Final Report

21-22 APRIL

2014

USAID FROM THE AMERICAN PEOPLE

biofund
Fundação para a Conservação e Biodiversidade

REPUBLIC OF MOZAMBIQUE
MINISTRY OF TOURISM

Ministry of Tourism
Agencia Nacional das Areas de Conservação (ANAC)

BIOFUND

Conservation Science in Mozambique
Research Updates, Gaps, National Research Agenda, and Priorities

1. Executive Summary

On April 21-22, 2014, a workshop on 'Conservation Science in Mozambique' was held at the Radisson Blu Hotel in Maputo. The conference was attended by approximately 130 individuals from government, academia, the donor community and civil society. More than 40 presentations were given during the first day and a half of the conference and this was followed on the second day by an afternoon of discussions to develop a national research agenda and a list of research priorities. The intended beneficiaries of this workshop were the Agencia Nacional das Areas de Conservação (ANAC) and BIOFUND. The main recommendations include:

I. Hold regular meetings of this type, preferably annually or every two years
II. Establish a knowledge database or electronic repository, accessible through the internet, with all the scientific literature on conservation science ever done in Mozambique, plus reports to ANAC, maps, Park management plans, current research being undertaken, and other relevant information and resources
III. Better communication and cooperation between government and scientists and the joint development of research plans
IV. More transparency in the management and distribution of park entry fees to communities
V. Improve capacity, infrastructure, office and field equipment, at ANAC and at park facilities
VI. Re-evaluate current Protected Area (PA) boundaries with the possibility of changing and shifting many.
VII. Develop an accurate national map of Key Biodiversity Areas (KBAs)
VIII. More and better engagement with communities living in and around PAs
IX. Closer cooperation between Mozambican and international scientists and students
X. More baseline biodiversity surveys across the country, particularly in poorly surveyed marine, fresh water, and terrestrial ecosystems. Identify and map biodiversity hotspots in the country
XI. A specific set of species, sites, and habitats that need further studies and research, found below
XII. Identify and secure scholarship funds for Mozambican students, which they can use to link to and work with international scientists and researchers
XIII. Quantify the full extent and ecological impacts of bush-meat poaching in Mozambique
XIV. Evaluate the permeability of conservation corridors in the GLTFCA for the dispersal of large carnivores and elephants.

The recommendations above can be used as a foundation for the development of a scientific agenda and a list of research priorities. As a follow up, USAID plans to hold a small meeting bringing together key members

from government (ANAC, Ministry of Tourism), NGOs, and the scientific community to further refine and develop the agenda.

2. Introduction and Background

The Government of Mozambique (GoM) has set aside large segments of the country as protected areas (PAs) in an attempt to conserve its natural heritage while promoting sustainable economic growth. Many of these are important KBAs such as Gorongosa Mountain, Lake Niassa, the Quirimbas Archipelago, Monte Namuli, the Chimanimani Massif, and the newly created Primeiras e Segundas Marine Protected Area. According to national estimates, the country is home to more than 5,500 plant, 220 mammal, and 690 bird species, many of which are endemic. Mozambique includes 14 ecological regions, of which seven have global importance as per the WWF Global 200 Ecoregion list. As of 2012, six categories of PAs, covering approximately 159,126 Km^2, represent approximately 20% of the country's total surface area.

Mozambique's low agricultural productivity, overfishing and high population growth rates have resulted in **i**) a rapid expansion of the agricultural frontier, **ii**) a decline in aquatic and marine resources, and **iii**) severe threats to PAs and ecosystem services. People have for many years been living inside park boundaries and freely exploit their natural resources. Pressures on land and natural resource use have further intensified in recent years as the Mozambican economy continues to expand. Weak marine, forest, wildlife, and land use governance have been key contributors to deforestation, poaching, and habitat degradation. As forests are converted to other uses and wildlife populations reduced, demands on remaining natural areas and resources are escalating, creating an environment conducive of greater economic inequality and conflict over these limited wilderness areas. In this light, it is urgent to understand the current state of PAs in the country, determine immediate threats to their biodiversity, and find the best ways to reduce and mitigate these threats. Conservation science can play an essential role in this endeavor, and its findings should prove useful to policy makers and conservation practitioners.

Therefore, the Office of Agriculture, Trade and Business (ATB) at USAID hosted a workshop on "Conservation Science in Mozambique" from 21 to 22 April, 2014 at the Radisson Blu Hotel in Maputo. The workshop aimed to (**i**) convene scientists, university faculty, graduate and undergraduate students, the Government of Mozambique, and Non-Governmental Organizations (NGOs) undertaking or interested in conservation science in the country; (**ii**) serve as a venue for investigators to present their latest research; (**iii**) identify lessons learned and share best practices from current and past research aimed at improving our understanding of biodiversity, ecosystems, ecosystem services, population dynamics, community relations, and human-wildlife conflict; (**iv**) help ANAC define a National conservation research agenda that can inform policy and park management, and (**v**) prioritize research projects for which findings are urgently needed. Individuals of any nationality working on terrestrial, fresh water and marine ecosystems were invited. Areas of interest included conservation science, biodiversity (genes, species, ecosystems), ecology, evolution, population dynamics, population genetics, behavioral ecology, social sciences, wildlife veterinary medicine, biogeography, anthropology, hydrology, and any other relevant subjects.

3. Justification

With the creation of ANAC, and an increased concern for the status of PAs in Mozambique, it is essential to gather all individuals directly involved in conservation science to update all participants on their latest discoveries. While this workshop was a first step in that direction, it was refreshing to hear that most participants believe meeting of this sort should take place regularly, perhaps every year or every other year. By sharing results and techniques currently applied in the field, we expected to develop standard research methods and procedures. The gathering of scientists and interested parties helped (**i**) find gaps in research efforts; (**ii**) guide the development of a research agenda to be used by ANAC in policy making, day to day decision-making, and management activities; and (**iii**) prioritize projects within the research agenda. Some of the scientific presentations also helped define policy aimed at deterring or reducing wildlife crime such as illegal logging and fishing, illegal mining, bush-meat hunting, elephant and rhino poaching, and trafficking of

ivory and rhino horn. In addition, this workshop may contribute to Mozambique's report on implementation of their Convention on Biological Diversity (CBD)'s National Biodiversity Strategies and Action Plans (NBSAP), or may help develop a National Action Plan for a Program of Work in PAs.

4. Themes and Outline of the Workshop

The theme for the conference was **'Research Updates, Gaps, National Research Agenda, and Priorities.'** Specific thematic discussions revolved around **(i)** biodiversity and wildlife population surveys, animal counts, and baseline studies; **(ii)** population dynamics of rare or endangered species and their threats; **(iii)** invasive species; **(iv)** human-animal conflict; **(v)** community development initiatives; and **(vi)** wildlife crime, among others.

The conference opened with welcoming remarks by Douglass Griffiths, US Ambassador to Mozambique, and Abdala Mussa, former director General of ANAC. The keynote address was given by Professor Jorge Ferrao, Rector of Universidade de Lurio. During the next day and a half, investigators presented the results of their latest research. On the afternoon of second day, two separate group discussions were held in order to start the development of a national research agenda on conservation science. Some of the questions posed to the discussion groups included: What do we know about the current state of PAs in Mozambique? What knowledge do we lack? What do we need to know to protect these areas more effectively? Who is in a position to answer these questions or gather data rapidly? How much would it cost to carry out this work? Where can we find funds to support these research activities? Which are the most urgent projects and which could wait? What is the estimated cost of all this research? Closing remarks were given by Luis Honwana, Director of BIOFUND, and by Alex Dickie, Mission Director of USAID/Mozambique.

5. Workshop Presentations and Discussions

Each speaker was given 20 minutes to show her/his work through power point presentations, including a few minutes for questions from the audience. Group discussion facilitators came up with innovative approaches to bring the themes together, helped weave them into a national research agenda, and guided the prioritization of projects. To encourage student participation, a small poster session was also held.

The workshop discussions were divided by type of protected area and threats to their wildlife:

I. **Marine Protected Areas, Fresh Water Ecosystems and Reserves**: Research on threats to marine and coastal biodiversity such as shark finning, intentional and unintentional catch of protected or endangered species, unsustainable and harmful fishing practices, coral bleaching, ocean acidification, and mangrove deforestation. Research on threats to freshwater biodiversity such as overharvesting for the pet trade (e.g., cichlid fish in Lake Niassa), unsustainable and harmful fishing practices, invasive species, pollution, runoff, siltation, and other types of human pressure. Additional topics included the establishment of no-take zones and its effects on catch, fisheries associations, community involvement, fish farming, and others.

II. **Terrestrial Parks and Reserves:** Research on threats to terrestrial biodiversity such as deforestation, habitat fragmentation, invasive species, poaching, overharvesting, bush-meat hunting, pollution, and other types of human pressure. Methodologies and techniques to perform animal counts and a possible way to standardize these counts nationwide. Topics such as community development, conservation agriculture, alternative livelihoods, and reduction of human-animal conflict are also included.

6. Speakers and Participants

The number of individuals taking part in the workshop was approximately 130. The following organizations were represented:

- Government of Mozambique (Ministry of Tourism, ANAC, Park Wardens)
- BIOFUND
- Investigators (Scientists, faculty, graduate and undergraduate students)
- Protected Area research coordinators and directors of scientific services
- NGOs
- Donors

7. Recommendations

Before the discussion groups split up, the facilitator asked the audience to focus on research priorities for conservation in Mozambique at three levels: species, sites, and habitat/landscape. Although some participants pointed that this expert opinion is an "ad-hoc approach" and may be valid for initial priority setting, a more defensible and robust method is needed for prioritization, taking in consideration the principles of biodiversity conservation planning: representativeness, complementarity, irreplaceability and persistence. Below is a summary of the initial suggestions by each group.

I. **Marine Protected Areas, Fresh Water Ecosystems, Wetlands and Reserves**

The marine and freshwater ecosystems group came up with an initial list of priority species, areas, and landscapes that require further studies. Also, general suggestions for ANAC and Mozambique were provided:

<u>Species</u>

1. Manta Rays
2. Whale Sharks
3. Predators such as sharks
4. Albatross
5. Whales
6. Marine Turtles
7. New Species (to Mozambique or to science) and where they occur once discovered
8. Hard and soft coral species, their abundance and diversity
9. Sea Horses
10. Dugongs
11. Tuna and other commercial fish of high value
12. Sea snails

<u>Sites</u>

For better resource use, it would be good to have more accurate knowledge of what is happening at different sites of biological significance to improve our understanding of the status of threatened species.

The creation of a knowledge database to improve access to past or current research is critical and a priority.

Important marine areas such as Tofo, Inhambane, Zavora, Primeiras e Segundas, and Quirimbas need to be managed sustainably and responsibly to ensure the long term survival of the rich biodiversity found there. The connectivity between marine waters also needs to be studied and we may need to revisit the boundaries of the current marine parks.

<u>Landscape/Biome</u>

1. Fish reproductive and spawning areas

2. River estuaries and mangroves
3. Lake Niassa Reserve, fresh water lakes,

General Suggestions

These are some subjects that were discussed and suggested as areas of concern and potential activities:

1. A need for more environmental educational programs nationwide.
2. A thorough understanding of the new Conservation Law and making sure that the regulations emanating from it are non-ambiguous and can be implemented effectively.
3. A need to improve the capacity of individuals and communities living within or on the buffer zones of PAs to participate in monitoring programs.
4. A need to improve the capacity of Mozambican academia to protect and monitor PAs.
5. We need to research ways to influence political will.
6. We need more research on cultural and behavioral changes.
7. We need a better understanding of the economic value of PAs.

II. **Terrestrial Parks and Reserves:**

The terrestrial ecosystems group came up with the following lists:

Species

1. Large predators (lion, leopard, hyena, cheetah, wild dog, crocodile)
2. Elephant and rhino, the latter if still present in the country
3. Various species of large herbivores (Buffalo, hippo, giraffe, wildebeest, zebra, large antelope)
4. Smaller predators (mustelids, viverrids, small canids and felids)
5. Bats and birds as pollinators and seed dispersers. Birds are flagship species and are thus good indicators of ecosystem health. The RED LIST for Mozambique should be updated

Sites

There appears to be little research done or literature available from many protected areas in the country. These include the following:

1. Banhine
2. Zanive
3. Chimanimani
4. Gile
5. Marromeu
6. Pomene
7. Niassa
8. Quirimbas
9. Limpopo and the GLTCA
10. Maputo Special Elephant Reserve
11. Trans-boundary Areas

In addition, the boundaries of many of these PAs need to be revised. The viability of large sections of several parks is already compromised by human settlements while sections in the buffer zones with no human settlements could be incorporated.

Finally, the impacts of mining and agriculture on PAs' habitats are a priority.

Landscapes/Biomes:

Because large parts of the country are covered by miombo woodland, a better understanding of this type of ecosystem, its current status and the resources it offers to diverse communities should be a research priority.

III. General Recommendations:

The following is a combination of thoughts and statements made by various individuals during the two sessions. I have grouped these as best as I could in common themes:

At the moment, ANAC has very little capacity to carry out basic research, monitoring and evaluation. There is a lot of work to be done but often scientists have to go to neighboring countries to carry out their research. Minimal infrastructure in Mozambique is a major hindrance to proper and effective research. ANAC needs better infrastructure, in addition to field and office equipment. There is a need for capacity building at ANAC and development of local scientific expertise. Is there potential for USAID to provide funding for Mozambican students, so that foreign researchers could better link their work with Mozambicans? As international researchers, we are often asked to capacity build. While there is much potential to link Mozambican students to our work, there does not seem to be an easily accessible conservation scholarship fund that Mozambican students can apply for to cover their tuition and living costs.

ANAC should also be a self-sufficient institution with enough resources to operate and manage Protected Areas (PAs) and to coordinate, help, and encourage scientific inquiry within the areas it is mandated to manage. How can ANAC generate its own resources?

We need a mechanism by which people can create institutional partners that allow us to access and share information.

There is an information circulation problem. For instance, from the 20% income destined by law to go to communities, there is no clarity as to who collects and distributes that money, or how much, when and how often communities receive those funds.

Scientists promised to give copies of their work to ANAC but apparently that has not happened since 1976, and that contributes to institutional memory loss. On the other hand, researchers say they have been sending their results and information to ANAC but ANAC does not acknowledge receipt. Researchers are unaware of how ANAC stores and uses those reports. This is an indication of a lack of clear communication between ANAC and investigators. There is also a need to know that researchers are being heard by ANAC and that their work is being transformed into management policies. There's a need to identify an institutional model for ANAC and for all PAs. When senior management changes priority areas change as well. Collaboration between researchers and government is needed. Projects have to be identified and initiated in a cooperative way. ANAC didn't answer to many research inquiries in a correct and timely way. Most research plans and activities are made and carried out by national and international NGOs and by universities. The results of that work should be shared with the conservation areas where it takes place.

We talked about fire but no one said why farmers burn and whether they know how to protect their land and plantations. More research is needed here as well.

Science is connected to culture, training, etc. What we notice in the field is very high rates of illiteracy, and that researchers seldom engage communities, and don't like the way communities see or understand conservation. Many Mozambicans see animals as food or as enemies and it is necessary to explain to them that the enemy is not wild animals themselves but their actual killings.

Animal protection is the best long-term solution to poverty through tourism and alternative livelihoods, but obviously communities need to see firsthand those benefits to become active stewards. It's important to emphasize the importance of Mozambique in conservation. Mozambique contributed to saving the elephants in South Africa. Communities must benefit directly from these efforts. For instance, the introduction of population shares such as land rights should be considered; land and resources ultimately belong to them. National Parks often try to do a co-amputation and not a partnership as it was supposed to be.

In following the normal ecological literature from around the world, it is evident that in ecosystems everything is interactive, biodiversity loss doesn't come back and it's a one way road. The number one issue of our time in conservation is bush-meat poaching and it's not ever acknowledged in Mozambique.

Birds are fantastic indicators of ecosystem health, the canary in the mine, so to speak. They are very easy to study. What ACCEM has to do first is to update that red list for threatened bird species. Marine and terrestrial-Mozambique is a gray area with many poorly studied wetlands. There's a network of wetlands and protected areas and each conservation unit has to have its own Management Plan. These plans then must be integrated and coordinated by ANAC to ensure cohesive and forward thinking policies and management.

A national map of KBAs would be extremely important to prioritize conservation action, in or outside PAs, and efficiently spend scarce funds and guide research in a vast country such as Mozambique. These KBA could be developed using a conservation planning system and would include a combination of aspects: restricted range, threatened and keystones species, landscapes that maintain vital ecosystems services, critical and endangered habitats, opportunity cost, threats, etc.

Politicians should try to connect conservation areas through networks. Understanding and cooperation agreements with local communities need to be established It is also essential to make resources available from PAs as part of institutional budgets. Conservation issues can't only be attached to Tourism. ANAC should be managed by an inter-ministerial office connected to the Prime Minister's Office.

We set our research priorities to study cheetah and lions in Limpopo, which is difficult to do in Mozambique because NGO's don't believe these iconic species are around in sufficient numbers anymore to be saved and because they already over exploited.

Not many people are able to work with the lack of facilities we have in Limpopo Park, and it is hard to engage Mozambicans to come out and join us in our efforts.

In general it's very difficult to translate research results into management decisions. We thought that we could have a website where scientists can upload and share their results. If we could have our research translated into other languages, more investigators could have access. A multi –disciplinary approach is needed to come up with more meaningful and powerful solutions. The problem is that we tend to forget the past, but there's a lot of work already done about which we know little. We need a repository, accessible on line, of all previous and current research on conservation areas in Mozambique. For Marine research and fresh water systems a website-accessible platform to search and share research priorities and work done or being carried out should be established so research and decisions can be made more effectively. This type of infra-structures should be set up, run, and maintained by ANAC or BIOFUND. Can USAID assist in providing an online platform that researchers can share their work, to increase communication and transparency with ANAC?

We cannot protect what we don't know; we can only protect species if we know more about them. We will lose many species if we don't prioritize and qualify the numbers taken by bush meat hunting. We also need to identify what we need to put in practice to maintain viable populations. There is probably a lot of unknown biodiversity in Mozambique. We need to perform biodiversity surveys across all PAs similar to those taking place in Gorongosa National Park to assess Mozambique's true biodiversity wealth and develop plans for its protection. Which are the species to protect besides the ones we work with? How do we know what is being represented and what's not in this conference? We need to reflect deeply and carry out impartial analysis in order to know what the big threats to PAs are.

Forest managers should take forestry engineers to court. For instance, in a place where there is no chanfuta, management plans based on chanfuta were developed. There is a certain responsibility people should be accountable for. More fair play is necessary.

We still don't have an open window to Research in Mozambique. In order for the country to develop, it would be good to identify hotspots and map them. The areas that we have in the map today have to be changed because probably the limits have changed as well and they're not what they use to be. Some areas have people living there, some more fauna than people. It's a must to investigate models for what our country needs are.

Challenges to do research in Mozambique:

1. The lack of large Mammal catchment facilities
2. Study hotspots – maps of biodiversity
3. Empty forest syndrome
4. Lack of a central repository for scientific literature, research findings, and management plans

8. Outcomes

The intended major outcome of the conference was a research agenda and a research action plan for ANAC. This report is a first step in that direction. Among the next steps is to hold another smaller meeting between key ANAC, Ministry of Tourism, and BIOFUND officials with key researchers to develop an agenda and

Another outcome was the establishment and maintenance of a website with Proceedings from the workshop, the actual presentations, reports and other findings. The website can be found here:

http://www.conservationmozambique.com/

Finally, the networking that occurred during the conference was a major accomplishment. Individuals who did not know each other before, or who were unaware of each other's work, were able to meet in person and start conversations about the issues, challenges to their research and potential future collaborations.

9. Appendices: Conference Agenda, Book of Abstracts and List of Delegates

Agenda

21-22 APRIL

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REPUBLIC OF MOZAMBIQUE
MINISTRY OF TOURISM

CONSERVATION SCIENCE IN MOZAMBIQUE AGENDA,
Monday April 21, 2014, General Room

7:00	Registration and Badges
7:30	Welcoming Coffee
8:00	Opening Remarks, Douglas Griffiths, United States Ambassador to Mozambique
8:20	Opening Remarks, Abdala Mussa, Director ANAC, TBC
8:40	C. L. Pereira - Implicações do foro veterinário na interface fauna, animais domésticos e Homem
9:00	A.D. Marshall, S. J. Pierce, C. A. Rohner, C. L. Dudgeon, D. van Duinkerken, L. Bowles - Summary of a decade of research on manta rays in southern Mozambique and the implications for conservation in Mozambique
9:20	M. Stalmans, P. Naskrecki, M. Mutemba - An integrated approach to information and specimen management for biodiversity conservation in central Mozambique
9:40	K. Allen - Dugong conservation in the Bazaruto Archipelago National Park: Enhancing protection and monitoring, and identifying risks and mitigation measures
10:00	G. Allport, C. Bento, M. Taylor, N. Aransay, M. Ngwenyama - Overview of bird conservation science in Mozambique – players and the key components
10:20	Coffee Break
10:40	A. Chaúque, R. R. Bandeira, A. Ribeiro, N. S. Ribeiro - Avaliação do impacto do fogo na acessibilidade dos principais produtos florestais na Reserva Nacional do Niassa - Moçambique
11:00	Y. Tibirica, S. Brumme - Losing unknown marine biodiversity?
11:20	T. Nhazilo - As Áreas Conservação Transfronteira (ACTF) em Moçambique como Janela de Oportunidades na Melhoria da Qualidade de Vida das Comunidades Locais: O caso da Reserva Especial de Maputo
11:40	B. Nhancale - Landscape Level Conservation Planning for prioritizing conservation action in Mozambique
12:00	S. J. Pierce, C. Rohner, A. Richardson, S. Weeks, J. Brunnschweiler, C. Prebble, J. Holmberg, A. Marshall - Residency and movements of whale sharks *Rhincodon typus* in Mozambique
12:20	Lunch
13:20	M. A. M. Pereira, R. S. Fernandes - Science for Conservation in Mozambique's marine protected areas (2003-2013)
13:40	S. N. Lisboa, Almeida A. Sitoe, N. S. Ribeiro - Estimation of Aboveground Biomass and Carbon in Evergreen Mountain Forest, Moribane Forest Reserve
14:00	L. Andresen - The impacts of humans on cheetah ecology in the Limpopo National Park, Mozambique
14:20	G. Allport, C. Bento, M. Taylor, N. Aransay, M. Ngwenyama - Globally Threatened Birds of Mozambique
14:40	A. Cangela, R. R. Bandeira, A. I. Ribeiro, N. S. Ribeiro - Mapping the Fire Regime of Niassa National Reserve Between 2000 and 2012
15:00	C. Ntumi - Dealing with human-elephant conflict: a landscape approach in Mozambique
15:20	J. Trindade, R. Rebelo, A. Guissamulo, I. Silva – Factors that Influenced Nesting Beach Selection by Green Turtles (*Chelonia mydas*) in Vamizi, Mozambique, between 2003 and 2012
15:40	Cofee Break adn Poster Session
16:00	F. D. Francisco, V. Macandza - Avaliação da diversidade da herpetofauna no Parque Nacional da Gorongosa
16:20	E. Militão, I. Maquia, M. Mazivile, C. Chirinzane, L. F. Goulão, N. Ribeiro, A. Ribeiro - Avaliação da variabilidade genética de chanfuta (*Afzelia quanzensis* welw.) na floresta de Michafutene: implicações para os programas de conservação da espécie
16:40	C. Bento, M. Couto - Engaging people
17:00	End of Presentations for the day
18:00	Reception to View the film "The Guide" at the MLK American Cultural Center. Film starts promptly at 18:40

CONSERVATION SCIENCE IN MOZAMBIQUE AGENDA,
Tuesday April 22, 2014, General Room

7:00	Welcoming Coffee
8:00	Keynote Lecture – Jorge Ferrao, Universidade Lurio/ UniLurio.
9:00	Consecutive Presentations Rooms 1 and 2
10:40	Coffee Break and Poster Session
11:00	Consecutive Presentations Rooms 1 and 2
12:40	Lunch
14:00	Breakout Sessions: Marine Ecosystems, Terrestrial Ecosystems
15:30	Coffee Break
16:00	General Discussion: A research agenda and priority list for ANAC and BIOFUND
17:00	Closing Remarks, Luis Bernardo Honwana, Director of BIOFUND
17:15	Closing Remarks, Alex Dickie, Director USAID Mozambique
17:30	Networking Reception – Radisson Blu Hotel Bar
19:30	End of conference

	ROOM 1
9:00	C. L. Pereira – C. Ntumi - Impacto da caça furtiva no tamanho da população de elefantes (*Loxodonta africana*) em Moçambique
9:20	I. Marques da Silva,N. Hill, M. Dornelas - Spillover effects of a community-managed marine reserve
9:40	E. Sola, D. Glassom, I. da Silva - Reproductive synchrony and recruitment ecology of scleractinian corals at Vamizi Island, nothern Mozambique
10:00	G. Allport, C. Bento, M. Taylor, N. Aransay, M. Ngwenyama - Bird Atlas of Mozambique
10:20	A.D. Marshall, O. Bowles, G. Winstanley, S. Pierce - A Giant Opportunity- The economic relevance of the world's largest rays to the marine tourism industry of Mozambique
10:40	Coffee Break and Poster Session
11:00	J.L. Jetimane, I. Maquia, L. F. Goulão, A. Ribeiro, N. S. Ribeiro - Ecological Characterization of *Afzelia quanzensis* welw. Plantation in Michafutene: Opportunities for species Ex-Situ Conservation
11:20	A. T. Mugadza - Sustainable tourism development in Transfrontier Conservation Areas (TFCAs): A Legal Perspective
11:40	K. Everatt - Lion population and habitat ecology in the Limpopo National Park, Mozambique
12:00	G. Allport, C. Bento, M. Taylor, N. Aransay, M. Ngwenyama - Seabirds
12:20	I. Marques da Silva, J. Trindade - Conservation of endangered species in North Mozambique through scientific and local community collaborative actions
12:40	Lunch
14:00	Breakout Session: Marine Ecosystems
15:30	Coffee Break

	ROOM 2
9:00	N. S. Ribeiro - 10 years of fire related research in Niassa National Reserve, northern Mozambique
9:20	G. Allport, C. Bento, M. Taylor, N. Aransay, M. Ngwenyama - Important Bird Areas (IBAs) of Mozambique
9:40	D.I. van Duinkerken, A.D. Marshall - Linking manta ray habitat use to effective conservation strategy in southern Mozambique
10:00	V. Macandza, F. Mamugy, J. Lichuge - Uso do espaço e habitat pelo elefante na Reserva Florestal de Moribane
10:20	M. Mathe, N. Ribeiro, P. Cabral - GIS Modelling to Assess the Fire Risk at Niassa National Reserve, northern Mozambique
10:40	Coffee Break and Poster Session
11:00	G. Allport, C. Bento, M. Taylor, N. Aransay, M. Ngwenyama – Wetlands of Mozambique
11:20	I. Maquia, L. F. Goulão, N. Ribeiro, A. Ribeiro - Aplicação de marcadores moleculares para avaliação da biodiversidade florestal nas matas de miombo: estudo de caso na Reserva Nacional de Niassa, Moçambique
11:40	C. Monteiro, R. Ducrotb, Chloé Legrand - Rumo ao Planeamento Integrado e Participativa para Gestão Integrada dos Recursos Naturais na Periferia das Áreas de Conservações: Contribução de uma Abordagem de Simulação Participativa
12:00	S. Bishop, N. Nhampossa - Swim today, Act together. Protect tomorrow
12:20	C. P. Ntumi, A. R. Martins, V. M. José, N. H. Monjane, J. A. Massinga, I. J. Uamba- Reserva e Comunidades Locais em Gilé (Moçambique): Resiléncia Sócio-ecológica e reencontro de velhos amigos?
12:40	Lunch
14:00	Breakout Session: Terrestrial Ecosystems
15:30	Coffee Break

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REPUBLIC OF MOZAMBIQUE
MINISTRY OF TOURISM

CIÊNCIA DA CONSERVAÇÃO EM MOÇAMBIQUE AGENDA,
Esboco da Agenda, Segunda-Feira 21 de Abril de 2014
Sala Principal

7:00	Registo e Entrega de Crachás
7:30	Café de Boas Vindas
8:00	Observações Iniciais, Douglas Griffiths, Embaixador dos Estados Unidos em Moçambique
8:20	Observações Iniciais, Abdala Mussa, Diretor ANAC
8:40	C. L. Pereira - Implicações do foro veterinário na interface fauna, animais domésticos e Homem
9:00	A.D. Marshall, S. J. Pierce, C. A. Rohner, C. L. Dudgeon, D. van Duinkerken, L. Bowles – Resumo de uma década de investigação sobre raias manta no Sul de Moçambique e as implicações para a a sua conservação em Moçambique
9:20	M. Stalmans, P. Naskrecki, M. Mutemba – Uma abordagem integrada para a informação e gestão de espécies para a conservação da biodiversidade na zona central de Moçambique.
9:40	K. Allen – Conservação dos Dugongos no Parque Nacional do Arquipélago de Bazaruto.Aumento da Proteção e da Monotorizacao, identificando os riscos e atenuando medidas.
10:00	G. Allport, C. Bento, M. Taylor, N. Aransay, M. Ngwenyama – Panorâmica da ciência de conservação dos pássaros em Moçambique – atores e components principais.
10:20	Coffee Break
10:40	A. Chaúque, R. R. Bandeira, A. Ribeiro, N. S. Ribeiro - Avaliação do impacto do fogo na acessibilidade dos principais produtos florestais na Reserva Nacional do Niassa - Moçambique
11:00	Y. Tibirica, S. Brumme – Perda da biodiversidade marinha desconhecida
11:20	T. Nhazilo - As Áreas Conservação Transfronteira (ACTF) em Moçambique como Janela de Oportunidades na Melhoria da Qualidade de Vida das Comunidades Locais: O caso da Reserva Especial de Maputo
11:40	B. Nhancale – Paisagem dos Níveis de Conservação – planejamento e priorizacao das ações de conservacao em Moçambique.
12:00	S. J. Pierce, C. Rohner, A. Richardson, S. Weeks, J. Brunnschweiler, C. Prebble, J. Holmberg, A. Marshall – Residência e Movimentos das Baleias tubarão *Rhincodon typus* em Moçambique
12:20	Almoço
13:20	M. A. M. Pereira, R. S. Fernandes - Science for Conservation in Mozambique's marine protected areas (2003-2013)
13:40	S. N. Lisboa, Almeida A. Sitoe, N. S. Ribeiro – Estimativa da Biomassa e do Carbono na Floresta de Evergreen Mountain,Reserva Florestal de Moribane.
14:00	L. Andresen – Impacto dos humanos na ecologia das chitas no Parque Nacional do Limpopo, Moçambique
14:20	G. Allport, C. Bento, M. Taylor, N. Aransay, M. Ngwenyama – Pássaros Globalmente atacados em Moçambique
14:40	A. Cangela, R. R. Bandeira, A. I. Ribeiro, N. S. Ribeiro – Mapeamento do Regime de Fogo na Reserva Nacional do Niassa entre 2000 e 2012
15:00	C. Ntumi – Lidando com o conflito homem-elefante: uma abordagem paisagística em Moçambique
15:20	J. Trindade, R. Rebelo, A. Guissamulo, I. Silva – Fatores que influenciam a seleção da praia para nidificação das Tartarugas Verdes (Chelonia mydas) em Vamizi, Moçambique, entre 2003 e 2012
15:40	Coffee Break e Sessão de Posters
16:00	F. D. Francisco, V. Macandza - Avaliação da diversidade da herpetofauna no Parque Nacional da Gorongosa
16:20	E. Militão, I. Maquia, M. Mazivile, C. Chirinzane, L. F. Goulão, N. Ribeiro, A. Ribeiro - Avaliação da variabilidade genética de chanfuta (*Afzelia quanzensis* welw.) na floresta de Michafutene: implicações para os programas de conservação da espécie
16:40	C. Bento, M. Couto – Participação do público
17:00	Final das Apresentações do Dia
18:00	Recepção para visionamento do filme "The Guide" no MLK Centro Cultural Americano. O filme começa imperetrivelmente as 18:40.

CIÊNCIA DA CONSERVAÇÃO EM MOÇAMBIQUE AGENDA,
Esboco da Agenda, Segunda-Feira 22 de Abril de 2014
Sala Principal

7:00	Café de Boas Vindas
8:00	Keynote Lecture – Jorge Ferrao, Universidade Lurio/ UniLurio.
9:00	Apresentações Consecutivas Sala 1 e 2
10:40	Coffee Break e Sessão de Posters
11:00	Apresentações Consecutivas Sala 1 e 2
12:40	Almoço
14:00	Sessão Aberta:: Marine Ecosystems, Terrestrial Ecosystem
15:30	Coffee Break
16:00	Debate Geral: Agenda de investigação e A research agenda and priority list Lista de Prioridades da ANAC e do BIOFUND
17:00	Comentários Finais, Luís Bernardo Honwana, Diretor of BIOFUND
17:15	Comentários Finais, Alex Dickie, Diretor USAID Mozambique
17:30	Recepção de Networking – Bar do Hotel Radisson Blu
19:30	Fim da Conferência

	Sala 1
9:00	C. L. Pereira – C. Ntumi - Impacto da caça furtiva no tamanho da população de elefantes (*Loxodonta africana*) em Moçambique
9:20	I. Marques da Silva,N. Hill, M. Dornelas – Efeitos Indiretos de uma reserva gerida por uma comunidade.
9:40	E. Sola, D. Glassom, I. da Silva – Sincronia reprodutiva e recrutamento ecológico dos corais scleractinia na Ilha Vamizi, norte de Moçambique
10:00	G. Allport, C. Bento, M. Taylor, N. Aransay, M. Ngwenyama - Atlas dos Pássaros de Moçambique
10:20	A.D. Marshall, O. Bowles, G. Winstanley, S. Pierce – Uma Oportunidade Gigante – Relevância Econômica das raias maiores do mundo na indústria turismo marítimo de Moçambique
10:40	Coffee Break e Sessão de Posters
11:00	J.L. Jetimane, I. Maquia, L. F. Goulão, A. Ribeiro, N. S. Ribeiro – Caracterização Ecológica da *Afzelia quanzensis* welw. Plantação em Michafutene: Oportunidades para as espécies em conservação Ex-Situ.
11:20	A. T. Mugadza – Desenvolvimento do Turismo Sustentável nas Áreas de Conservação Transfronteiriça (ATCT): Uma perspectiva Legal
11:40	K. Everatt – População e Habitat Ecológico dos leões no Parque Nacional do Limpopo, em Moçambique
12:00	G. Allport, C. Bento, M. Taylor, N. Aransay, M. Ngwenyama – Aves Marinhas
12:20	I. Marques da Silva, J. Trindade – Conservação das Espécies em vias de extinção no Norte de Moçambique através da colaboração de ações científicas e de comunidades locais.
12:40	Almoço
14:00	Sessão Aberta: Marine Ecosystems
15:30	Coffee Break

	Sala 2
9:00	N. S. Ribeiro -10 anos de investigação ligada ao fogo na Reserva Nacional do Niassa, Norte de Moçambique
9:20	G. Allport, C. Bento, M. Taylor, N. Aransay, M. Ngwenyama – Áreas Importantes de Pássaros (AIP) de Moçambique
9:40	D.I. van Duinkerken, A.D. Marshall – Ligando o uso do habitat da raia manta a estratégia de uso efetivo de conservacao no sul de Mocambique. conservacao ao uso efetivo
10:00	V. Macandza, F. Mamugy, J. Lichuge - Uso do espaço e habitat pelo elefante na Reserva Florestal de Moribane
10:20	M. Mathe, N. Ribeiro, P. Cabral – Modelo GIS para o acesso do Risco de Fogo na Reserva Nacional do Niassa, norte de Moçambique
10:40	Coffee Break e Sessão de Posters
11:00	G. Allport, C. Bento, M. Taylor, N. Aransay, M. Ngwenyama – Zonas Pantanosas de Moçambique
11:20	I. Maquia, L. F. Goulão, N. Ribeiro, A. Ribeiro - Aplicação de marcadores moleculares para avaliação da biodiversidade florestal nas matas de miombo: estudo de caso na Reserva Nacional de Niassa, Moçambique
11:40	C. Monteiro, R. Ducrotb, Chloé Legrand - Rumo ao Planeamento Integrado e Participativa para Gestão Integrada dos Recursos Naturais na Periferia das Áreas de Conservações: Contribução de uma Abordagem de Simulação Participativa
12:00	S. Bishop, N. Nhampossa – Nadar Hoje, Agir juntos, Proteger amanha
12:20	C. P. Ntumi, A. R. Martins, V. M. José, N. H. Monjane, J. A. Massinga, I. J. Uamba- Reserva e Comunidades Locais em Gilé (Moçambique): Resiliência Sócio-ecológica e reencontro de velhos amigos?
12:40	Almoço
14:00	Sessão Aberta: Terrestrial Ecosystems Almoço
15:30	Coffee Break

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ABSTRACTS

21-22 APRIL/ABRIL

2014

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REPUBLIC OF MOZAMBIQUE
MINISTRY OF TOURISM

IMPLICAÇÕES DO FORO VETERINÁRIO NA INTERFACE FAUNA, ANIMAIS DOMÉSTICOS E HOMEM.

Carlos Lopes Pereira*

***Wildlife Conservation Society**
Moçambique

A continua expansão da população humana tem resultado na ocupação de muitas áreas de conservação que possuem algum potencial agrícola resultando na perda do habitat e ou a sua fragmentação. São as áreas mais secas e com solos mais pobres as que mantêm ainda uma população natural de animais selvagens e uma certa distância física entre a fauna o homem e os animais domésticos. É nesta competição pelos recursos que a interface entre animais selvagens , domésticos e homem se expressa e se torna cada vez mais aparente como resultado do contacto cada vez mais frequente. Esta interacção resulta em fenómenos de transmissão e ocorrência de doença aberta e que na maior parte das vezes se encontra oculta no ambiente natural da fauna. O estabelecimento das áreas de conservação transfronteiriça como forma de evitar a fragmentação ecológica trouxeram outros desafios e complexidades e a necessidade de confrontar estes desafios e riscos com recurso a novas metodologias de trabalho.

O potencial infeccioso de vários agentes está em alguns casos bem estabelecido, mas as consequências dessa interacção continuam ainda pouco conhecidos ou previsíveis. A Peste Bovina, a Febre do Vale do Rift, a Febre Aftosa, a Peste Suína Africana , a Febre Catarral Maligna a Raiva , o carbúnculo hemático, brucelose, tuberculose, pleuropenumonia contagiosa , tripanossomose e teileriose têm tido não só impacto directo originando perdas económicas e dificultando as trocas comerciais internas , assim como têm influenciado as trocas comerciais entre os países, privando os mesmos do acesso aos mercados internacionais. A tuberculose bovina e a teileriose ou doença do corredor são os novos desafios para algumas regiões de Moçambique enquanto a febre aftosa mantida pelo búfalo africano continua sempre presente como uma ameaça conhecida para os países vizinhos exportadores de produtos agrícolas e em particular animais ou carne. A interacção entre bovídeos domésticos infectados pelo vírus do tipo O da Febre aftosa introduzido em Moçambique na década de 70 através de bovinos importados do Brasil é um exemplo único de referencia para toda a região austral de África e outras e cujas implicações estão ainda por dimensionar na sua totalidade.

Na maior parte das áreas de Conservação em Moçambique , incluindo os parques nacionais o contacto entre animais selvagens e domésticos e homem é favorecido pela competição pelos mesmos recursos: terra, forragem e a água. Neste contexto é essencial ter em consideração a complexidade e a interacção entre todos os componentes envolvidos e que se reconheça que a implementação das estratégias de controlo de doenças endémicas e epidémicas enfrentam cada vez mais um novo paradigma. Este paradigma leva em conta não só os aspectos intrínsecos relacionados com as características do agente da doença, do hospedeiro e do ambiente em que ele existe mas também a percepção que as pessoas têm das vantagens e desvantagens comparativas ou dos benefícios económicos que resultam das intervenções ou não intervenções sobretudo quando estão directamente expostas a elas.

O aumento de densidade e confinamento de algumas espécies faunísticas no seu ambiente natural como resultado da perda de habitat natural tem resultado no aparecimento da surtos de carbúnculo hemático (Bacillus anthracis) e por vezes sua transmissão ao homem por ingestão de carne contaminada. O desenvolvimento da industria faunística e a sua parcial intensificação na região austral de África e em particular na África do Sul tem exposto na fauna doenças endémicas e outras doenças semelhantes ás dos animais domésticos. Por outro lado os animais selvagens estão cada vez mais expostos as doenças infecciosas intimamente associadas aos animais domésticos como a tuberculose e a brucelose. Esta comunicação faz uma revisão não exaustiva das implicações do foro veterinário na interface fauna.

SUMMARY OF A DECADE OF RESEARCH ON MANTA RAYS IN SOUTHERN MOZAMBIQUE AND THE IMPLICATIONS FOR CONSERVATION IN MOZAMBIQUE

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2 University of Queensland, Brisbane, Australia

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The recently differentiated manta rays (Manta birostris and Manta alfredi) are listed as Vulnerable on the IUCN Red List (2011) and in 2013 were listed on CITES due to their conservative life histories and the growing fisheries for their body parts. Manta birostris has also been listed on CMS in recent years. A decade ago we knew very little about how these giant rays use their environment, what habitats they prefer, where they travel to and why. As a result, this ray is now the focus of intense scientific scrutiny to support more effective management of their populations. Over the last 12 years, over 1000 individuals have been photographically identified from Inhambane Province, Mozambique, making it one of the largest identified populations of manta rays in the world. Population sizes were estimated in 2007 to be 600 individuals (SE = 174.3, 95% CI = 258.1–941.5) for Manta birostris and 802 individuals (SE = 106, 95% CI = 706–1073) for Manta alfredi. In 2013, eight-year logbook data of numbers of both Manta species were used to do a stock assessment using concurrent environmental, temporal and celestial variables to standardise sightings and identify how these variables influence Manta sightings using GAMs and GLMs. A significant decline of 88% in the standardised sightings for the reef manta ray was noted. We hypothesized that this severe decline may in part be attributed to escalating human traffic of inshore reefs but mainly influenced by inshore fisheries for and by-catch of manta rays in their primary habitat in the Inhambane Province. No decline was evident for the giant manta ray. The local predictors best fitted reef manta ray sightings, a coastal species with high residency, but less so for the giant manta rays. With year-round sightings and one of the only truly sympatric distributions of these species in the world, southern Mozambique represents the most critical habitat for these threatened rays in Africa and supports important feeding, cleaning and breeding grounds for both species.

Keywords: manta ray, population estimates, population decline, conservation

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AN INTEGRATED APPROACH TO INFORMATION AND SPECIMEN MANAGEMENT FOR BIODIVERSITY CONSERVATION IN CENTRAL MOÇAMBIQUE

Stalmans M., Naskrecki P. & Mutemba M.
Parque Nacional da Gorongosa

The EO Wilson Lab was recently inaugurated in the Parque Nacional da Gorongosa. Its existence and purpose are defined in the Long term Agreement between the Gorongosa Restoration Project and the Government of Moçambique. It has been created to explore, document, and protect biodiversity of the Park. It offers research and training opportunities in biodiversity-related fields for students and conservation leaders in Moçambique. The Laboratory will work closely with Moçambique's national institutions in the field of biodiversity. The Laboratory conducts comprehensive surveys and long term research of biological diversity of the Park, the results of which will create a detailed and dynamic picture of life in Gorongosa, and help guide the National Park's restoration efforts. The Laboratory is home to a permanent synoptic collection of Gorongosa's flora and fauna. The Lab has a climate-controlled herbarium and entomological collection, two work areas with stereomicroscopes and computers (with a WiFi network), a -40°C freezer and a lab-grade refrigerator. The collection has a comprehensive data management and specimen tracking system, including physical barcoding of specimens. Every specimen in the collection is linked to spatial and temporal information regarding the specimen and the corresponding species. Conversely, through the specimen storage information recorded in the database, each specimen can immediately be located in its particular cabinet and drawer. Species lists can be easily generated for specific localities and for specific groups of organisms. At this early stage, the database already holds information on more than 2000 species known to occur in the Park.

DUGONG CONSERVATION IN THE BAZARUTO ARCHIPELAGO NATIONAL PARK: ENHANCING PROTECTION AND MONITORING, AND IDENTIFYING RISKS AND MITIGATION MEASURES.

Karen Allen
Executant: Dugong Emergency Protection Project, Endangered Wildlife Trust.

Dugong Emergency Protection Project: Executant Support
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Mozambique's Bazaruto Archipelago maintains a Dugong (*Dugong dugon*) population of approximately 247 individuals (Findlay et al. 2012); representing East Africa's single remaining viable population. Two distinct Dugong assemblages are apparent; one located within the Bazaruto Archipelago National Park, and another in the Nova Mabone-Nhamabwe region. The latter constitutes 50 kilometres of coastline south of the Save River. Illegal bycatch in the semicommercial gill net fishery is the most significant threat to Dugongs, while seine netting uproots seagrass habitat. The human-induced pressures placed on Bazaruto's coastal ecosystems and threatened marine species, through extractive utilisation and habitat degradation will continue to reduce marine biodiversity unless a multi-disciplinary conservation strategy is developed to mitigate these threats. Interventions applied by the Endangered Wildlife Trust, in partnership with the Parque Nacional do Arquipélago do Bazaruto, have reduced Dugong mortalities and improved law enforcement effectiveness within the Park. Outcomes of 12 months of regular marine patrols covering 9,017km, and 60 hours of unsystematic aerial surveillance have provided the Park with spatial representations of fisheries distribution and Dugong occurrence in the Greater Bazaruto Archipelago, and enabled them to apply reactive conservation approaches to infringements. Findings indicate consistent illegal gill net use in the Nova Mabone-Nhamabwe region, which suggests a need for (i) strengthened CCP's (Community Fisher Associations) and a capacitated Maritime Department that will be able to apply fisheries regulations, (ii) potential expansion of the Bazaruto Archipelago National Park northwards to the Save River, and (iii) the development of alternative income generating activities for fishing communities after a thorough Coastal Community Livelihoods Assessment.

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OVERVIEW OF BIRD CONSERVATION SCIENCE IN MOZAMBIQUE – PLAYERS AND THE KEY COMPONENTS

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Morris Ngwenyama, Associação Ambiente, Conservação e Educação Moçambique (AACEM), Museu de Historia Natural, 104 Maputo, Mozambique

Bird conservation science has been advanced by a huge range of actors in Mozambique over many years but the main advocates and actors are now the Museum of Natural History, BirdLife International, BirdLife South Africa and the new Associaçao Ambiente, Conservaçao e Educaçao Mocambique (AACEM). The set of main areas of research presented in this meeting are based on a scaled bird conservation strategy focussed on key species, sites, wider landscapes and engagement of people. These are complementary and form a cogent set of conservation actions for birds (and other taxa) approaches. There are, however, wider and more programmatic research priorities which should also be considered for the full range of biodiversity, an outline of which can be presented.

AVALIAÇÃO DO IMPACTO DO FOGO NA ACESSIBILIDADE DOS PRINCIPAIS PRODUTOS FLORESTAIS NA RESERVA NACIONAL DO NIASSA - MOÇAMBIQUE

Por: Chaúque, A.1; Bandeira, R.R.1; Ribeiro, A.I.2 e Ribeiro, N.S.1

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A ecologia e dinâmica das matas de miombo são fortemente influenciadas pelas queimadas, para além de outros factores. Alterações do regime normal de queimadas podem influenciar a disponibilidade dos recursos florestais para as populações rurais, dependentes desses recursos. O presente estudo teve por objectivo avaliar o impacto das queimadas sobre a disponibilidade dos Principais Produtos Florestais (PPFs) na Reserva Nacional do Niassa (RNN). Esta, é dominada pelo ecossistema de miombo e representa uma das mais importantes áreas de conservação deste ecossistema no Mundo. O trabalho de campo consistiu no levantamento de dados de vegetação em 132 parcelas circulares de 15m de raio, alocadas em 6 estratos de níveis de frequência de queimadas (anual, bi-anual, tri-anual, quinquenal, onzenal e nulo). Em cada parcela levantaram-se dados relativos à abundância, dominância e frequência dos PPFs designadamente, Julbernardia globiflora, Brachystegia boehmii, Pterocarpus angolensis e Pericopsis angolensis. Os resultados do estudo indicam a nível do ecossistema existem variações ecológicas de acordo com a frequência de queimadas ($p < 0.01$), mas a nível dos PPFs não se verificam efeitos significativos das queimadas. Não obstante, observou-se uma correlação positiva ($R = 0.24$) entre a abundância de PPFs e a distância dos povoamentos. Assim, recomenda-se a adopção de medidas de conservação do ecossistema e dos PPFs designadamente a aplicação de queimadas frias controladas e a definição de um plano de uso sustentável dos PPFs.

Palavras-chave: Queimadas, matas de miombo, Produtos florestais, Reserva Nacional do Niassa

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LOSING UNKNOWN MARINE BIODIVERSITY?

Yara Tibirica1, Sabrina Brumme2

1, 2.Association of Coastal Conservation of Mozambique (ACCM – Zavora Marine Lab.)
1.University of Cadiz, Marine Science Dep., Spain

The marine biodiversity of Mozambique, particularly for non-commercial species is poorly known. Several species may disappear even before they are described. In Zavora 160 species of nudipleura (nudibranchs and pleurobranchs) have been found, around 30 are new for science and 135 are new record to Mozambique. Around 70 species are found in the tidal rock pool, which has been quickly degraded by fishing nets in the last 3 years. ACCM is doing monthly underwater removing of fishing nets waste with an average of 30 corals saved per clean up. We provide an overview of the on-going research projects and marine biodiversity of Zavora. An astonish biodiversity is presented. We also discuss the conservation of the region using SWOT analyses. The lack of management and patrolling are one of the biggest threats to conservation.

AS ÁREAS CONSERVAÇÃO TRANSFRONTEIRA (ACTF) EM MOÇAMBIQUE COMO JANELA DE OPORTUNIDADES NA MELHORIA DA QUALIDADE DE VIDA DAS COMUNIDADES LOCAIS: O CASO DA RESERVA ESPECIAL DE MAPUTO.

Por: Tiago Nhazilo
Organização: Peace Parks Foundation

As ACTFs são ecossistemas interligados de uma vasta paisagem ou uma eco-região que vai para além das fronteiras internacionais, geralmente agrupando uma ou mais áreas protegidas, bem como áreas com recursos de uso múltiplo para as comunidades e outros detentores de terras. De acordo com a DNTF (1995), as ACTFs têm como objectivo as ACTFs desenvolvem-se de maneira integrada no uso múltiplo dos recusrsos naturais de modo a beneficiar economicamente as comunidades locais sem degradar a biodiversidade .

Hatton (1995) sustenta que as ACTFs visam apoiar as comunidades locais no melhoramanto das condições sócio-económicas através da sua integração na gestão sustentável de recursos naturais e na criação de mecanismos que lhes permitam acesso aos recursos de forma a beneficiarem-se.

O Governo de Moçambique indicou a PPF para implementação da Estratégia de Desenvolvimento Comunitário em que um dos objectivos é garantir o acesso pelas comunidades organizadas dos fundos para empresas comunitárias (CEF) para em parceria com o sector privado implementar projectos como (lodges, campismo e outros de agricultura) que capacitem as comunidades em termos cohecimentos e recursos necessaries para melhorar os seus rendimentos e segurança alimentar de maneira sustentável.

Dois projectos de geração de renda estão em implementacão na REM
1) Produção e Comercialização de Piripiri
2) Construção e exploração de um lodge pelas comunidades e sector privado

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LANDSCAPE LEVEL CONSERVATION PLANNING FOR PRIORITIZING CONSERVATION ACTION IN MOZAMBIQUE

Bruno Nhancale, PhD
Fauna and Flora International, Country Representative
University Eduardo Mondlane, Lecturer

Biodiversity is declining around the world at alarming rates mainly due to some combination of habitat degradation and loss and overexploitation and in Mozambique it is not an exception. In order to minimise this risk of local extinction, Key Biodiversity Areas (KBAs) are commonly identified and managed. The most efficient and widely used approach for locating these KBAs is using a Landscape Level Conservation Planning approach, which is a target-based system that identifies networks of KBAs using the concept of complementarity and taking into account biodiversity, ecosystems services and socio-economic concerns. This approach aims to select a group of areas that represent important biodiversity features whilst minimizing the financial cost, social burden and forgone development opportunities on other sectors and stakeholders. Here we describe process and present the results of implementing such methodology in the Maputaland Centre of Endemism. Further, we discuss the constraints and opportunities of repeating the approach in other regions, e.g. Mountain Mabu, Zambézia Province and District of Palma, Cabo Delgado Province, as well as of scaling up to a national level. Finally, we conclude drawing attention for the importance of such approach for prioritizing conservation action in Mozambique.

RESIDENCY AND MOVEMENTS OF WHALE SHARKS *Rhincodon typus* IN MOZAMBIQUE

Simon J. Pierce1,2*, C. Rohner1,3, A. Richardson3, S. Weeks3, J. Brunnschweiler4, C. Prebble1, J. Holmberg2 & A. Marshall1,2
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Mozambican waters are a hotspot for whale shark sightings. The species is not currently protected within the country, and the increasing use of large-mesh gill nets in coastal areas is resulting in whale shark mortalities. Routine photo-identification of individual sharks has taken place since 2005, with over 650 individual sharks identified from Inhambane Province. Nineteen sharks were tagged with satellite-linked SPOT5 or pop-up archival tags between 2006 and 2011. Movement of SPOT5-tagged sharks was evaluated using kernel density estimation, with habitat preferences examined through comparison to random movement in model sharks. Inter-annual site fidelity was demonstrated in 46% of sharks. While several individuals were tracked to or re-sighted in Madagascar (n = 1), South Africa (n = 23), or Tanzania (n = 1), tagged sharks had a significant preference for provincial waters. This study has delineated high-use movement corridors by whale sharks within the Inhambane Province that overlap with areas where large nets are increasingly being used. Management of this situation is required.
Keywords: Mozambique, Indian Ocean, conservation, tagging, photo-identification

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SCIENCE FOR CONSERVATION IN MOZAMBIQUE'S MARINE PROTECTED AREAS (2003-2013)

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Five marine protected areas (MPAs) constitute the network of MPAs in Mozambique. These cover a total area of 20 462 km2, in which, marine habitats constitute approximately 8630 km2. MPAs are considered important ecological, socio-economic and cultural assets. Research and monitoring are fundamental components of MPA management and should ultimately contribute towards effective conservation. Here, we present a snapshot analysis of the primary literature on studies conducted in the last decade (2003-2013) on Mozambican MPAs and their current capacity to conduct monitoring and research. A total of 70 papers were analysed and covered biology/ecology (69.9%) and taxonomy/biodiversity (10.9%). Several other disciplines were grouped into a "miscellaneous" category representing 19.2% of the papers, which included oceanography, governance, renewable energies and geology. The great majority of studies were conducted at Inhaca Island. In terms of MPAs, 74.1% of the studies addressed the Ponta do Ouro Partial Marine Reserve (POPMR), followed by the Quirimbas National Park (QNP, 12.9%), Bazaruto Archipelago National Park (10.6%) and finally the Cabo de São Sebastião Total Protection Zone and Primeiras and Segundas Islands Environmental Protection Area (both with only 1.2%). Of the five MPAs, only the POPMR has a current management plan and only the QNP has a research and monitoring plan. None of the MPAs employs a resident scientist. An analysis of the management plans (past and current) revealed that the majority of these do not incorporate recommendations from published studies. Overall, the rules contained in the management plans are not based on empirical studies but rather opinions and "personal experience". Recommendations to address these and other issues are presented.

ESTIMATION OF ABOVEGROUND BIOMASS AND CARBON IN EVERGREEN MOUNTAIN FOREST, MORIBANE FOREST RESERVE

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Forests are considered one of the most efficient ways of mitigating the effects of global warming. The Reducing Emissions from Deforestation and forest Degradation (REDD+) is a mechanism to promote rural communities engagement in forest conservation and rehabilitation, but reliable estimations are needed at national level. This study aims to develop an allometric equation and biomass expansion factor (BEF) to estimate of forest biomass and carbon of Moribane Forest Reserve in Manica Province. Forty-three trees were removed from the ecosystem and measured for diameter at breast height (DBH in cm), total height (m) and commercial height (m). Basic wood density and commercial volume were assessed using the Smalian method. The total dry weight (TDW) of each tree was determined. Ten equations were adjusted by the least squares method in which DBH and total height were independent variables. The selection of the best equation was based on the statistics of adjusted coefficient of determination (R2adj.), standard error of estimate (Syx) and distribution graphic of residual. BEF was determined by relating tree volume, wood basic density and total dry weight. To estimate the forest biomass, a forest inventory carried out on 12 plots of 50 m x 50 m was used. The carbon content was determined by multiplying the biomass by 0.5 default. The proportion of each component in the total dry weight followed the order: stem (50.17 %) > thick branches (32.07 %) > canopy (17.17%). The best allometric equation was TDW = exp[–3.161 + 2.829ln(DBH)] with R2adj. and Syx of 0.97 and 26.36 %, the BEF forest was 2.13 0.31. The estimated mean biomass was 201.78 22.60 t.ha-1 and carbon density was 100.89 11.30 tC.ha-1. The BEF generated average biomass estimated of 208.98 14.22 t.ha-1 and carbon density of 104.49 7.11 tC.ha-1 average carbon. The use of the selected equation and determined BEF constitute reliable methods for estimating biomass and forest carbon studied. The estimates generated by the two methods are not statistically different and are within the expected values for the studied forest.

Keywords: allometric equations, biomass expansion factor, biomass and carbon.

THE IMPACTS OF HUMANS ON CHEETAH ECOLOGY IN THE LIMPOPO NATIONAL PARK, MOZAMBIQUE

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In this study, I quantify the influence of settlements and bushmeat poaching on cheetah occurrence and habitat use in the Limpopo National Park (LNP), Mozambique, providing the first empirical data on cheetah ecology in the country. First, I identify how an occupancy modelling technique that explicitly accounts for detectability can be used for targeted monitoring of less-known cheetah populations. I use replicated camera-trap and track surveys of 100 km2 sample units to estimate the proportion of area occupied by cheetah and to determine the survey effort required to inform conservation planning. Following this, I investigate cheetah habitat selection across two spatial scales. The results show that cheetahs were more limited by human pressures than by biotic factors. Additionally, cheetah's principal prey was strongly negatively influenced by human settlements. The greatest limiting factor of cheetah occurrence was a strong avoidance of human bushmeat poachers and their dogs. Overall my results highlight the importance of LNP for cheetah conservation and cast a positive light on the opportunities for the species management across the broader region. However, the results also emphasize the need for increased wildlife protection. That cheetah exhibited low occurrence along the eastern park boundary may be indicative of edge effects, and therefore the ability for cheetahs to exploit potential corridor areas to other nearby protected areas needs to be assessed. This study provides the first unbiased estimate of occurrence for cheetah in LNP that can be used to compare status across different sites and as a basis for long-term monitoring.

GLOBALLY THREATENED BIRDS OF MOZAMBIQUE

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All species are reviewed regularly and categorised by level of threat. There are 28 birds categorised as threatened in Mozambique which range over forest, grasslands, wetlands and seabirds (http://www.birdlife.org/datazone/speciessearchresults.php?cty=144&cri=EN&rec=N&vag=N&hdnAction=ADV_SEARCH). There is one Critically Endangered bird the Long-billed Tailorbird, poorly known only found at one site in Mozambique, the Njesi Plateau. Surveys of this bird, and of this site, are a very high research priority. A further 11 species are Endangered category of which Mozambique holds known significant populations of Thyolo Alethe, White-backed & Hooded Vultures and of Grey Crowned Crane. All these birds require further survey work to underpin conservation action.

MAPPING THE FIRE REGIME OF NIASSA NATIONAL RESERVE BETWEEN 2000 AND 2012.

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The Niassa National Reserve (NNR) in northern Mozambique covers 42,000 km2, representing the largest conservation area in the country. Anthropogenic fires occur every year mainly as a result of hunting, honey production and pedestrian routes to Tanzania. There are indications that varied fire regimes may change ecosystem structure and composition thus compromising conservation objectives. This study aims to contribute to the establishment of a fire management plan in NNR by mapping and characterizing the fire regime between 2000 and 2012. MODIS active fires and burned areas product to calculate the fire frequency, Fire Return Interval (FRI), seasonality, intensity, density and extent of the burned area. A logistic regression analysis was performed to determine how various factors (vegetation density, rainfall, temperature, altitude, elephant density, human population density, pedestrian routes) influence the fire frequency in NNR. Accuracy assessment of the fire frequency map was performed using 105 circular plots of 30m of ray. Within this plots we also registered any signs of fire damage on vegetation. The analyses indicate that between 2000 and 2012 about 43% of the total area of the NNR was burned every 1 to 2 years. The Mean FRI is 3.29, which indicated a fire frequency of 0.36 per year but there is a high spatial variability of fire across the area. Fire seasonality is related to the annual rain distribution within the area and has a peak between September and October. The Central-Northern and East regions of NNR registered more frequent fires than other regions. The occurrence of fire is mainly influenced by the vegetation density, elephant density and temperature. Our main recommendations are to concentrate fire management activities in places that burn more frequently. In these areas, cold fires in the beginning of the dry season may be applied to reduce fuel-load.

Key words: Fire regimes, wildfire, Niassa National Reserve.

DEALING WITH HUMAN-ELEPHANT CONFLICT: A LANDSCAPE APPROACH IN MOZAMBIQUE

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1. Human Elephant Conflicts influence the negative attitude to elephant conservation in Mozambique. People exposure to risk from elephants can be spatial, temporal and behavioral. Within HEC hotspots, both people and elephant deaths and injuries and crop damages by elephants may be a function of some local environmental and behavioral predictable factors. If these factors are identified and tested, valid RSF models can be built and used to predict HEC across the human dominated landscapes.

2. Using a 5X5 km grid cell approach with landscape maps describing environmental HEC drivers and RSF models generated from a case study in Southern Mozambique under the same approach, I explored the applicability of RSF models across the country in predicting the (i) susceptibility of any cell to elephant and people use and to HEC and (ii) I validated the results through elephant satellite tracking data; settlements distribution data from the national census and the nationwide HEC incidents data recorded between 2006 and 2009.

3.The results confirmed that human related activities have strong influence in elephant, human and HEC distribution ranges. Distance to settlements and to roads reduces elephant ranges while the distance to water increases. Both increase the likelihood of HEC within the cell, but with human related factors being determinants.

4. A validation trial test confirmed my leading hypothesis that land use planning is lacking. The validity of my RSF models accounted for k statistic ranging from slight for elephant range; fair for people range and moderate for HEC models. Both models yielded higher specificity values with 0.96, 0.98 and 0.99 respectively for elephant range; people range and HEC models. Calibrated models improved significantly the predictability of the three models.

5. Synthesis and applications. These results suggest that human related factors (e.g. density and settlement distribution, distance to roads, cultivated area) and some environmental drivers (e.g. water distribution and forest availability) could form the basis of HEC mitigation strategy, regardless of reducing elephant numbers per se. The increase of HEC incidents may be due to the lack of land use planning in the country. Researchers should be encouraged to replicate such RSF models building over spatial and temporal gradient scales to improve its applicability under different human needs, ecological and socio-economical variability.

FACTORS THAT INFLUENCED NESTING BEACH SELECTION BY GREEN TURTLES (*Chelonia mydas*) IN VAMIZI, MOZAMBIQUE, BETWEEN 2003 AND 2012

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The identification of the possible clues that drive nest site selection has received a considerable attention. Sea turtles are likely to use multiple environmental factors when selecting a nest site. One method of investigating possible clues used in nest-site selection is to document the spatial pattern of nests in relation to a naturally occurring range of beach conditions. The main goal of this work was to identify the factors influencing nest site selection by Green turtles (Chelonia mydas L. 1758) in Vamizi, Mozambique, between 2003 and 2012.

The distribution of the nests through the beach sections wasn't uniform for any of the years analyzed. Furthermore, there was a change in the distribution pattern of the preferred beaches. The change in nesting pattern might be due three consecutive positive Indian Ocean Dipole events between 2006 and 2008, but it could also be the result of individual preferences between females that nest in different years. The factor that seemed to have the biggest influence in nest site selection in Vamizi was beach width. The other factors that influenced this selection were tree height, percentage of weeds, percentage of dune, rock cover and proximity to promontories. This is one of the few studies which have analyzed and identified proximity to promontories as a factor influencing nest site selection in 2005.

From a practical point of view, a better understanding of the variables that affect nest site selection, and, consequently, hatchling survival, can help identify which nesting beaches are a priority. These beaches should be protected from coastal development, with beach renourishment programs in the main rookeries, undertaken in a way compatible to this species' biological necessities.

AVALIAÇÃO DA DIVERSIDADE DA HERPETOFAUNA NO PARQUE NACIONAL DA GORONGOSA

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A diversidade da herpetofauna em Moçambique é sub-estimada por falta de dados. O objectivo deste estudo foi descrever a composição das comunidades de herpetofauna no Planalto de Cheringoma, Parque Nacional de Gorongosa. As espécies foram capturadas através da combinação de armadilhas de interceptação e queda, e procuras sistemáticas em microhabitats ao longo de transectos. A composição das comunidades de répteis e anfíbios nos diferentes locais de amostragem e tipos de habitat (florestas, margens de rios, pântanos e lagoas) foram comparados usando índices de diversidade e similaridade. Foram identificados 31 espécies de anfíbios, de 16 géneros e 11 famílias e; 42 espécies de répteis pertencentes a 32 géneros e 21 famílias. As famílias com maior número de espécies foram Hyperoliidae (rãs das bananeiras e rãs do caniço) e Colubridae (serpentes típicas) representando 35% e 24% da riqueza de espécies de anfíbios e répteis, respectivamente. Os habitats com maior riqueza e diversidade de espécies de anfíbios foram os pântanos e margens de lagoas, enquanto que a riqueza e diversidade mais alta da classe reptília foi registada nas florestas. Todas as espécies identificadas estão listadas na categoria de baixa preocupação de conservação da lista vermelha da União Mundial para Conservação da Natureza. Os resultados poderão ser usados como linha de base para a monitoria das comunidades de herpetofauna e detectar o efeito de alterações antropogénicas ou naturais no habitat na composição das comunidades destes grupos taxonómicos.

Palavras –Chave: herpetofauna, riqueza, diversidade , habitat, espécie

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AVALIAÇÃO DA VARIABILIDADE GENÉTICA DE CHANFUTA (*Afzelia quanzensis* WELW.) NA FLORESTA DE MICHAFUTENE: IMPLICAÇÕES PARA OS PROGRAMAS DE CONSERVAÇÃO DA ESPÉCIE

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RESUMO
Os recursos genéticos florestais representam um dos repositórios mais importantes da diversidade biológica, constituindo um componente chave para a estabilidade dos ecossistemas. Devido à crescente pressão humana e às alterações ambientais, a gestão e conservação de espécies florestais é algo cada vez mais importante no sentido de manter o seu valor produtivo, ambiental e socioeconómico.

A floresta de Michafutene (localizada no distrito de Marracuene, província de Maputo) é uma das poucas zonas de conservação ex situ de chanfuta (Afzelia quanzensis Welw.) existentes no país. Com uma área inicial de cerca de 1000 hectares compostos por mais de 20 espécies florestais nativas e exóticas, esta plantação foi sofrendo ao longo dos anos os efeitos do ambiente e da precária manutenção, estando presentemente reduzida a cerca de 50 hectares, compostos quase exclusivamente por chanfuta, numa população presumivelmente constituída por diferentes clones. Dada a degradação progressiva desta espécie verificada a nível nacional nos últimos anos, deu-se início ao desenvolvimento de marcadores moleculares Inter-Simple Sequence Repeats (ISSR) nesta espécie, visando caracterizar a biodiversidade da floresta de Michafutene.

Neste estudo, os marcadores ISSR mostraram-se adequados para a A. quanzensis, gerando uma percentagem de polimorfismos superior a 90%. Pela análise multivariada, concluiu-se que a população de chanfuta da floresta de Michafutene representa um pool genético francamente bem seleccionado aquando do seu estabelecimento, apresentando um grau elevado de diferenciação genética e que cada talhão da floresta representa um conjunto de diferentes genótipos.
Palavras-chave: Afzelia quanzensis, Diversidade genética, Marcadores ISSR.

ENGAGING PEOPLE

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Ideas for citizen science projects involving birds, especially using cool smart phone tech to engage young people.
One project idea specifically for monitoring the spread of invasive House Crows in Maputo environs below:

Corvo Indiano (Corvus splendens) expande a sua distribuição e cresce numericamente na Cidade do Maputo.

O Corvo Indiano tem a sua origem o Sul da Ásia e expandiu rapidamente para o resto do mundo, incluindo para as principais cidades portuárias em Moçambique. A dez anos atrás a população desta espécie exótica e invasora foi estimada em cerca de 35 indivíduos. Atualmente temos acima de 400 indivíduos e tende a aumentar rapidamente. A ocorrência dos primeiros indivíduos foi registada no espaço Praça Roberto Mugabe, Samachild e Zona Militar. A baixa da Cidade do Maputo tem uma grande concentração destes invasores alados, sobretudo nas primeiras horas nas manhãs. A partir destes pontos a população expandiu-se amplamente pelos diversos pontos da Cidade do Maputo. Nos últimos meses alguns indivíduos são observados na Cidade da Matola. A produção massiva e o fraco manuseamento do lixo nas cidades do Maputo e Matola está a facilitar a expansão destas aves nocivas e perigosas para a saúde pública. Existe uma forte associação da presença destas aves e a ocorrência do lixo doméstico. Sendo assim, estas aves são potenciais vetores de doenças tais como cólera, Salmonella, Plesiomonas, enteropathic Escherichia coli, Shigella e Aeromonas hydrophila. Pelo menos oito tipos de doenças identificadas são transportadas nos intestinos dos corvos (Ash 1984a, in Ryall 1992). O corvo indiano causa problemas na fauna local, incluindo sobre as aves nativas (Feare and Mungroo 1990). As autoridades Municipais, o governo e a sociedade civil são chamados para considerar o problema do corvo indiano com seriedade e a participar na concepção de um programa de educação cívica, controle e erradicação desta peste. Este programa deve ser extensivo para a Ilha da Inhaca e para as cidades da Beira e Nacala.

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RUMO AO PLANEAMENTO INTEGRADO E PARTICIPATIVO PARA GESTÃO INTEGRADA DOS RECURSOS NATURAIS NA PERIFERIA DAS ÁREAS DE CONSERVAÇÕES: CONTRIBUIÇÃO DE UMA ABORDAGEM DE SIMULAÇÃO PARTICIPATIVA.

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Enquanto o sonho de um desenvolvimento fundado pelo (eco)turismo tem dificuldade a se materializar, os habitantes da periferia e zona tampão das áreas de conservação permanecem dependentes dos recursos naturais para a sua subsistência. Nessas áreas, o uso e acesso à estes recursos estão restringindo pelas regulamentações nacionais, pelas instituições locais, as regulamentações especiais das áreas de conservação e pelo desenvolvimento de infra-estruturas cujo desenvolvimento está da responsabilidade dos distritos. Neste senários multi-institucional como desenvolver um planeamento integrado para gestão dos recursos de naturais?

Neste objectivo foi concebido uma experiencia piloto de modelagem e simulação participava no distrito de Mabalane (Gaza) na periferia do Parque Nacional do Limpopo. Técnicos dos serviços distritais e do PNL foram mobilizados para desenvolver um modelo do funcionamento do sistema social e do ecossistema usando a plataforma de jogo de papéis Wat-A-Game: O jogo “Mabulu Kuyacana” simula a segurança alimentar de vários tipos de famílias nas condições semiáridas do Norte da província de Gaza e permite discutir o planeamento de pequena infra-estruturas (furos, pequenos sistemas de irrigação, represas) e as regulações locais para acesso o uso dos recursos florestais, de água ou solo. Seis sessões de simulação foram desenvolvidas com os conselhos consultivos locais do distrito que sublinharam a contribuição da metodologia para a compreensão global funcionamento deste sistema complexo e o compartilhamento de conhecimento.

Trata-se numa segunda parte de integrar esta ferramenta numa abordagem multi-level para desenhar planos de desenvolvimento e usos dos recursos naturais. Nesta abordagem a ferramenta de simulação esta usada para estimular a identificação colectiva de opções técnicas ou organizacionais a diferente nível (de comunidade, distrital ou de zona tampão). Essas opções integradas num plano espacial e temporal estão testadas no jogo de papéis a fim de analisar a coerência global do plano e os potenciais problemas. Finalmente se discute a operacionalização das estrategias nas organizações e instituições responsáveis: trata se de especificar os diferentes passos, recursos e compromissos necessários para implementação dos planos colectivamente validados.

10- YEARS OF FIRE RELATED RESEARCH IN NIASSA NATIONAL RESERVE, NORTHERN MOZAMBIQUE

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Miombo woodlands are one of the largest and most important ecosystems of southern Africa, covering 2.7 million km2 over 7 countries. Together with climate and soils, fires and other disturbances such as herbivory and human activities are the main driving factors of miombo ecology and dynamics. Niassa National Reserve (NNR) is the largest conservation area in Mozambique (42 000 km2) and represents one of the most important areas for protection of the miombo woodlands on southern Africa. The reserve has a unique situation of well-conserved and highly diverse woodlands, where anthropogenic fires and herbivory play a major role in the ecosystem's status. Aiming at addressing the role of fire on vegetation and establish a fire management system, the former Sociedade para a Gestão e Desenvolvimento da Reserva do Niassa (SGDRN) and the Forestry Department of the Eduardo Mondlane University, established a research program that initiated in 2004. This oral communication will present the results of 10 years fire-related research including some evidences of the role of fire on vegetation and miombo ecosystem characterization. The communication will address issues of research needs and some recommendations for ecosystem management in this important conservation area.

Key Words: Niassa National Reserve, Fire ecology, miombo woodlands.

IMPORTANT BIRD AREAS (IBAS) OF MOZAMBIQUE

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The BirdLife International Partnership has identified over 10,000 sites worldwide each of which are of global significance for birds, based on rigorous scientific criteria. These sites have become a focus for advocacy and conservation action as well as the development of locally based civil society conservation groups. The first inventory for the African continent was completed in 2001 (copies of Mozambique inventory to be tabled) with subsequent rolling updates undertaken in many countries. However, there are now a range of new sites known in Mozambique which require review, mapping and delineating, and formal accession to the IBA list (cf presentation on wetlands).

LINKING MANTA RAY HABITAT USE TO EFFECTIVE CONSERVATION STRATEGY IN SOUTHERN MOZAMBIQUE

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Habitat use, i.e. home range size, movement patterns and critical habitats, by the reef manta ray, Manta alfredi, was examined along the southern Mozambican coastline; for the purpose of designing appropriate conservation strategies for the species. The Inhambane province in Mozambique boasts one of the largest documented manta ray populations and contains many critical habitats in the form of inshore cleaning stations, feeding areas and breeding grounds. No current management plans for this species are in place in Mozambique and directed artisanal fishing and gill netting continue to remove individuals from the population at alarming rates. A substantial decline in the sightings of this species has been reported from the study area. Multiple techniques, i.e. field observations, acoustic and satellite telemetry, were strategically used to allow for overlapping input, resulting in a more robust and informative study on the behaviour of this species along the southern Mozambican coastline. Preliminary results indicate individual rays frequently travel between critical habitats up to 95 kilometres apart and are capable of movements of at least 470 kilometres. Distinct diurnal visitation patterns were shown in regards to inshore study sites. At least partial residence to the Inhambane province is indicated, with 40% of individuals resighted at least once over a nine-year study period. Results indicate conservation strategies do not only need to focus on critical habitats where these rays aggregate, but also on key coastal movement corridors. This project expands on one of the most comprehensive manta ray studies in the world and will add critical information on habitat use and ecology of this species.

USO DO ESPAÇO E HABITAT PELO ELEFANTE NA RESERVA FLORESTAL DE MORIBANE

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A sobreposição no uso do espaço pode resultar em restrição no uso de recursos e em conflitos entre as espécies envolvidas. O objectivo deste estudo foi determinar padrões sazonais de uso de espaço e habitats por elefantes na Reserva Florestal de Moribane, uma área de conservação sob pressão da agricultura itinerante. Em Maio de 2011 foram colocadas coleiras com GPS em 2 elefantes, os quais forneceram as coordenadas geográficas dos locais usados pelas manadas até Janeiro de 2013. As coordenadas dos assentamentos humanos foram extraídas de imagens de Google Earth. Os mapas de uso do espaço produzidos usando o método de kernel adaptativo foram sobrepostos com o mapa de uso e cobertura vegetal para a avaliar a selecção do habitat pelo elefante. Os mapas de uso do espaço pelas duas espécies foram sobrepostos para identificar os locais com maior risco de conflitos. A área total de uso foi de 158 km2 e a de uso intenso foi de 31 km2, destes últimos, 37% têm elevada concentração de habitações, cujos proprietários praticam agricultura e extraem recursos naturais na área de uso intenso pelo elefante. A mais alta interacção espacial ocorre no fim da época seca, período em que elefantes têm preferência pelas áreas de agricultura itinerante, próximas a habitações. A sobreposição espacial reduz na época chuvosa, período em que os elefantes dispersam-se na floresta sempre verde. Os resultados poderão contribuir para a planificação de acções de prevenção de conflitos homem-elefante e para a conservação do elefante e seus habitats naturais.
Palavras chave: elefante, uso do espaço, habitat, conflito homem-elefante

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GIS MODELLING TO ASSESS THE FIRE RISK AT NIASSA NATIONAL RESERVE, NORTHERN MOZAMBIQUE

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Keywords: Niassa National Reserve, wildfire risk, Geographical Information System.

The incidence of fires in size, frequency and intensity has increased in Niassa National Reserve (NNR). Efforts for prevention are still insufficient to reduce fire frequency and intensity. Moreover, the generation of fire risk maps is still lacking in Mozambique. The ability to predict occurrence of fire ignition constitutes an important tool for managers, helping to define priorities among areas of equivalent fire propagation risk, and to improve the effectiveness of fire prevention and firefighting resources allocation. The general objective of this study is to model wildfire risk for NNR. In order to do this, biophysical and human variables were considered.

For risk assessment, our model integrates hazard (probability*susceptibility) and consequences (vulnerability*economic value). In this study, we used the Moderate Resolution Imaging Spectroradiometer (MODIS) burned area product to characterize the fire in terms annual probability of burn. For susceptibility assessment, our model integrates some widely used variables in wildfire hazard modelling. The following variables were considered: land cover, elephant density, distance from roads, precipitation and elevation.

Using GIS tools, components of risk were identified and the potential fire damage estimated. As a final result two maps are presented: one hazard map and other risk map. Validation of the wildfire risk model is made through the computation of a ROC curve and the results show that was very accurate to classify the fire risk categories (up to 94%). The methodology used allowed to evaluate where more likely fire can occur, which may be considered as priority for fire management in NNR.

WETLANDS OF MOZAMBIQUE

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The coastal wetlands of important for birds in Mozambique were recently reviewed showing very important sites and a number of likely gaps in coverage or Important Bird Areas and protected areas too. Research priorities include further monitoring of key sites and targeted surveys in some areas, and the opportunity to set up a regular wetland monitoring scheme as part of the African Waterfowl Census is outlined.

APLICAÇÃO DE MARCADORES MOLECULARES PARA AVALIAÇÃO DA BIODIVERSIDADE FLORESTAL NAS MATAS DE MIOMBO: ESTUDO DE CASO NA RESERVA NACIONAL DE NIASSA, MOÇAMBIQUE

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As matas de miombo ocupam cerca de 70% da fitoregião Sudano-Zambeziana. Este ecossistema, tipicamente dominado por espécies dos géneros Brachystegia, Julbernardia e Isoberlinia, tem um valor socio-económico e ambiental imensurável, desempenhando um papel preponderante nas economias formais e informais das populações locais. Em Moçambique, a Reserva Nacional de Niassa (RNN) é a maior e mais valiosa área de conservação da vegetação de miombo. Um dos factores que mais compromete o equílibrio ecológico da RNN é o fogo, que afecta principalmente a zona Este da reserva, onde existe maior concentração humana e animal. Este facto, associado às baixas precipitações e elevadas temperaturas, resulta num gradiente de frequência de fogos no sentido Este – Oeste. Consequentemente, ao nível da vegetação, observa-se um gradiente de espécies e de biomassa lenhosa. Integrado nos objectivos da investigação da RNN e em complementaridade a outras áreas disciplinares, o presente estudo baseou-se na caracterização da diversidade e estrutura genética de duas espécies típicas de miombo – Burkea africana Hook. f. e Brachystegia bohemii Taub., com base em marcadores moleculares ISSR. De acordo com os resultados, existe uma relação significativa entre a tolerância ao fogo e a diversidade genética. Apesar do fogo afectar de forma diferente a biodiversidade de cada uma das espécies, observa-se que, de um modo geral, a diversidade genética e a sobrevivência das mesmas não parece estar comprometida pela frequência de ocorrência de fogos e a sua intensidade. Esta observação está em concordância com o facto da RNN ser considerada uma das áreas menos perturbadas de miombo decíduo.

END FOF PRESENTATIONS FOR THE DAY

IMPACTO DA CAÇA FURTIVA NO TAMANHO DA POPULAÇÃO DE ELEFANTES (*Loxodonta africana*) EM MOÇAMBIQUE.

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Moçambique perdeu desde a década 70 cerca de metade da sua população de elefantes, que era estimada em cerca de 50 mil. De acordo com o censo da fauna realizado em 2008 a estimativa da população de elefantes era de 22144 (16393 -27894 CF 95%).

Factores de natureza antropogénica directa ou indirecta entre outros, ditaram a actual crise de conservação desta espécie em Moçambique. As últimas duas guerras que assolaram o país entre as décadas 60 e 90 reduziram os efectivos de elefantes a níveis históricos de cerca de 13.000. Paralelamente, a população humana quase que quadruplicou no mesmo período até atingir os actuais cerca de 23 milhões de habitantes a uma taxa de crescimento anual estimada em 2.2%. Factores associados a este crescimento, entre outros a fixação desordenada da população humana no espaço geográfico, fragmentação e modificação de habitat, o aumento de incidência de conflitos entre humanos e elefantes bem como da caça furtiva, aumentaram significativamente.

No começo da década 90, foi posto em prática o primeiro plano de conservação dos elefantes em Moçambique, que recuperou ligeiramente o número de elefantes na década subsequente. Nos últimos 5 anos (2009-2013) a caça furtiva com ligações ao crime organizado transnacional tem sido o factor de maior impacto na evolução da população de elefantes em Moçambique, sobretudo no Norte do país. As contagens aéreas e observações no terreno nas duas áreas de conservação com mais de 80% da população de elefantes ocupando uma superfície de aproximadamente de 50.000 Km2 revelam um panorama preocupante para a viabilidade da espécie. Calcula-se que presentemente entre 1000 a 1500 elefantes são abatidos ilegalmente por ano, o que pode conduzir a um declínio abrupto da população de elefantes no país. A taxa de carcaças encontradas na Reserva Nacional do Niassa e no Parque Nacional das Quirimbas foi de 17.9% (Craig, 2012) e 48.7% (Craig, 2014) respectivamente . Estes valores são considerados muito elevados, quando comparados com a taxa de 7.5%, considerada como a de estabilização da população de elefantes. Este declínio abrupto poderá distorcer a estrutura etária da população de elefantes, ameaçar a sua viabilidade e persistência em Moçambique.

SPILLOVER EFFECTS OF A COMMUNITY - MANAGED MARINE RESERVE

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The value of no-take marine reserves as fisheries-management tools is controversial, particularly in high poverty areas where human populations depend heavily on fish as a source of protein. Spillover, the net export of adult fish, is one mechanism by which no-take marine reserves may have a positive influence on adjacent fisheries. Local fishery benefits from spillover are likely to alleviate poverty and generate support from fishing communities for marine reserves. Here, we quantify the effects of a community-managed marine reserve in a high poverty area of Northern Mozambique. For this purpose, underwater visual censuses of reef fish were undertaken at three different times: 3 years before, at the time of implementation and 6 years after the marine reserve establishment. The survey locations were chosen inside and outside and on the border of the sanctuary. Coral cover, coral recruitment and rugosity were quantified. After the reserve implementation fish sizes were also estimated. Regression tree models show that distance from the border and time after reserve implementation were the variables with the strongest effect on fish abundance. The extent and direction of spillover depends on trophic group and fish size. Poisson Generalized Linear Models show that prior to the reserve implementation the survey sites did not differ, but after 6 years the reserve had increased the abundance all fish inside the reserve and caused spillover of herbivorous fish. Spillover was detected 1,55km beyond the limit of the reserve for small herbivorous fishes. After 6 years of a community-managed reserve, the fish assemblages have changed dramatically inside the reserve, and spillover is benefitting fish assemblages outside the reserve.

REPRODUCTIVE SYNCHRONY AND RECRUITMENT ECOLOGY OF SCLERACTINIAN CORALS AT VAMIZI ISLAND, NORTHERN MOZAMBIQUE

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Sexual reproduction and larval recruitmentare key processes for the renewal and persistence of healthy coral populations and thus coral reefs. Understanding dynamics of coral reproduction is therefore essential to effectively manage and conserve these precious ecosystems. Worldwide knowledge on coral reproduction as greatly advanced over the last decades, but some areas, such as East Africa, have received little attention. Here, we describe aspects of hard coral reproduction for the first time in Mozambique. We investigated seasonal patterns of coral spawning and larval settlement at Vamizi Island, Quirimbas Archipelagos ina 15 months study, between 2012 and 2013.

In both years, gamete maturation was synchronized in over ten species of Acropora, a keystone reef-building genus, and culminated in multispecific spawning events lasting two to three nights. In September 2013, 50% of colonies from 49% of 25 sampled species had mature gametes in the week prior spawn-slicks were observed and 93% were empty after, indicating gametes had been released.

Seasonal variability of larval supply was evaluated by deploying settlement plates. Annual mean larval settlement (upto 1135 spat m-2 y-1) was comparable to other East African reefs, but was dominated by acroporids (>80% of all spat), as opposed to Kenya and South Africa where pocilloporids settle in higher density. While pocilloporids settled throughout the year with a peak observed over the summer months, settlement of acroporids was highly seasonal, with 97% of spat settling between July and October 2013, which coincided with the spawning period Acropora spp.

These results constitute the first quantitative report of a multispecific coral event off the East Coast of Africa and contribute to bridging the gap of knowledge on coral settlement along this coast. High spawning synchrony implies concentration of reproductive effort in a short period annually, which may increase larval production and settlement improving resilience, but it also makes those reefs sensitive to any disturbance occurring during that period. For management and conservation, it is crucial to understand the timing of reproduction to avoid disrupting this critical process and mitigate impacts of human activity on these reefs, especially in the context of gas offshore mining developing in the region.

BIRD ATLAS OF MOZAMBIQUE

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The Mozambique Bird Atlas project was started in the 1990s with the support of the Endangered Wildlife Trust and the Avian Demography Unit of University of Cape Town. The Atlas was completed in Southern Mozambique and in Central Mozambique, both produced as separate reports, but the northern part of Mozambique remains incomplete. There remains a major priority to undertake the atlas in this region and to update the data in the remaining part of the country, which can also link in to the ongoing Southern African Bird Atlas Project (SABAP).

A GIANT OPPORTUNITY- THE ECONOMIC RELEVANCE OF THE WORLD'S LARGEST RAYS TO THE MARINE TOURISM INDUSTRY OF MOZAMBIQUE

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The recently differentiated giant species of manta ray, Manta birostris, is the world's largest ray and a focal species for marine tourism. Manta rays, recently valued at 140 million USD annually to the global tourism industry, are a gentle natured species often predictably encountered at shallow water reefs, or in surface waters as they feed. This, coupled with a lack of legal protection, makes them an easy target for human pressures. Major aggregation sites for both species of Manta have been identified in most of the world's oceans and seas. The Inhambane Province in Mozambique was recently named as one of the top destinations to encounter both recognised species of manta ray. It is one of the only known global locations where both species can be encountered in the same habitats and both use the coastline throughout the year, making this location uniquely attractive for tourists and scientists alike. A detailed economic evaluation of their importance and value to the thriving dive tourism industry of the region was conducted, demonstrating their significance to local coastal communities and the economy of Inhambane. Tourists were polled to determine the importance of these species to their decision to visit the country as well as the probability of returning to the region. The significance of these species to local stakeholders outside of the diving industry was also evaluated. With notable declines in the abundance of Manta alfredi in the Tofo/Barra region over the last decade, an artisanal fishery for this species still in existence and an absence of protective legislation nationally, it is a critical time to examine the current use of this species in Mozambique and the need for more focused management efforts to protect its sustainable use as a drawcard for marine tourism in the country.

ECOLOGICAL CHACTERIZATION OF THE *Afzelia quanzensis* WELW. PLANTATION IN MICHAFUTENE: OPPORTUNITIES FOR SPECIES EX-SITU CONSERVATION

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Afzelia quanzensis (chanfuta) is one of the most important timber species in Mozambique but is being depleted from its natural habitat. The Michafutene plantation was established in the 1960s aiming at conserving this specie. Over the years the plantation is being degraded and its objectives are currently compromised. This study aims to contribute to the conservation of chanfuta species by: (i) assessing its floristic composition and structure and (ii) estimating aboveground biomass and carbon. We established thirty, 50 x 20 m random plots in which, all individuals with Diameter at Breast Height (dbh) 10 cm were measured. The botanical material was identified to species level in the Herbarium of National Research Institute (IIAM). For biomass estimation 33 chanfuta trees were removed and weighted for fresh weight (kg) and dried at 100oC to obtain the dry weight. An allometric equation was determined to estimate biomass (t/ha). Carbon density (tC/ha) was estimated using the conversion factor of 0.5 of biomass. The results of this study reveal that the Michafuene plantation has 2.092 individual trees and shrubs distributed in 23 families. A. quanzensis (Importance Value Index – IVI = 203.08) is ecologically, the most important species followed by Albizia adianthifolia (IVI = 31.81) and A. versicolor (IVI =15.66). The plantation has an inverted J diamteric curve,where about 85 % of the individuals are smaller than 20 cm dbh. The selected allometric equation [PST = exp (-2.2941 +2.4152 lnDBH); h R2aj. = 0.91; Syx = 18.04%] estimated an average aboveground biomass of 17.3 t/ha and a carbon density of 8.65 tC/ha. In conclusion, the Michafuene Ex-situ conservation area still has potential for conservation of A. quanzensis but several management actions are needed to avoid loosing this important plantation.

Keywords : Biomass , Carbon , floristic composition, Afzelia quanzensis.

SUSTAINABLE TOURISM DEVELOPMENT IN TRANSFRONTIER CONSERVATION AREAS (TFCAS): A LEGAL PERSPECTIVE

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TFCAs have been endorsed and established in the SADC region as an important mechanism for biodiversity conservation, economic development, poverty alleviation and regional integration. In order to realise these objectives tourism has been identified as a key driver of the TFCA programmes in the region. However, in developing countries tourism in itself does not necessarily guarantee economic development, poverty alleviation and environmental protection. In fact, large scale tourism may result in pressure on domestic resources, the environment and the preservation of cultural heritage. Thus sustainable tourism development (STD), that is, any form of development, provision of amenities or tourist activity that emphasises respect for and long-term preservation of natural, cultural and social resources and makes a positive and equitable contribution to the economic development and fulfilment of people living, working or staying in these areas should be employed in the TFCA initiative. Put simply there is need for the linking and integration of conservation, tourism and local community development in TFCA initiatives. One of the fundamental ways to ensure that this link and integration is made possible is through relevant and adequate legal mechanisms. This study therefore examines the potential role of the law in achieving STD in TFCAs. The GLTFCA comprising of Mozambique, South Africa and Zimbabwe is used as a case study.

LION POPULATION AND HABITAT ECOLOGY IN THE LIMPOPO NATIONAL PARK, MOZAMBIQUE.

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Here we provide baseline data on the population and habitat ecology of lions in Limpopo National Park (LNP), Mozambique. Using call-up surveys I estimated a density of 0.99 lions/100 km2 and a population abundance of 66 lions for the park. I compared this direct estimate of density with an indirect estimate derived from trophic scaling of available prey resources. The direct density estimate was less than 1/3 of the estimate derived from prey resources (3.05 lions/100 km2), suggesting lions in LNP are limited by external top-down, anthropogenic pressures. Following this, I used camera trap and track surveys within an occupancy framework to estimate the proportion of area occupied by lions and explore lion habitat use at two spatial scales. The proportion of area occupied by lions was approximately 44% of a 2400 km2 sample of potential habitat. Habitat use by lions was most strongly influenced by the occurrence of their preferred prey across both spatial scales and seasons. However, lions showed strong spatial avoidance of bushmeat poaching at the finer spatial scale and selected against agro-pastoralist use at the coarser scale. Restricting the analysis to a singular coarser scale would have greatly underestimated the impact of bushmeat poaching on the habitat ecology of lions. Altogether, our results describe a lion population held below resource-based carrying capacity by anthropogenic factors and spatially limited by settlements. Our study provides the first empirical quantification of a population that future change can be measured against.

SEABIRDS (GARY ALLPORT)

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A short contribution as very little is known but the existing knowledge indicate both very important migratory seabird populations and little known breeding colonies. A simple next step at sea would be to develop a simple observer network on vessels, to analyse existing satellite tagging data and undertake targeted at sea surveys to identify key species concentrations key areas. Note that there is evidence of very interesting seabirds, possibly even a new species of Petrel in Mozambique waters. The identification of former colonies is an especially interesting idea as some islands now deserted by seabirds could be cleared of invasive species and rehabilitated. Analysis of recent/subfossil skeletal material at potential sites (eg Bazaruto) would give a quick idea as to the former distributions in order to target such work.

CONSERVATION OF ENDANGERED SPECIES IN NORTH MOZAMBIQUE THROUGH SCIENTIFIC AND LOCAL COMMUNITY COLLABORATIVE ACTIONS

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Marine predators including sharks, groupers and some wrasses (napoleon wrasse), are the most threatened groups of fishes in our oceans. Reef sharks, giant and potato groupers, napoleon wrasses are commonly highly site attached rendering them highly susceptible to localized and regional extirpation. Other species that moves in groups highly sensible to extirpation is Bumphead parrotfish, the biggest of the parrotfish. These endangered species in coastal waters of the North of Mozambique (Western Indian Ocean, WIO) are currently threatened by direct exploitation for fins and meat, and gas exploration developments. Neptunes seamount, Quirimbas archipelago, Northern Mozambique represents one of the few sites in the WIO where large numbers of sharks aggregate including young specimen; where you can see regularly giant and potato grouper and napoleon wrasse. The community sanctuary of Vamizi is another place where bumphead parrotfish and other endangered species are regularly seen. The Vamizi Sanctuary has strong evidences of being an spawning aggregation site for napoleon wrasse and giant kingfish. This program aims to use telemetry technology coupled with a well-established local community project to better understand the residency and movements of these sharks, giant groupers, napoleon wrasses and bumphead parrotfish to educate local regional partners on the value of shark and endangered species conservation

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MARINE MEGAFAUNA FOUNDATION

OCEAN NEMOS PEQUENOS GUARDIANS

Swim today, Act together, Protect tomorrow

Inhambane Province, Mozambique is lined with some of the richest and most productive waters in the Indian Ocean and over 125,000 international tourists per year are drawn to this area to encounter its unique marine megafauna, such as whale sharks and manta rays. Commercial fishing practices including illegal poaching, are now seriously threatening resident populations of these animals. However, the marine wildlife are not the only ones at risk. In this area alone, an estimated 45% (130,000) of local jobs require people to work in, on or around the water yet the majority of the population cannot swim. Each year there are thousands of drowning fatalities along Mozambique's coastline as people risk their lives on a daily basis to provide for their families. The Marine Megafauna Foundation aims to change this. In 2012, Sarah Bishop, MMF's Director of Education, created Nemos Pequenos, a swimming and marine conservation education program to save lives and create ocean guardians.

First, we identify communities in need and select appropriate community program leaders. Then we provide them with swimming instructor, First Aid and marine conservation training. We support instructors in facilitating the Nemos Pequenos program for local children with expert personnel and resources. Together, we develop partnerships with schools to enhance their education standards and with local businesses to implement sustainable solutions.

For two years, we have been running small and extended scale pilot programs in Tofo, Inhambane. In conjunction with this, local instructors have been trained and qualified to South African recognized 'Learn to Swim' instructor certification. Marine education and conservation resources have been developed and promotion of the program on an international scale has begun.

So far this year, we have established our first remote program on Bazaruto Island. This is the first of many, as we aim to extend our reach along the length of Mozambique's coastline. Our hope is for local people to be more confident around water, to inspire a greater love and understanding of the ocean and to encourage them to benefit from the burgeoning eco-tourism industry in the province. Ultimately, we want Mozambicans to celebrate and protect their native marine animals and environment, as natural heritage and a means of sustainable livelihoods.

For more information

- Education, Marine Megafauna Foundation http://www.marinemegafauna.org/education/
- Introduction to Nemos Pequenos http://www.youtube.com/watch?v=1PpBzdgHZ8c
- Swim Instructor Training for Nemos Pequenos www.youtube.com/watch?v=xBDmk6Jk0P0
- https://www.facebook.com/nemospequenos

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MMF is a tax-exempt non-profit charitable organization under section 501(c)(3) of the US tax code (Tax ID #46-0645082). The Marine Megafauna Association is also a registered not-for-profit association in Mozambique.

RESERVA E COMUNIDADES LOCAIS EM GILÉ (MOÇAMBIQUE): RESILIÊNCIA SÓCIO-ECOLÓGICA E REENCONTRO DE VELHOS AMIGOS?

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Os seres humanos e a natureza co-evoluiram durante milénios, criando sistemas bio-culturais resultantes da modificação de ecossistemas, transformação e criação de novas paisagens. Alguns desses processos de co-evolução têm sido favoráveis ou impulsionadores da conservação da biodiversidade e podem ser testemunhados em algumas paisagens no mundo.

Sistemas sócio-ecológicos são paisagens em que sistemas humanos e biofísicos estão acoplados e interdependentes, e podem absorver perturbações, ser modificados e depois se auto-organizar, mantendo ainda assim a sua identidade e retendo a mesma estrutura básica e modo de funcionamento.

Conceitos modernos de conservação da biodiversidade, advogam fronteiras de exclusão de humanos das áreas protegidas sendo a gestão transferida para as autoridades administrativas externas às comunidades indígenas.

À excepção da Reserva Nacional do Gilé (RNG), em Moçambique, as áreas protegidas incluem humanos no seu interior. O futuro das populações que residem nessas áreas continua incerto. Comunidades locais, que no passado exploravam livremente os seus recursos no interior da RNG, passaram a viver fundamentalmente na base da agricultura que não produz o suficiente para o sustento dos seus agregados familiares.

Actualmente, a população que vive ao redor da RNG está a crescer a uma taxa de 9,5%. Tal como o era no passado, os agregados familiares recorrem sistematicamente à reserva para a recolha de recursos naturais que na sua maior parte são utilizados para a satisfação das suas necessidades básicas.

Perante um cenário de crescimento populacional em que a terra para a agricultura se torna cada vez mais reduzida e pouco produtiva, o sistema actual de gestão da reserva se tornará insustentável e exacerbará ameaças à biodiversidade e à resiliência de todo o sistema.

Argumentamos que, tal como o era no passado, no futuro, a gestão da biodiversidade na RNG assentar-se-á no sistema de gestão tradicional baseada na interdependência entre sistemas humanos e sistemas biofísicos, garantindo a resiliência do sistema sócio-ecológico, com benefícios para a conservação da biodiversidade como para as comunidades locais.

HERBIVORE COMMUNITY AND BENTHIC STRUCTURE ON TWO ROCKY REEFS AT INHAMBANE, SOUTHERN MOZAMBIQUE

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Herbivores are considered an important community structural group at tropical coral reefs because of their ability for preventing algal competition with corals, and thus clearing the substratum for coral settlement and growth. However, it has not yet been established if this role is also extensive or equally important at high latitude subtropical reefs, such as those of southern Mozambique reefs. Therefore this study aims to describing the herbivore community of two sub-tropical reefs at Inhambane, Southern Mozambique, and evaluate their potential effects on the benthic cover between June and October 2011. Underwater visual and photo-quadrat methods were used to quantify both herbivore densities (fishes and urchins) and the benthic community. No significant differences were observed in herbivorous fish densities between the reefs, and fishes of Acanthuridae dominated both reefs. The density of sea urchins at Anchor Bay (46.13 urchins/10m2) was significantly higher that observed on Buddies Reef (23.38 urchins/10m2) ($p<0.001$). Although some variation was observed between reefs, the benthic cover was dominated by turf algae (mean cover 54.05%) and hard substratum (mean 30.7%). Macroalgal cover (mean 9.18%), and hard (mean 1.45%) and soft coral cover (mean 0.63%) were lower than on most other sub-tropical reefs.

No relationship was observed between herbivorous fishes and all categories of benthic cover, but sea urchin density was negatively correlated with algal cover and positively correlated with hard substratum on both reefs. Herbivores in this study were not found to influence growth and survival of corals by clearance of suitable settlement sites. This suggests that the very low coral cover on both reefs may rather be caused by other external disturbances (natural and/or anthropogenic) than competition with algae. Implementation of experimental studies at these reefs and replication studies in other reefs of southern coast of Mozambique are suggested to test the findings of these study.

LEVANTAMENTO DA MACROFAUNA BENTÓNICA NO MANGAL DE GOVURO, SUL DE MOÇAMBIQUE - UMA ÁREA DE MANGAL IMPACTADA PELAS MUDANÇAS CLIMÁTICAS

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Os mangais são um importante habitat para diversas comunidades de organismos bentónicos. Estes ecossistemas colonizam as zonas entre-marés crescendo no limite entre o habitat terrestre e marinho e assim são considerados bons indicadores de mudanças climáticas. Os mangais de Govuro, sul de Moçambique, foram afectados pelo ciclone Eline de 2000 e pelas chuvas de 2000 que levaram a uma elevada sedimentação. O presente estudo teve como objectivo principal, avaliar o efeito destes eventos sobre a macrofauna dos mangais de Guvuro. A amostragem foi realizada em Setembro de 2011 em três áreas distintas que após os eventos apresentaram diferenças no impacto de sedimentação (área impactada, de impacto medio e área não impactada). Em cada área foram realizados três transectos perpendiculares a linha de costa e divididos em três estratos correspondentes a zonação das espécies do mangal. Resultados desta amostragem indicaram a ocorrência de organismos representantes das seguintes classes: Polychaeta, Gastropoda, Bivalvia e Crustacea. Tendo a área não impactada apresentado uma maior representatividade de organismos da classe Crustacea (>160ind/m2). A diversidade de endofauna no mangal de Govuro foi baixa, porem entre as três áreas estudadas a área impactada apresentou maior diversidade (H=0.41). De um modo geral é notaria a influencia dos eventos de 2000 sobre os organismos nos mangais do Guvuro, no entanto, futuros estudos relacionados com efeito das mudanças climáticas são propostos de forma a demonstrar a resiliência de área impactadas por estes fenómenos em termos de biodiversidade de macrofauna.

HEAVY METALS CONTAMINATION ASSESSMENT IN PENAEID SHRIMP SPECIES CAPTURED ON THE ARTISANAL AND SEMI-INDUSTRIAL FISHERIES IN MAPUTO BAY – SOUTHERN MOZAMBIQUE

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The shrimp fishery is highly emblematic in Mozambique, with Maputo Bay as the second largest and important shrimp fishing ground in the country. Making use of atomic absorption spetrophotometry, the present study intended to assess the heavy metals contamination, through Cadmium (Cd), Copper (Cu), Iron (Fe), Manganese (Mn) and Zinc (Zn) determinations, in penaeid shrimps (Metapenaeus monoceros and Fenneropenaeus indicus), abdominal tissue, captured on the artisanal and semi-industrial trawl fisheries in Maputo Bay.

Sampling was performed from July to September 2010, where one kilogram of shrimps were bough directly from fishermen immediately after landing, in two days chosen randomly per spring tide per month. Cd, Cu, Fe, Mn and Zn concentrations in M. monoceros abdominal muscle were not significantly different ($p>0.05$), among artisanal and semi-industrial fisheries, suggesting an uniform metal deposition in the substrate due the sedimentation dynamic in the bay, since the artisanal fishery is performed near shore and the semi-industrial in deeper waters. F. indicus presented significantly, ($p>0.05$), lower concentrations of Cd and Cu and higher concentrations of Mn than M. monoceros on the semi-industrial captures, suggesting different accumulation rates for these species or, on the other end, levels related to the previous juvenile habitat preferences.

Both species presented an ontogenetic variation on the concentration of most metals analysed for the two fisheries, which may be attributed to dietary shifts or even metabolic rate modification during growth. The analyzed metals concentration was compared to the permissible limits for human consumption according to WHO. The results showed that only the Fe and Zn, for M. monoceros, and all metals analyzed, excluding Mn, for F. indicus, are below the maximum limit value for human consumption, although, is mandatory to closely monitor the levels of all the metals analyzed since these species are economically important resources.

RELATIONSHIP BETWEEN ECOLOGICAL FACTORS AND CLEANER WRASSE LABROIDES DIMIDIATUS DENSITY ON TWO ROCKY REEFS NEAR INHAMBANE, SOUTHERN MOZAMBIQUE

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Despite cleaners playing an important role in the control of potentially deleterious ectoparasites and maintenance of reef fish health, little information is currently available about the ecology, distribution and behaviour of cleaner fish on Mozambican reefs. Thus, this study aimed to estimate the density of the cleaner wrasse Labroides dimidiatus on two rocky reefs (Buddies and Anchor Bay) located at Ponta da Barra, Inhambane coast, southern Mozambique. General comparisons on reef ecological factors (substrate and reef fish components) were carried out to understand how habitat conditions affected the density of L. dimidiatus. A total of 96 species of reef fish were identified on the reefs, of which 67 species were common to both. Although the mean density of L. dimidiatus cleaning stations did not differ between reefs, the mean density of individuals was significantly lower at Buddies (1.63 ± 0.41 fish/ 25 m2) compared to Anchor Bay (3.06 ± 0.50 fish/ 25 m2), contradicting the hypothesis that a more impacted reef would have a lower number of cleaners than a less disturbed reef. Positive correlations between substrate structural complexity and cleaner wrasse densities, supported by the CCA plots, reveal an association of cleaners with more complex reef relief, supporting the hypothesis that L. dimidiatus density would be higher where the complexity of the substrate was higher. Thus, it seems that substrate structural complexity may provide shelter not only against natural predators, and physical phenomena but also offer refuge sites when such small fish are indirectly threatened by anthropogenic disturbances.

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