FACTS Reports

**Field Actions Science Reports**
The journal of field actions

**Special Issue 3 | 2011**
**Brazil**

# Abrolhos: challenges for the conservation and sustainable development of the area that encompasses the largest marine biodiversity in the southern Atlantic

*Les Abrolhos : enjeux pour la préservation et le développement durable dans la zone abritant la plus grande biodiversité marine de l'Atlantique Sud*

*Abrolhos: retos para la conservación y el desarrollo sostenible en el área de mayor biodiversidad marina el Atlántico sur*

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OpenEdition Journals

**Electronic version**
URL: http://journals.openedition.org/factsreports/2347
ISSN: 1867-8521

**Publisher**
Institut Veolia

**Electronic reference**
Guilherme Fraga Dutra, Eduardo Camargo, Carlos Alberto Pinto dos Santos and Paula Ceotto, « Abrolhos: challenges for the conservation and sustainable development of the area that encompasses the largest marine biodiversity in the southern Atlantic », *Field Actions Science Reports* [Online], Special Issue 3 | 2011, Online since 15 December 2012, connection on 19 April 2019. URL : http://journals.openedition.org/factsreports/2347

http://factsreports.revues.org/2347
Published 15 december 2012

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# Abrolhos: challenges for the conservation and sustainable development of the area that encompasses the largest marine biodiversity in the southern Atlantic

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**Abstract.** The Abrolhos Region spans from southern Bahia state to northern Espírito Santo state, Brazil. It harbours the highest known marine biodiversity in the entire southern Atlantic. The two main economic activities in the region are fishing and tourism, which are highly dependent on natural resources. In this context, social, economic, and environmental aspects are intertwined and should be the basis for sustainable development policies for the region. This article presents the most important experiences linking conservation and sustainable development in Abrolhos since the 1990s. Among those, we highlight the creation of protected areas, notably the Abrolhos Marine National Park in 1983, and the Corumbau and Canavieiras Marine Extractive Reserves in 2000 and 2006 respectively; the successful experience of sustainable use of fishing resources - through implementation of no take zones in the Corumbau Extractive Reserve; and the social achievements of local communities in the Canavieiras Extractive Reserve, promoted by the creation of a network of community organizations. Despite these positive developments, the Abrolhos Region still faces great threats, including overfishing as probably the most prominent one. In order to strengthen the conservation actions in the region, the planned initiatives for the future include, among others, a large expansion of the marine protected areas network of the region and the creation of a Marine Conservation Fund to ensure long-term financial sustainability.

**Keywords.** Abrolhos, Canavieiras, Corumbau, Biodiversity Conservation, Marine Protected Areas, Overfishing, Management of Fishing

## 1. Introduction

The Abrolhos Region is located between southern Bahia state and northern Espírito Santo state (Figure 1) and harbours the highest known marine biodiversity in the entire southern Atlantic (Werner et al. 2000, Dutra et al. 2005). The reef formations in the region are the largest in Brazil and display unique structures, among which stand out the chapeirões – large mushroom-shaped reefs – that can reach 25 meters in height and 50 meters in diameter (Leão et al. 2003). Abrolhos also hosts the largest concentration of humpback whales on the Brazilian coast, who seek this region between July and November for shelter and to nurse their young (Andriolo et al. 2010, Martins et al. 2001).

Abrolhos is also significant for its fishing activities, with relatively large populations of species of high commercial value, such as groupers, red snappers, lobsters, shrimps, and crabs. Figures 2 to 5 illustrate a few of the region's landscapes and distinctive biological groups. It is estimated that approximately 20,000 fishermen currently use the region's natural resources as their main source of income. Their activity is predominantly artisanal, performed with small and medium-sized boats. However, a growing number of larger and industrial fishing boats have moved to this region in the last few years, increasing the pressure on the species and competing with artisanal fishing.

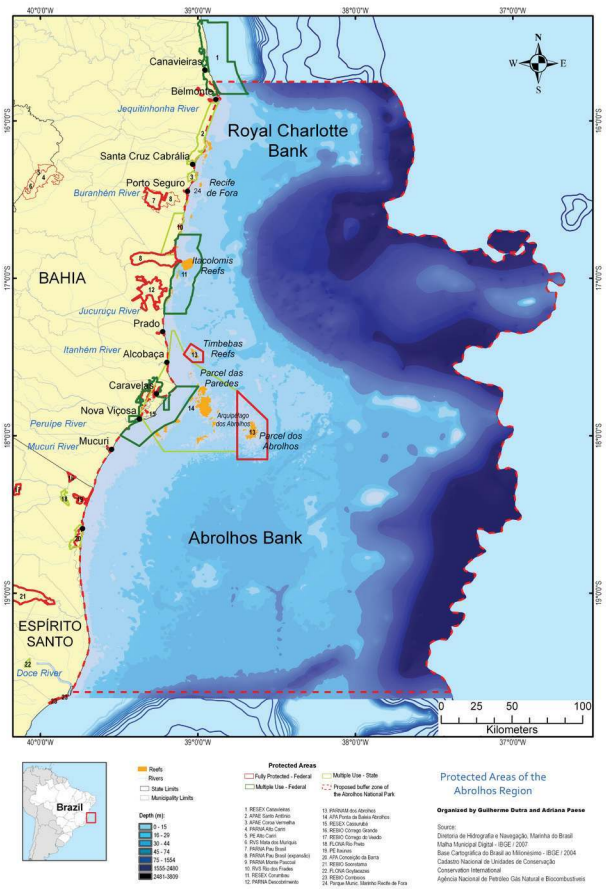


**Figure 1.** Map of the Protected Areas of the Abrolhos Region.

**Figure 2.** Chapeirão, coral reef formation unique to Abrolhos. Photo credits: Guilherme Dutra.

**Figure 3.** Mangroves from Cassurubá Extractive Reserve (Caravelas, Bahia). Photo credits: Sterling Zumbrunn.

**Figure 4.** Boobies marine birds in the Abrolhos Archipelago. Photo credits: Sterling Zumbrunn.

**Figure 5.** Marine life at Abrolhos Marine National Park. Photo credits: Guilherme Dutra.

Tourism is another significant economic activity, involving approximately 80,000 people in the Bahia sector of Abrolhos. The tourists mainly come to the region for its natural attractions, such as the beauty of its beaches, reefs and mangrove forests and the remaining Atlantic Forest (PRODETUR NE II 2003). As for fishing, the environment is pivotal for the creation of jobs and income for the local communities.

In this context, environmental, social, and economic aspects are inseparable and should be the basis for the region's sustainable development policies. In this article we will review initiatives that seek to align conservation and sustainable development in Abrolhos, as well as discuss some proposals aimed at expanding these initiatives to the entire region.

## 2. Conservation and sustainable development initiatives in Abrolhos:

### 2.1 The Abrolhos Marine National Park as a driver for regional development

The Abrolhos Marine National Park, created in 1983, was the first Brazilian marine national park. The large number of seabirds and the wide biodiversity of fish and coral formations – such as the chapeirões that only exist in Abrolhos and nowhere else in the world – were decisive to the creation of the park (IBAMA-FUNATURA 1991). Thanks to research that has been undertaken since 1988, the scientific community has

discovered that the region is the main area on the Brazilian coast for nursing and reproduction of humpback whales (Megaptera novaeangliae), which visit the region every year between July and November (Martins et al. 2001).

The creation of the national park and the promotion of its beauties in the national media have attracted a significant number of visitors. Tour operators first began operating in the region in 1987. By 1998, at least six companies were in operation that took tourists to enjoy the natural beauties of the Abrolhos Archipelago, especially those found underwater. Between 1988 and 1997, the number of park visitors increased from 870 to 15,230 visitors per year (Morete et al. 2000). This increase has had a significant impact on the regional economy, making tourism the second most important economic activity in the region.

Initially, the visitors' favourite season was January to March, when the weather conditions favour visibility for underwater activities. After the recovery of the humpback whale population, which had been almost driven to extinction by commercial fishing, visitors to Abrolhos began to favour the whales' reproductive season that takes place from July to November (Brumati et al. 2003). Humpback whales became an important tourism attraction for the region, generating an average of R$ 106.71/day/tourist (approximately US$50/day/tourist) and representing an important source of income for coastal municipalities (Brumatti 2008).

However, partly due to the lack of public policies to support the development of tourism, the region's tourism activities suffered a significant drop in the last decade. Currently, the number of visitors is approximately four thousand tourists per year, mostly divers, who have started to focus on the whale season. Main causes included lack of investments in the access to the region (the airport of which unfortunately closed in 2007), ineffective bus lines, and lack of advertising. Another factor frequently pointed out by local businessmen is the lack of security for investments in the tourism sector: tourism activities within the park are not guaranteed, as ICMBio (Instituto Chico Mendes de Conservação da Biodiversidade [Chico Mendes Institute for the Conservation of Biodiversity], responsible for the management of the federal protected areas) has not yet implemented the public use plan, which is expected to include a public notice of concession for visitor services – promised more than 10 years ago.

The Abrolhos Marine National Park experience illustrates how there is a great potential for the development of ecotourism in the region that is not being fully utilized due to a lack of appropriate policies and investments. The authors believe that a joint effort between the government, private sector, and civil society is necessary to sustainably plan for the full use of this region's potential, generating economic and social gains that may also result in significant environmental benefits.

## 2.2 Environmental benefits of enhanced fishery management

In the 1990s, increasing fishery capture efforts caused a drop in production in shrimp fishing grounds in various areas of the region. Many fishing boats began focusing their efforts in the Corumbau region, a small fishing village located between the Prado and Porto Seguro municipalities. The local community – mostly of Pataxó ethnicity – rebelled against what they called the "invasion by foreign boats" and sought means to protect the areas where they have traditionally fished for generations. By order of the local judge they asked IBAMA to create a Marine Extractive Reserve – RESEX[1], a marine protected area co-managed by local communities, government, and NGOs. The government body then invited Conservation International (CI) to take part in the creation of the protected area and provide technical support (Moura et al. 2009).

After twov years of studies and meetings with the local fishermen and neighbour communities for the discussion of limits and rules of use of its natural resources, in 2000 the Corumbau RESEX was created, covering an area of 89,525 hectares where approximately 260 families rely on fishing as their main source of income (Moura et al. 2007). With the creation of the RESEX the local fishermen gained exclusive rights of use over these areas, where "foreign boats" were forbidden to fish. The fishermen also became responsible for the sustainable management of the extractive reserve through the participation, together with government representatives and NGOs, in its deliberative council, which is responsible for establishing the rules for the use of the reserve's natural resources. The discussions about RESEX management that had been taking place since its inception were formally documented in a Plan of Use approved by the RESEX council. Innovative regulations were proposed, including the creation of no-fishing areas inside the reserve.

The main no-take area established in the RESEX, located in its largest reef formation - the Itacolomis Reefs (1,050 hectares: 20% of the total reef area) started being monitored by a joint team of CI researchers, universities and local communities. After five years, data show that some species of high commercial value, such as the black grouper (Mycteroperca bonaci), greatly increased in abundance not only in the no-take area but also in proximal areas close to its limits (Moura et al. 2007, Francini-Filho & Moura 2008). This example illustrates the authors' statement that it is possible to align conservation and fisheries management, with benefits to both sectors.

Fishes caught in the area are free of any kind of pollution, and the fishing community uses artisanal techniques with reduced impact on the marine environment.Although catch rates from the Corumbau RESEX have apparently been stable since the reserve's creation, unfortunately Corumbau's local communities have not yet been directly benefitted from the fisheries products they work to secure, since they encounter great difficulties in selling their products as a result of poor access to markets for distribution (lack of infrastructure, etc.). To change this situation, important challenges for the sustainability of this management model are to improve local

1 Brazilian legislation defines Extractive Reserves (RESEX) as protected areas used by traditional communities whose livelihoods are based on the extraction of natural resources, subsistence agriculture, or small livestock. The objective of a RESEX is to protect the culture and means of survival for traditional communities while also guaranteeing the long-term sustainable use of the protected area's natural resources.

infrastructure, invest in the added value of the sustainable fishery products and encourage the development of differentiated markets in this area.

### 2.3 Social benefits resulting from community organisation

The Reserva Extrativista de Canavieiras [Canavieiras Extractive Reserve], created on June 5, 2006 north of the Abrolhos Region, covers an area of 100,600 hectares comprising extensive mangrove forests, coastal islands, rivers, and marine environments. The creation and implementation process of the reserve has been marked by conflicts between the extractivists – predominantly artisanal fishermen who fight to maintain their traditional territories of use, residence, and livelihood – and large-scale economic factions such as shrimp farmers, businessmen, and real estate speculators. Politicians susceptible to lobbying by these economic interests were also involved in the conflicts.

This context, including death threats, intimidation, and violation of human rights, strengthened the social cooperation of artisanal fishermen and women to come together to support the creation of the RESEX. These communities went forth with the strengthening and union of their associations and colonies to defend their traditional territory from the invasion of other factions that would prevent them from carrying on with their activities. The environmental, economic, and social sustainability of about 1,400 families of the traditional population was at risk; these families depend on the use of the natural resources in the mangroves, rivers, and sea as their main source of income.

The process of creation of the area supported and strengthened 11 community organisations that came to be led by the Associação Mãe dos Extrativistas de Canavieiras – AMEX [Extractivist's Mother Association of the Canavieiras RESEX]. With the support of the social movements, NGOs, and private companies, AMEX achieved substantial social gains for the communities such as the construction of 160 houses for the fishermen in their communities of origin[2], the purchase of a boat for the transportation of students to schools, the completion of a socioeconomic diagnosis[3], and the implementation of a fishery monitoring program[4], among others. Local social organisation, allied to a strategy of integration and experience exchanges with other communities in the state and at the national and international levels has been driving the organization of Canavieiras RESEX fishermen to influence the creation and implementation of public policies. This makes Canavieiras one of the strongest and most active coastal co-management processes in any reserve in the country, enabling the replication of this model in other Brazilian extractive reserves.

## 3. Outlooks for a sustainable future

Despite the above-mentioned positive experiences, the Abrolhos Region still faces great threats, overfishing probably being the most visible with a growing number of boats from other regions fishing in Abrolhos where relatively large populations of fish with good market value can be found. Human actions in more distant areas also affect the region, as the deforestation of slopes in the watershed basins (causing a greater displacement of sediments by the rivers that discharge in the region and damage the reefs), or the effects of climate change, especially changes in water temperature, which directly affects marine wildlife.

The unplanned development of other economic sectors, such as the exploitation of oil and gas, shrimp farming, coastal tourism, or the urban growth over areas of mangrove forests and restingas (coastal vegetation) are also growing threats to the region. A tremendous effort for control and management of these activities is needed and is part of the proposed solutions we present below.

### 3.1 Expansion of the Marine Protected Areas Network in Abrolhos

The establishment of marine protected areas, and especially marine reserves, is one of the most effective instruments to restore and sustain ocean ecosystems (PISCO 2011). In Brazil, protected areas are regulated by Law 9985 of 2000 that establishes the Sistema Nacional de Unidades de Conservação da Natureza [the National System for Protected Areas]. This law classifies the protected areas according to categories of use of the natural resources, dividing them into two main groups: 1) full protection , where only the indirect use of the resources is allowed (by means of activities such as contemplative tourism, environmental education or scientific research); and 2) sustainable use , where the use of the natural resources is allowed by means of specific rules.

The sustainable management model that CI and partners are proposing for the Abrolhos Region is based on the creation of a network of Marine Protected Areas comprised of managed areas of different categories that vary from marine reserves – such as National Parks and Biological Reserves - to sustainable use areas – such as Extractive Reserves and Environmental Protection Areas. Each unit is managed by a federal or state environmental body (municipal bodies cannot regulate marine areas following the Brazilian law) and has a management council, composed of representatives of the local communities, civil society, private sector and governments. The integration of these efforts will result in a wider collective governance system, composed by the former councils together with a Conselho de Mosaico [Mosaic Council] – also part and regulated by Law 9985.

In 2005, CI partnered with a set of Brazilian universities[5],

2 Financed by the Projeto Habitação de Interesse Social [Social Interest Housing Project] – from the Federal and Bahia governments.

3 Through the Envolver Project [To Involve Project], executed in partnership by Conservation International, Pangea, ICMBio and local associations, with the support of InvestTur (a tourism company, currently incorporated by the Brasil Hospitality Group).

4 Implemented by Conservation International in partnership with Ecomar and Universidade Estadual de Maringá [Maringá State University], with the support of the Ministry of Fisheries and Aquiculture.

5 Federal University of Espírito Santo, University of São Paulo, Federal University of Paraíba, Maringá State University, Santa Cruz State University, Botanical Garden of Rio de Janeiro, Federal University of Rio de Janeiro, National Institute for Space Research, Federal Univer-

NGOs, and governmental bodies to launch – the Marine Managed Areas Science Program, supported by the Gordon and Betty Moore Foundation – to generate research and knowledge key to the efficient management of the Abrolhos region. For five years, data on the physical medium, ecosystems and marine species, as well as on social, economic and cultural aspects of the communities and economic sectors that use natural resources of the region were collected and analysed.

In 2010, CI partnered with ICMBio to analyze the data collected using MARXAN software - a Systematic Planning tool for Conservation (Game & Grantham 2008). The software helped create different modelling scenarios with costs and benefits detailing possible use and conservation of marine areas[6].

Based on these studies, the Ministry of the Environment and ICMBio are now proposing a large expansion of the marine protected areas network in the region, which includes the expansion of the Abrolhos Marine National Park, the creation and expansion of a Sustainable Development Reserve in the coastal area, the creation of a specific area for the protection of the humpback whales, and the creation of a large multiple use protected area for the governance and management of activities at a regional scale. This process, led by Brazil's federal government, is under discussion with various stakeholders.

### 3.2 Fishing Monitoring, Adaptive Management and Certification

The sustainable management of fishing is one of the greatest challenges for the conservation of marine environments worldwide. The establishment of marine protected areas is an important step in that sense, but additional management measures are also necessary (PISCO 2011). For this to happen, it is fundamental to know the dynamic of the activity, which is achieved through fishing monitoring programs. Since the creation of the Corumbau RESEX in 2000, CI and its partners have been conducting monitoring activities that were gradually expanded through new projects.

In 2009, the newly-created Ministry of Fishing and Aquaculture established a National Fishing Monitoring Program and decided to implement a pilot-project in Abrolhos for the development of methodologies to obtain more accurate data on artisanal fishing (quite underestimated in previous monitoring initiatives). For that purpose, it relied on the experience of local NGOs, including CI and Ecomar, in addition to the technical support of the Maringá State University. This project, in addition to the basic goal of gathering reliable data on fishing in 22 cities of the region, also intends to make comparisons of the fishing situation in areas that have specific management designations (Extractive Reserves) and non-managed areas. The project also aims at strengthening the participatory management of the fishing activity by promoting the engagement of local communities.

Monitoring is a decisive step for assessment of fish stocks and for planning their sustainable use. With that information in hand, it will be easier to better manage fishing activities and in defining clear and specific rules for it, especially for main species and its sustainable exploitation levels. The effectiveness of the measures applied can be validated by the monitoring program and adjustments may be implemented through adaptive management. This is another fundamental step in the sustainable use of the fishing resources.

Once the sustainable use of these resources is demonstrated, CI's goal is to advance into certification of these fisheries that can corroborate the respect of the environment and the high quality of the management during the process. This will open the doors for new markets, adding value to the certified fisheries, with direct economic benefits for the fishermen and the creation of a system of incentives for sustainable management. CI and local partners, with the support of the Fondation Veolia Environnement and FUNBIO, are investing intensively in the implementation of a project that demonstrates the viability of this model and we expect concrete results in the next few years.

### 3.3 The role of private sector in the protection of Abrolhos

In addition to the efforts of the government, civil society, and universities, the authors consider that the private sector also plays a fundamental role in the promotion of sustainability in Abrolhos. Positive actions from this sector aimed towards the conservation and sustainable use of the region may be conducted mainly in two ways: direct intervention, by developing practices and businesses that favour sustainability, or indirect intervention, by supporting the work of non-governmental organizations acting on this front.

Among the companies performing direct actions it is noteworthy that nautical and diving tour operators have structured their businesses around the region's scenic beauty and biodiversity. In this case, there should be a close relationship between the effectiveness of the conservation actions and the success of the tourism operation, since a healthy marine environment is the main attraction for the development of the activity. The acknowledgement that Abrolhos is a biodiversity gem with extraordinary characteristics on the Brazilian coast is also an important starting point for non-tourism related companies from other sectors – operating or with intentions to operate in the region – to adequately prepare their operations or to avoid operations in sensitive areas altogether. Clear examples are companies that exploit oil and gas. Simulations of oil leaks were performed for this industry to estimate its possible impact in the region's different environments (Marchioro et al. 2005). Since reefs and mangrove forests are the most sensitive environments to the activity, an exclusion area was proposed and has been maintained by the government and respected by companies of the sector.

The support to conservation actions lead by NGOs – indirect intervention – has been growing in the region as a result of the greater visibility and acknowledgement of the significance of Abrolhos for marine conservation in Brazil and in the world. Organizations that act in the region, such as the

sity of Bahia, Boston University and SCRIPPS.

6 These stages had the support of the Waitt Family Foundation, International Conservation Fund of Canada, Fondation Veolia Environnement and individual donors.

Instituto Baleia Jubarte [Humbpback Whale Institute] and Ecomar are currently supported by companies that traditionally sponsor conservation actions in marine environments, such as Petrobras. CI relies on a wide range of supporters represented by companies and foundations that are increasingly aware of their social and environmental responsibilities, including commitments from foundations such as Gordon and Betty Moore, Veolia Environnement, Waitt Foundation, and International Conservation Fund of Canada, as well as companies that have been investing directly such as Alpargatas/Havaianas, Brasil Hospitality Group, and The Graces Jewelry company. We also count on the generous support of individuals such as the businessmen Marcos de Moraes and Daniel Cohen, and the Oliveira family. The generous support from these companies, foundations and individuals have been key to the the protection of Abrolhos in the past few years.

In order to maintain the work going forward, there is a great need to set up a sustainable long-term financing mechanism. CI and its partner, SOS Mata Atlantica Foundation, are working together to establish a Marine Conservation Fund for the area. We aim to have US$ 10 million invested, with the proceeds from the investment used to maintain the key conservation and development activities. We hope to identify key companies that will be interested in investing in the sustainable future of this very important marine area - the Abrolhos region.

## 4. Acknowledgements

We greatly thank Marcos de Moraes, Claudia Oliveira, Daniel Cohen, Tammy Crown, Alpargatas/Havaianas, Fondation Veolia Environnement, Waitt Foundation, The Graces, International Conservation Fund of Canada, Gordon and Betty Moore Foundation, Pew Fellows for Marine Conservation, Brazilian Fishing and Aquaculture Ministry, FUNBIO, ICMBio, and The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety of the Germany for their generous support to Conservation International that makes our conservation work in the Abrolhos Region possible. We are also greatly thankful to Marcia Cota and Christina Wurschy for corrections on the English version of the text.

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