RUFFORD INNOVATION AWARD #I.178

Island Coastal Academy Network Western Indian Ocean- Internationally accredited capacity-building for sustainable coastal biodiversity conservation

The concept of the Coastal Academy is a unique, innovative and entrepreneurial plan to engage private, public and non-governmental sectors in a holistic project that will assure the sustainable development of marine resources in the western Indian Ocean islands. It has long been recognized that this region harbours incredible and little-explored marine biodiversity with enormous actual (and potential) value in terms of food production, medicinal uses, coastal protection and recreational value. Since the 1800s, there has been a one-sided emphasis on conservation of Africa's unique terrestrial fauna yet there are currently huge gaps in scientific knowledge and local capacity for the conservation of marine species and habitats and a lack of technical expertise is limiting the effectiveness of current conservation initiatives.

Coastal Academy was initiated by Community Centred Conservation (C3) with funding from Rufford Small Grants Foundation

Community Centred Conservation
C3 Madagascar and Indian Ocean Islands Programme

2nd Annual Report - January 2011

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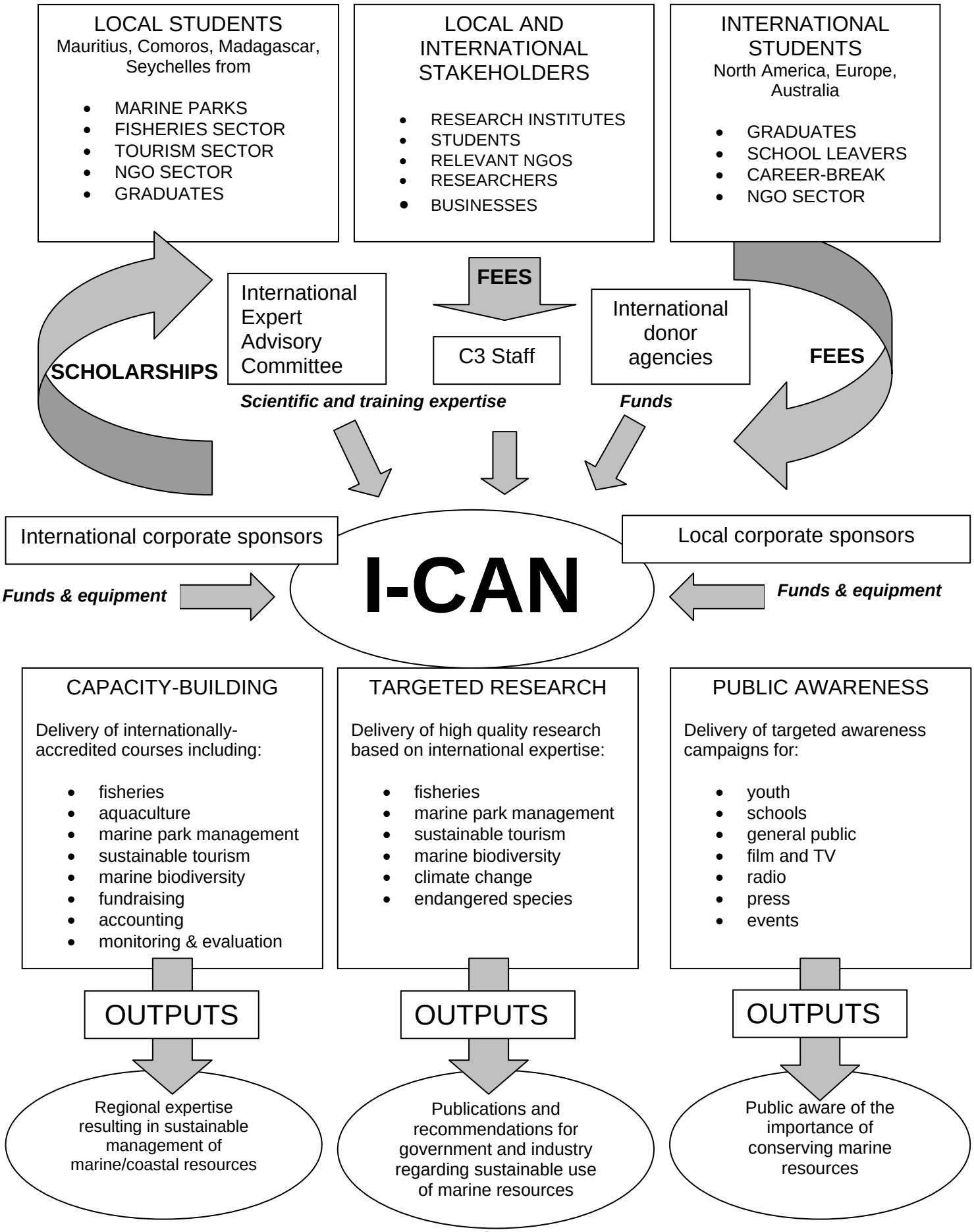
The Western Indian Ocean, showing the primary beneficiary countries: Mauritius, Madagascar, Comoros and Seychelles

Executive Summary

The concept of the Island Coastal Academy Network (I-CAN) is a unique, innovative and entrepreneurial plan to engage private, public and non-governmental sectors in a holistic project that will assure the sustainable development of marine resources throughout the Western Indian Ocean. It has long been recognized that this region harbours incredible and little-explored marine biodiversity with enormous actual (and potential) value in terms of food production, medicinal uses, coastal protection and recreational value. However, a lack of technical expertise is limiting the effectiveness of current conservation initiatives. The Network, with nodes in Mauritius, Madagascar and the Comoros, will be the first of its kind and will build local capacity through internationally-recognized vocational BTEC qualifications in Coastal Biodiversity Management, Sustainable tourism and Community Based Organization management. Training of local BTEC trainers and a unique plan for financial sustainability will ensure that this project leaves a regional legacy for years to come.

Project summary flow chart



Summary of progress

The project is generally proceeding very well, with notable achievements including:

- Launch of the website www.coastal-academy.org and development of the online capacity-building network
- Launch of the Academy at the National Annual Opening of Malagasy Universities
- Finalization of training facilities at and logistical agreements with the University of Antsiranana, Madagascar;
- Supervision of four Malagasy BSc and one Comorian BSc students and fieldwork training (coastal habitat mapping and socio-economic surveys) for 22 students from all three sites

The project is running approximately 6 months behind schedule since we have experienced some delays in the finalization of the BTEC courses, mainly due to changeover of partners in Madagascar and several University staff strikes following the recent *coup d'etat* (March 2009). All local partners are very keen to implement the BTEC courses as soon as accreditation has been approved and we expect the courses to start within the next 6 months.

Current progress with respect to original objectives and outputs

Objective 1: To develop internationally-accredited tailor-made BTEC courses in (1) Coastal Biodiversity Management, (2) Sustainable tourism and (3) Community Based Organization management

- ***Output 1.1: Relevant course manuals and lecture series created***

Course materials are in preparation and are being reviewed by EdExcel prior to accreditation. See Appendicesfor an example course outline. A lecture series (see Appendices) has been developed and is currently being piloted in collaboration with the University of Antsiranana to gauge partner interest and feedback.

- ***Output 1.2: Course accredited by EDEXCEL***

The accreditation progress is underway and we expect the courses and centre accreditation very shortly

- ***Output 1.3: Course accredited by the Mauritius Qualifications Authority (MQA)***

We will apply for MQA accreditation as soon as the courses have received approval by EdExcel

Objective 2: To build institutional capacity for marine biodiversity conservation through linking existing national 'node' institutions within a research and training network

- ***Output 2.1: Suitable office premises identified in each country and modified as necessary, relevant permits obtained***

Offices and teaching facilities have been established in Comoros, Mauritius and Madagascar. Contracts and permits have been finalised and premises rented and re-furbished. Internet, telephone and utilities have been installed.

- ***Output 2.2: Classroom facilities set up***

Following consultation meetings, a

five-year agreement was signed with the government of the Comoros in July 2009 and a two-year agreement with the University of Antsiranana, Madagascar in May 2009. Sir Gaetan Duval Hotel School, Mauritius has also agreed to assist with provision of teaching facilities.

- ***Output 2.3: Research facilities set up***

IT facilities and internet access have been established in each country. All nodes have been equipped with snorkelling equipment, camping equipment and field survey equipment.

- ***Output 2.4: Media centre established***

The primary media centre is now completed with equipment purchased in the UK and imported from March 2009. All nodes now have access to video and still cameras, underwater housings and editing software.

Objective 3: To deliver the courses to local and international students

- ***Output 3.1: Courses delivered to 20 local students in year 1***

- ***Output 3.2: Courses delivered to 15 international students in Year 1***

The courses are expected to start in Early 2011 they have been delayed by the political problems in Madagascar (International travel warnings were in place February – June 2009) which meant putting a 6-month freeze on the project and also led to a sudden turnover of staff at partner institutions. The accreditation process is taking longer than expected.

In the meantime, the Academy's facilities and staff have supported a number of local and international students conducting Bachelors and Masters theses (see Appendices) and trialled all course materials and field sessions which have proven popular and successful.

Objective 4: To impact marine conservation efforts at the regional level through creation of an interactive online learning network across the Indian Ocean islands

- ***Output 4.1: Website design and launch***
- ***Output 4.1: Online forum established***
- ***Output 4.3: Relevant reports / papers / grey literature database made available online***

A website for the Network has been launched at www.coastal-academy.org and we currently have over 120 members who are able to access out teaching materials and reference database of over 1000 (and growing) publications.

Objective 5: To train a network of local BTEC trainers

- ***Output 5.1: 6 national trainers trained in Year 1***
- ***Output 5.2: 3 regional trainers trained in Year 1***

Teacher training has been conducted with selected individuals (graduates) and has focused on the following core skill modules:

- Oral presentation skills
- Designing MS Powerpoint presentations
- Running tutorial groups
- Marking assignments according to course prerequisites
- Planning field trips
- Management of students in the field
- Health and safety guidelines
- Emergency First response training
- Student counselling procedures
- Course evaluation process
- Writing student references

The Academy has established a strong team of 6 trainers who will be able to teach the BTEC courses as soon as they are accredited.

Objective 6: To ensure long-term financial sustainability

- ***Output 6.1: Business plan developed and reviewed***

A business plan has been produced and reviewed by Mauritian entrepreneurship advisors. The plan will be reviewed and updated quarterly. This business-driven approach to the project will ensure that it is sustainable and will grow in the future rather than face the funding shortages that have affected other projects in the region.

- ***Output 6.2: Corporate sponsorship secured***

Discussions are underway with a number of corporate donors to support students or materials for the courses. Air Madagascar has provided the Academy with corporate membership, providing cheaper fares and preferential booking. We are waiting on launch of the courses to truly demonstrate the project to interested donors since the development stage had to be put on hold for 6 months and dialogue needs to be resumed in the next trimester.

- ***Output 6.3: International publicity and marketing campaign established***

A marketing strategy was finalised by the end of 2010 based on market research and using professional advice as to how to optimise recruitment of overseas students. The strategy has identified target audiences and recommends a combination of web-based and in-person promotional activities. As the first stage of this campaign, the Comorian staff team visited the UK in late 2009 to publicize the Academy at educational institutes.

The project coordinators have confirmed attendance at various biodiversity conservation conferences in 2011 held in the following locations; Kenya, London, Scotland, Canada and USA. This will provide further networking and publicity opportunities. We are currently finalizing brochure design and awaiting the official start date for courses. Once this is confirmed the brochures will go to print and and be ready for distribution within 2 weeks. They will be distributed internationally as soon as the BTECs are fully accredited.

Appendix 1 Students supported by the Coastal Academy

Tombo Amida (Madagascar)
BSc Natural Sciences, University of Antsiranana

Patric (Madagascar)
BSc Natural Sciences, University of Antsiranana

Zara Francisco Paul (Madagascar)
BSc Natural Sciences, University of Antsiranana

Ibrahim Assan (Madagascar)
BSc Natural Sciences, University of Antsiranana

Elodie Camprasse (Madagascar)
Camprasse ECM (2010) STUDY OF THE INTERACTIONS BETWEEN FISHERMEN AND DUGONGS (DUGONG DUGON) IN THE NOSY HARA MARINE PARK, MADAGASCAR. Joint European MSc Degree Marine Environment and Resources Joint European PhD Degree. Leioa, September 2010

Olivier Raynaud (Madagascar)
Raynaud O (2010) PRISE EN COMPTE ET INTEGRATION DES PECHEURS MIGRANTS EN TANT QUE PARTIE PRENANTE DE L'AIRE MARINE PROTEGEE DE NOSY HARA. Master Management de la Qualité, Université Paul Cézanne Aix-Marseille III, Institut de Management Public et de Gouvernance Territoriale

Owen Jones (Comoros)
Jones O (2010) ARTISANAL FISHING IN THE COMOROS. BSc Environmental Science, University of East Anglia, UK. 59pp

Marek Mikus (Comoros)
Mikus M (2009) STRATEGIES, MEANINGS AND ACTOR-NETWORKS: COMMUNITY-BASED BIODIVERSITY CONSERVATION AND SUSTAINABLE DEVELOPMENT IN THE COMOROS. MSc Anthropology and Development 2008/2009 Final Thesis. London School of Economics and Political Science, Department of Anthropology, 37pp.

Ben Ahmed Al'yas'aa (Comoros)
Ben Ahmed A (2009) ETUDE DE STRATEGIES DE PROTECTION DE L'ENVIRONNEMENT MARIN DES COMORES. Rapport de Stage Effectue a La Conservation Centrée sur la Communaute (C3), Universite des Comores Instituit Universitaire de Technologie Departement : Tourisme et Hotellerie, 23pp.

Appendix 2 : Example course structure – Tropical Biodiversity Management

CORE UNIT 1

Unit title MARINE TROPICAL ECOSYSTEMS

Unit value 40 hours

Unit description

This core unit provides an overview of the various marine tropical ecosystems and the research skills and tools that candidates are expected to be knowledgeable about for adequate identification, monitoring and subsequent data recording and presentation. Other specific areas of attention include an insight on climate change and its impacts on marine biodiversity globally and within the WIO.

Summary of learning outcomes

To achieve this unit a learner must:

1. Show an understanding of the **ecology of marine tropical ecosystems**
2. Acknowledge the importance of current marine and coastal **agreements, conventions and initiatives**
3. Carry out specified **biological survey techniques**
4. Understand the causes of **climate change** and its impacts on **biodiversity**

Summary of the content for each learning outcome

1. Ecology of marine tropical ecosystems

Tropical biodiversity	definition, importance (direct and indirect values), natural disturbances
Tropical ecosystems	coral reef, mangrove and seagrass general ecology, ecological importance and distribution

2. Agreements, conventions and initiatives

International agreements and conventions	Convention on Biological Diversity and the Jakarta Mandate; The Ramsar Convention on Wetlands; World Heritage Convention; United Nations Convention on the Law of the Sea; International Convention for the Prevention of Marine Pollution from Ships (MARPOL)

Regional agreements and conventions	Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African Region (Nairobi Convention); African Convention on the Conservation of Nature and Natural Resources
Initiatives	World Summit on Sustainable Development, UNESCO Man and the Biosphere Programme (MAB), FAO Code of Conduct for Responsible Fisheries, International Coral Reef Initiative (ICRI), International Coral Reef Action Network (ICRAN), African Protected Areas Initiative (APAI), WWF Eastern African Marine Ecoregion (EAME) Programme, WWF Western Indian Ocean Marine Ecoregion (WIOMER) Programme

3. Biological survey techniques

Species identification tools	simple taxonomy (kingdom, phylum, class, order, family, genus, species); computer based tools (Knowledge base of the Mascarene corals, fish base); identification keys and books
Planning a survey technique	identifying aims and objectives, target species, logistical considerations
Carrying out biological survey techniques	appropriate techniques for survey area (e.g. underwater fish transects, hard and soft substrata sampling methods, reef check)

4. Climate change and biodiversity

Climate dynamics	oceanic circulation, El Niño Southern Oscillation (ENSO), green house gases and their effects, ultraviolet radiation, ozone and CFCs, anthropogenic aerosols, volcanic eruptions, hurricanes, global warming, future climate trends and changes
Impacts of climate change on the environment	loss of genetic diversity, adaptation capacity, sea level and temperature fluctuations, shifts in species distribution and abundance, extinction, ecosystem functioning and productivity (coral reefs, mangroves, pelagic ecosystems)

Assessment criteria for each learning outcome

Learning outcomes	Assessment criteria To achieve each outcome a learner must demonstrate the ability to**:**

1.	Show an understanding of the **ecology of marine and coastal tropical ecosystems**	• Appreciate the value of biodiversity • Recognise principal threats to biodiversity (natural and anthropogenic – more detail later) • Appreciate the consequences of biodiversity loss • Describe the systems of tropical coastal and marine zones
2.	Acknowledge the importance of current marine and coastal **agreements, conventions and initiatives**	• Comprehend the role of governance in marine and coastal management and use of resources at various levels • Appreciate the importance of regional and international initiatives for biodiversity conservation
3.	Carry out specified **biological survey techniques**	• Understand simple taxonomy principles • Demonstrate ability to use various identification tools • Plan and deliver a biological survey • Perform at least three biological survey techniques proficiently
4.	Understand the causes of **climate change** and its impacts on **biodiversity**	• Describe the major climatic processes and how they affect global climate change • Discuss the impacts of climate change on natural systems • Appreciate the consequences of habitat and biodiversity loss

Resources

- ⇨ expedition and biological survey equipment
- ⇨ black/whiteboard
- ⇨ computer and projector
- ⇨ program CDs

Suggested reading

Websites
Seagrass-Watch : http://www.seagrasswatch.org/home.html
Marine Mammal Commission (listing of marine mammal species) : http://www.mmc.gov/species/
Coral list : http://coral.aoml.noaa.gov/mailman/listinfo/coral-list/

Fish base : http://www.fishbase.org/search.php

Knowledge base of the Mascarene corals : http://coraux.univ-reunion.fr/

Ecology of marine and coastal ecosystems

Dorenbosch M et al. (2005) Indo-Pacific seagrass beds and mangroves contribute to fish density and diversity on adjacent coral reefs. *Marine Ecological Progress Series* 302:63-76

Jackson JBC (1997) Reefs before Columbus. *Coral Reefs* 16 Supplement: S23-S32

garth P (2007) *The biology of mangrove and seagrasses*, Oxford University Pre USA, 2nd edition, 252pp

cClanahan TR, Sheppard CRC and Obura DO (2000) *Coral reefs of the Indi Ocean: Their Ecology and Conservation*, Oxford University Press, USA, 552pp

Sale PF (1999) *The Ecology of Fishes on Coral Reefs*, Academic Press, 754pp

Swaminathan MS (2003) Bio-diversity: an effective safety net against environmental pollution. Environmental Pollution 126(3):287-291

Agreements, conventions and initiatives

The Ramsar Convention on Wetlands : http://www.ramsar.org

Convention on biological diversity : http://www.biodiv.org

Jakarta Mandate : http://www.biodiv.org/programmes/areas/marine
World Heritage Convention : http://whc.unesco.org
United Nations Convention on the Law of the Sea : www.un.org/depts/los
International Convention for the Prevention of Marine Pollution from Ships : www.imo.org

Nairobi Convention : www.unep.org/easternafrica/

African Convention on the Conservation of Nature and Natural Resources : www.iucn.org/themes/wcpa/wpc2003/pdfs/outputs/africa/africa_pasconvention.pdf

World Summit on Sustainable Development : www.johannesburgsummit.org

UNESCO Man and the Biosphere Program : www.unesco.org/mab

FAO Code of Conduct for Responsible Fisheries : www.fao.org

International Coral Reef Initiative : www.icriforum.org
International Coral Reef Action Network : www.icran.org
African Protected Areas Initiative : www.nepad.org
WWF Eastern African Marine Ecoregion (EAME) Program ; WWF Western Indian Ocean Marine Ecoregion (WIOMER) Program: www.panda.org

Biological survey techniques

English S et al. (1997) Survey Manual for Tropical Marine Resources (2nd ed.) ASEAN-Australia Marine Science Project: Living Coastal Resources, Australian Institute of Marine Science, PMB No. 3, Townsville Mail Centre, Australia 4810, 390p.

Kulbicki M and Sarramégna S (1999) Comparison of density estimates derived from strip transect and distance sampling for underwater visual censuses: a case study of chaetodontidae and pomacanthidae. *Aquatic Living Resources* 12:315-325

Lessios HA (1996) Methods for quantifying abundance of marine organisms. In M.A. Lang and C.C. Baldwin (eds.) Methods and techniques of underwater research. Smithsonian Institution, Washington. pp. 149-175.

McClanahan TR et al. (2007) Influence of instantaneous variation on estimates of coral reef fish populations and communities. *Marine Ecological Progress Series* 340:221-234

McCormick MI (1994) Comparison of Weld methods for measuring surface topography and their associations with a tropical reef fish assemblage. *Marine Ecological Progress Series* 112:87-96

McKenzie LJ et al. (2003) Seagrass-Watch: Manual for mapping & monitoring seagrass resources by community (citizen) volunteers. 2nd Edition (QFS, NFC, Cairns) 100pp. C3 REFERENCE ID 72

Samoilys MA and Carlos G (2000) Determining methods of underwater visual census for estimating the abundance of coral reef fishes. *Environmental Biology of Fishes* 57(3):289-304

Thompson A and Mapstone B (1997) Observer effects and training in underwater visual surveys of reef fishes. *Marine Ecological Progress Series* 154:53-63

Watson R and Quinn T (1997) Performance of transect and point count underwater visual census methods. *Ecological Modelling* 104:103-112

Wilson SK et al. (2007) Appraisal of visual assessments of habitat complexity and benthic composition on coral reefs. *Marine Biology* 151(3):1069-1076

Climate change and biodiversity

Ehlers A et al. (2008) Importance of genetic diversity in eelgrass *Zostera marina* for its resilience to global warming. *Marine Ecology Progress Series* 355:1-7

Gilman EL et al. (2008) Threats to mangroves from climate change and adaptation options: A review. *Aquatic Botany* 89(2):237-250

Goulet TL (2006) Most corals may not change their symbionts. *Marine Ecology Progress Series* 321:1-7

Graham NAJ et al. (2006) Dynamic fragility of oceanic coral reef ecosystems. *PNAS* 103(22):8425-8429

Graham NAJ et al. (2007) Lag effects in the impacts of mass coral bleaching on coral reef fish, fisheries, and ecosystems. *Conservation Biology* 21:1291-1300

Graham NAJ et al. (2008) Climate warming, marine protected areas and the ocean-scale integrity of coral reef ecosystems. *PLoS ONE* 3(8):1-9

Hoegh-Guldberg O (1999) Climate change, coral bleaching and the future of the world's coral reefs. *Marine and Freshwater Research* 50:839-866

Hoegh-Guldberg O et al. (2007) Coral reefs under rapid climate change and ocean acidification. *Science* 318:1737-1742

Hughes TP et al. (2003) Climate change, human impacts, and the resilience of coral reefs. *Science* 301:929-933

McClanahan TR et al. (2007) Effects of climate change and seawater temperature variation on coral bleaching and mortality. *Ecological Monographs* 77:503-525

Orth RJ et al. (2006) A global crises for seagrass ecosystems. *BioScience* 56(12):987-996

Sheppard CRC (2003) Predicted recurrences of mass coral mortality in the Indian Ocean. *Nature* 425:294-297

Ulstrup KE et al. (2006) Variation in bleaching sensitivity of two coral species across a latitudinal gradient on the Great Barrier Reef: the role of zooxanthellae. *Marine Ecology Progress Series* 314:135-148

Union des Comores (2002) Communication Nationale Initiale sur les Changements climatiques. 12pp. C3 REFERENCE ID 8

Walther GR et al. (2002) Ecological responses to recent climate change. *Nature* 416:389-395

Worm B et al. (2006) Impacts of biodiversity loss on ocean ecosystem services. *Science* 314:787-790

CORE UNIT 2

Unit title HUMAN DIMENSIONS OF MARINE SYSTEMS

Unit value 40 hours

Unit description

This core unit focuses on the importance of human activities within marine systems and the associated assessment and monitoring techniques for sustainable use and management of marine natural resources. Topics include an insight on anthropogenic threats and mitigation measures; an overview of tourism in the coastal zone; an introduction to biological assessment techniques for fishery resources management; general information on aquaculture; and an introduction to socioeconomic research and application in the field.

Summary of learning outcomes

To achieve this unit a learner must:

1. Recognise the **anthropogenic threats and mitigation measures to biodiversity**
2. Understand the elements associated with the **tourism industry**
3. Describe **fishery stock assessment techniques and the management tools** and their application
4. Demonstrate an understanding of the **fisheries by-catch** problem and its potential **solutions**
5. Comprehend the value of and environmental issues in relation to **aquaculture**
6. Demonstrate the ability to conduct a **socioeconomic assessment**, including the writing of a semi-structured interview

Summary of the content for each learning outcome

1.	Anthropogenic threats and mitigation measures to biodiversity	
	Anthropogenic threats	habitat loss/degradation/fragmentation (e.g. coral extraction, aquarium trade, fishing), invasion of non native species, pollution (e.g. sewage, nutrient run-off), climate change
	Mitigation measures	habitat creation/rehabilitation, ecological monitoring programs, protection, law enforcement
2.	Tourism industry	
	Tourism overview	structure and sectors in the tourism industry
	Impacts of tourism	cultural, economic (local economic disruption) and environmental impacts (waste, sewage, buildings)
	Ecotourism and sustainable tourism	definition, benefits, issues
3.	Fishery stock assessment techniques and management tools	
	Stock identification techniques	traditional and genetic based
	Stock dynamics	growth, mortality, reproduction/recruitment rates of individuals and populations, modelling and interpretation (just in extra reading for more advanced students)
	Management tools	quotas, gear restrictions, minimum size, limited entry, closed seasons, MPAs, international law and fisheries policy
4.	Fisheries by-catch and solutions	
	Fisheries by-catch	accidental catch (e.g. sharks, turtles, cetaceans), disruption of ecosystem functionality
	Conservation initiatives	better informed science, new legislation, public pressure, market drivers, improve selectivity of fishing gear (e.g. turtle excluder device, by-catch reduction devices), influence of NGOs
5.	Aquaculture	

	Aquaculture overview	definition, history, world production, types of aquaculture
	Environmental impacts	positive impacts (restock populations, lower dependence on wild stocks of fish, new jobs, feed the worlds growing population), negative impacts (habitat destruction, genetically engineered fish escape, protein balance, alien species introduction, nutrient pollution)
	Future of aquaculture	socio-economic effects (visual pollution, traditional employment vs. aquaculture industry), growing world population needs, profitability and environmental compatibility, new technologies
6.	Socioeconomic assessment	
	Socioeconomic assessment	definition, socioeconomic topics, types (participatory, extractive, product-oriented, process-oriented)
	Preparation and planning	define goals and objectives, study areas and study sites, stakeholders, secondary data, team
	Collecting field data	observations, semi-structured interviews, focus groups, oral histories and survey
	Data analysis	compiling information, quantitative data, analysis workshop, final report

Assessment criteria for each learning outcome

Learning outcomes	Assessment criteria To achieve each outcome a learner must demonstrate the ability to**:**
1. Recognise the anthropogenic **threats and mitigation measures to biodiversity**	• Recognise the potential anthropogenic threats altering structure and function of tropical coastal ecosystems • Evaluate mitigation strategies for those threats • Investigate the threats to one endangered marine specie and discuss solutions and conservation issues
2. Understand the elements associated with the **tourism industry**	• Critically assess the elements of the tourism industry at a cultural, economic and environmental level • Distinguish between ecotourism and sustainable tourism

		• Recognise the potential benefits and issues of both eco- and sustainable tourism
3.	Describe **fishery stock assessment techniques and the management tools** and their application	• Describe aquatic resources identification techniques • Show ability to interpret simple stock dynamics graphs • Give examples of tools and their application to fisheries management
4.	Demonstrate an understanding of the **fisheries by-catch** problem and its potential **solutions**	• Understand how certain fishing activities have the potential to disrupt the functionality of an ecosystem • Propose conservation initiatives to reduce fisheries by-catch
5.	Comprehend the value of and environmental issues in relation to **aquaculture**	• Recognise the potential benefits of aquaculture • Identify the negative impacts of aquaculture on the environment • Acknowledge the challenge to maintain profitability and environmental compatibility
6.	Demonstrate the ability to conduct a **socioeconomic assessment**, including the writing of a semi-structured interview	• Appreciate the importance of socioeconomic research for management • Demonstrate ability to plan and design a socioeconomic assessment • Compose a semi-structured interview from a fictional case-study • Understand how to analyse and present data

Resources

- ⇨ black/whiteboard
- ⇨ computer and projector
- ⇨ program CDs

Suggested reading

Anthropogenic threats and mitigation measures to biodiversity

Bax N et al. (2003) Marine invasive alien species. *Marine Policy* 27(4):313-323

Cardoso PG et al. (2004) Dynamic changes in seagrass assemblages under eutrophication and implications for recovery. *Journal of Experimental Marine Biology and Ecology* 302:233-248

Dolbeth M et al. (2007) Anthropogenic and natural disturbance effects on a macrobenthic estuarine community over a 10 year period. *Marine Pollution Bulletin* 54:576-584

Halpern BS (2008) A global map of human impact on marine ecosystems. *Science* 319(5865):948-952

Halpern BS et al. (2007) Evaluating and ranking the vulnerability of global marine ecosystems to anthropogenic threats. *Conservation Biology* 21(5): 1301-1315

Tourism industry

Cater E (2007) *Marine ecotourism: between the devil and the deep blue sea*, CABI, 307pp

Davenport J and Davenport JL (2006) The impact of tourism and personal leisure transport on coastal environments: A review. *Estuarine, Coastal and Shelf Science* 67(1-2):280-292

Higham JES (2007) *Critical issues in ecotourism: understanding a complex tourism phenomenon*, Butterworth-Heinemann, 439pp

Kalli De M and Fernando S. *Admission fees: opportunities and challenges of using admission fees as a funding source at a small scale, tourism dependant MPA. Case study of the Bonaire National Marine Park*. Bonaire. 9pp. C3 REFERENCE ID 80

Lansing P and De Vries P (2007) *Sustainable Tourism: Ethical Alternative Marketing Ploy?* Journal of Business Ethics, *72(1):77-85*

L'écotourisme sur l'île de Mohéli (Rapport final) (2005) C3 REFERENCE ID 124

Les sites de conservation et de promotion écotouristiques aux Comores. C3 REFERENCE ID 125

Pearce DG (2008) « Tourism planning in small tropical islands: methodological considerations and development issues in Samoa », *Études caribéennes*, Le tourisme dans les îles et littoraux tropicaux et subtropicaux, [Online], published online the 8th of Septembre 2008. URL : http://etudescaribeennes.revues.org/document1393.html.

Scheyvens R and Momsen J (2008) Tourism in Small Island States: From Vulnerability to Strengths. *Journal of Sustainable Tourism*, 16 (5):491-510

Stolk P et al. (2007) Artificial Reefs as Recreational Scuba Diving Resources: A Critical Review of Research. *Journal of Sustainable Tourism*, 15(4):331-350

(in press) Confronting tourism's environmental paradox: Transitioning for sustainable tourism

Amin SH (1983) The Law of fisheries in the Persian Arabian Gulf. *Journal of Maritime Law and Commerce* 14(4):581-593 C3 REFERENCE ID 135

De San M. (1983) Profil de la Pêche Artisanale aux Comores, FAO: 18 C3 REFERENCE ID 91

International Collective in Support of Fishworkers (2006) *Fishing communities and sustainable development in Eastern and Southern Africa: the role of small-scale fisheries*. ESA Fish Workshop, Dar Es Salaam, Tanzania 69pp. C3 REFERENCE ID 86

Van Der Elst RP et al. (2005) Fish, fishers and fisheries of the Western Indian Ocean: their diversity and status, a preliminary assessment. *Philosophical Transactions of the Royal Society of London* 363:1-22 C3 REFERENCE ID 85

Graham NAJ et al. (2007) Lag effects in the impacts of mass coral bleaching on coral reef fish, fisheries, and ecosystems. *Conservation Biology* 21:1291-1300

Fisheries by-catch and solutions

Bachem SJ (2003) By-catch mitigation tools: selecting fisheries, setting limits, and modifying gear. *Ocean and Coastal Management* 46(1-2):103-125

Cox TM et al. (2007) Comparing effectiveness of experimental and implemented by-catch reduction measures: the ideal and the real. *Conservation Biology* 21(5):1155-1164

Davis PZR and Poonian CNS (2007) Incidental capture of the Dugong, *Dugong dugon*, in gillnets, Moheli, Union of the Comoros. In Kizska J and Muir C (eds). Ist Regional Workshop on incidental catches of non-targeted marine species in the western Indian Ocean. Workshop Proceedings 13-15th November 2006. Mayotte, France. C3 REFERENCE ID 63

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CORE UNIT 3

Unit title MARINE PROTECTED AREAS (MPAs)

Unit value 40 hours

Unit description

This core unit introduces and develops theoretical and practical aspects of Marine Protected Area management with reference to local case studies and a significant fieldwork component. The final section of this unit focuses on the various marine habitat restoration techniques.

Summary of learning outcomes

To achieve this unit a learner must:

1. Comprehend the concepts involved in the **establishment of MPAs**
2. Understand subject-specific principles, theory and practice related to **management of MPAs**
3. Carry out specific **habitat restoration** techniques

Summary of the content for each learning outcome

1. Establishment of Marine Protected Areas

	MPAs theory	definition, types and categories of MPAs (including reserves for species/habitat), aims and objectives, benefits
	Establishment of MPAs	design and zonation, effectiveness of protected areas, levels of protection, legislation and enforcement
2.	Management of Marine Protected Areas	
	Long term monitoring programmes	importance of monitoring programmes in improving management, designing a monitoring programme (resource and capacity limit, appropriate indicators), types of monitoring programmes (habitats, fisheries, physical conditions, socio-economic)
	Surveillance and enforcement	compliance issues, equipment for surveillance, surveillance tasks (i.e. respect of regulations and legislation, fees and licenses paid etc.), understanding the wider national legal framework, stakeholder involvement, training and appropriate behavior
	User conflicts	types of conflicts, conflict resolution methods, steps in resolving a conflict
	Stakeholder consultations and the participatory approach to management	levels of participation, identifying stakeholders, participatory techniques
	Infrastructure	construction vs. environment, main building and facilities, planning buildings (i.e. location, size, design, construction material etc.)
	Management structures	strengths and weaknesses, co-management, community based management, top down/bottom up
	Financial planning and management	various funding sources (i.e. trust funds, grant proposals writing, volunteer schemes, user fees), budgets, accounting, financial plans
	Evaluating success	interest in marine protected area management effectiveness evaluation, methodology
3.	Habitat restoration	
	Choosing a restoration technique	identifying aims and objectives, target area, ecological and logistical considerations, costs and benefits
	Carrying out a restoration technique	coral transplant, mangrove and seagrass reseeding

Assessment criteria for each learning outcome

Learning outcomes	Assessment criteria
	To achieve each outcome a learner must demonstrate the ability to**:**

1.	Comprehend the concepts involved in the **establishment of MPAs**	• Appreciate the importance of MPAs • Give examples of the factors involved in setting up an MPA
2.	Understand subject-specific principles, theory and practice related to **management of MPAs**	• Appreciate the importance of long term monitoring programmes • Show capacity to build a management plan from a hypothetical case study
3.	Carry out specific **habitat restoration** techniques	• Plan a habitat restoration project • Appreciate the importance of ecological and logistical considerations for habitat restoration • Perform at least one habitat restoration technique proficiently

Resources

appropriate expedition and biological survey equipment, black/whiteboard, computer and projector, program CDs

Suggested reading

International news and analysis on Marine Protected Areas: http://depts.washington.edu/mpanews/

Pomeroy RS et al. (2004) How is your MPA doing?: A guidebook of natural and social indicators for evaluating Marine Protected Area management effectiveness. IUCN, 215p.

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OPTIONAL UNIT 1

Unit title: PROJECT REPORT WRITING AND PUBLISHING ARTICLES

Unit value: 10 hours

Unit description:

This optional unit will provide the students with the skills to write various professional project reports and scientific papers for publication.

Summary of learning outcomes:

To achieve this unit a learner must:

1. Demonstrate the ability to **plan and compose a scientific paper**
2. Understand the basic requirements to **publishing a scientific article**
3. Understand how to produce an accurate

Summary of the content for each learning outcome:

1. Plan and compose a scientific paper

Plan: objectives, hypotheses,

Format: title, authors, abstract, table of contents, introduction, experimental techniques and methods, results and discussion, summary/conclusions, references, appendices

References: writing a standardised bibliography (book, article, website), pertinence of references, plagiarism

2. Publishing a scientific article

Authors: deciding the implication of each author in writing the paper

Journal: finding a journal, specific guidelines for submission

OPTIONAL UNIT 2

Unit title: REMOTE SENSING AND GIS

Unit value: 10 hours

Unit description:

This optional unit introduces the students to a basic theoretical and practical understanding of remote sensing and GIS as tools for supporting research studies and management initiatives. Through a case study, students will also get acquainted to the implementation and the issues associated with managing a GIS project. Additionally, students will learn how to collect data with a GPS and get acquainted with data incorporation into GIS using one of the software packages available.

OPTIONAL UNIT 3

Unit title: DATA RECORDING/PRESENTATION AND APPLIED STATISTICS

Unit value: 10 hours

Unit description: This optional module is aimed at the students who wish to gain further knowledge on how to record, present and analyse ecological and socioeconomic data collected in the field. Appropriate basic statistical techniques will be taught using computer-based statistical programs.

Summary of learning outcomes:

To achieve this unit a learner must:

1. Demonstrate proficiency in **data recording and presentation**
2. Carry out specific **univariate and bivariate statistical techniques**

Summary of the content for each learning outcome:

1. Data recording and presentation

Recording data: designing datasheets, completing datasheets in the field, incidental observations

Computer spreadsheets: accuracy, quality control, tables, graphs, suitability of each format for displaying data

2. Univariate and bivariate statistical techniques

Basic statistics: mean, standard error, correlation, regression, pair-wise tests, ANOVAs, statistical computer programmes

Assessment criteria for each learning outcome:

Learning outcomes	Assessment criteria for pass
1. Demonstrate proficiency in **data recording and presentation**	• Log comprehensive field notes • Formulate a biological survey datasheet • Record data accurately • Assess data for reliability • Utilise computer systems for data storage • Present survey data
2. Carry out specific **univariate and bivariate statistical techniques**	• Proficiency in statistical data analysis • Choose appropriate statistical tests • Interpret statistical values/outcomes • Utilise statistical computer programs

OPTIONAL UNIT 4

Unit title: FUNDING MECHANISMS

Unit value: 10 hours

Unit description:

This optional unit introduces and develops the practical skills required for successfully obtaining funds for conservation initiatives. Candidates practise recognising and justifying conservation requirements and suitable management initiatives. In addition, logistical requirements of project planning are covered such as budgets and timetables.

Summary of learning outcomes:

To achieve this unit a learner must:

1. Demonstrate the ability to compose a **grant proposal**, including budgets and timetables.
2. Show an understanding of the **reporting requirements** of conservation donors.

Summary of the content for each learning outcome:

1. Grant proposals

Approach to proposal-writing: identifying donors, identifying conservation requirements

Planning a project: budget forecasting, timetables

2. Reporting requirements of conservation donors

Progress reporting: scientific reports, recording weekly achievements

Project management: accounts, time management

Programme de Madagascar et des Îles de l'Océan Indien 2010

Présente: AMP 2
Types d'Aires Marines Protégées

Exposés sur les Aires Marines Protégées (AMP)

- *La semaine passée nous avons introduit les AMP*

  Exposé 1: **Que sont les AMP?**

- Nous continuons aujourd'hui avec :

  Exposé 2. **Types d'AMP**

- La semaine prochaine nous finirons avec :

  Exposé 3. **Efficacité des AMP**

Plan de l'exposé

1. Rappels sur les AMP
2. Types d'AMP
3. Objectifs de gestion pour définir les types d'AMP
4. Types d'AMP en Afrique Orientale
5. Réseaux d'AMP potentiels dans l'Ocean Indien
6. Conclusions

1. Rappels sur les AMP

- Une AMP est une zone marine ou côtière qui est davantage protégée que les eaux l'environnant

- Les AMP varient en taille, en but, en conception et en réglementation

- Les AMP ne sont pas seulement des zones de non-droit, elles sont un outil de gestion efficace pour la protection de l'environnement marin

- La bonne utilisation de la zonation et de la planification spatiale de réseaux d'AMP peut augmenter l'efficacité de l'utilisation durable des ressources

2. Types d'AMP

Moyens de protection des stocks de poissons :

- **Zones de non droit** ou

- **Usage réglementé :**

- Limiter la pêche
- Règlementer les espèces pêchées
- Règlementer l'effort de pêche

La **zonation** des AMP peut permettre différentes restrictions pour différents utilisateurs (pêcheurs, touristes,…)

3. Objectifs de gestion pour définir les types d'AMP

Location	Description	Catégorie IUCN
	Protection stricte (recherche scientifique)	1 a
	Protection stricte (nature Sauvage)	1b
	Conservation écosystème + loisir (parc naturel)	II
	Conservation d'éléments naturels	III
	Conservation par gestion active	IV
	Conservation paysage Terrestre/marin + loisir	V
	Utilisation durable des ressources	VI

3. Objectifs de gestion pour définir les types d'AMP

- **Réserve de pêche**
  - e.g. Nosy Atafana (Madagascar)
- **Réserve de non droit**
  - e.g. Aldabra Atoll (Seychelles)
- **Pêche et tourisme**
  - e.g. Mafia Island (Tanzania)
- **Réserve écotouristique**
  - e.g. Chumbe (Zanzibar)
- **Réserve de poulpe**
  - e.g. Andavadoaka (Madagascar)

Pêcheur de poulpe, Andavadoaka

3. Objectifs de gestion pour définir les types d'AMP

Régimes de gestion et de législation

- Gouvernement national
  - e.g. Nosy Hara (Madagascar)

- Co-gestion
  - e.g. Moheli (Comores)

- Système DINA (communauté locale
  - e.g. Ile de Nosy Ve

Nosy Ve (Tuléar)

4. Types d'AMP en Afrique Orientale

a. Petites zones destinées à la protection d'une espèce ou d'un seul habitat marin

b. Grandes AMP à usages multiples destinées au développement côtier et à la protection de la biodiversité

c. AMP gérées par des ONG ou par le secteur privé

d. AMP gérées par la communauté locale

(Francis *et al.*, 2002)

4. Types d'AMP en Afrique Orientale

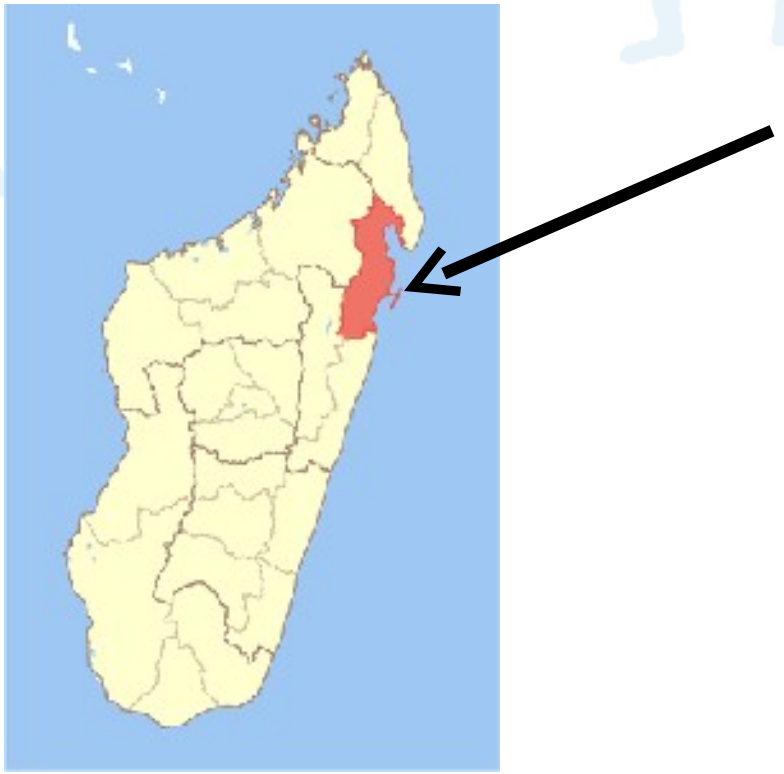
a. *Petites zones destinées à la protection d'un seule espèce/d'un seul habitat marin :*

Parc Marin de Nosy Atafana, Madagascar

Taille : 10 km²

Zone centrale
- activités interdites

Zone tampon ZUC
- limitation de la pêche
- accord du Projet Mananara Biosphere



4. Types d'AMP en Afrique Orientale

Parc Marin de Nosy Atafana, Madagascar

Pourquoi créer une AMP ?

- Établie en 1989
- biodiversité et habitat riche (mangrove, coraux, herbiers)
- Pressions (pêche destructrice, proximité villages)

Surveillance :
-Captures de poissons par pêcheurs
-Santé des récifs coralliens
-Exploitation des ***concombres de mer***

4. Types d'AMP en Afrique Orientale

b. Grandes AMP à usage multiple:

Parc National Marin de Mafia Island, Tanzanie

Taille : 821 km²

Zones:

- Centre
- Utilisation spécifique (réglementée)
- Utilisation générale (non réglementée)

4. Types d'AMP en Afrique Orientale

Parc National Marin de Mafia Island, Tanzanie

Pourquoi créer une AMP?

-Établie en 1995

-Zones de haute diversité, île = « facile » à limiter

-Menaces : Pêche à la dynamite, destruction des récifs

-Parc = gains financiers par le tourisme

4. Types d'AMP en Afrique Orientale

a. *AMP gérées par des ONG ou par le secteur privé :*

Parc Corallien de Chumbe Island, Zanzibar

Réserve corallienne et forestière

- Loué par un privé et géré comme une AMP
- Activités interdites
- 0.5km² protégés
- Financé par un écotourisme faible et de luxe

4. Types d'AMP en Afrique Orientale

Parc Corallien de Chumbe Island, Zanzibar

Pourquoi créer une AMP?

-Établie en 1992
-Récif corallien très riche
-Site de reproduction/
nidification pour les poissons

→Préservation de la biodiversité
→Économie des pêcheries

4. Types d'AMP en Afrique Orientale

a. *AMP gérées par la communauté locale:*

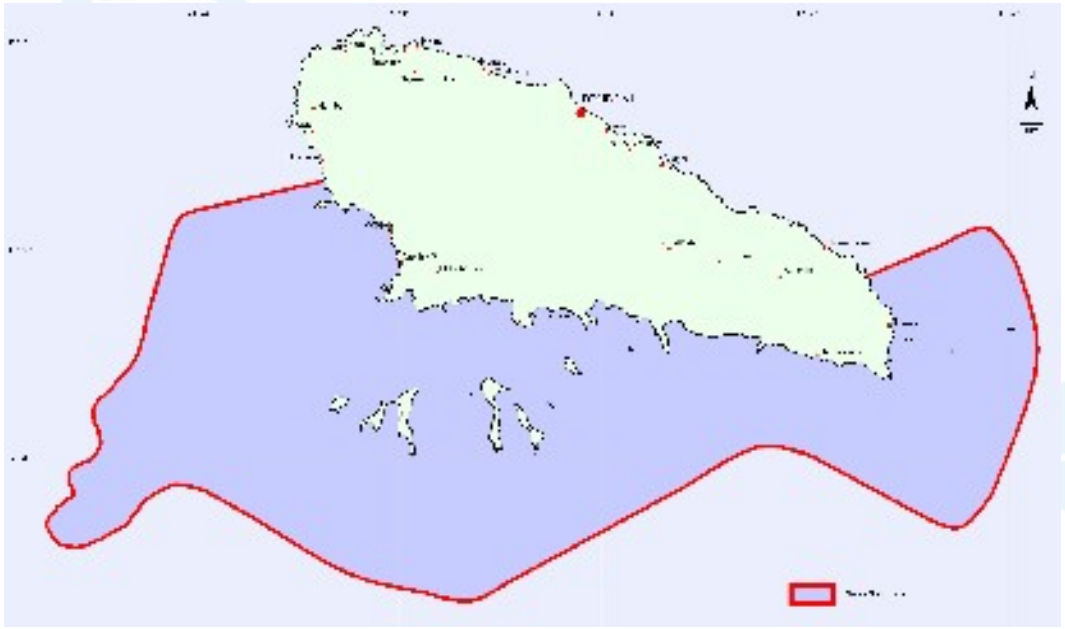
Parc Marin de Mohéli, Comores

- 2001: 1ère AMP aux Comores
- Projet Biodiversité
- 404Km²

- Comité de co-gestion:
  - 10 représentants des villages
  - 12 éco-gardes locaux
  - Conservateur attitré

4. Types d'AMP en Afrique Orientale

Parc Marin de Mohéli, Comores



Pourquoi établir une AMP ?

-Protection d'espèces migratrices (lieux de ponte)

-Faune et flore diversifiée

-Pratiques de pêche destructrices

5. Réseaux d'AMP potentiels dans l'Ocean Indien

WIOMER Projet de Réseau d'Aires Marines Protégées

Western Indian Ocean Marine Ecoregion: Madagascar, Comores, Réunion, Maurice, Seychelles

5. Réseaux d'AMP potentiels dans l'Ocean Indien

WIOMER Projet de Réseau d'Aires Marines Protégées

- Plus de 27 AMP créées dans le WIO
- Mais pas planifiées au niveau régional (WIO), donc :
  - Les habitats sont mal représentés
  - Certains sites importants pour les espèces clés ne sont pas encore protégés
  - Les gestionnaires d'AMP n'ont pas beaucoup d'opportunités de partager/échanger leur savoir

(Commission Océan Indien)

5. Réseaux d'AMP potentiels dans l'Ocean Indien

WIOMER Projet de Réseau d'Aires Marines Protégées

Succès :

- études socio-économiques et environnementales nationales
- SIG régionaux pour les habitats, les espèces clés et les distributions d'AMP
- rencontres annuelles nationales de gestionnaires d'AMP
- Plans de sensibilisation et base de donnée centralisée des activités d'éducation environnementale

5. Réseaux d'AMP potentiels dans l'Ocean Indien

Législation internationale

- Convention UN sur la Loi de la Mer (UNCLOS)
- Convention sur la Diversité Biologique(CBD)
- Accord UN sur les stocks de poisson

Législation régionale

- Commission de l'Océan Indien sur le thon
- Accord sur les pêcheries du Sud de l'Océan Indien
- Association sur les pêcheries en eaux profondes du Sud de l'Océan Indien
- Convention Nairobi (UN) pour la protection des espèces et des habitats marins

6. Conclusions

•La zonation et les réseaux d'AMP sont efficaces pour des larges zones à utilisations multiples

•Les réseaux permettent de connecter différentes zones de protection (intéressant pour les espèces migratrices)

•Les AMP peuvent être gérées :
- localement, régionalement, nationalement,
- co-gérées avec les communautés locales
- entièrement conçues et gérées par les communautés locales

6. Conclusions

- La gestion des AMP implique une planification, une implantation et une évaluation pour attester de sa réussite et de sa durabilité

- Futur réseau d'AMP dans l'Océan Indien : WIOMSER

- La semaine prochaine nous complèterons cette série d'exposés avec "l'efficacité des AMP"

Références

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- Hauzer *et al.* (2008) Moheli Marine Park, Comoros Successes and Challenges of the Co-Management Appraoch

- King and Faasill 1998 in Parks 98 vol 8 no 2 MPAs IUCN

- IUCN (no year) “The Seamounts Project”, in *Applying an Ecosystem Approach to Fisheries Management in the High Seas-A focus on Seamounts of the southern Indian Ocean,* IUCN Global Marine Programme, UNEP-GEF.Millner Gulland and Rowcliffe (2007) Choosing Management approaches. Section 6 pg 209

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- www.coi-amp.org

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