



NETBIOME-CSA

STRENGTHENING EUROPEAN RESEARCH COOPERATION FOR SMART
AND SUSTAINABLE MANAGEMENT OF TROPICAL AND SUBTROPICAL BIODIVERSITY
IN OUTERMOST REGIONS AND OVERSEAS COUNTRIES AND TERRITORIES

Good practice guidelines for tropical and subtropical biodiversity conservation

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Executive Summary

The NetBiome-CSA project will produce a Biodiversity Management Toolbox as one of its key resources. Task 4.3 focuses on compiling examples on good practices for the Toolbox. The present report “Good practices guidelines for sustainable conservation of biodiversity in tropical and subtropical regions” - D4.3, provides an overview of the c. 80 good practices that were compiled for the EU Overseas Areas, including the methodology that was used for gathering the data and information.

The exchange of good practices is expected to help stakeholders to be aware of ongoing work that has been and is being conducted for the conservation of biodiversity in EU Overseas Areas, reduce replication in efforts, and save time and resources.

The report highlights and describes in detail eleven examples of good practices, addressing different regions and topics. These examples include:

- a) Dutch Caribbean Nature Alliance (DCNA)
- b) Dutch Caribbean Biodiversity Database (DCBD)
- c) Atlantis Database
- d) Fauna records collecting and sharing Website
- e) Total Economic Valuation of Bermuda’s Coral Reefs
- f) Economic value of seagrass meadows
- g) Marine Ecotourism at El Hierro Island
- h) Marine Protected Areas and Recovery of Benthic Communities
- i) ZoNeCo Program: a local R&D program dedicated to the sustainable management of marine resources of New Caledonia
- j) Sea Turtle Conservation Bonaire (STCB)
- k) Co-management of a local small scale sea-cucumber fishery in the North-West region of New-Caledonia

The good practices are not exhaustive. Once they have been uploaded to the Toolbox and a centralized portal is available, it is expected that the stakeholders from the EU Overseas Areas will be able to search, curate, and update the data and information by adding new good practices entries when found appropriate.

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Part I – Introduction

The EU FP7 funded NetBiome project, a Coordination & Support Action which brings together a partnership for research and sustainable management of (sub)tropical biodiversity in the European Outermost Regions (ORs) and Overseas Countries and Territories (OCTs), will produce a Biodiversity Management Toolbox as one of its key resources. The following set of tools will be part of the Toolbox:

- a) A database of stakeholders involved in biodiversity management and research. This includes details on their areas of expertise, interests and activities, and for registered users also their contact details;
- b) A database of case studies for biodiversity valuation in, or relevant to, the EU ORs/OCTs, with links to the original studies;
- c) **A database of good practices for tropical biodiversity conservation. Details include the geographical region concerned, the category and criteria for defining it as a best practice and its transferability to other cases and regions, and links to the original studies;**
- d) A database of training and communication materials on biodiversity valuation with links to where they are available;
- e) A dedicated communication tool for registered stakeholders, allowing them to launch queries or discussions, develop projects or seek partners for collaboration.

Through the data and information contained in the Toolbox, the project envisages to:

- **Facilitate the exchange of knowledge and good practices between the national and/or regional policies and programmes;**
- Encourage the pooling of resources between infrastructure operators at European level in order to face the grand challenges and to foster a culture of co-operation between them, **spread good practices and encourage infrastructures to develop in complementary ways;**
- Enhance partnerships between policy makers, funding bodies, academia and industry and promote the development of appropriate monitoring tools for decision making;
- Contribute to the emergence of sustainable approaches for the provision of cross-disciplinary research services;
- Strengthen the development of a consistent and dynamic European Research Area policy for research infrastructures.

Good practice guidelines for sustainable conservation of biodiversity, ecosystem-based indicators and regulations are required at the policy and governance level to support international and interregional consistent and prolonged strategies for monitoring programmes on which sustainable exploitation schemes can be based.

We live on a planet with finite natural resources, hence, when we deal with natural habitats that are not well managed there is only loss. Sustainable conservation of biodiversity involves different dimensions ranging from direct management to effective conservation. For instance, it requires a multidisciplinary **process-driven approach** that facilitates understanding of the ecological functioning of biological resources and the services provided by the local ecosystems that support these resources, including cost-benefit considerations. The development of good practice guidelines, policies, and strategies focusing on the conservation of single key or flagship species out of their ecological context do not contribute to the concept of ecosystem-based management and carry the risk of disturbing fragile ecological relationships between species and between different ecosystems, especially in small and insular areas.

Sustainable conservation of biodiversity requires **increased public awareness and engagement in the planning and decision-making process**. Biodiversity issues should be central to high-level policy decisions so that government bodies can implement consistent and adequate legislation on biodiversity issues. This

paradigm shift is currently gaining support in many European countries and should also be fostered in Europe's Overseas Areas.

It also requires **investment in human capacity**. 70% of the European biodiversity is in the European Overseas Areas. Many of these regions and territories are quite isolated and exposed to natural hazards (e.g. typhoons, volcanoes, earthquakes), hence they are vulnerable and strongly dependent on local resources in case of risks. There is a need for investment in human capacity that can address the needs and problems in relation to biodiversity in these Areas.

Part II – Approach

From June 2014 - June 2015, partners and stakeholders of the project (e.g. local governments, research institutions, NGOs) were requested to identify and share existing Good practices for tropical and subtropical sustainable biodiversity conservation for their region. In particular, they were asked to identify the criteria for deciding what biodiversity conservation management worked for their region, and to explain why the selected example worked.

Contributors were requested to provide examples of good practices for sustainable conservation of biodiversity within their region, including directions for further information (i.e. documents/reports, web link, a contact person). In order to cover correctly the diversity of situations and the whole logical framework from knowledge to action, contributors were requested to indicate:

(i) to which of the following four categories each good practice corresponds, and why:

- a. Characterization of biodiversity (e.g. inventory, description of species and ecosystems)
- b. Drivers of evolution (e.g. global and local change, dynamics of evolution, impact of human activities)
- c. Biodiversity management (e.g. conservation ex situ and in situ, sustainable use and exploitation, rehabilitation, management of invasive species, pollutants, pesticides)
- d. Governance and policies (e.g. interactions science/societies, regulations, decision-makers, networks, international collaborations)

(ii) which of the following seven criteria would be appropriate to classify each example (several can apply simultaneously), and why:

- a. Significant contribution to conservation of biodiversity and ecological effectiveness
- b. Provision of further environmental and socio-economic benefits
- c. Applicability/transferability to other ORs/OCTs
- d. Sustainability of projects (i.e. projects continue beyond the initial funding period)
- e. Adaptive management of biodiversity (allowing to cope with change of environmental conditions, e.g. climate change)
- f. Good governance (involvement of relevant stakeholders, including local ones, and integration of different interests, perspectives and needs)
- g. Generating multiplier/imitation effects

Where information was missing, the good practices received were complemented as much as possible with a bibliographic study. Contributors were contacted and asked to validate the information before inclusion in the Toolbox.

Part III – Outcomes

Contributions on good practices were received for the following geographic regions: Macaronesia, Caribbean, Indian Ocean and Pacific Ocean; including the following locations:

- French West Indies = Antilles-Guyane (Guadeloupe, Martinique, French Guyana)
- Dutch Caribbean (Aruba, Bonaire, Curaçao, Saba, St. Eustatius, St. Maarten)
- Greater Caribbean
- La Réunion
- Macaronesia (Canaries, Azores, Madeira)
- New Caledonia
- UK Overseas Territories (Anguilla, Bermuda, British Indian Ocean Territory, British Virgin Islands, Cayman Islands, Monserrat, Pitcairn, Henderson, Ducie and Oeno Islands, Saint Helena and Dependencies, Ascension Island, Tristan da Cunha Island, Ascension Island, Turks and Caicos Island)

The c. 80 compiled good practices address topics ranging from invasive species to protected areas. The list is here available: <http://www.netbiomedata.org/user>. The final version will be accessible through the Netbiome.eu site by the end of 2015.

Eleven examples of good practice were selected based on their achievement of one or more of the seven criteria mentioned in part II above. The examples range from effective species protection to participatory governance approaches and evidence-based decision support. The examples are described below.

Example 1 – Caribbean: Dutch Caribbean Nature Alliance (DCNA)

Source

Paul Hoetjes (paul.hoetjes@rijksdienstcn.com) – Ministry of Economic Affairs, Caribbean Netherlands
Kalli De Meyer (director@DCNAnature.org) – Director DCNA

Short summary and / or success story of good practice

DCNA is a joint non-governmental umbrella organization uniting the various protected area organizations of the Dutch Caribbean islands. Enabled by a strong and active secretariat, it has proven to be an effective network for capacity building, exchange of knowledge, experience, and support, for joint activities, and advocacy directed mainly at the metropolitan government in Europe (i.e. Dutch Government). Many joint training programs have been realized for the staff of the protected area management organizations, from project management and monitoring methods to equipment use and administration skills. Management plans for protected areas have been brought up to high standards and have been harmonized. Successful joint projects from sea turtle conservation and bird monitoring to education programs have been realized.

Category of good practice

- **Biodiversity management (e.g. conservation ex situ and in situ, sustainable use and exploitation, rehabilitation, management of invasive species, pollutants, pesticides)**
Primary goal of DCNA is to strengthen the management of biodiversity by strengthening the management organizations through capacity building and professionalization, joint conservation projects and sourcing of funding.
- **Governance and policies (e.g. interactions science/societies, regulations, decision-makers, networks, international collaborations)**

The management organizations have been professionalized, use standardized management plans, are recognized as an important partner in the formulation of policy plans and strategies. The organization effectively networks its constituent organizations, collaborates with intergovernmental organizations in the region and with international NGOs active in the region.

Criteria used to define the Good practice

- **Significant contribution to conservation of biodiversity and ecological effectiveness**
Joint conservation and outreach projects have contributed to improved protection for sea turtles, birds and sharks. Support has been provided to the highly successful eradication program for invasive Lionfish.
- **Provision of further environmental and socio-economic benefits**
Successful outreach program has contributed to increase in awareness on the islands of the importance of biodiversity, has helped to engage people in conservation through volunteer programs. The organization has played a major role in creating awareness in the continental Netherlands about overseas biodiversity, and was able to convert that into increased funding and support from Dutch citizens.
- **Applicability/transferability to other ORs/OCTs**
The model of cooperation between distant islands that share common challenges is simple and can easily be copied. DCNA is already recognized as a model to be followed by the UK territories in the Caribbean and by the SPAW regional activity center which works on many islands in the Caribbean.
- **Sustainability (i.e. projects remain beyond the initial funding period)**
Starting with funding from one governmental source DCNA has been successful in raising funding for its operation from various sources (National Lottery fund, large NGOs), and has succeeded in establishing itself as an essential partner that needs to be sustained. Together with a trust fund that has been established this will help to ensure its continued existence. Its projects have focused on capacity building, providing lasting improvement of nature management and conservation.
- **Adaptive management of biodiversity (allowing to cope with change of environmental conditions, e.g. climate change)**
The professionalization of its constituent organizations included the development of adaptive protected area management plans, ensuring timely responses to changing conditions. This includes joint coral bleaching response plans for example, but also prepared the marine parks on all of the islands for the arrival of the invasive lionfish, enabling them to immediately start with implementing control measures.
- **Good governance (involvement of relevant stakeholders and integration of different interests and perspectives and needs)**
The organization of DCNA was carefully considered and constructed in order to fully include and enable its constituent organizations, while also including independent board members to ensure alternative perspectives and necessary outside expertise. It works closely with the governments of the islands. The adaptive protected area management plans developed by DCNA ensure the involvement of stakeholders in the development and periodical review of the plans.
- **Generating multiplier/imitation effects**
Although originally envisioned as a fundraising organization and peer communication network, DCNA quickly became an instrument for capacity building and professionalization and an essential partner for biodiversity conservation policy. It has become an important generator of conservation projects, instrumental in generating attention for bird conservation, which had been completely lacking before. It also helped to professionalize biodiversity monitoring and establishing research priorities

of the islands. It has earned the admiration of the rest of the region and is seen as a model to be followed.

Documents for further reading

- AIDEnvironment, Barry Spergel, Ecovision. 2005. Sustainable Funding for Nature Parks in the Netherlands Antilles. Feasibility Study of a Protected Areas Trust Fund. <http://www.dcbd.nl/sites/www.dcbd.nl/files/documents/TrustfundstudyNethAntilles-complete.pdf>
- DCNA. 2013. Multi Year Plan 2013-2017 ver. 2013/003. <http://www.dcnanature.org/wp-content/uploads/2013/12/Multi-Year-Plan-2013-2017.pdf>

Website of good practice

- <http://www.dcnanature.org/about-dcna/>

Example 2 – Caribbean: Dutch Caribbean Biodiversity Database (DCBD)

Source

Paul Hoetjes (paul.hoetjes@rijksdienstcn.com) – Policy coordinator nature
Peter Verweij (Peter.Verweij@wur.nl) – Alterra, Wageningen University, Netherlands

Short summary and / or success story of good practice

The Dutch Caribbean Biodiversity Database (DCBD) supplies a central repository for all biodiversity related research and monitoring data, information and interactive maps from the Dutch Caribbean. The goal of the DCBD is to guarantee long-term data access and availability, support nature management and facilitate international reporting obligations.

To supply the nature conservation organizations on the islands with valuable tools to prioritize and fine-tune conservation efforts, a user-friendly and appealing database that hosts an extensive number of datasets on key conservation species, such as sea turtles, flamingos, tropicbirds, parrots, butterflies and many more, a GIS-based map functionality and a literature archive are included in the DCBD. Since no online library exists with the focus on the Dutch Caribbean, the DCBD strives to provide that for the NGOs on the islands. Here all reports, journal articles and other documents concerning biodiversity research and monitoring, education and outreach, etc. are gathered and users can search the database for any information they need. Data are provided by researchers, NGOs on the islands and professionals and volunteers involved in biodiversity monitoring.

Category of good practice

- **Characterization of biodiversity (e.g. inventory, description of species and ecosystems)**
The database provides an inventory of species and ecosystems.
- **Drivers of evolution (e.g. global and local change, dynamics of evolution, impact of human activities)**
The monitoring data provide information on trends of populations or ecosystems, reflecting local or global changes or anthropogenic impacts.
- **Biodiversity management (e.g. conservation ex situ and in situ, sustainable use and exploitation, rehabilitation, management of invasive species, pollutants, pesticides)**
The database provides maps to support management, monitoring data for adaptive management and baseline and research data to guide conservation management of species and ecosystems.

- **Governance and policies (e.g. interactions science/societies, regulations, decision-makers, networks, international collaborations)**

The database provides the means for rational and effective management and policy development, data to engage stakeholders or decision-makers, and dissemination of information for the general public to help engender support.

Criteria used to define the Good practice

- **Provision of further environmental and socio– economic benefits**

The database is an instrument of outreach providing information for the general public as well as stakeholders.

- **Applicability/transferability to other ORs/OCTs**

The database uses open source programs and can easily be copied for other regions.

- **Sustainability (i.e. projects remain beyond the initial funding period)**

The Dutch government has committed itself to both the development and the long term maintenance of the database.

- **Adaptive management of biodiversity (allowing to cope with change of environmental conditions, e.g. climate change)**

The baseline and monitoring data provide the basis for adaptive management.

- **Good governance (involvement of relevant stakeholders and integration of different interests and, perspectives and needs)**

Data are provided by the stakeholders in consultation with the developers to ensure the needs are met. The database provides necessary information for good governance.

- **Generating multiplier/imitation effects**

The database stimulates professionalization of monitoring efforts, provides examples to model other monitoring efforts on. It is currently being used to encourage uniform coral monitoring in the Caribbean region.

Website of good practice

- www.dcbd.nl

Example 3 – Macaronesia: Atlantis Database

Source

José Azevedo (jose.mn.azevedo@uac.pt) – Professor, Universidade dos Açores

Paulo Borges (pborges@uac.pt) – Coordinator Azorean Biodiversity Group Morada, Universidade dos Açores

Short summary and / or success story of good practice

The Atlantis software, now on its 3.1 version, is an online application which allows the storage and retrieval of information about the geographical distribution of a set of species, as well as the supporting bibliographical references. The software can be used for basic tasks such as providing a list of taxa or obtaining the distribution range of a particular species. It also contains powerful tools for geographical analysis, such as, for instance, the selection of a given area and the creation of a richness grid, with the cumulative distribution of the species of a selected group.

The software is in use in the Outermost Regions of the Canary Islands and of the Azores. In both these autonomous regions the information includes all the historic records and is updated regularly. In the Canaries, the Atlantis database is the official repository of geographical information about biodiversity for all legal purposes including the reporting under the Habitat and Birds Directives. The administration team scans the scientific and technical publications to retrieve the pertinent geographic information and enter it on a database, with a resolution of 500*500m. Data is open access.

Category of good practice

- **Characterization of biodiversity (inventories and mapping)**
The administration team scans the scientific and technical publications to retrieve the pertinent geographic these databases, the following output has been produced: taxonomic compilations, books, TOP 100 lists for threatened or/and invasive species.
- **Biodiversity management (e.g. conservation ex situ and in situ, sustainable use and exploitation, rehabilitation, management of invasive species, pollutants, pesticides)**
The database is an important management tool being used in the context of the Natura 2000 obligations but also for other purposes. For instance, in the ongoing BEST III project, the geographic information on the Atlantis databases forms the core of the analysis to define the Key Biodiversity Areas for the Macaronesia.
- **Governance and policies (e.g. interactions science/societies, regulations, decision-makers, networks, international collaborations)**
Participative governance ensuring involvement of observers and citizens beside scientists and naturalists. Three user-friendly Websites from the same network Visionature have been implemented with the support of the Life+ CAP DOM project. Their aims are to record data from fauna (birds, mammals, reptiles, some groups of invertebrates) and to share them between providers in real time.

Criteria used to define the Good practice

- **Applicability/transferability to other ORs/OCTs**
The software can be used to create similar databases in other regions.
- **Sustainability (i.e. projects remain beyond the initial funding period)**
The database was the product of the Bio-Natura project (project that compiled the existing bibliographic references (scientific papers and grey literature) on the distribution of species into biodiversity databases). Bio-Natura resulted from a formal cooperation between three ORs belonging to two member states, justified by biogeographic reasons. It started as an initiative of the Canaries government in 1999 but was subsequently extended to the Azores and Madeira. From 2000-2008 it was funded by two consecutive INTERREG III-B projects. After the European co-funding ended it continued to receive funding from regional governments.
- **Good governance (involvement of relevant stakeholders and integration of different interests and, perspectives and needs)**
This open access Database contributes to the good governance of biodiversity in several ways. For example, stakeholders can use the geographical information to evaluate the impact of a given intervention on the territory. It also stimulates researchers to submit information that has not been published; in the context of the BEST III project, owners of important information are being urged to make it public through the Atlantis portals in order to reach as many users as possible.
- **Generating multiplier/imitation effects**
Having been developed for the Canary Islands, the database was later adopted in the Azores and is being considered for Madeira, therefore, covering all the Macaronesian archipelagoes.

Websites of good practice

- Canary Islands (<http://www.biodiversidadcanarias.es/atlantis/common/index.jsf>)
- Azores (<http://www.atlantis.angra.uac.pt/atlantis/common/index.jsf>)
- <http://interreg-bionatura.com/>

Example 4 – Antilles-Guyane: Fauna records collecting and sharing Website

Source

Philippe Feldmann (philippe.feldmann@cirad.fr) – Advisor, ANR/CIRAD, France

Short summary and / or success story of good practice

Database of records of biodiversity with information on evolution and mapping. Can be adapted to plants and is already available for orchids in France.

Category of good practice

- **Characterization of biodiversity (inventories and mapping)**. Participative Science actions allowing all citizens to participate, share and benefit of the collected information through direct access to records, areas checklists, distribution maps.
- **Drivers of evolution (following dynamics of population)**
Since the information is recorded exactly as it appeared at a specific date and time, and there are maps displaying the records, it is possible to follow-up on line and in real time some features concerning the evolution of records. Extraction of files is available for scientific studies.
- **Biodiversity management (e.g. conservation ex situ and in situ, sustainable use and exploitation, rehabilitation, management of invasive species, pollutants, pesticides)**
Through GIS analysis of extracted information, analysis of interactions with issues of biodiversity management is possible, including evaluation of impacts of projects or of actions (e.g. pesticides area use, presence of invasive species).
- **Governance and policies (e.g. interactions science/societies, regulations, decision-makers, networks, international collaborations)**
Participative governance ensuring involvement of observers and citizens beside scientists and naturalists, i.e. involving them in validation committees. Three user-friendly Websites from the same network Visionature (LPO/BirdLife) have been implemented with the support of the Life+ CAP DOM project. Their aims are to record data from fauna (birds, mammals, reptiles, some groups of invertebrates) and to share them between providers in real time. Information is available for all visitors and can be used by decision makers to develop or follow-up policies.

Criteria used to define the Good practice

- **Applicability/transferability to other ORs/OCTs**
Easily transferred anywhere in the world at low costs (already most of West Europe and Colombia). It could be also adapted to plants records (i.e. for orchids as developed already in France mainland). The general management of the system is implemented in a participative manner involving all the representatives in the same advisory committee. Since the structure of the database and the Website basis are the same for all projects, costs are shared and very low compared to the developing of an independent specific Website.

- **Sustainability (i.e. projects remain beyond the initial funding period)**
Due to low costs, sustainability is easily ensured, even with non-permanent staff, mostly by NGOs. It nevertheless requires having some kind of administrative support by a permanent structure (i.e. NGO).
- **Good governance (involvement of relevant stakeholders and integration of different interests and perspectives some and needs)**
Initially developed by non-professional birdwatchers, it is organized to be managed with the help of interested stakeholders for the governance, the quality implementation (validation committee), typically as a citizen science project.
- **Generating multiplier/imitation effects**
Some European websites of the network have already been translated in different languages and local innovation (tools for the follow-up of breeding of birds, on line GIS) can be used and shared by other Websites. One of the last innovation is the availability of a smartphone application, NaturaList (<https://play.google.com/store/apps/details?id=ch.biolovision.naturalist>) that may already be used in different languages and anywhere, without the pre-existence of a local Website.

Websites of good practice

- <http://www.faune-guyane.fr/>
- <http://www.faune-martinique.org/>
- <http://www.faune-reunion.fr/>

Example 5 – UK Overseas Territories: Total Economic Valuation of Bermuda’s Coral Reefs

Source

Samia Sarkis (sarksarkis@gov.bm) – Senior Marine Research Scientist (TEV Project Manager for Department of Conservation Services 2007-2011, Government of Bermuda)

Short summary and / or success story of good practice

Ecosystem valuation studies are fundamentally important to the integration of ecological processes into economic development. The results of the Total Economic Valuation of Bermuda’s Coral Reefs have been made available to the local community and to the government. A policy brief providing four specific recommendations aiming to enhance transparency and improve legislation regarding marine development and protection of important marine habitats was approved by the Cabinet (Government of Bermuda). The study results provide an environmental economic tool which can feed into future policy and decision-making. Six key ecosystem goods and services were valued within a well-defined boundary encompassing Bermuda's reefs on the inner edge of the North Lagoon.

Category of good practice

- **Characterization of biodiversity (e.g. inventory, description of species and ecosystems)**

The valuation study on Bermuda’s coral reefs identifies ecosystem goods and services and provides an economic value for these, as well as recommendations for improved conservation and management measures. Ecosystem goods and services valued were: 1) Coral reef-associated tourism, (2) Reef-associated fisheries, (3) Amenity or reef associated surplus value on real estate, (4) Physical coastal protection, (5) Reef-associated recreational and cultural values, and (6) Research and education value.

- ***Drivers of evolution (e.g. global and local change, dynamics of evolution, impact of human activities)***

The two main drivers for the study relate to the accommodation for increased economic activity: 1) The increased need for maritime transport related to the import of goods and 2) the changing face of the cruise tourism industry, associated with the building of larger ships. The need for destinations to accommodate these, namely the widening and dredging of shipping channels, and coastal development for larger berths, drove the Coral reef economic valuation study as a means to raise awareness among policy makers and the general public on the importance of reefs and recognition of their ecosystem services.

- ***Biodiversity management (e.g. conservation ex situ and in situ, sustainable use and exploitation, rehabilitation, management of invasive species, pollutants, pesticides)***

The recognition of the importance and value of reefs has contributed to a more sustainable decision related to ship channel modifications; in that 1) an EIA was first commissioned to assess the planned marine development; 2) plans were later modified to reduce the number of corals removed by >70%; 3) measures are outlined to translocate corals removed for widening of the channel to appropriate sites whenever possible. The minimized removal of corals and attempts to preserve them addresses the concern of destroying slow growing coral species and impacting the associated biodiversity. 4) Mitigation measures will be put in place to reduce the amount of suspended particles in the water column over the adjacent coral reefs; this will minimize the negative impacts of sedimentation to nearby reefs. Both Actions 3 and 4 address the concern of direct impact by removal and indirect impact by secondary effects of siltation produced, and mitigation measures planned work towards maximal conservation of this ecosystem during this economic and tourism-driven marine development.

- ***Governance and policies (e.g. interactions science/societies, regulations, decision-makers, networks, international collaborations)***

Although there has been no new legislation approved or enacted (at the time this report was written), a policy brief stemmed from this technical report as an information document to Bermuda's Cabinet with specific recommendations; this was approved by Cabinet in September 2011 for decision, indicating that recommendations be taken to action. The results of the study have contributed to the following: 1) NGOs have used the outcome of the study as a substantive argument for mitigation of dredging and widening of shipping channels. 2) The study has also enabled the drafting of a Cabinet Paper addressing vessel grounding and provides a process whereby reporting, mitigating impacts and restoring measures are outlined. At this time, there is no such provision; the Cabinet Memo is available for presentation to Cabinet when appropriate. This addresses recommendation¹ #1 of the policy brief. 3) A marine spatial plan is being developed for Bermuda, and the Cabinet paper is awaiting approval at the time of writing; this addresses Recommendation #4 of the TEV policy brief. 4) Finally, addressing Recommendation #2 in the Policy

¹ The four recommendations are: 1) Prioritize potential policy interventions in an economically sound manner- A. Develop legislation pertaining specifically to marine developments. B. Improve the transparency of decisions on the required modifications of shipping channels to accommodate larger ships, by developing an extended cost-benefit analysis incorporating the economic costs of damage to coral. C. Develop a standard damage cost procedure for marine vessel groundings and other forms of injury to the reef in Bermuda. 2) Actively involve the tourism industry in the development of sustainable coral reef management. A. Establish a new vehicle for earmarking of funds. 3) Make use of the cultural importance residents place on marine ecosystems to improve coral reef management. A. Enable existing community support for environmental conservation and management. B. Incorporate environmental economics in the national school curriculum and launch a public awareness campaign. 4) Balance consumptive and non-consumptive uses of coral reefs by strategizing spatial management and protecting critical marine areas. A. Identify and protect areas critical to ecosystem function while engaging stakeholders for long term sustainability.

Brief and with the support of government, Living Reefs Foundation (www.livingreefs.org) has been recently formed to establish a mechanism for taking advantage of the visitors' willingness to pay (WTP) and earmark funds for prioritized reef conservation and management actions. It is too early to assess the potential for success however, it sets a precedent and raises awareness in establishing such a concept in Bermuda.

Criteria used to define the Good practice

- **Significant contribution to conservation of biodiversity and ecological effectiveness**
Coral reef translocation when removed for marine development purposes (Shipping Channels). Approximately 500 coral heads are planned to be translocated when ship channels are widened for accommodation of larger cruise ships, as opposed to thousands originally planned.
- **Provision of further environmental and socio-economic benefits**
 - 1) Two Cabinet papers: a) Marine Spatial Plan, b) Vessel groundings.
 - 2) Formation of a new mechanism (non-governmental) to take advantage of the visitors' willingness to pay for reef conservation/management and provide sustainable funding for reef conservation and management; this ultimately benefits the scientific community directly, and the wider community through conservation of the goods and services of this ecosystem.
- **Applicability/transferability to other ORs/OCTs**
 - 1) Tourist exit questionnaire and choice modeling approaches developed and used in Bermuda served as a template for assessing the value of coastal zones (namely beaches) in the Cayman Islands.
 - 2) Methodology made available through web and potentially applicable to other jurisdictions (jncc.defra.gov.uk; conservation.bm; livingreefs.org)
 - 3) Study was included as a case study during a UNEP Workshop for SIDS (New York, 2014).
- **Good governance (involvement of relevant stakeholders and integration of different interests and perspectives and needs)**
 - 1) The Bermuda National Trust (a local NGO), made use of the TEV results supporting their case during discussions regarding ship channel modifications.
 - 2) Ministry of Transport requested a brief on environmental considerations (based on the TEV study) to assess best approach for environmental considerations during ship channel modifications (2014) (addressing recommendation 1 of the policy brief). This led to a request for proposal for an environmental impact assessment on the proposed modifications.

Websites of good practice

- www.conservation.bm
- www.jncc.defra.gov.uk
- <http://www.sciencedirect.com/science/article/pii/S2212041614000679>

Documents for further reading

- <http://www.sciencedirect.com/science/article/pii/S2212041614000679> (published article Tourism value)
- <http://jncc.defra.gov.uk/pdf/Executive%20report.pdf> (Executive Summary)

Example 6 – Macaronesia: Economic value of seagrass meadows

Source

Ricardo Haroun (ricardo.haroun@ulpgc.es) and Fernando Tuya (ftuya@yahoo.es) – Biodiversity and Conservation Research Group, University of Las Palmas de Gran Canaria

Short summary and / or success story of good practice

The publication of data on the economic value of seagrass meadows is promoting the social perception of the key role that seagrasses play on the coast and, therefore, the need to include seagrass habitats in conservation legislative frameworks.

Category of good practice

- **Characterization of biodiversity (e.g. inventory, description of species and ecosystems)**

The research conducted on the ecology of seagrass meadows has firstly increased the catalogue of marine species associated with this keystone habitat, as well as providing insight on the interactions of these species with other marine habitats in the coastal ecosystem (Tuya et al. 2014b), including the matrix of habitats around seagrass meadows (Espino et al. 2015).

At the same time, the “nursery” role” provided by seagrass meadows for diverse early stages of fish and invertebrates species, some of them with direct fisheries value, has been demonstrated. For example, in the Gran Canaria island the value of ecosystem services of seagrass meadows dominated by *Cymodocea nodosa* reaches up to half a million euro per year (Tuya et al. 2014a).

- **Governance and policies (e.g. interactions science/societies, regulations, decision-makers, networks, international collaborations)**

Despite the paramount functions that *Cymodocea nodosa* seagrass meadows play in the coastal zone, neither the seagrass nor the meadows it creates are considered a priority species / habitat under the conservation policy of the regional government. A better governance approach is much needed, as a result of the progressive deterioration that this marine habitat has suffered in recent decades (Fabbri et al. 2015).

Criteria used to define the Good practice

- **Significant contribution to conservation of biodiversity and ecological effectiveness**

The work has clearly demonstrated that seagrass meadows dominated by *Cymodocea nodosa* provide key functions in the coast, particularly when relative to similar bottoms dominated by alternative vegetation (Tuya et al. 2014a). These functions include increase in primary production and sea-water oxygenation, recycling of nutrients, Carbon sequestration, stabilization of coastal zones (mitigation of erosion processes), and provision of food and habitat for associated invertebrates and fish assemblages.

- **Provision of further environmental and socio-economic benefits**

Carbon sequestration by seagrass ecosystems is recognized as one of the main coastal natural sink reservoirs, which accumulates and store some carbon compounds for indefinite period (Fourqurean et al. 2012). This case study mainly focused on the nursery role of the seagrass meadows as related to artisanal fisheries. Other inherent benefits of this marine habitat are its role as a carbon sink as well as the coastal protection it provides against wave action. The conservation and, eventually, the restoration of seagrass meadows have the capacity to increase organic Carbon storage, while delivering key ecosystem services to coastal ecosystems (Nelleman et al. 2009).

- **Applicability/transferability to other ORs/OCTs**

The procedures that have been implemented to valorize some ecosystem services (here the fishery and nursery function of seagrass meadows) can be transferred to other regions. This represents a possible way to raise awareness on the necessity to preserve shallow water keystone marine habitats such as seagrass-dominated ecosystems.

Websites of good practice

- www.ulpgc.es
- www.ecoaqua.eu

Documents for further reading

- Fabbri, F. Espino, F., Herrera, H., Moro, L., Haroun, R., Riera, R., González-Henríquez, N., Bergasa, O., Monterroso, O., Ruiz de la Rosa, M., Tuya, F. 2015. Trends of the seagrass *Cymodocea nodosa* (Magnoliophyta) in the Canary Islands: population changes in the last two decades. *Scientia Marina* 79(1): 7-13.
- Espino, F. González, J.A., Haroun, R., Tuya, F. 2015. Abundance and biomass of the parrotfish *Sparisoma cretense* in seagrass meadows: temporal and spatial differences between seagrass interiors and seagrass adjacent to reefs. *Environmental Biology of Fishes* 98:121–133.
- Fourqurean, J.W., Duarte, C.M., Kennedy, H., Marbà, N., Holmer, M., Mateo, M.A., Apostolaki, E.T., Kendrick, G.A., Krause-Jensen, D., McGlathery, K.J., Serrano, O. (2012) Seagrass ecosystems as a globally significant carbon stock. *Nature Geoscience*, 5: 505-509.
- Nellemann, C., Corcoran, E., Duarte, C. M., Valdés, L., De Young, C., Fonseca, L., Grimsditch, G. (Eds). 2009. *Blue Carbon. A Rapid Response Assessment*. United Nations Environment Programme, GRID-Arendal (www.grida.no)
- Tuya, F., Png-Gonzalez, L., Riera, R., Haroun, R., Espino, F. 2014a. Ecological structure and function differs between habitats dominated by seagrasses and green seaweeds. *Marine Environmental Research* 98: 1-13
- Tuya, F., Haroun, R. & Espino, F. 2014b. Economic assessment of ecosystem services: Monetary value of seagrass meadows for coastal fisheries. *Ocean & Coastal Management*, 96: 181-187.

Example 7 – Macaronesia: Marine Ecotourism at El Hierro Island

Source

Ricardo Haroun (ricardo.haroun@ulpgc.es) and Fernando Tuya (ftuya@yahoo.es) – Biodiversity and Conservation Research Group, University of Las Palmas de Gran Canaria

Short summary and / or success story of good practice

The abundance and biomass of diverse fish species is larger in El Hierro Island than many other locations inside the Canarian Archipelago, mainly as consequence of lower fishing pressure. In 1996 a small Marine Protected Area was designated around the southern tip of the island supporting only artisanal fisheries practices by local fishermen; this fact has promoted the development of ecotourism activities, particularly recreational diving, with economic benefits for the local communities.

Category of good practice

- **Drivers of evolution (e.g. global and local change, dynamics of evolution, impact of human activities)**

It was demonstrated that released fishing intensity and other human-mediated stressors enhance biological production, with recovery of diverse trophic guild levels and promote conservation of marine resources. The area is considered as a sentinel site for Global Change and long term dynamics of benthic communities.

- **Biodiversity management (e.g. conservation ex situ and in situ, sustainable use and exploitation, rehabilitation, management of invasive species, pollutants, pesticides)**

The implementation of a marine reserve where exploitation of resources and ecotourism activities (recreational diving) cohabit boost the development of an entire sustainable commercial sector: diving centers, restaurants and lodging sites. At the same time, the protection of the area enhance its biodiversity abundance as well as the biomass / size of different fish species.

- **Governance and policies (e.g. interactions science/societies, regulations, decision-makers, networks, international collaborations)**

In 1996 a marine reserve was enacted in the southernmost part of the island. Since that time, the local artisanal fishermen as well as island governmental agencies are fully aware of the social and economic benefits derived from the extant regulatory status and are particularly eager to export its methodological approach to other coastal areas; for example, some other local communities inside the canarian archipelago are eager to implement new marine protected areas. Local stakeholders are appreciating the benefits derived from the interactions between conservation biology and society.

Criteria used to define the Good practice

- **Provision of further environmental and socio-economic benefits**

Areas, e.g. islands, with a high degree of conservation are ideal for the development of certain ecotourism activities, such as the case of recreational diving, with commercial relevance in El Hierro, a top diving destination. This fact is fully understood by local people who are quite proud of the environmental and economic achievements gained in recent decades. Moreover, the island has been declared a UNESCO Biosphere Reserve taking into consideration its marine values.

- **Applicability/transferability to other ORs/OCTs**

Small islands are living laboratories where it is possible to see the linkages of human activities and environmental status, sometimes with positive interactions and many times with clear examples of overexploitation of natural resources. In the case of El Hierro Island, the public awareness of its healthy marine environment and the sustainable benefits derived from ecotourism activities are fully applicable to other coastal regions.

- **Good governance (involvement of relevant stakeholders and integration of different interests and perspectives and needs)**

At the island level, the different social sectors are all convinced of the high value of marine biodiversity and the health of its island marine ecosystems. Relevant stakeholders includes National, Regional and Island administrations which are working together to preserve the nature value of the island's coasts.

- **Generating multiplier/imitation effects**

Local stakeholders obtain different benefits from the ecotourism activities linked with recreational diving activities in El Hierro from lodging, car rental, local food provisions, diverse artisanal products, etc. Therefore, there is a multiplier effect on the island economy associated with the flow of tourists throughout the year.

Website

- www.ecoaqua.eu

Documents for further reading

- Tuya, F., Ortega-Borges, L., Sanchez-Jerez, P & Haroun, R.J. 2006. Effect of fishing pressure on the spatio-temporal variability of the parrotfish, *Sparisoma cretense* (Pisces: Scaridae), across the Canarian Archipelago (eastern Atlantic). *Fisheries Research*, 77: 24-33.

- Tuya, F. García-Diez, C., Espino, F & Haroun, R.J. 2006. Assessment of the effectiveness of two marine reserves in the Canary Islands (eastern Atlantic). *Ciencias Marinas*, 32(3): 505-522.

Example 8 – Macaronesia: Marine Protected Areas and Recovery Benthic Communities

Source

Ricardo Haroun (ricardo.haroun@ulpgc.es) and Fernando Tuya (ftuya@yahoo.es) – Biodiversity and Conservation Research Group, University of Las Palmas de Gran Canaria

Short summary and / or success story of good practice

A few years after setting up the “Fisheries related Marine Protected Areas of La Palma Island”, the initiative provides strong evidence of the recovery of the main benthic communities and, at the same time, of artisanal fisheries around its borders (“spill over effect”).

Category of good practice

- **Characterization of biodiversity (e.g. inventory, description of species and ecosystems)**
The work described patterns in the abundance and distribution of a range of fish species, all of them commercially exploited, inhabiting rocky reefs in shallow water off the entire Canarian Archipelago. Inside the Fisheries related Marine Protected Area, the number and size of fish species were higher than outside its borders.
- **Drivers of evolution (e.g. global and local change, dynamics of evolution, impact of human activities)**
The research demonstrated that releasing fishing intensity promote recovery of commercially exploited fish by comparing areas subjected to varying fishing intensity, particularly a marine protected area with low fishing intensity and areas under severe exploitation.
- **Biodiversity management (e.g. conservation ex situ and in situ, sustainable use and exploitation, rehabilitation, management of invasive species, pollutants, pesticides)**
Results show that in a short time since its enactment, marine protected areas may replenish fishery resources thereby acting as a feasible methodology to promote a sustainable use of resources.
- **Governance and policies (e.g. interactions science/societies, regulations, decision-makers, networks, international collaborations)**
Scientific evidence based decision making demonstrates the benefits of a bottom-up management strategy via the implementation of marine reserves.

Criteria used to define the Good practice

- **Significant contribution to conservation of biodiversity and ecological effectiveness**
Increased diversity and abundance of fish assemblages within marine reserves compared to exploited areas. This higher biodiversity is also seen in other marine species without commercial interest, such as many invertebrates and macro algal populations.
- **Provision of further environmental and socio-economic benefits**
The marine protected area is acting as a control area to compare the effects of diverse events, such as Global Change or Coastal Eutrophication. Indirectly, marine reserves with high conservation status are ideal spots for certain ecotourism activities; in this case, with the organization of some International Videosub contests in the border of the marine protected area. These actions supported activities of commercial relevance such as recreational diving centres.

- **Applicability/transferability to other ORs/OCTs**
The case described is fully transferable to other coastal regions.
- **Good governance (involvement of relevant stakeholders and integration of different interests and, perspectives and needs)**
To attain good environmental status in a marine protected area, the National, Regional and especially the Island administration, will have to involve local stakeholders in the long term goal of protecting fisheries resources. Public awareness campaigns and diverse types of meetings have been organized on the island to disseminate the value of the marine protected area as well as the major regulatory measures.
- **Generating multiplier/imitation effects**
The Fisheries related Marine Protected Area was designated in 2003. Its positive effects were not fully described in 2006 (Tuya et al, 2006a & b) with few top predators inside the area; but in a later publication (Sangil et al. 2013) showed a high number of top predator fishes. Also, the macroalgal coverage of the substrate was more intense in later years, as a consequence of the reduction of the sea urchin population. Those facts reflect a cascading effect on the coastal trophic level with indirect benefit for the local fishermen. Besides, more complex benthic communities are now present inside the marine protected area as well as more diverse fish communities are observed by recreational divers in nearby underwater locations (larger benefits to local scuba diving companies).

Website

- www.ecoaqua.eu

Documents for further reading

- Tuya, F. García-Diez, C., Espino, F & Haroun, R.J. 2006a. Assessment of the effectiveness of two marine reserves in the Canary Islands (eastern Atlantic). *Ciencias Marinas*, 32(3): 505-522.
- Tuya, F., Sanchez-Jerez, P. & Haroun, R.J. 2006b. Populations of inshore serranids across the Canarian Archipelago: Relationships with human pressure and implications for conservation. *Biological Conservation*, 128: 13-24.
- Sangil, C., Martín-García, L. & Clemente, S. 2013. Assessing the impact of fishing in shallow rocky reefs: A multivariate approach to ecosystem management. *Marine Pollution Bulletin*, 76: 203-213.

Example 9 – Pacific: ZoNeCo Program: a local R&D programme dedicated to the sustainable management of marine resources in New Caledonia

Source

R. Farman. Aquarium des Lagons, New Caledonia
 M. Ducrocq. ADECAL-Technopole, New Caledonia
 A. Rivaton. ADECAL-Technopole, New Caledonia

Short summary and / or success story of good practice

The ZoNeCo programme started in 1991 for the evaluation of the living and non-living marine resources of New Caledonian waters in a sustainable development perspective. This original programme lies at the interface between local policy makers, natural resource managers and the scientific community. It funds applied research and transfer projects to respond to local needs. For 25 years, this programme produces knowledge for informed decision making about sustainable management and harnessing of natural resources on New Caledonia.

Category of good practice

- **Biodiversity management (e.g. conservation ex situ and in situ, sustainable use and exploitation, rehabilitation, management of invasive species, pollutants, pesticides)**

In 1991, governments of New Caledonia (French Government, Government of New Caledonia and the three provinces), in association with their research institutions decided to set up the multidisciplinary program ZoNeCo in order to produce, gather and disseminate knowledge about the living and non-living resources of the New Caledonia Exclusive Economic Zone (EEZ), aiming at its enhancement and sustainable management.

ZoNeCo's core themes can be classified in five major categories, from environment, to resources-environment relationships, petroleum assessment, human pressure and management tools assessment.

- **Governance and policies (e.g. interactions science/societies, regulations, decision-makers, networks, international collaborations)**

The Strategic agenda and annual priorities are co-designed with governmental policy makers and managers (natural resource management, economic development, etc.) and the local scientific community.

Criteria used to define the Good practice

- **Significant contribution to conservation of biodiversity and ecological effectiveness**

For more than 25 years, the ZoNeCo programme sits at the interface between science and policy in order to transfer the results of research conducted on marine resources and environment and to identify knowledge and management gaps and promote actions to fill those gaps. Knowledge is produced either on inventory and assessment of resources in a sustainable enhancement perspective; conservation of ecosystems and habitat as well as the services they provide; requirements for the sustainable management of marine resources and to maintain the quality of environment.

- **Provision of further environmental and socio-economic benefits**

With regard to living resources, the programme's objectives have moved on from a prospecting and resource-evaluation approach to management issues or, at least to management decision-making support, with the aim of optimizing economic development based on the sustainable use of New Caledonia's living marine resources.

- **Applicability/transferability to other ORs/OCTs**

There are limited examples of similar programmes in the world, notably in ORs and OCTs. In New Caledonia, the division of competencies between the different governments had a role in this common will to join skills and resources toward this huge continuous marine area. However, the general objective and governance principles of this program is applicable and transferable.

- **Adaptive management of biodiversity (allowing to cope with change of environmental conditions, e.g. climate change)**

Acting as a link between science and policy, the programme has a governance structure and a coordination staff that foster and ensure a regular adaptation of research and transfer activities to societal needs (including biodiversity management) and systematic efforts to ensure the results of the funded studies are taken up by managers and policy makers to feed the decision making process.

- **Good governance (involvement of relevant stakeholders and integration of different interests and perspectives and needs)**

The ZoneCo programme includes a call for proposals (1-step procedure), which is focused on applied research and transfer. Project proposals are evaluated by two distinct bodies that assess the societal

impacts on one side and the research quality on the other side. The evaluation body on societal relevance is composed of local managers and policy makers (natural resources management, economic development, etc).

- **Generating multiplier/imitation effects**

The multidisciplinary results of ZoNeCo funded projects led to an improvement in the knowledge of the marine environment that surrounds New Caledonia, both on lagoon and oceanic compartments.

Website of good practice

- www.zoneco.nc

Documents for further reading

- Chavance, P., A. Rivaton, J.P. Torreton, R. Farman. 2007. ZoNeCo programme for sustainable management of marine resources of New Caledonia's EEZ Diversity of study scales and complexity of methods and disciplines - 7th International Fisheries Observer Congress, Vancouver, British Columbia ([here](#), page 308-309).
- ZoNeCo program: Bilan et perspective: 2000-2005 ([here](#))
- ZoNeCo program: Bilan et perspective: 2006-2010 ([here](#))

Example 10 – Caribbean: Sea Turtle Conservation Bonaire (STCB)

Source

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Mabel Nava (stcb@bonaireturtles.org) – Director STCB

Short summary and / or success story of good practice

Successful longstanding (20 yrs) sea turtle conservation program on Bonaire. Includes nesting beach monitoring, in-water sea turtle surveys and tagging program as well as satellite tagging. STCB also provides training and capacity building for the other islands of the Dutch Caribbean, i.e. Curaçao, St. Maarten, and St. Eustatius, and is part of the Wider Caribbean Sea Turtle Conservation Network (WIDECAST).

Category of good practice

- **Biodiversity management (e.g. conservation ex situ and in situ, sustainable use and exploitation, rehabilitation, management of invasive species, pollutants, pesticides)**
Aimed at conservation and management of sea turtle populations of Bonaire.
- **Governance and policies (e.g. interactions science/societies, regulations, decision– makers, networks, international collaborations)**
Provides input to government on development and implementation of action plans and policy for sea turtle conservation and recovery. Participates in local nature conservation platform. Member of the Wider Caribbean Sea Turtle Conservation Network (WIDECAST).

Criteria used to define the Good practice

- **Significant contribution to conservation of biodiversity and ecological effectiveness**
STCB was instrumental in changing the mindset of Bonaireans from traditional consumption of sea turtles in the eighties and early nineties to general acceptance as a protected species over a period of some 10 years.

- **Provision of further environmental and socio– economic benefits**
Thanks to STCB’s efforts sea turtles now are an integral part of the Bonaire dive experience providing a valuable added attraction for the tourists to come to the island, with sea turtle sightings during snorkeling or diving is practically guaranteed.
- **Applicability/transferability to other ORs/OCTs**
STCB has already trained or exchanged knowledge with people on St. Maarten, St. Eustatius, Curaçao and Aruba, for monitoring of nesting beaches and in-water surveying.
- **Sustainability (i.e. projects remain beyond the initial funding period)**
STCB raised its own funding from the start 15 years ago (mainly from the private sector) and has been able to do so continuously, starting with only volunteers it now employs a director, and three part-time staff in addition to the many volunteers. It currently also receives support from the Dutch national government and the World Wildlife fund Netherlands.
- **Adaptive management of biodiversity (allowing to cope with change of environmental conditions, e.g. climate change)**
STCB monitors beach profile changes, invasive beach vegetation encroaching on nesting beaches and invasive seagrass on foraging areas, helping to identify appropriate management response actions.
- **Good governance (involvement of relevant stakeholders and integration of different interests and perspectives and needs)**
STCB employs a local former fisherman in its fieldwork, involves local people in its extensive volunteer network. It is a partner in the Dutch Caribbean Nature Alliance (DCNA) and in the Bonaire Nature platform, and it works closely with the island government.

Documents for further reading

- Various reports at:
<http://www.bonaireturtles.org/explore/publications/>

Website of good practice

- <http://www.bonaireturtles.org/>

Example 11 – Pacific: Co-management of a local small scale sea-cucumber fishery in the North-West region of New Caledonia

Source

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 Z. Monteapo (dde-sap@province-nord.nc) and C. Marty (c.marty@province-nord.nc) – Province Nord - Direction du développement économique et de l'environnement, New Caledonia
 M. Leopold (marc.leopold@ird.fr) – Institut de Recherche pour le Développement (IRD). CRH Sètes - France

Short summary and / or success story of good practice

In the North-West of New Caledonia, a co-management initiative of a local small scale sea-cucumber fishery, involving the local fishing community, the local authority in charge of the Northern Province of New Caledonia and a scientific institution have shown good results on stock biomass as well as on fisherman yields and economic income. At present this experience is being transferred to neighboring countries.

Category of good practice

- **Characterization of biodiversity (e.g. inventory, description of species and ecosystems)**
Use of high-resolution satellite imagery to map benthic habitats and stratify sampling sites, coupled with underwater visual census.
- **Drivers of evolution (e.g. global and local change, dynamics of evolution, impact of human activities)**
The impact of human activities (fishing) on the sea-cucumber (*Holoturia scabra*) local stock was limited by the allocation of quotas calculated each year with in situ monitoring of the species in the fishing area.
- **Biodiversity management (e.g. conservation ex situ and in situ, sustainable use and exploitation, rehabilitation, management of invasive species, pollutants, pesticides)**
Across the world, many sea-cucumber fisheries have declined due to un-adapted practices and levels of catch. This experience shows, for this localized fishery, how managing the fishing pressure (annually calculated quotas allocations) leads to sustainable practices.
- **Governance and policies (e.g. interactions science/societies, regulations, decision-makers, networks, international collaborations)**
A local fishing community, associated with fishing grounds and customary fishing rights (plateau de Boyen), raised concerns in 2006-2008 about the depletion of the main sea-cucumber species on their fishing ground, due to non-sustainable fishing/harvesting practices. The local administration in charge of economic development and environment (DDE-E), the fishing community and a French scientific institute (IRD) worked on a R&D programme to assess the resource and propose an adapted management strategy. The quotas are calculated every year, after assessment of the local stock using the sampling scheme and survey methodology. The organization of the fishing activities to catch the quota defined is entirely under-responsibility of the fishing community in itself. The local authority gives support when it is required.

Criteria used to define the Good practice

- **Significant contribution to conservation of biodiversity and ecological effectiveness**
Fully understanding the contribution the contribution of those invertebrates to the reef ecosystem, and particularly sea-grass beds, still requires further research. However, available information (i.e. ecological studies, local experiments, and observed status of sea-grass beds were sea-cucumber were depleted) support the hypothesis that sea cucumbers make significant contributions to the interactions between sediment and surface of the sea ground which are essential for the ecology of some benthic communities.

Provision of further environmental and socio-economic benefits

This initiative had significant positive impacts on the local stock abundance and fishermen's income.

- **Applicability/transferability to other ORs/OCTs**
The good practice has been adapted to Vanuatu and other pacific island contexts. Other local small scale fisheries in New Caledonia are willing to implement a similar co-management strategy. The good practice is not transferrable to mobile species as it is difficult to implement in open access fishing grounds.
- **Sustainability (i.e. projects remain beyond the initial funding period)**
This co-management system became sustainable after a few years. Annual monitoring, quotas calculation and management of the fishing activity is jointly done by the local authority and the fishing community. The scientific institute (IRD) can be requested for particular expertise, if needed.

- **Adaptive management of biodiversity (allowing to cope with change of environmental conditions, e.g. climate change)**
Quota allocation is done every year after in situ monitoring. In addition, a close relationship between local fishing communities and the local authorities in charge, ease the uptake by the local community and adaptation of existing initiatives and policies.
- **Good governance (involvement of relevant stakeholders and integration of different interests and perspectives and needs)**
Involvement of a scientific institution to respond to a need expressed by the local authority in charge following concerns and needs expressed by end-users. Co-design of the overall approach and monitoring methodology and participative science with the involvement of fishermen and technical staff in the annual monitoring and resource allocation.
- **Generating multiplier/imitation effects**
This initiative had significant positive impacts on the local stock abundance and fishermen's income. This has been adapted to Vanuatu and other pacific island contexts. Other local small scale fisheries in New Caledonia are willing to implement a similar co-management strategy.

Website of good practice

- **Direction of Economic Development and Environment in Province Nord** http://www.province-nord.nc/institution/connaitre_visite_admin_directions_ddee.asp

Documents for further reading

- Léopold M., N. Cornuet, and S. Andréfouët. 2013. Comanaging small-scale sea cucumber fisheries in New Caledonia and Vanuatu using stock biomass estimates to set spatial catch quotas. Cambridge Univ Press. Environmental Conservation, Volume 40, Issue 04. Pp 367-379.
- La Bêche-de-mer, Bulletin de la CPS N°35 - Juin 2015 "Stratégie de gestion spatialisée des holothuries au Vanuatu et en Nouvelle-Calédonie"
(http://www.spc.int/DigitalLibrary/Doc/FAME/InfoBull/BDM_VF/35/BDM35VF_03_Leopold.pdf)
- The success story of the co-management of the sea-cucumber fishery (New Caledonia). People in place Symposium, Halifax 2011. <http://www.coastalcura.ca/documents/LeopoldSecured.pdf>

Video documentary

- <http://nouvelle-caledonie.ird.fr/science-en-partage/videos-canal-ird/dans-un-esprit-de-cogestion>

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