

Zwazo

An underwater photograph of a coral reef. The central focus is a large, intricate piece of branching coral, possibly a sea fan, with a color gradient from light blue to yellow. Numerous small, colorful fish, including orange and red ones, are swimming around the coral. The background is a deep blue, with sunlight filtering down from the top right corner.

Number 22 Seychelles conservation magazine

Tackling **Climate Change**



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Zwazo

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Zwazo

Zwazo is produced biannually by Nature Seychelles, a non-profit, non-governmental organization that has worked in conservation in Seychelles since 1998. Its primary objective is to improve the conservation of biodiversity through science, education, awareness and training programmes. To achieve this we are dependent on voluntary support and funding. If you would like to help this work, please contact us at the address below.

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Special Reserve corals and fish

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A word from the **FRONT LINES**



Climate Change: It's not all Doom and Gloom

It's difficult to talk about climate change without a touch of desperation. The news we hear is grim. From failed talks, to extreme warming events in our seas, species in danger, floods, droughts and crop failures. The world is indeed in peril.

But slowly this harsh reality is beginning to be tempered with stories of hope. We hear now about activities to mitigate and adapt to climate change.

The end of year even came with a ray of light from the climate talks in Cancún, Mexico. For although progress was not made on emissions reductions, there was still enough steps forward to warrant optimism for the next round of talks in South Africa. These talks it is hoped will finally nail down a globally binding agreement on long term actions to address climate change.

Outcomes from Cancún such as REDD+, which is a deal to protect tropical forests, the Cancún Adaptation Framework, which was established to enhance action in adaptation, and financing adaptation and mitigation through the establishment of the Green Climate Fund, were widely applauded.

With regards to biodiversity and climate change, many steps are being taken at home and in the region to help species and ecosystems respond to climate change. We bring you some of these stories.

Some of them have been engineered by ourselves such as the project to re-stock dead corals in selected sites in Seychelles and to make the nature reserve we manage carbon neutral. We hope these steps will inspire others to respond with more action.

Concern has also been raised about the effects of climate change and its impacts food security in the Seychelles. We highlight Seychelles response in this issue.

As always we have news of the association, which has been very active in this latter part of the year. We are as ever happy to hear your feedback; on climate change, the subject of this issue and other matters concerning our environment.

May we also take this opportunity to thank our advertisers without whom this publication would be difficult to realise and all our contributors who have faithfully kept up their writing on important subjects.

Nirmal Shah

Project to save reefs from Climate Change launched



“Over the past years people just kept on talking about coral bleaching. We decided to do something about it”

A historic grant agreement has been signed by the US Agency for International Development (USAID) and Nature Seychelles through which corals affected by climate change in selected sites in the Seychelles will be restored. Through this agreement USAID will provide financial support to a project called *Reef Rescuers - Restoring Coral Reefs in the Face of Climate Change*, which will be implemented by Nature Seychelles.

The agreement was signed by the US Ambassador to the Seychelles Mary Jo Wills and Nirmal Shah, Nature Seychelles CEO. Present at the signing was Seychelles Minister for Investment, Natural Resources & Industry, Peter Sinon, principal secretary for Foreign Affairs Maurice Loustau-Lalanne, and government and civil society representatives.

The project is part of the United States strategic global commitments to partner with governments, civil society organizations and other relevant stakeholders to address the impacts of climate change.

“The United States is actively

engaged in the mitigation of climate change.” Ambassador Wills said.

“President Obama announced in Copenhagen that the US would provide funds to developing countries to assist them in meeting climate change mitigation goals. The US partnership with Nature Seychelles on coral reef restoration is proof that small island states can access climate change mitigation pledges made by the US at Copenhagen.”

“We believe that both public and private entities must act now to halt continuing degradation in all island countries and coastal regions of the world. We also believe that a historic opportunity is at hand in the Indian ocean, with Nature Seychelles, to make positive and lasting changes in the way we manage, restore and rescue our reef resources including fisheries resources and coral reefs upon which fisheries depend.”

Minister Sinon hailed the project saying there is great and immediate need to seriously consider climate change mitigation and adaptation measures.

“Whilst our reefs continue to act as our first line of defence from rising ocean levels that threaten to erode our shores, they remain the most important habitats and spawning grounds for our main protein and daily diet - our fish supply.” He said.

Corals of a variety of species will be grown and then planted on selected sites. While growing, they will be protected from predators and other disturbances. The project will also bring in participants from Seychelles and several countries of the region.

“Over the past years people just kept on talking about coral bleaching. We decided to do something about it and use our skills and experience in restoring ecosystems on land and in saving rare birds and do the same under the sea.” Says Nirmal Shah, Nature Seychelles Chief Executive.

Photo: Ambassador Wills and Nirmal Shah (Seychelles Nation)

Cousin: World's first carbon neutral nature reserve



Cousin Island Special Reserve is carbon neutral. Cousin's status was launched in September at the opening ceremony of Tourism Expo 2010 held in Victoria to celebrate tourism and biodiversity during World Tourism Day and week. Present was Seychelles President James Alix Michel, who was the first to congratulate Nature Seychelles for this achievement and British High Commissioner Mr.

Matthew Forbes. The British Embassy funded the carbon assessment.

Nature Seychelles took the decision to make the reserve carbon neutral to reduce the carbon footprint of visitors to the island. Most visitors to the Seychelles arrive here by air, which contributes to green house gases emissions. (See full story on page 23)

And also congratulating Nature Seychelles, Alain St. Ange Chief Executive of the Seychelles Tourism Board said, "As custodians of the tourism industry and the beauty of Seychelles, which is what we have to sell to the world, we are thankful to Nature Seychelles and

Cousin for the effort they have put in." While Mr. Bernard Elizabeth, the Chair of LUNGOS, the national platform for civil society said, "On behalf of the LUNGOS family and myself, I wish to congratulate you for this first in the Seychelles and the world. Nature Seychelles' achievement is a testimony of the capacity of NGOs and civil society in general to embark on high value-added projects for the benefit of society and humankind."

The move also received regional and international approval.

"On behalf of COMESA I congratulate Seychelles for dedicating one of its islands as a Special Reserve and becoming the world's first carbon neutral reserve."

Mr. Sindiso Ngwenya COMESA's Secretary General said at a ceremony in Lusaka when accepting the letters of credentials for Amb. Joseph Nourrice Seychelles Permanent Representative to COMESA.

Nature Seychelles, which was also an exhibitor at the Tourism Expo, used this occasion to provide information on the carbon management process to visitors and the public.

Photo: (L to R) Mr. Barry Faure, Mr. Matthew Forbes, President James Michel, Dr. Nirmal Shah and Mr. Alain St. Ange after the launch.

Species Champion in campaign to save rare bird



The Seychelles paradise flycatcher (Vev) is the only Critically Endangered bird of the Seychelles due to its tiny population and extremely small range. But conservation action has resulted in the steady increase in its population in recent years and its range has been enlarged after a successful translocation to Denis Island. Further conservation action will help take it off the critical list.

Now, Viking Optical, a leading UK importer and distributor of high quality optical equipment have become "Species Champion" for the Vev to provide support to this work.

Species champions are a growing community of active conservationists who generously support BirdLife (Nature Seychelles is BirdLife in Seychelles) by providing vital funding and publicity that enables work to be undertaken to prevent the extinction of the world's most threatened birds. Apart from contributing financial support to conservation efforts, they draw attention to the plight of the species they champion.

Viking Optical are already supporting a new advocacy and education project to help protect the species in its stronghold on La Digue.

During a visit to the Seychelles recently, Viking donated high-powered binoculars for the bird's monitoring. The binoculars were handed over to Nature Seychelles at its headquarters by the company's Managing Director Richard Bonnet.

"We looked at the current status of all endangered species which so far did not have a champion and decided that the Seychelles paradise flycatcher would benefit the most from our financial support." Said Bonnet.

"We are therefore delighted to be able to donate funds to this project and also to present the project with binoculars for fieldwork use."

Viking have also begun a publicity and branding campaign to attract further financial support.

Tim Strivens, a representative of the company, explained that one of the most important things they are



doing as species champion is to get the message out about the work being done to save these birds.

"So with every single product that we sell we attach a leaflet that talks about the paradise flycatcher and the importance of preventing extinctions." Strivens said.

The leaflets have tiny badges representing the bird attached. The badges are in addition sold separately to earn extra income for conservation work and Viking products have stickers of the Vev. Viking has placed advertisements on the internet and is developing more promotional material for its campaign.

Viking has a long history of cooperation with conservation bodies in the UK such as the Royal Society for the Protection of Birds (RSPB).

"We are pleased to have them as species champion." Nirmal Shah, Nature Seychelles Chief Executive said.

Photos: Top - Viking's Tim Strivens and Nirmal Shah admire the new binoculars. Above - Sample of Viking's leaflets.

Small Grants Programme supports Turtles and Climate Change

Nature Seychelles has signed a grant agreement with the Small Grants Programme - SGP (funded by the Global Environment Facility and implemented by the United Nations Development Programme) to look at the effects of climate change on Hawksbill Turtles. The agreement was signed in August 2010 at the scenic Botanical Gardens in Mahe, on the occasion of the launch of the SGP in the Seychelles. SGP started in 2009 in Seychelles and focuses on empowering communities to tackle conservation issues at the local level.

"I extend congratulations to the first Seychellois Grantees here with us today in joining the global SGP Family," said the UNDP's Resident Representative Leyla Tegmo-Reddy on launching the programme and signing agreements. "I look forward to visiting your projects under implementation in my future missions to your beautiful country." Mr. Bernard Solomon, Nature Seychelles administration and operations manager signed on behalf of the organization.

"The SGP supports initiatives which are community-based, are innovative, and gender sensitive, and also lead to reduced threats to the local and global environment," says Veronique Bonnelame, the SGP National Coordinator.



Photo: Bernard Solomon and Ms. Leyla Tegmo-Reddy

Nature Seychelles Turtle project seeks to lessen the effects of climate change on nesting Hawksbill turtles on Cousin Island (see story on page 30).

Environmentalism at economic forum



Nirmal Shah (left) was one of the speakers at the sixth edition of the Economic Forum of the Indian Ocean Island States held in Seychelles from 19-21 October 2010. Shah delivered a plenary presentation on sustainable development and tourism in Seychelles. The forum, which draws participation from Seychelles, Mauritius, Reunion, Madagascar, Mayotte and Comoros, provides a platform to exchange ideas, address economic issues affecting the region and promote public-private sector partnerships in the region. Themes addressed at the forum were regional and commercial integration, a tourism label for the Indian Ocean States, and sustainable regional co-development.



Heritage Garden inspires



Roche Caiman (Nature Seychelles headquarters) after a visit in 2009. When plans got underway to start this garden, Lucina, Nature Seychelles horticulturalist, visited the home where she helped to identify various plants for the garden and gave advice on planting and care.

In the few months since the garden has started being used, caregivers say, it has become apparent that this space serves several other functions, and because of its popularity more people are coming out from their rooms into the fresh air. The range of activities that take place in the garden have expanded from just gardening to include a regular group of domino players, several craft activities like mat and broom making as well as more quieter ones such as just being with others or reading magazines.

Photo: Dr. Athanasius with Dr. B. Valentin, Nirmal Shah and Lucina Denis.

On the occasion of the international day for the elderly, a therapeutic garden, which draws its inspiration from the Heritage Garden at Roche Caiman was opened at the Regional Home for the elderly at North East Point, by Dr. Erna Athanasius, the Minister for Health.

The therapeutic garden is a result of effort put in by some residents of the home and their caregivers, and was inspired by the Heritage Garden at

Recruiting a new generation of conservationists



On Thursday 23rd of September, a talk organized by Nature Seychelles was given at the Maritime Training Centre (MTC) by Cousin Island Special Reserve Warden Jakawan Hoareau, a former student of the school, to Fisheries Science year 2 students, comprising of 13 trainees. Its aim was to enthuse the students about conservation particularly on Cousin Island and to tell them about job opportunities on offer. Most of the trainees had no previous knowledge of conservation and ecotourism activities on Cousin and

were extremely keen to gather new knowledge.

Positive feedback was received after the talk. Three weeks later, there was a follow-up field trip to Cousin by the MTC, and three trainees joined Cousin staff for their final work attachment before they finish their course and graduate in 2011. "We anticipate that this newly established partnership between the MTC and Nature Seychelles will be ongoing and will continue to flourish." Said Bernard Solomon, Nature Seychelles' Administration Manager.

Nature Seychelles also participated at an exhibition set up as part of World Maritime Day activities at the MTC. The day was established to focus people's attention on the importance of shipping safety, maritime security and the marine environment. Nature Seychelles used this opportunity to showcase its work and to encourage public participation through volunteering and careers in conservation.

Photo: Jakawan and students at the Nature Seychelles stand at the MTC

Capturing nature

Photographers Jean Phillippe Vantighem and Herve Chelle were recently in the Seychelles to help grow Nature Seychelles' photographic database of key species of Seychelles particularly those found on Cousin Island. JP and Herve work for the NGO Le Sternes, which provides photography expertise to protected areas. It's their way of doing something practical for nature, they say. They do this voluntarily. They have previously worked with national parks in France. JP and Herve who also visited La Digue to photograph the paradise flycatcher, and were on Mahe for the Scops Owl and Sheath tailed bat, said they were impressed with Cousin, and took the opportunity to acknowledge the people who started it and those who continue to work for it.



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Reaching out to the young



The Centre for Education and Environment, Nature Seychelles headquarters, and the adjacent wetland and Heritage Garden continue to be popular with students. During this latter part of the year, teachers from adjacent schools as well as further afield have organized trips for outdoor classes with children ranging from early childhood to secondary school. Teachers use these classes to compliment the formal curriculum that their students are following.

The first stop for children and their teachers is usually the centre itself. Here, colourful murals of the fauna and flora of Seychelles painted by Seychellois artist Philip Mousbe, and displays of the organization's work, are a centre of attraction. Children are delighted to learn about and identify animals and plants on the murals.

In the garden, children and visitors are shown medicinal plants and herbs, indigenous and native trees, and traditional foods. They crush and smell exotic herbs. They ask questions about what they see.

Then there is a visit to the wetland, where activities like pond dipping, are enjoyed with much squealing! The children learn about different pond creatures that exist in Seychelles and also about their conservation. And finally, through bird watching at the bird hide, children are taught to appreciate birds. Binoculars are used and the children make extra effort to curb their enthusiasm so as not to disturb the birds.

Action for Conservation and Teaching, Seychelles (ACTS)



A website that provides information, materials and tools that can be used and downloaded for free by environmental educators, students, and others has been set up by Nature Seychelles. The Action for Conservation and Teaching, Seychelles (ACTS) website is part of an Africa-wide project by BirdLife International started to provide access to environmental information to African children. The project: *Linking African children to the global conservation community – for the benefit of nature and people* is funded by the Jensen Foundation and coordinated by BirdLife. It aims to link up almost 400,000 African children, members of wildlife clubs, with each other and the rest of the world. The website contains audio material featuring radio programmes, videos, publication and posters by Nature Seychelles and others, particularly on birds and other species. Apart from downloading all the materials, the website has social bookmarking for popular sites like Digg, Delicious and Facebook to increase opportunities for sharing items for those on social networks.

See: <http://education.natureseychelles.org>



Reflecting Paradise: Nature Seychelles Green Health Programme

Does nature affect our health, our well being, our happiness and if it does to what degree? In what ways? Does it differ for different people and can we increase the benefits it may bring?

Studies show that nature has huge positive benefits for people. Simply walking in natural surroundings can be beneficial. Researchers at the University of Michigan (UoM) found that walking in a park in any season, or even viewing pictures of nature, can help improve memory and attention. Psychology researchers Marc Berman, John Jonides and Stephen Kaplan at UoM found memory performance and attention spans improved by 20 percent after people spent only one hour interacting with nature.

These researchers believe the findings could have broader impact on helping people who may be suffering from mental fatigue. The researchers believe that people are far more likely to be satisfied with their lives when their environment supports three basic needs: the ability to understand and explore; to feel they make a difference;

and to feel competent and effective.

Groundbreaking research by Professor Jules Pretty of the University of Essex shows that exercising in nature has huge individual and social benefits. Ninety percent of those participating showed increased self esteem. Seventy one percent reported decreased levels of anxiety and the same percentage said they felt less tense.

Now based on this and other researches, Nature Seychelles has begun a programme to help people interact with nature while also participating in activities that help nature. We hope to make a new and valuable contribution to the well being of society by reconnecting people with themselves and with nature. The programme aims specifically to make use of our surroundings here at Nature Seychelles, the Heritage Garden, and the wetland, Sanctuary at Roche Caiman, as well as the beautiful nature that surrounds us in Mahe.

Robin Hanson, a Yoga teacher who was also a Manager of a Nature Reserve and RAMSAR site in the UK, is

running the programme. Zwazo put to Robin a number of questions about the programme. And this is what he said:

"We never really consciously think about the benefits of nature. How would your health be if you didn't have all the vitamins and minerals your body needs? Good food found throughout nature is essential for good health. But there is more to nature.

If nature has ever inspired a sense of wonder or awe in you, brought you calm or joy, then you know what am talking about. Studies have shown that walking or outdoor activities for as little as twenty minutes a day can reduce stress, depression, anxiety and increase self esteem to mention just a few of the benefits.

This is really the basis of the programme - it will give people the opportunity explore every aspect of their well being while appreciating and giving back to nature.

The programme combines yoga and fitness in natural surroundings, with conservation activities. We are using nature as the pivot for all activities. The Sanctuary and Heritage Garden have developed through the help of people and they still need continued support. Through the Green Health Programme people will be able to keep fit while exploring new areas of the Reserve and improving it for the wildlife and all the visitors to come. They will finish fitter and stronger with a sense of well being knowing that they have aided in something good and others will reap the benefits of their work.

Already one activity has been started and that is yoga. Some of the well known benefits of yoga are being calmer, more relaxed, improving concentration as well as physically becoming stronger and more flexible. We have had a great response to our sessions. Many people who have walked through our door are saying they were not aware something so beautiful existed here. During the sessions, people are encouraged to become aware of the sounds of nature around them, feel the breeze against their skin, open their eyes and take in the majesty of the mountains before them.

A further benefit to the project is the purpose built Nature X centre making a perfect setting for sessions such as these and future activities. The high roof and nearby trees gently shade the activity area, alongside fish swim in the open pool of the wetland.

We aim to introduce in the very near future activities in our Heritage Garden. Here people can learn about gardening - from sowing seeds to harvesting, natural remedies and healthy diets. We also aim to introduce walks and other outdoor activities.

I have never been in a country so conducive to exploring the health benefits of nature before coming to the Seychelles. Here at Nature Seychelles we are bringing all these different elements together through the Green Health Programme and its benefits will be as diverse and rich as the country itself."



Photo: Nature Seychelles member Larissa Young at the Sanctuary at Roche Caiman

Spotlight on Volunteerism



Chris Magin, the Country Program Director of four African countries - Uganda, Zimbabwe, South Africa and Seychelles - at the Royal Society for the Protection of Birds (RSPB) made his first visit to the Seychelles in October.

During his visit he met with Nature Seychelles management and staff, and also visited Cousin Island. RSPB is a valued partner of Nature Seychelles, which it supports through a volunteer programme that Magin is in charge of.

For the past 3 years, the RSPB has been sending volunteers to work with Nature Seychelles, mainly on Cousin. Two volunteers are sent every three months. They bring with them different skills that are put to use in conservation and eco-tourism. Volunteer positions are advertised on the RSPB website.

The volunteers have provided good feedback of their Seychelles experience. They feel they have made a positive contribution to conservation (See Lindsey Zhao's Cousin Experience below).

Does this have anything to do with the beautiful destination that is Seychelles?

"Cousin isn't exactly a luxury resort - there are plenty of mosquitoes and flying cockroaches in the hair." Magin jokes. "Seychelles is of course magnificent and Cousin is no exception. But above all, the time spent here with the wardens is about what contribution the volunteers can make."

"Collaborations with our international partners, such as the RSPB, are at the core of conservation. Without these invaluable partnerships, successes with birds such as the flycatcher and warblers would not have been recorded." Nirmal Shah, Nature Seychelles Chief Executive says.

My Cousin Experience: Lindsey Zhao, April-July 2010



My three months of volunteering on Cousin Island exceeded all my expectations. By the end of my three months stay, Cousin became my home in every sense of the word.

The opportunity for me to volunteer arose after I had been admitted to medical school in the US and was scheduled to start in August of 2010. While I never had much experience with or exposure to nature conservation as a field, from an early age animals and birds, and particularly marine life had always fascinated me.

As a volunteer on Cousin Island, I assisted the wardens and the researchers with their island conservation efforts, which included monitoring the island's biodiversity and ecotourism. In the beginning, the majority of my time was dedicated to working with the island's wardens. The mornings were taken up by the island's very successful

ecotourism program. My work involved pushing boats to transfer the tourists to and from the island and giving guided tours to showcase Cousin's magnificent flora and fauna.

On my first morning of pushing boats, I remember thinking that I couldn't believe I had spent the last two years of my life sitting in an office cubicle when there was this whole other world available to me.

In the afternoons after the tourists were gone, we focused on conservation efforts and island maintenance. These activities included bird monitoring (mostly of the magpie robins), raking the paths, cleaning the beach, maintenance of the boats, and removing invasive species. I also participated in a bird census with Gareth, a Masters student, for one month. I really enjoyed all of these activities and learned a lot about the flora and fauna of Cousin. It gave me a newfound appreciation for nature and our environment.

My experience on Cousin would not have been the same without the wardens, who I am proud now to call my good friends. During my first week on Cousin, amidst meeting all the wardens and researchers and learning about their extensive experience in nature conservation work, I felt intimidated and unsure about how much I would be able to contribute to the island's conservation efforts. At the same time, however, I was inspired by their genuine passion and dedication to preserving the island's biodiversity. Working closely with them also introduced me to "island culture" and opened my eyes to an entirely different lifestyle than what I had been accustomed to back in the US. It was truly a learning experience in every aspect.

Photos: Top - an international volunteer leads a tour Left - Lindsey (R) with cousin wardens Annesa and J'elle and conservation officer Mary

Magpie Robin: the success story continues



Cousin Island's Seychelles Magpie Robin population now stands at 42. The population is also using all the ten territories of the Magpie robin on Cousin, and there is a dominant male and female in nine out of ten territories.

This is welcome news as Seychelles Magpie Robins are highly territorial and largely monogamous. So having a dominant male and female in these territories, and each territory occupied is good for reproduction.

This is one of the endemic species in the Seychelles that is highly managed. Data on every individual in the population is maintained and data on breeding and social status kept. All individuals in the population are identified by unique coloured rings. All birds are ringed as soon as they fledged.

The world's population of Seychelles Magpie Robins

lives on five islands. Between the 1950s and 1990s, the whole world population was restricted to Frégate Island and came very close to extinction. A recovery programme in the 1990s saved the species. The population when the program started in the 1990s was 23 birds and today it stands at a minimum of 207 birds.

The Seychelles Magpie Recovery Team (SMART) - a participatory stakeholder group coordinated by Nature Seychelles and comprising island owners and managers and the Department of Environment - harmonizes current conservation and management of the species.

Photos: Main - Cousin warden Jakawan checks on a magpie nest box (Peter Chadwick) Inset - Seychelles Magpie Robin (Martjin Hammers)

Seabird monitoring on track



Photo: Fairy tern chick (Martjin Hammers)

The seabird breeding population census of five of Cousin's seabird species - White-tailed Tropicbird, White Tern, Lesser Noddy, Brown Noddy and Audobon's Shearwater was commenced in July during the breeding season. The yearly census is conducted to establish long term trends in seabird populations that also can provide general and specific insights into other biodiversity as well as vital parts of the natural environment such as the ocean.

The seabird programme for Nature Seychelles involves a monitoring regime, which documents populations of seven species. This involves annual censuses (to determine long-term trends) and monitoring of breeding performance (survival of eggs and chicks, chick growth and fledgling size). Regular monitoring provides an early warning of troubled populations, the effects of other species in the ecosystem, human disturbance, invasive alien species and climatic changes. On the flip side, monitoring helps to show when things are going well.



Research explains warbler infidelity

Why does female infidelity occur so frequently throughout the animal kingdom? A 10-year study from the University of East Anglia seems to have an answer. It shows that Seychelles warblers (Timelz Dezil) may increase their offspring's survival through their infidelity.

Although in many animals females may pair up with a specific 'Social' mate who helps raise the pairs' offspring, DNA fingerprinting studies across a wide range of animals reveals that offspring may often be sired by other males.

What has perplexed scientist is why females engage in such infidelity – what is the benefit of being fertilised by these other males – males which do not contribute towards raising the offspring.

Despite being apparently monogamous and pairing with the same male for life, female Seychelles warblers often prefer to be fertilised by other males, and this appears to increase the genetic quality of their offspring.

The study has shown that these extra-pair fertilisations can result in a higher diversity of specific genes which detect disease and trigger an immune response in offspring. As a consequence, the offspring survive longer probably as a result of having greater resistance to a wider range of diseases.

The research 'MHC-dependent

survival in a wild population: evidence for hidden genetic benefits gained through extra-pair fertilisations' has been led by Dr David Richardson (UEA) and is published in the *Molecular Ecology* journal. It was conducted with the University of Sheffield, the University of Groningen and Nature Seychelles and used the warbler population on Cousin Island.

Since 1997 more than 97 per cent of warblers on Cousin were ringed, blood sampled, and their breeding attempts followed. The researchers monitored the fate of 160 birds hatched on the island between 1997 and 1999, over 10 years.

They found that females paired to males with a low diversity of disease-detecting genes (known as major histocompatibility complex or MHC) elevate gene diversity of their offspring by gaining extra-pair fertilisations from males with higher diversity. This extra pair fertility was found to be common – accounting for 40 per cent of offspring.

Importantly, the offspring born as a result of this female infidelity have higher genetic diversity at these disease-detecting genes than they would have had if sired by the cuckolded pair male.

However they were not found to be higher than the population average.

The researchers then found a positive association between diversity of MHC genes and juvenile survival. A higher than median MHC diversity was

found to increase lifespan more than two-fold.

Dr Richardson said: "We first tested whether extra-pair offspring have a survival advantage compared to within-pair offspring. Then we tested whether there are genetic benefits to the patterns of the MHC-dependent extra-pair fertilisations observed in this species."

"We did not find any evidence for genetic benefits of extra-pair fertilisations per se, as on average extra-and within-pair offspring survived equally well.

"However, by not being faithful to a pair male with low MHC diversity, females are ensuring that their offspring do not end up with below average levels of MHC diversity and therefore lower survival.

"We have shown that the association between survival and MHC diversity levelled off with increasing diversity, so choosing males with above average MHC diversity would not have resulted in any additional fitness benefits for the offspring."

"One thing that remains unknown however, is what mechanism drives the patterns of MHC-dependent extra-pair mate choice. Experiments are needed to determine whether females actively choose more diverse MHC males or whether other factors like male-male competition or sperm competition play a role."

Seychelles Warbler (Cas Eikenaar)

Turtle Rush Hour



The now famous Hawksbill turtle nesting season was a little delayed this year. Way into what is normally considered turtle season, only a few females had made the annual stop over - traversing beaches to their favourite spots to lay their eggs. There was the usual speculation as to the cause of the delay. Whatever the cause, suddenly, midway into the normal turtle nesting season the turtles came in. It was turtle rush hour on Cousin Island Special Reserve.

During this time Mary, the Science Officer in charge of Cousin's long-established turtle monitoring programme increased turtle patrols to 7 per day; starting them early in the morning with 2 hour-intervals in between.

Turtle patrols require people to regularly walk across nesting beaches in order to collect data. Turtles coming in to nest are intercepted, and data - size of carapace and tracks, and tag numbers - is collected. Additionally, nest locations are marked and tags applied on new turtles. When turtles are not seen, their nests are located and recorded using the tracks they leave behind.

"As you can imagine this is a labour-intensive and time consuming exercise. It can take as long as two hours to collect data on one turtle, as one should not disturb a turtle when it emerges. They could be distracted and head back to sea without nesting. It's also common for turtles to dig several nests before they lay. We collect data only while they are laying and they become calm and relaxed." Says Mary.

Fortunately, in addition to the Cousin Wardens, we had volunteers who helped in the patrols.

The volunteers receive training on how to conduct patrols and data collection. In the beginning they are



assigned an experienced person to go on patrol with. Eventually, as they gain confidence, they are allowed to go in pairs.

But track signs and nest can be difficult to interpret even for the very skilled person. The only way one can really confirm the presence or absence of eggs is at laying and when a nest is excavated. Nest excavation is avoided to discourage predation particularly from crabs. For this reason in addition Mary is also assessing the percentage of error in the turtle patrols.

The Cousin Turtle Monitoring Program has been running since 1972 and is the world's longest running monitoring program for hawksbill turtles.

Photos: Main - Taking carapace measurements (Peter Chadwick) Inset - Warden J'elle collects data with Dorothy, a student volunteer (Liz Mwambui)

Turtles, Tortoises and Torti:

a voluntary week on Cousin Island, Sarah Bunce

I've just returned from a wonderful week on Cousin Island where the boat ride up onto the beach is just beginning of the rush of things to do and see as a volunteer.

As the Hawksbill sea turtle egg laying season is just peaking my friend and I were able to lend some hands to the sea turtle monitoring programme. Cousin Island Special reserve has been collecting data about sea turtles since 1972 so Gilles-David Derand, the Nature Seychelles Science Coordinator from Mahé, showed us the ropes of this well established programme.

We had a bit of time to settle into our digs and meet the 3 students from the Seychelles Maritime School who are on Cousin for a month of work experience before their graduation; plus a volunteer from the Royal Society for the Protection of Birds, UK. It was a fun group of young women living away from home for the first time and generally enjoying one another's company.

Then it was off to find turtles on our first patrol. As hoped, the turtles were out and about. I had the great pleasure of watching the process from body pitting to returning to the sea. During body pitting the turtle settled herself into the sand, under some vegetation for shade, by using her front flippers and body to create an impression of her body while clearing away the surface leaf litter. Once she seemed comfortable, she started to dig the egg chamber. This fascinating process involves the use of her back flippers in a highly agile and manipulative way. She is able to create a long scoop with her flipper to dig sand from as deep as 60cm. It looks like she scoops the sand up with one flipper dumps it and then pushes it away with the other flipper. Alternating flippers she achieved her goal. Between sessions of flying sand there were lovely pauses when she seemed to catch her breath and worked up her resources to recommence the dig.

Then, the laying began, peering down into the depths; I could see the light yellow ping pong ball size eggs dropping into the chamber. Again there were little pauses in the process, when she would raise her head a bit and seem to take a deep breath before more eggs would drop. After about 45 minutes she was finished with the hard part. Now she pushed the sand over the eggs and proceeded to gently pat the mound under which her babies would incubate

for the next 65 days, again with her rear flippers. Finally, she camouflaged the mound and nest to prevent the ghost crabs or other predators from digging up the eggs for supper. Camouflaging seemed to involve a lot of flying sand and generally stirring up the surface near the nest to spread vegetation. She created a clear crescent with her front flippers maybe to infer the nest was located a bit further away.

Observing this first 3 hour nesting event, the process seemed clear to me, however I was to learn that it isn't always that simple. If you do not actually see the turtle, the process can be a bit more complex. The tracks are generally visible for a tide cycle so 2 or 3 patrols were conducted between high tides to reduce the number of turtles and tracks we missed since the aim is to record as close to 100% of turtles as possible. So, on numerous occasions we found tracks but no turtle as the expectant mother had already been up the beach, body pitted, dug, laid and returned to the sea or any combination of these activities without us seeing her. Sometimes the tracks were clear and the nest mound and camouflaging gave away the secret hiding place to any human with good vision. However, on other occasions it took some detective work to determine whether she had really laid or not.

The other thing that becomes evident when one spends 7 days (or, for other lucky people, a month to 6 months) doing the patrols is that 3 hours seems a long time to patiently watch and not interfere. If you come across an emerging turtle, it is critical not to disturb her as she could be frightened and return to the sea without laying and, without one collecting any useful information. So one may end up waiting 3 hours or more until the safest time to collect data (carapace measurements, tag numbers etc.) which is while she is laying and her mind is on other things.

During the waiting time, we were able to enjoy the scenery around us, the occasional sunset, and the many birds that take advantage of the sea breezes. During a previous visit it was the tropic birds that had really caught my fancy but this time I was enamoured by the Frigate birds and the Fairy terns. The latter were returning in pairs to lay their single egg on what always seem precarious locations but to them it is a convenient notch in a branch. When the Fairy terns weren't sitting on the branch,

they were doing wonderful synchronised acrobatic flights, particularly in the early morning and evening.

Well all in all, it was a successful trip for us and it looks like it will be a successful year for the Hawksbill. It was recently published that there has been an eight-fold increase in the abundance of nesting females since the early 1970s on Cousin Island and I reckon this year is only going to add to the growth since there were already more than 150 nests when we left on 15th Nov and that was half-way through the nesting season!

Thanks to Nature Seychelles for giving us this opportunity to lend a hand.



Photos: J-Phillipe Vantighem, Nature Seychelles, Martin Harvey

World's key sites for conservation on one map



BirdLife has published a map showing the location of over 10,000 of the world's most important sites for birds and biodiversity, and their protection status.

The map, presented for the first time at COP-10 of the Convention on Biological Diversity in Nagoya, Japan, shows the global network of Important Bird Areas (IBAs) identified by the BirdLife Partnership.

Although chosen using standardised scientific criteria based on the distribution of key bird species, IBAs have also been shown to be important for other animals and plants. They provide a “first cut” of the overall network of the most significant sites for biodiversity conservation worldwide.

IBAs have been recognised worldwide as practical tools for conservation, enabling efforts to be concentrated where they will be most effective. For example, with the publication of this new global map of IBAs, BirdLife is exposing the gaps in the world's network of protected areas. While some 59% of the sites are shown in dark green, indicating that they are wholly or partially protected, the remaining sites are shown in light green, indicating that they lack any form of protection or, in some cases, that their protection status is unknown.

Such information is very pertinent to the CBD Programme of Work on Protected Areas (POWPA) whereby every country has agreed to conduct a gap analysis of its protected areas network. To help with this, BirdLife has made its information on the protection status of IBAs available to governments and a number of countries are already using their national IBA inventories to help guide the expansion their protected area networks.

Despite recent progress in declaring new protected the protection status of IBAs worldwide shows that only 26% of IBAs are currently fully legally protected.

Wherever possible, IBAs are identified and documented through a process led by BirdLife's national Partners. This ensures that the best local knowledge feeds into the process, and builds engagement and capacity for later IBA conservation and monitoring work. By mid-2010, 126 national IBA inventories had been published, in a variety of languages, together with five continental directories. The extensive datasets are managed globally in BirdLife's World Bird Database, and much of the information is made available to everyone through BirdLife's website.

BirdLife recognises that successful conservation needs the wholehearted support of local people. Since the late 1990s, BirdLife has been nurturing and networking grassroots groups at IBAs, working with communities to develop site-specific solutions that combine conservation with sustainable livelihoods.

IBAs across the world are monitored using BirdLife's standardised and simple methods for scoring their condition (based on the key species and habitats within them), the pressures (threats) impacting upon them, and the conservation responses in place (such as action plans and management activities). Such monitoring, carried out by local groups, volunteers, government staff and BirdLife Partners, generates data for IBA indices that provide powerful tools for quantifying conservation efforts and measuring their impact.

Photo: Global map of Important Bird Areas

CANCUN: Not perfect, but something for everyone



taken to start to address the finance required, with the establishment of the Green Climate Fund, which will support developing country actions on climate change mitigation and adaptation. But fundamentally, finance is still needed, and those funds pledged a year ago in Copenhagen must be realised.

Disappointingly little progress was made on setting legally binding emission reduction targets to curb global warming, and keep temperature rises to below 2 degrees. Procedural efforts were made to inscribe the pledges made in Copenhagen, although adequate, and it remains urgent that these are addressed next year. Countries must close the gigatonne gap between the emission reduction pledges on the table, and what the science demands.

Overall the talks were undoubtedly aided by the strong leadership of Mexico, with parties applauding the transparent and inclusive way in which the negotiations were conducted, dispelling the discontent of Copenhagen last year.

“The UN process is back on the road after the disappointment of Copenhagen”, said Melanie Heath, Senior Climate Change Advisor at BirdLife. “We have come away with renewed faith in multilateralism – but the challenge remains on how to translate these uplifting aspirations into a fair, ambitious and legally binding agreement.

“Negotiations in the new year will not be easy. Countries must continue to work together with urgency to build on the agreement made in Cancún, to narrow their differences and ensure that the spirit of ambition and compromise prevail.”

Melanie Heath, BirdLife Community

Photo: Cousin beach (Peter Chadwick)

The climate change negotiations (COP-16) concluded with the Cancún Agreement. After two weeks of intense discussion countries reached a compromise, and set the world's efforts back on track for COP-17 next year (2011) in Durban, where there is renewed optimism that a globally binding agreement on long term actions to address climate change could be made.

The last few hours in Cancún displayed a spirit of constructive compromise, with nearly all parties remarking that although the Cancún Agreement is not perfect, it contains elements they like. It seems that the text has something for all.

So what makes this package emerging from Cancún balanced? In BirdLife's view there were three main advances.

Firstly, a deal to protect tropical forests was kicked off. The scope and goal of a new mechanism (REDD+), which will deliver financial incentives to developing countries to conserve and restore their forests, was agreed.

“This is a significant step forward, to both reduce emissions and conserve tropical forests”, remarked John Lanchbery, Principle Climate Change Advisor at the RSPB, and co-chair of the Climate Action Network REDD Group. “Safeguards

are included in the agreement to ensure that the biodiversity benefits of forests are fully recognised, and the rights of indigenous peoples and local communities are protected.”

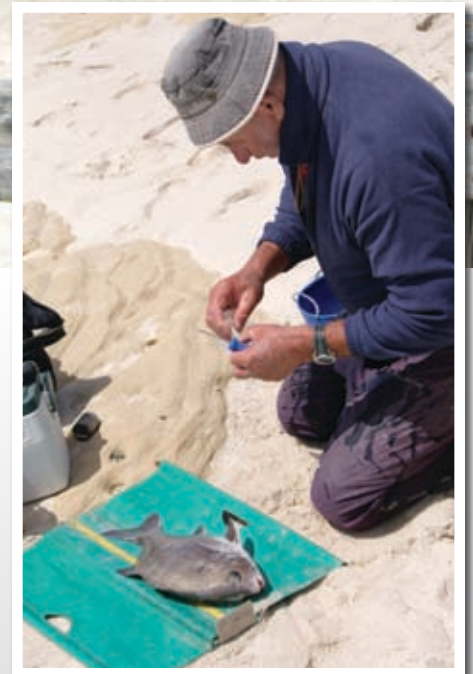
However, how these safeguards will be applied and respected, as well as many financial and methodological issues surrounding REDD, will need to be worked out in the coming months.

Secondly, advances were made to assist adaptation to climate change. The agreement affirms that adaptation must be addressed with the same priority as mitigation. A Cancún Adaptation Framework was established to enhance action in adaptation, including through international cooperation, which recognises the needs and contributions of nature. An Adaptation Committee with functions was also agreed.

“Overall this a good outcome for adaptation. It has finally received the attention it deserves within the climate change talks, with advances on several important components, although much detail needs to be worked out, and links with finance still need to be strengthened”, said Robert Munroe, Climate Change Officer at BirdLife International.

Thirdly, an important step was

Learning from South Africa



Ian Valmont, Cousin Island coordinator visited South Africa as a guest of WWF and the Department of Environmental Affairs to attend a Marine Protected Areas (MPA) forum in the western cape region.

The forum was held in Langebaan National Park, about 100 km north of Cape Town. It brought together several MPAs represented by their managers, scientists, researchers, lawyers, policy makers, journalists, government officials, and a group of international representatives from Tanzania, Kenya, Namibia, Mozambique and Seychelles. It is believed to be one of the few forums of this calibre.

Apart from sharing experiences about Cousin Island, his MPA, Ian says he learnt a great deal more about how MPAs are managed elsewhere. He also had the opportunity to visit different protected areas in the western cape.

"I visited amazing Dyer Island Nature Reserve where I saw Cape Cormorants, Black Oyster Catchers, lots of seals and penguins. The boat ride was stupendous as I had never experienced such a rough and wicked sea in my whole entire life. On Cousin Island, we come across a few bad sea

conditions at times, but this was nothing in comparison to the crossing from Gansbay to Dyer Island!" Ian says.

On the beach he met diligent fishermen like Uncle John who despite his age was volunteering his time and energy from 6a.m to 6p.m to fish and tag different fish species. Tagging provides valuable data giving both scientists and MPA managers alike an insight into how healthy and sustainable their fish stocks are.

At Betty's Bay, Ian learnt about the conservation measures being taken for the rare African penguins. "I appreciated seeing them in their own habitats, as they are endangered." He also saw up close a Southern Right Whale with its calf. "I took many pictures of some harbour relics where these gentle giants were slaughtered en masse in the past. Fortunately, there are laws and regulations that protect these creatures now."

The trip also provided some poignant moments that touched Ian, such as the sad but heroic life story of a young man who is now a marine guide at one of the Nature Reserves. He had started down a path consisting of gangs, drugs and bad influences. However, his whole life was transformed when he encountered some mentors, who got him back to school to train as a marine guide.

The visit also provided for some light moments. Whereas in Seychelles fish is the daily fare, for an average South African, meat rather than fish, is part of every meal. "My daily intake of medium to well-done steak helped me understand why MPA managers in South Africa are fighting tooth and nail in order to sustain the current fish stocks so that the future generation can have a good taste of a 'galjoen', one of the fish species that is on the 'red list' due to overexploitation."

Photos: Ian with African penguins and inset, fish tagging on the beach (Peter Chadwick)

Climate Change - Unravel the Jargon

Adaptation - Coping with the effects of climate change

Adaptation fund - Established to finance adaptation projects and programmes in developing countries that are Parties to the Kyoto Protocol.

Alliance of Small Island States (AOSIS) - An ad hoc coalition of low-lying and island countries particularly vulnerable to rising sea levels and who share common positions on climate change. Includes Seychelles.

Anthropogenic climate change - Climate change caused by human activity as opposed to natural processes.

Carbon dioxide is the main greenhouse gas.

Carbon dioxide equivalent - A term used to describe the global warming potential of greenhouse gases in terms of the equivalent amount of carbon dioxide, CO₂. For instance, CO₂ concentrations in the atmosphere are now approaching 390 parts per million (ppm). If other greenhouse gases added by human activity are included the figure rises to above 460 ppm of CO₂ equivalent.

Carbon footprint - The total greenhouse gas emissions from an organisation or activity, expressed in tonnes of CO₂ equivalent.

Carbon neutrality - The state in which the emissions from one activity are balanced by emission reductions achieved elsewhere.

Carbon offsetting - Improving organisation or individual impact on the environment by contributing to projects which reduce CO₂ production.

Carbon sequestration - The process of removing carbon from the atmosphere and depositing it in a store.

Carbon sink - Any natural store of carbon that can absorb CO₂ from the air e.g. forests, grasslands and oceans.

Carbon source - Any natural store of carbon that releases CO₂ into the atmosphere. Note that soils, forests and oceans can be both sinks and sources at different times.

CFCs (Chlorofluorocarbons) - A family of gases that have contributed to stratospheric ozone depletion, but which are also potent greenhouse gases.

Clean Development Mechanism - A mechanism under the Kyoto Protocol through which developed countries may finance greenhouse-gas emission reduction or removal projects in developing countries, and receive credits for doing so which they may apply towards meeting mandatory limits on their own emissions.

Climate change - A pattern of change affecting global or regional climate, as measured by yardsticks such as average temperature and rainfall, or an alteration in frequency of extreme weather conditions.

Emissions reduction - The removal, limitation, reduction, avoidance, sequestration or mitigation of greenhouse gas emissions.

Global average temperature - The mean surface temperature of the Earth.

Global warming - The steady rise in global average temperature in recent decades, which experts believe is largely caused by man-made greenhouse gas emissions.

Green house gases - Any gas that traps heat in the atmosphere. The Kyoto Protocol covers human-induced emissions of six gases: carbon dioxide (CO₂, the most important), methane, nitrous oxide, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆).

Greenhouse effect - The term used to describe the warming of the atmosphere due to an increase in heat-trapping gases.

Intergovernmental Panel on Climate Change (IPCC) - Established in 1988 by the World Meteorological Organization and the UN Environment Programme, the IPCC surveys world-wide scientific and technical literature and publishes assessment reports that are widely recognized as the most credible existing sources of information on climate change.

Kyoto Protocol - An international agreement that, among other things, sets binding targets for the reduction of greenhouse-gas emissions by industrialized countries.

Mitigation - A human intervention to reduce the sources or enhance the sinks of greenhouse gases. Examples include using fossil fuels more efficiently for industrial processes or electricity generation and expanding forests and other sinks.

REDD – Reduced Emissions from Deforestation in Developing Countries - A proposed system for compensating developing countries that reduce emissions linked to cutting down forests, and protect forests as planetary “carbon sinks”.

Tippling point - Any point of no return, after which change is sudden and irreversible. In climate change, this might be runaway global warming, the collapse of an ice sheet or the shutting down of an ocean current which won't switch back on even if you go back to the old climate conditions.

United Nations Framework Convention on Climate Change (UNFCCC) - Signed in 1992 at the Rio Earth Summit and ratified by 192 nations. It commits them to stabilizing climate-changing emissions and to preventing “dangerous human interference with the climate”.

Sources: http://unfccc.int/essential_background/glossary/items/3666.php, www.panda.org/about_our_earth/.../climate_jargon_acronyms/
<http://www.copenhagenclimatecouncil.com/get-informed/climate-negotiations-updates/jargon-buster.html>
http://www.carbon-clear.com/uk/projects/carbon_jargon

Ringling up the costs of Climate Change

By Andrew Deutz



of its wheat production as a result of the fires and drought. The Russian government imposed restrictions on wheat exports, which caused a spike in global wheat prices since Russia is such a big producer. Wheat prices today, on global markets, are 42% higher than they were a year ago.

What does that mean for the rest of the world? Well, it means billions more in economic losses for other countries.

Take Egypt for example. Bread is the principal staple in Egypt and the Egyptian government provides subsidies for 78 million people. The last time there was a spike in wheat prices – in 2008 when oil prices in excess of \$100 per barrel drove up costs for a wide range of primary commodities – the Egyptian government couldn't afford to keep the same subsidies in place. The results were price hikes and shortages. And that led to bread riots in the streets of Cairo.

No government wants to face that, so this time, the Egyptian government is prepared to spend an additional \$5-6 billion to buy higher-priced wheat in global markets and still maintain the subsidies. So, there were no riots in Cairo this summer. But the Egyptian economy sacrificed .2% of its GDP to foreign farmers – resources that otherwise would have been available for schools and childhood immunization in Egypt – or improved conservation of the Nile watershed.

Egypt is only one country. Multiply their costs by those of all of the other wheat-importing countries and we see that the world already is paying billions and billions of dollars to adapt to climate change, just for our daily bread.

So, yes, it is late. But you know what they say – better late than never.

Andrew Deutz is Director of International Government Relations, The Nature Conservancy

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I was pondering the question of whether the world should start investing more in adapting to climate change. After all, we aren't making a lot of progress in the U.S. or the U.N. on reducing the emissions that contribute to climate change.

Frankly, I think it is late to start investing in adaptation. Nature has already decided for us, and we are already paying.

The Asian Development Bank just released a report estimating the costs of reconstruction from the floods in Pakistan – \$10 billion. To the extent that the record breaking monsoonal flooding was climate-related (impossible to prove scientifically, but consistent with our scientific

understanding of expected climate impacts) then we can put a fair bit of those costs into the climate change adaptation accounting ledger.

How about the forest fires in Russia? Again, to the extent that the record-breaking heat wave and associated drought was symptomatic of scientific predictions of climate change, this is also a big entry in the adaptation ledger. A recent estimate suggested that the direct and indirect economic cost was about \$15 billion, or about 1% of Russia's GDP. That is significant at a macroeconomic scale for Russia.

But Russia isn't the only country bearing the costs. Russia is a major wheat producer, and it lost about 1/3

The quest for low carbon tourism

By Liz Mwambui



Tourism and climate change are intimately entwined. On one side, changes to the world's climate will have a direct impact on many tourism destinations with far reaching implications. On the other hand tourism is itself a contributor to climate change.

The Caribbean, Small Island Developing States, Southeast Asia and Africa are the regions thought to be most at risk due to climate change impacts. Nature tourism is likely to suffer damage from most of the effects of climate change on island states. Beach erosion, higher sea levels, greater damage from sea surges and storms are some of the predicted impacts.

But tourism is a significant contributor to many national and local economies around the world. It is a central pillar of the Seychelles economy and according to a government statement eco-tourism and biodiversity are going to be the future of the Seychelles brand. Seychelles President James Michel has said, "Our tourism industry depends on our ability to protect the natural beauty of our islands."

It is estimated that the global travel and tourism industry contributed 9.6 per cent of global Gross Domestic Product (GDP) and 7.9 per cent of worldwide employment in 2008. According to the World Tourism Organization (WTO), in 2008, there were also 922 million international tourist arrivals with tourism receipts of US\$944 billion.

But, it is recognized that global tourism has an environmental impact and contributes to the emission of green house gases that cause global warming. Again, according to WTO by 2035, under a "business as usual" scenario, carbon dioxide emissions from global tourism are projected to increase by 130 per cent. The sector's contribution to emission is mainly via air travel and this is now one of the areas being targeted for an emissions reduction.

Tourism also has a high consumption of resources such as water and energy. The concentration of tourism in certain areas furthermore places stress on the local biodiversity, which many tourists go to see. Such stresses themselves may worsen the effects of climate change on biodiversity.

While concern about tourism's negative impacts is targeted at all aspects of tourism, the primary focus has been on air travel. Travel to distance locations has thus become the target of green and media campaigns in the quest for low carbon. Words like "staycation" - a vacation where one doesn't need to do any travelling or at most, travel is limited to ones locality, have entered into travel lingo.

The predicament that countries like Seychelles face as a result is that while they are extremely vulnerable to effects of climate change on tourism, they are equally vulnerable to mitigation measures being proposed. The irony is that Seychelles' overall contribution to global warming is minimal.

So what can Seychelles do to become less susceptible to these repercussions of climate change? It is inevitable that countries such as Seychelles adapt to climate change and reduce their own impact on the environment to save biodiversity and carry out sustainable tourism, experts say. Additionally, it seems Seychelles must constantly reassure visitors and the world that its tourism is "green".

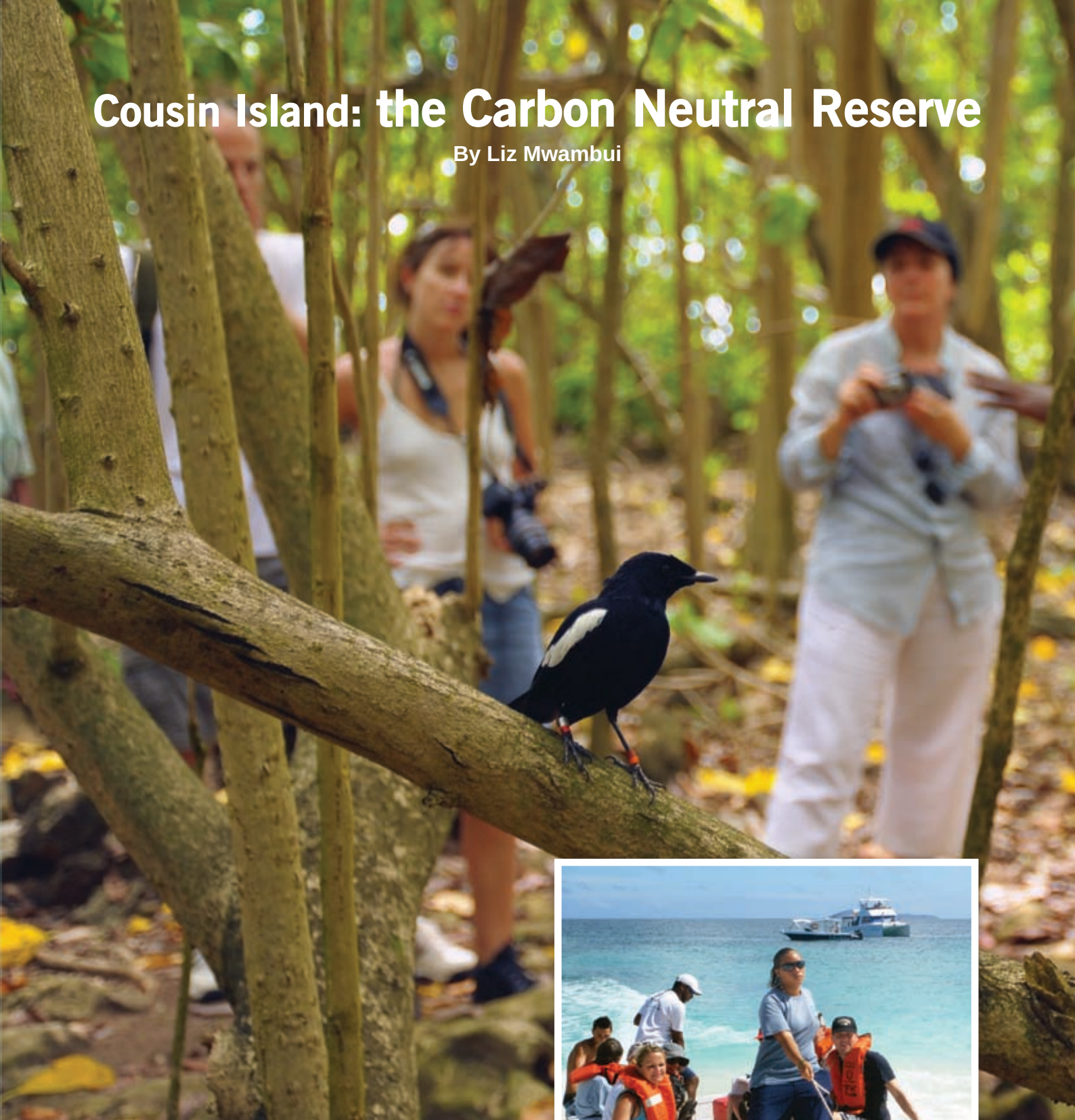
Seychelles, whose 47 percent of total land area is protected, is already in an enviable position to do this. Protected areas are strongholds for species but also act as carbon sinks. They already play an important role as natural protection against extreme weather events and rising sea levels. Over 80% of Seychelles land area is under some form of forest or vegetation cover. Forests act as sinks storing the carbon that could have been released to the atmosphere. This aspect of the Seychelles has great potential in reassuring visitors.

Already, water and energy conservation measures are being taken to help minimize tourism's environmental footprint. Programs such as that introduced by Nature Seychelles and Empretec of Mauritius - a capacity building NGO running a regional programme that introduce low impact environmental management systems, can easily be adopted.

The country's destination's sustainability can also be achieved and publicized through hoteliers, tour operators, travel agents and tourist guides adjusting their activities by using more energy-efficient and cleaner technologies and logistics. And by replicating carbon management processes such as the one that has resulted in Cousin Island achieving carbon neutrality, visitors can be invited to come to Seychelles conscience free.

Cousin Island: the Carbon Neutral Reserve

By Liz Mwambui



Cousin Island Special Reserve, welcomes thousands of tourists each year. Apart from providing local employment, it also benefits local communities on the neighbouring island of Praslin through eco-tourism.

Conservation activities on the Reserve include monitoring of the island's biodiversity, research, re-introduction of endangered species such as the Seychelles Magpie robin, ecotourism and education. Cousin has received international awards for its conservation and ecotourism efforts.

In recognition of the environmental impact of international visitors to Cousin, most of whom fly from

Europe and reach the island by boat, Nature Seychelles which manages the island, has undertaken a rigorous approach to carbon neutrality. This has involved measuring all the emissions associated with the island, reviewing opportunities for on-going reductions and investing in high quality carbon credits.

The organisation initiated a process that involved

measuring all the emissions associated with the island, reviewing opportunities for on-going reductions and investing in carbon credits from a clean cook stove project in Sudan.

“We did not want to purchase credits over the internet or invest in just any generic scheme. The process we initiated lasted about 15 months but provided a verifiable and assured result.” Says Nirmal Shah, CEO, Nature Seychelles about the carbon management process that was initiated after seeing media reports that discouraged long-haul travel in order to reduce greenhouse gas emissions. “We wanted our eco-visitors to come to Cousin Island conscience-free, knowing their carbon footprint has been neutralized,” says Shah.

In 2009, with the assistance of UK partner the Royal Society for the Protection of Birds (RSPB), Carbon Clear a leading European carbon management company, was hired to assess the footprint of conservation and tourism activities on Cousin Island Special Reserve. Funding was received from the British High Commission in Seychelles to carry out the assessment.

The Carbon Footprint

To measure the carbon footprint, Carbon Clear looked at the following activities:

1. All the emissions generated on Cousin Island - the island's operations generate a small number of emissions, but using efficient technology these are kept to a minimum
2. A portion of the emissions from the Nature Seychelles operation. As Cousin Island is one of several projects that Nature Seychelles is responsible for, 15% of its overall organisational footprint has been attributed to the Cousin Island footprint.
3. The visitor footprint - Approximately 10,000 to 14,000 eco-tourists visit annually. 2008 visitor figures (a record (high) year in terms of numbers) were used for the calculations. For this footprint to be complete, emissions from international flights to and from the Seychelles, internal travel and hotel stays were included. As a visit to Cousin Island is one part of a longer holiday to the Seychelles (visitors spend approximately 1/3rd of a day on the island), Cousin Island cannot be solely responsible for all greenhouse gas emissions. Therefore using the amount of time spent on the island as a guideline 3% of total visitor travel and hotel emissions was allocated to the Cousin Island footprint.
4. Finally, the footprint recognised the contribution of the reforestation programme on Cousin Island. Since 1968 the island has been restored with the result that the Island is 85% covered by natural tropical vegetation (based on GIS). Based on available scientific information, the amount of annual carbon that the island's 22.95 hectares can absorb was calculated and netted off against the footprint.

With flights forming such a large part of the footprint, and with a lack of scientific consensus on the global warming impact of flights, a Radiative

Forcing Index (RFI) of 1.9 as recommended by DEFRA (The UK Government Department for Food and Rural Affairs) was used. Carbon Clear, used ISO14064-1:2006 (the International Standards Organisation's recommended best practice for relevance, completeness, consistency, accuracy and transparency) to measure the organisation's greenhouse gas emissions and to help Nature Seychelles establish credible benchmarks for tracking future emissions reductions from its carbon management activities.

The Results - The Carbon Statement

The total emissions for Nature Seychelles' activities on Cousin Island, including the allocations from visitor travel and the Nature Seychelles offices, in the calendar year 2008 amounted to approximately 1,569 tonnes of CO₂e (carbon dioxide equivalent, representing the universal unit of measurement used to indicate the global warming potential (GWP) of all greenhouse gases).

However, incorporating emissions reductions of 211 tonnes (from CO₂ sequestered by Cousin Island's natural tropical vegetation) the final footprint prior to offsetting is calculated at 1,358 tonnes of CO₂e. The remainder of this footprint has been offset using carbon credits from a clean cook stove project in Sudan reducing the island's emissions to net zero.

Offsetting Cousin Island's Emissions

Whilst managing the footprint to ensure that emissions are kept to an unavoidable minimum, for a small country like Seychelles, tourism is essential to the economy and given its remoteness, visitors can only arrive by aeroplane. Therefore, it is not possible to reduce these emissions directly and carbon offsetting is the most realistic option in these circumstances to mitigate impact.

To offset the remainder of the emissions carbon credits were purchased in an African clean cook stove project, based in Darfur, Northern Sudan. This project was rigorously selected because it delivers on many levels:

- Significant and verifiable carbon reductions
- Substantial health benefits – reducing indoor air pollution
- Reduces demand for wood from unsustainable sources
- Located in Sudan – described as the location for the world's first climate change war.

The project is currently at listed status with the Gold Standard Foundation. This project has been implemented by Practical Action. The project has been running since December 2007, with a local team fully trained and new stoves being rolled out. Importantly, the project is being independently verified by Bureau Veritas.

Liz Mwambui is Nature Seychelles Communications Manager.

Photos: Visitors on Cousin Island (David Burns, James Gilbert)

Carbon Q&A

How to manage a carbon footprint

Carbon Clear is a world-leader in carbon management. In an interview with Zwazo the company, which undertook Cousin Island's carbon assessment and management answers questions about the process. What is carbon management and why is it important?

Zwazo: Could you tell us briefly how Carbon Clear helps organizations to manage their carbon footprint?

Carbon Clear: Carbon Clear works with organizations to reduce their impact on the environment and climate change in particular. We do this by focusing on carbon and greenhouse gas emissions, the gases that contribute to climate change.

First we establish the scope of the carbon footprint by identifying all the sources of greenhouse gas pollution that need to be measured, to ensure that a carbon footprint is accurate. Then data is collected for each source of greenhouse gases, and reported in tones of CO2 equivalent.

This is only the first step. Once an organization knows which activities contribute the most to its carbon footprint, reduction measures can be designed. These may involve a mix of technology investment, behavioral and operational change, and carbon offsetting. It's also important for organizations to communicate their commitment to reducing their carbon footprint to their staff and customers.

Zwazo: Please explain to our readers what carbon credits are?

Carbon Clear: Carbon credits are used to balance out greenhouse gas pollution in one place with equivalent greenhouse gas reductions in another place. So one tonne of carbon emission produced on Cousin Island through the use of electricity or from travel, for example, is offset by one tonne of carbon saved by a project that prevents deforestation using efficient cook stoves in Sudan.

A key feature is that the project where the carbon saved must show that the money generated by the sale of carbon credits was necessary for the project to happen. For the Sudanese project, 100% of the funding for this project was provided by Carbon Clear.

When all emissions are offset, carbon neutrality, or no net carbon impact, is achieved.

Zwazo: What kind of projects do you recommend for carbon offsetting? How are they validated?

Carbon Clear: Carbon Clear invests in carbon reduction projects in developing countries, in the areas of renew-

able energy and energy efficiency. Each of our projects removes a measurable amount of greenhouse gases, or prevents the emissions in the first place, to reduce the total concentration of greenhouse gases in the atmosphere that contribute to climate change. Projects are carefully monitored and verified by a third party organization, such as the Gold Standard, giving you total peace of mind that your offsetting is transparent and effective.

Zwazo: Why the Darfur Clean Stove project?

Carbon Clear: This project helps to improve livelihoods in the Darfur region of Sudan - an area going through what one expert has called "the world's first climate change war". Carbon Clear is providing carbon finance and management advice for the project so that poor families have access to Low Smoke Stoves.

This switch to a more efficient and cleaner-burning fuel not only reduces greenhouse gas emissions but also prevents deforestation and reduces indoor air pollution from burning firewood and charcoal, thereby improving the health of women and children.

Zwazo: What are the benefits of carbon offsetting?

Carbon Clear: Carbon offsetting provides a cost effective way to balance the emissions that you produce in your daily life, from travelling or energy in your home. We all produce carbon emissions and offsetting allow individuals and companies to take responsibility for these whilst new low-carbon technologies emerge.

Many carbon credit projects also have a significant and positive social and economic impact on the communities and locations where they are located.

Zwazo: Critics suggest carbon offsets allow people to pay for their carbon guilt rather than stop actions that are contributing to climate change. What would you say to these critics?

Carbon Clear: It is important that we all take actions to reduce our carbon footprints as far as possible. With the current technology available however, it is virtually impossible to live in a carbon-free way. By offsetting the emissions that you have not been able to reduce, you are taking a positive step against climate change, while also helping communities in the developing world to access cleaner energy that would not otherwise have been possible.



Climate Change and Food Security

By Antoine Marie Moustache

Climate change is affecting the national agricultural sector and hence the national food security in many ways. Of great concern are the changes in weather patterns - there is either too much or too little rain at any one time, and rising sea levels are causing sea water to intrude into coastal farms with consequent soil salinisation. There has also been a significant increase in pests, particularly during periods of intense rainfall, with prevailing high heat and humidity. Furthermore, in 1998 within the Indian Ocean including the Seychelles, the El Niño caused widespread coral bleaching, affecting corals which are vital for

fish stocks.

The fact that Seychelles is already experiencing extreme weather changes raises important questions. What impact will these changes have on the national agricultural sector and food production? How can Seychelles mitigate and adapt to these changes?

Seychelles imports most of its food (the country has the highest carbon footprint of Africa) and is extremely vulnerable to external shocks. Current agricultural production meets some of the local needs; for instance in 2008, 60%-70% of vegetables and fruits were locally produced. Because Seychelles

is distantly placed from the main markets, it does not necessarily benefit from trade in food specifically from regional groupings such as the Common Market for Eastern and Southern Africa (COMESA) and the Southern African Development Community (SADC). Seychelles is indeed in a very precarious position with respect to ensuring a continuous adequate supply of basic food. In addition, although contributing only about 2.9% of the GDP (Seychelles relies heavily on tourism and fishing) agriculture employs around 3,200 persons.

The negative impacts of climate change can only make Seychelles'

fragile situation worse. Extreme weather events as manifested in the weather events of 1997, 2002 and 2004, which caused serious losses to the national agricultural sector, among others, must be viewed with seriousness.

But what climate challenges does the national agricultural sector face?

The coastal plateau have 70% of the traditional total of agricultural land potential of the Seychelles. They are in effect beach sand accumulation; they slope inland, making drainage of excess water into the sea difficult. This is complicated by the fact that at about 1.5 metres deep in the plateau soil there is a hard pan of calcium carbonate further impeding water draining in circumstances of heavy flooding on the plateau. Additionally, a series of heavily laden small streams disgorge onto the plains during periods of heavy rainfall, flooding crop cultivation with resultant production losses.

Sea water intrusion into the coastal plateau is a new phenomenon caused both by changing sea level and tidal surges. Sea water intrudes into the lower part the soil where it damages the root of cultivated crops.

The upland soil where a number of farms are located is derived from the weathering of granite and is relatively low in clay and does not hold water well. The hilly and sloping nature of the land also does not facilitate water infiltration. Consequently, during heavy downpours evident in extreme rainfall events, there is high surface flow which has to be managed so as to reduce soil erosion.

National Strategies for Climate Change

The Seychelles Agricultural Development Strategy (2007-2011) aspires to increase national food security by reducing vulnerability and dependency on external food sources. It also attempts to maintain the contribution of agriculture to the national economy. Agricultural activities it recommends, must now incorporate adaptation and mitigation measures against frequent extreme weather events. This includes the adoption of

technologies to increase production.

Some of the adaptation options that have been introduced are the tropical greenhouse and the fertigation technology. To date there are about 10 hectares of land under greenhouses and the associated fertigation system. This has led to important positive increases in the supply of vegetables during the rainy months.

Raised beds, terraces, surface drains on coastal plateau and the use of storm drains on slopes have allowed crop production during periods of heavy rains. Raised beds are used particularly under open field conditions to mitigate both the effects of surface flow after heavy rains and also to eliminate excessive soil moisture both of which increase the prevalence of soil disease organisms.

Terraces which slope backwards make crop cultivation along the contours of slopes possible and at the same time limit soil erosion and soil degradation. The terrace faces are established with grass with a view to limit soil erosion. Storm drains to the limit of the terraces dispose excess water limiting excess surface flow.

To mitigate the effect of heavy downpours on soil degradation, the practice of Integrated Crop Nutrition (ICN) has been introduced. Food producers have been encouraged to use ample amounts of farm yard manure, crop debris such, decaying leaves, sea weeds as well as inorganic and organic sources of fertilisers.

Extreme weather events have also included periods of prolonged droughts. Therefore, irrigation systems comprising of various types of low volume irrigation water have been adopted alongside the greenhouse technology.

However, an adequate and easily available source of water is needed during prolonged droughts. Both livestock and crop producers are encouraged to use roofs to catch rain water and boreholes to supplement their water supply for their crops and livestock.

Pests are being controlled through an Integrated Pest Management system that has included the use of extracts of

natural products such as chilli, garlic and onion.

Risk covering options are also being assessed. These involve the use of an agricultural insurance to reduce vulnerability, manage risks and to mitigate the impacts of climate change.

Heritage Gardens can help in Mitigation

In 2009, The Seychelles Agricultural Agency and Nature Seychelles signed an MoU under the aegis of the Food Security Strategy 2008-2011 to promote a model of gardening called the Heritage Gardens. Initiated in 2005 by Nature Seychelles and spread widely by Wildlife Clubs of Seychelles, the Department of Natural Resources and the Ministry of Education, it encourages schools and communities to grow food around houses, buildings and small urban lots. Nature Seychelles established a demonstration garden at its Centre for Environment and Education (CEE) Roche Caiman. The model garden served as a central nursery and research ground. It contains many traditional food crops, herbs, fruits and medicinal plants. The model garden has already been reproduced in several schools and homes and serves as inspiration for others like the Therapeutic Garden at the North-East Point home for the elderly in Mahe.. Nature Seychelles's concept of Edible Landscaping promoted through this project is ideal as a mitigation tool because it makes food production the business of everyone by making it fun, aesthetic and interesting.

Antoine Marie Moustache is the Chief Executive of the Seychelles Agricultural Agency

Saving reefs from Climate Change

By Nirmal Shah



“Reefs can sometimes recover after disturbances, but we have shown that after severe bleaching events, collapse in the physical structure of the reef results in profound impacts on other organisms in the ecosystem and greatly impedes the likelihood of recovery.

“Unfortunately it may be too late to save many of these reefs but this research shows the importance of tackling greenhouse gas emissions and trying to reduce global warming and its effect.”

While this bleak picture was being painted, other scientists were looking at possibilities of helping coral recovery through restocking. They have experimented with culturing bleaching-resistant corals in underwater farms and transplanting them on target reefs.

The most successful and affordable coral culture methods originated in Micronesia and Fiji and the methods have been tried in the Indian Ocean, Atlantic and Caribbean.

In the case of the Maldives, the knowledge and practical demonstration were spread with the assistance of donors and private banks which hosted a national workshop on the topic and supported a “kick-start” demonstration project at three key island resorts during 2004-2006.

In the Maldives, many of the shallow reefs that suffered badly in 1998 are in areas where the supply of coral larvae from deeper non-bleached reef areas has led to high rates of natural recovery rates. However many reefs ‘inside’ the atoll lagoons are not so well positioned.

The aims of these projects has been to enhance and accelerate a locally slow rate of natural recolonization and coral cover regrowth.

Nature Seychelles has received funds from USAID to start coral restoration in Seychelles where there has been no similar effort so far.

Nirmal Shah is Nature Seychelles’ Chief Executive

2010’s extreme heat put the Indian Ocean’s coral under severe stress. Many reefs are dead or dying across the Indian Ocean following a bleaching event first reported in May 2010. Scientists confirmed widespread die off of coral that has endangered not only the richest ecosystems in the ocean, but also fisheries that feed millions of people.

The bleaching, it is reported, extended from the Seychelles in the west to Sulawesi and the Philippines in the east and included reefs in Sri Lanka, Burma, Thailand, Malaysia, Singapore, and many sites in western and eastern Indonesia.

According to the National Oceanic and Atmospheric Administration (NOAA), sea surface temperatures in the region peaked in late May 2010, and by July the accumulated heat stress was greater than in 1998, where global warming caused Indian Ocean surface temperatures to increase to unprecedented and sustained levels. In the 1998 event, more than 90 per cent of the inner Seychelles coral were killed.

This new event, Scientists say, has resulted in the worst coral die-off seen since 1998, and may “prove to be the worst such event known to science.” Around 80 percent of *Acropora* colonies and 50 per cent of colonies from other species died in the outbreak.

The main long-term impacts of coral bleaching are caused by damaged reefs inability to reseed and recover. In a 2006 report on the 1998 coral bleaching event and its impact on Seychelles, researchers from the University of Newcastle upon Tyne, and others from the UK, Australia and the Seychelles, speculated that Seychelles reefs’ inability to reseed was due to their relative isolation. A lack of nearby reefs to provide larvae, which could settle and grow into new coral structures and the absence of favourable sea currents to transport the larvae could be largely to blame, they said.

Lead researcher Nick Graham, of Newcastle University’s School of Marine Science and Technology, said then: “We have shown there has been very little recovery in the reef system of the inner Seychelles islands for seven years after the 1998 coral bleaching event.

Acting for marine turtles in the face of Climate Change

By Gilles-David Derand

There is now an increased awareness that climate change will have negative impacts on ecosystems and species. Experts warn that climate change is likely to become the dominant direct cause of biodiversity loss by the end of the century.

Local and global research and interest has now turned to examining the effects of climate change and the actions that can be put in place to reduce species vulnerability to climate change.

Ongoing research suggests that marine turtles, which are climate sensitive, are particularly vulnerable to the additional pressure of global warming. Authors of a 2009 paper published in the *Endangered Species Journal* say that marine turtles may be good indicators of climate change effects on coastal and marine habitats because they are closely tied to climatic variables such as ambient temperature and storminess. Their dependence on multiple, interlinked habitats also makes them ideal for examining the impacts of climate change on coastal ecosystems.

The authors highlight the types of data that would be most useful for an accurate assessment of future effects. They suggest that future research should focus on climate change effects on key habitats upon which turtles depend; factors that influence nest site selection; the consequences of skewed primary sex ratios; and the effect of climate change on turtles at sea, for example range shifts and dietary breadth.

In 2009, Nature Seychelles began an experiment to monitor nest incubation temperatures and record

hatching success and hatchlings sex ratio for the critically endangered hawksbill turtle (*Eretmochelys imbricata*), one of the flagship species of Cousin Island Special Reserve.

Cousin Island is the most important nesting site in the South-West Indian Ocean for this species. A turtle monitoring program, probably the longest running for this species in the world, has resulted in an eight-fold increase in the number of nesting turtles per season since monitoring began in 1972. However, there is concern that global warming and predicted increases in temperature may greatly affect turtle hatchlings production and sex-ratio, thus affecting the demography of this species. Turtles are a species with temperature-dependant sex determination, meaning that warmer temperatures produce more females and cooler temperatures give more males.

The 2009 project was supported by Kelonia – the Marine Turtle Observatory in Reunion. To investigate nest temperatures on Cousin Island, data loggers were placed within a sample of 30 nests at the time of laying to record the nest incubation temperature at hourly intervals. The incubation period for hawksbill turtles is about 60 days and it is the temperature within the middle third of this period that determines the sex of the hatchlings. Nests were closely monitored around the time of hatching and the number, weight and size of the hatchlings recorded.

Results from the experiment showed that most of the nests experienced temperatures between 27 - 33°C for





effects of climate change on marine turtles and other components of the coastal and marine ecosystem in Seychelles.

The proposed scientific activities will improve our understanding of natural breeding parameters of hawksbill turtles and allow us to start relating the rate at which sand and ocean temperatures are likely to increase to the changes in hatching success and sex ratio. The project will also reforest the beach crest in degraded coastal areas by replanting native broad-leaved shrub species already found in other areas of Cousin to provide more shade to turtle nests and mitigate for future temperature increases.

Public awareness will help both local people and tourists to understand the threats that marine turtles are facing, the negative impacts of climate change on their reproduction, and the importance of maintaining natural coastal habitats and enhancing native coastal vegetation cover in degraded areas.

The project will most usefully complement the long term Cousin Turtle Monitoring Program, and contribute to the body of knowledge being collected locally, regionally and globally on the reproduction of the critically endangered hawksbill turtle.

David Derand is Nature Seychelles Science Coordinator

All photos Nature Seychelles

the majority of the nest emergence period, values that fall within the thermal tolerance range for the development of sea turtle embryos. However there were 11 nests where the temperature exceeded the higher thermal threshold of 33°C for more than 10% of the nest emergence period (Ledlie, 2010), thermal threshold above which prolonged exposure typically results in hatchling mortality.

Building on this experiment, Nature Seychelles developed in 2010 a new 2-year project for which we

received funding from the Global Environment Facility Small Grants Programme.

Its objectives are to start monitoring the local impacts of climate change on hawksbill turtle reproduction and implement mitigation measures to increase the nesting sites capability to cope with predicted temperature increases. In addition to these research and conservation interests, we aim to build public - local communities, tourists, scuba-divers, school children - awareness about the local

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Seabirds in changing seas

By Michelle Kappes



Seabirds rely on marine environments in order to find food, but what happens when those environments change? Given the impact global climate change will have on the world's oceans, how will seabirds cope with these changes? These important questions can begin to be addressed by tracking seabird movements at sea in order to learn which habitats are most important when they head out for their next meal. By understanding these preferences, we can predict how changes to those habitats might impact seabird species in the future.

At the Université de la Réunion, Dr. Matthieu Le Corre is heading a research program funded by the Pew Environment Group aimed at tracking seabirds at a regional scale in the western Indian Ocean in order to identify oceanic hotspots used by marine birds, and to investigate the habitat characteristics of these important areas. These data will be used to help identify marine Important Bird Areas and target areas for designation as pelagic Marine Protected Areas. These data will also be extremely valuable for predicting how global climate change may impact the seabirds of the western Indian Ocean.

As part of this project, we have been recovering miniaturized electronic tags that were deployed about a year ago on wedge-tailed shearwaters (*Puffinus pacificus*) and white-tailed tropicbirds (*Phaethon lepturus*) at sites in the western Indian Ocean. These tags collect data on light level that can be used to determine the position of the bird at sea. Basically, the time of local noon is used to determine longitude, and latitude is estimated using local day length. The tags are attached to a metal ring on the bird's tarsus using a

plastic zip-tie (see photo). Because these tags store their data on-board, we need to recover the tags in order to see where these marine birds have been traveling at sea.

So far this year we have recovered 11 tags from wedge-tailed shearwaters and 9 tags from white-tailed tropicbirds on Cousin Island, Seychelles, 14 tags from wedge-tailed shearwaters at St Joseph Atoll, Seychelles, and 5 tags from wedge-tailed shearwaters at Réunion Island. We are now beginning to process and analyze these new datasets, which will be integrated with data collected by Dr. Le Corre's team on barau's petrels (*Pterodroma baraui*), red-tailed tropicbirds (*Phaethon rubricauda*), and previous data from wedge-tailed shearwaters at Aride Island and Cousin Island, Seychelles. These data have demonstrated that many of these species disperse widely throughout the Indian Ocean, especially once they have completed their land-based breeding activities; now we can begin to investigate whether there are some areas where all species congregate.

These data will tell us which areas of the western Indian Ocean are most important to these seabird species, and ultimately where there are hotspots of biodiversity that should be protected. These data will also allow us to examine what kinds of oceanic habitats these marine birds prefer when searching for food, information which will help predict how future environmental changes may impact these wide-ranging species.

Michelle Kappes is a postdoctoral researcher at the Laboratoire d'Ecologie Marine at the Université de la Réunion. Photo: recovering geolocators (Peter Kappes)

Partners with Nature

How healthy ecosystems are helping the world's most vulnerable adapt to Climate Change

By Rob Munroe



Healthy, bio-diverse environments play a vital role in maintaining and increasing resilience to climate change, and reducing risk and vulnerability (Millennium Ecosystem Assessment, 2005; TEEB, 2009; RSPB, 2009; Secretariat of the Convention on Biological Diversity, 2009). This is particularly critical to many of the world's 2.7 billion poor people, who depend on natural resources most directly for their livelihood and survival.

BirdLife International's experience shows that supporting the application of local knowledge and community engagement can build the resilience of natural and societal systems, delivering

locally appropriate solutions to help communities, countries and economies adapt to climate change.

The role of ecosystems in climate change adaptation can usefully be applied at all scales: local, landscape, national, transboundary and international. The BirdLife Partnership's unique local-to-global structure has enabled structures and processes to be established that contribute to long-term and flexible approaches to climate change adaptation. Of BirdLife's 100-plus national Partners, more than 60 are in low income countries. Partners are working in many areas already impacted by climate change, and in others where it will add to current vulnerabilities.

Partners with Nature

Partners with Nature, published by BirdLife in December 2009, includes 14 examples of BirdLife Partners' work with vulnerable communities in Important Bird Areas (IBAs) (places of international importance for bird conservation, forming part of a global network of sites (BirdLife International, 2009)). See: http://www.birdlife.org/climate_change/adaptation/index.html. The case studies, drawn from different geographic regions, include:

- conserving and restoring forests to stabilise slopes and regulate water flows, preventing flooding and landslides as rainfall levels and intensity increase (Palas

Valley, Pakistan; Macaya Biosphere Reserve, Haiti; Tumbesian forests, Peru/Ecuador)

- establishing diverse agroforestry (the integration of trees into food and animal production) systems to cope better with the changing temperatures, water shortages and pest infestations associated with climate change (Kikuyu Escarpment Forest, Kenya; Mbeliling, Indonesia; Mount Siburan, Philippines)

- sustainable management of wetlands and floodplains for maintenance of water flow and quality, acting as floodwater reservoirs and as important stores of water in times of drought (Lake Oursi-Lake Darkoye, Burkina Faso; Hadejia-Nguru Wetlands, Nigeria; Koshi Tappu Wetland, Nepal; Ooijpolder, The Netherlands)

- coastal defence through the maintenance and restoration of mangroves and other coastal wetlands, which act as coastal buffers, helping to reduce flooding and erosion and protect against cyclone damage (Upper Bay of Panama, Panama; Samoa; Babeldaob Island, Palau; Humberston, UK)

- integrating 'nature-based' infrastructure and technology into hard engineering approaches, to avoid damage to ecosystems (Hadejia-Nguru Wetlands, Nigeria; Humberston, UK)

The case studies demonstrate that including the role of ecosystems in different approaches to adaptation can provide many benefits. They are accessible to rural and poor communities, and are often more cost-effective and enduring, because they provide local benefits, and can be locally managed and maintained. They balance immediate needs with preparation for long-term impacts, providing alternative livelihood options in the face of climate change uncertainty. They combine indigenous and local knowledge with external expertise. They contribute to the conservation and sustainable use of biodiversity, and to climate change mitigation by maintaining carbon storage.

Relevance to Seychelles

The impact of climate change on coastal livelihoods as a result

of sea level rise, storm and tidal surges, extreme sea-surface temperatures, and coastal flooding will have serious consequences for livelihood on small islands, such as the Seychelles. In the Seychelles, more than 90% of the population and development are concentrated on the coastal plateau of the main granitic islands, which are themselves very narrow strips, no more than two km wide (The Seychelles National Climate Change Committee, 2009). The Mahé region is characterized by wetlands and marshes such as mangrove stands, which act as cost-effective flood buffers by accumulating silt, reducing erosion and absorbing wave power and can provide multiple co-benefits such as food and raw materials, livelihood options such as fishing and tourism, conserving biodiversity, and carbon storage. However, with increased development in coastal areas these wetlands are under increasing pressure. Land use planning and guidelines for development on coastal areas are lacking, and where present poorly enforced (The Seychelles National Climate Change Committee, 2009). The role of these ecosystems in defending human communities against climate change impacts must be fully recognised in local, national, regional and international climate change and development policy and practice.

Making it Happen

To create a climate-resilient society, adaptation priorities need to be agreed in-country, through nationally-led, inclusive and participatory processes. Governments need to base policy on sound science, recognise ecosystems as cross-cutting and underpinning for adaptation, and address ecosystems effectively within national adaptation frameworks, strategies and plans. Governments should significantly step up efforts to protect nature and biodiversity, as a prime strategy to ensure ecosystem resilience, recognising this as vital to addressing climate change.

Local communities and resource users should be fully involved in adaptation planning,

implementation, monitoring and evaluation—and support and information should be readily available to enable this. Sectors such as agriculture, energy and transport should apply an ecosystem approach (taking into account vital ecosystem functions and valuing the ecological goods and services they provide in all decision-making) to business planning and delivery, and ensure that ecosystem resilience is strengthened rather than weakened by their activities. Sectors should work together in assessing risks posed by climate change and find sustainable adaptation solutions that, where possible, work for all. The international community (including governments, international and regional institutions, and multinational corporations) has a vital role to play in preventing dangerous climate change and helping those most affected adapt. The interlinkages between biodiversity, climate change, and sustainable development, must be effectively recognized within the United Nations Framework Convention on Climate Change (UNFCCC) and the Convention on Biological Diversity (CBD), as well as other international fora.

Robert Munroe is Climate Change Officer at BirdLife International

Photo: Seychelles mangroves (Dao Nguyen)



Robin Hanson's passions

Robin is the Natural Health Coordinator at Nature Seychelles. A British Wheel of Yoga teacher, Robin has fifteen years experience of meditation and yoga. His lifetime passion for wildlife has evolved into an environmental career which culminated in the management of an internationally important wetland reserve (Stodmarsh) in the United Kingdom where he joins Nature Seychelles from. He is a keen sportsman who loves cross country running, hiking, swimming and diving. He has worked with a full spectrum of the community; children to retired, individuals to whole communities, the general public to specialized groups.

"I have always been a practical minded person and I have always loved nature. When I was five I went to my first environmental campaign,

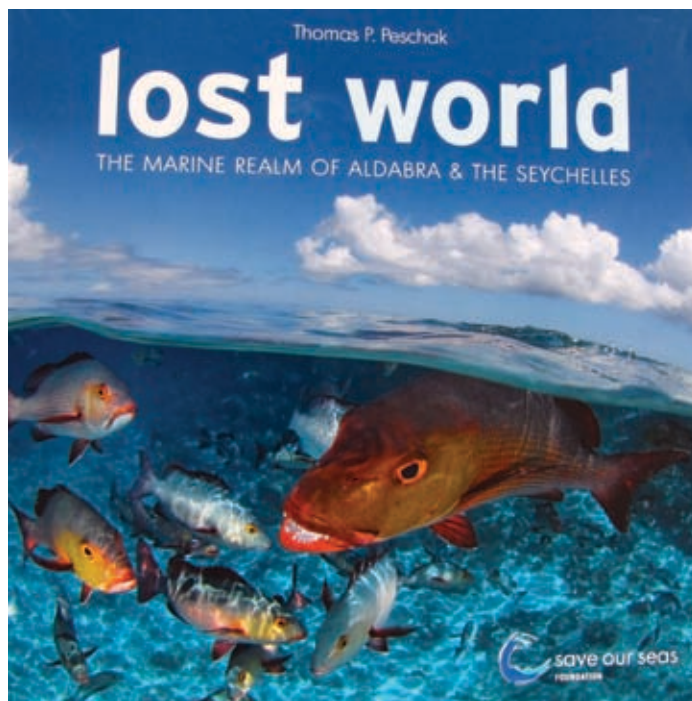
a "save the whale rally", held by the lake in Hyde park, London . I went with my family. Having set up our picnic spot amongst all the other families I looked around, a slightly confused and concerned look coming to my features. My mum on seeing this asked me what was wrong, to which I replied "where is the whale?" It is possibly no surprise then that I ended up studying, training and building a career in practical conservation, leading to the management of an international important site the size of St Anne. I have always loved nature, felt a connection to it that has nourished my soul and I take great joy in sharing this with others and providing opportunities for all people to explore this themselves. At the age of 20 I discovered meditation and yoga and this connection deepened my intellectual search for evidence of nature's benefits. Both continue to



grow to this day.

I feel privileged to be here in the Seychelles leading a project that allows me to not only combine my two biggest passions but to do so for the benefit of others and for that of the Seychelles. " Robin Says

Lost World: The Marine Realm of Aldabra & the Seychelles



A new book on Aldabra, *Lost World: The Marine Realm of Aldabra & the Seychelles* has been launched by the Save our Seas Foundation (SOSF). The book by award winning photographer Thomas P. Peschak gives Aldabra's sharks, groupers, turtles and many other marine animals that live there a voice.

In an age where human-induced environmental change is advancing across the globe, Aldabra's near-pristine marine realm is a unique and precious refuge for all that is natural in the Indian Ocean. Nonetheless both local and people thousands of kilometers away need to be inspired to care about Aldabra's seas if they are to survive into the future. This stunning book, it is hoped, will act as a catalyst for conservation action and inspire global stewardship and passion for Aldabra's seas and the abundant life that dwells there.

"My mission is to create images that make a difference: images that make people change behaviour that is damaging to our environment, and images that inspire people to utilise their skills, enthusiasm and financial resources to aid marine conservation." Peschak writes.

You've come a long way baby!



Zwazo truly has come a long way from its humble beginnings as the newsletter of BirdLife Seychelles to its full colour magazine status that covers conservation in Seychelles and the region. Here is what readers and contributors have to say.

"It takes real passion to keep a publication going – many don't succeed!" Says Rudy Van Der Elst of the Western Indian Ocean Marine Science Organization, and a contributor.

"This colourful magazine with interesting articles will surely help our visitors and researchers to the documentation centre to better understand our island's biodiversity." Says Ms Jeanette Larue, Director General, Public Education and Community Outreach

Your
Space

This page is Zwazo's interactive forum. We invite you as our readers to make contributions, including short stories, observations, art and photos.

Kantilal Jivan Shah: A conservation pioneer passes on



Kantilal Jivan or Kanti as he is better known, father of Nature Seychelles CEO, Dr. Nirmal Jivan Shah, and a Trustee of Nature Seychelles passed away suddenly at Victoria Hospital, Mahe, Seychelles on Thursday 21st October 2010. He was active till the end successfully running his business, entertaining and meeting people including students, cooking his own vegetarian fare every day and on Tuesday 19th enthusiastically showing clients new goods he had received.

Described as Seychelles' Renaissance Man, Kanti needs no introduction either locally or internationally. He is a pioneer in the creation of national parks and protection of species in Seychelles. He is a winner of numerous awards notably the United Nations Environmental Program Global 500 Award for environmental achievement, for his work in setting up national and marine parks in Seychelles, in protecting turtles and seabirds and in banning spear guns. Other awards include the Silver Medal of the Royal Academy of Sciences and Letters of Norway and the Rajiv Gandhi Lifetime Achievement Award. Several new species of Seychelles flora and fauna were named after him. He was part of the campaign to prevent a military base from being built on Aldabra and in the set up of the Indian Ocean Alliance which led to the Indian Ocean to become a whale sanctuary. He persuaded the family who owned Cousin Island to sell it to Birdlife International to save the Seychelles Warbler. He organized scientific expeditions to Seychelles earning the title of Scientific Collaborator of the Free University of Belgium and was the Seychelles Representative for the International Council for Bird Preservation (ICBP) for many years. His personal campaign to Members of Parliament in the UK saved the Port Launay wetland from being developed into a golf course. He was the Chairperson of the National Regional Seas Committee, a regional process which led to the creation of the Nairobi Convention.

He has promoted the Seychelles all around the world. He was the first Seychellois to have received the Seychelles National Tourism Trophy. He was the leader

of Seychelles First Tourism Delegation to Europe. He served as the Chair of the Seychelles Small Hotels and Guesthouse Association for many years. He attended the Salon Mondale de Tourism for several years running. He has been featured in more than two hundred magazine and newspaper articles, TV interviews and films. He starred with Omar Shariff in the film "Return to Eden" and was included by Ian Fleming as a character in a story in the James Bond novel "For Your Eyes Only". He wrote many articles about the Seychelles and was a prolific speaker at many national and international meetings and fora including at the Indian Ocean Symposium, the Babha Atomic Research Centre, the Lindblad Explorer, SS Universe Floating University, Seychelles Bicentennial Celebrations and Central Bank Annual Symposium.

He has served as founding member, trustee or chairperson on more than 200 committees and organisations such as the Seychelles Islands Foundation, Seychelles Tourism Board, Seychelles Town and Country Planning Commission, Seychelles Conservation and National Parks Committee, Seychelles National Environment Commission, Seychelles National Research and Development Council, the local boards of Cousin and Aride islands and the Seychelles Environment Trust Fund. He served as the vice chair of the Victoria District Council.

His knowledge of the history of the Seychelles was second to none and he has not only contributed to the understanding of Seychelles history but has become part of it. He has an extensive library and archives on Seychelles. He was a very knowledgeable antiquarian and collected many pieces to do with Seychelles history. He was also a naturalist, palm reader, vegetarian cook, and healer, and people come from all over the world to meet him. He won several prizes at the first national Horticultural Show for growing peanuts and potatoes successfully.

His photographs were made into the first definitive set of postage stamps for Seychelles. He produced the first colour calendar of Seychelles and colour Christmas cards for Government House. He produced the official gift of the Government of Seychelles to the Queen of England –a wooden casket of Seychelles shells- on her visit to Seychelles. He has been involved in the designs of coins, stamps and paper money of Seychelles.

His career as a successful business man included being a partner in Jivan Jetha and Company founded by his father, one of the top three firms in Seychelles at the time and involved in export of copra and cinnamon, sale of products and commodities ranging from foodstuffs to textiles, vehicles to fuel, services such as banking, insurance and ship chandelling, industry and production such as coconut oil, ice cream, soft drinks and soap.

Most of all, as a Seychellois of Indian origin, he went beyond his career as a successful businessman and influenced many people both in Seychelles and overseas. His web of friendship is spread all over the world including thousands of people who remember him with great love and admiration.



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