer and possibly weaker coral larvae. In the vicinity of a coral reef, settling corals respond to a hierarchy of environmental cues in both the water and from the reef. Crustose coralline algae can facilitate coral settlement, but disturbingly, this group of algae is becoming rarer on coral reefs as macro algae become increasingly dominant. Macro algae are known inhibitors of settlement which may be due to their ability to rapidly occupy settlement habitat, their suite of secondary metabolites, their microbial communities, or a combination of some or all of these mechanisms. Macro algal cover on coral reefs continues to increase world-wide, resulting from declines in herbivory and input of nutrients. Globally, many Indo-Pacific reefs have higher rates of settlement, recruitment and recovery from disturbances. This could be the result of higher biodiversity in the region. In contrast, Caribbean reefs may have evolved a strategy of low recruitment and considerable clonally growth, with low post-settlement mortality. Unfortunately, that strategy may be ineffective in the future given the global climate trajectory of higher ocean temperatures, acidification, and greater disturbance from tropical storms.

Research at Carmabi: 2008 in a nut-shell

The second half of 2008 has certainly been a productive one. Forty-seven researchers from twelve different universities and institutions, mostly from the United States, visited Carmabi for a variety of terrestrial and marine focused research projects. The average occupancy rate for Carmabi was hence a little less than 50% for this period. Unfortunately Carmabi, like many other places on the island, was hit by Dengue in October/November which caused various visitors to spend some of their time in bed. Most studies focused on reefs, including deepwater corals, social crustaceans living in sponges, species distributions whereas the number of researchers searching for biologically active compounds has once again increased. These compounds will later be tested for potential medical use (Dengue maybe). Another major event comprised tropical storm Omar that hit the island on the night of October 15th. Carmabi was hit pretty severely: the pier collapsed, the pump-system broke down and many of the roofs were blown off. Research activities were put on hold after this event for 1-2 weeks. Most of the storm’s damage was repaired by November and at present Carmabi looks like it looked pre-Omar. Hopefully the productive atmosphere will be continued in 2009. So far, three universities will teach their field courses at Carmabi, the first visiting researchers for 2009 have shown up and reservations are coming in everyday. For further information on research that took place at Carmabi in the second half of 2008, we recommend Carmabi’s Annual Report that will soon appear on its website.