Data to inform the Inter-Ministerial and Expert Conference on Biosphere Reserves in the Caribbean Sub-region: Tools for Sustainable Development and Growth

St. Kitts and Nevis, 26-27 March 2013

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1. INTRODUCTION

The Caribbean has been recognized as one the most diverse coastal and marine environments of the world. However, due mainly to human derived impacts, this biodiversity is under great risk of being affected to a severe extent. One way of protecting ecosystems is to establish areas under special administration regimes in which conservation strategies may be implemented. Such areas exist all over the world, however, terrestrial ecosystems are much more represented than coastal and marine ones in at least a ratio of 2:1. In Latin America and the Caribbean, 116 Biosphere Reserves have been declared, but in the Island States of the Caribbean only 7 have been defined.

The Caribbean is a relatively shallow water body, its deepest zone being the Cayman Trench (~7700 m), but is also the basin for the Puerto Rico trench (~8000 m), the deepest zone in the Atlantic.

The coastal Caribbean region is a large marine ecosystem (LME) characterized by coral reefs, mangroves, and seagrasses, but also includes other environments, such as sandy beaches and rocky shores. These tropical ecosystems incorporate a high diversity of associated flora and fauna, and the nations that border the Caribbean collectively encompass a major global marine biodiversity hot spot. During the 2000-2010 decade, two major efforts were done under the umbrella of the Census of Marine Life Program to advance the state of knowledge of marine biodiversity in this region (Miloslavich & Klein, 2005; Miloslavich et al., 2010). Results of these reviews and analyses indicate that the Caribbean region holds nearly 12,100 marine species, of which 88% belong to 9 taxonomic groups, being the mollusks (3032 species), the crustaceans (2916 species), and the fish (1539 species) the most diverse and accounting for more than 60% of the total described species. This could indicate perhaps that these three groups are the best studied in terms of their collection and identification, however, even in these well studied groups, there are indications that many more species are still to be discovered. In this sense, there is relatively good knowledge of species in shallow, nearshore waters, while offshore and deep environments are poorly known. Coastal species richness tends to concentrate along the Antillean arc (Cuba to the southernmost Antilles) and the northern coast of South America (Venezuela – Colombia), however, such distribution pattern, rather than accurately reflecting the true situation for marine biodiversity for the region may be instead the result of (1) highly localized concentrations of collecting effort and a lack of collecting in many areas and ecosystems, (2) high variability among collecting methods, (3) limited taxonomic expertise for many groups, and (4) differing levels of activity in the study of different taxa.

Previous Experiences

In the Caribbean, many initiatives have been made to design and implement protected areas inside national jurisdiction territories. These protected areas range from national parks to sites of special interest. However, only few of these, address the Caribbean as a region or make conservation planning exercises for a whole country. Reviews of the status of the marine biodiversity have been published since 2005 (Miloslavich and Klein 2005, Miloslavich et al. 2010) which recognize the high value of the marine biodiversity but also the conservation
initiatives along the present and future threats. Regional and country wide exercises for conservation planning exist for several Caribbean Island Countries, most of them made by The Nature Conservancy and integrated later in a large scale, low resolution analysis (Huggins et al. 2007). There are also initiatives for Caribbean Continental countries such as Colombia (Instituto de Investigación de Recursos Biológicos Alexander von Humboldt 2008), Venezuela (Klein 2008, Klein and Castilo 2009) and the Meso American Reef in Belize (Kramer and Kramer 2002)

Special attention has been given to the coral reef, as one of the most conspicuous ecosystems in the region. The World Resources Institute regularly publishes the book Reefs at Risk in which experts analyze the current conservation status of this ecosystem. Recently, they also provide geo-referenced data about the distribution of corals, its conservation status and global threats.

Other conservation initiatives include those carried out by the Convention for Biological Diversity (CBD) who organized a workshop in Recife, Brazil in 2011, to facilitate the description of areas of Ecological and Biological Significance (EBSA) for the Western Tropical Atlantic and Greater Caribbean. More information about the many areas proposed under this figure can be found at http://www.cbd.int/doc/?meeting=4921.

Also recently (November 2012), as part of the Regular Process of the United Nations to regularly provide accurate information on the state of the marine environment to decision makers, a Workshop for the Wider Caribbean was held. The workshop gathered regional marine experts and policy makers within governments and intergovernmental organizations, with the purpose of taking the first steps towards the first global integrated marine assessment so that States can enhance their assessment capacity (http://www.woawcr.org/). Such integrated assessment is expected to be concluded in late 2014 and will include biophysical, food security and safety, socioeconomic (including capacity building needs), and marine biological diversity aspects.

Scope

This project will collect publicly available geo-referenced information about marine and coastal biodiversity, the physical environment and human derived threats for the English-speaking countries of the Caribbean: Antigua and Barbuda, Bahamas, Barbados, Dominica, Grenada, Jamaica, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, and Trinidad and Tobago

All the information is summarized in a GIS and all the files provided. The GIS and derived maps will serve as a tool for future considerations about designing future Biosphere Reserves.
1. Biodiversity

1.1. Layer Title: Amphibians

Title Qgis: Amphibians

Figure 1.1. Map of amphibian species occurrence

General description:

The Global Biodiversity Information Facility (GBIF) was established by governments in 2001 to encourage free and open access to biodiversity data, via the Internet. Through a global network of countries and organizations, GBIF promotes and facilitates the mobilization, access, discovery and use of information about the occurrence of organisms over time and across the planet (source: http://www.gbif.org/+).

GBIF was used to find data on species occurrences recorded in the Antigua and Barbuda, Bahamas, Barbados, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Republic of Trinidad and Tobago, Commonwealth of Dominica,
Grenada and Jamaica, through the browser by country (Explore Countries). The information consists of the species occurrence recorded in each country, including records shared by publishers from throughout the GBIF network. Downloaded information includes:

- **Required fields:** Data Publisher and Dataset
- **Dataset:** Date collected, Institution code, Collection code, Catalogue number and Basis of record
- **Taxonomy:** Scientific name, Scientific name (interpreted), Kingdom, Phylum, Class, Order, Family and Genus.
- **Geospatial:** Country, Country (interpreted), Locality, County, State/Province, Min depth, Max depth, Min altitude, Max altitude and Altitude precision.

All non-georeferenced records were eliminated, resulting in a database with occurrences of species that may be represented in a Geographic Information System (GIS). Thereafter, the species were classified and grouped by taxa, generating layers (Qgis 1.8.0-Lisboa, WGS 84 / Latlong) of species occurrence as defined taxonomic groups such as the case of Amphibians.

**Data type:** Vector (point)

**Source:** The Global Biodiversity Information Facility (GBIF). Data available from: [http://www.gbif.org/](http://www.gbif.org/)

**References:**
1.2. Layer Title: Annelids

Title Qgis: Annelids

Figure 1.2. Map of annelids species occurrence

General description:

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• Taxonomy: Scientific name, Scientific name (interpreted), Kingdom, Phylum, Class, Order, Family and Genus.

• Geospatial: Country, Country (interpreted), Locality, County, State/Province, Min depth, Max depth, Min altitude, Max altitude and Altitude precision.

All non-georeferenced records were eliminated, resulting in a database with occurrences of species that may be represented in a Geographic Information System (GIS). Thereafter, the species were classified and grouped by taxa, generating layers (Qgis 1.8.0-Lisboa, WGS 84 / Latlong) of species occurrence as defined taxonomic groups such as the case of Annelids.

Data type: Vector (point)


References:
1.3. Layer Title: Arthropods

Title Qgis: Arthropods

Figure 1.3. Map of Arthropods species occurrence

General description:

The Global Biodiversity Information Facility (GBIF) was established by governments in 2001 to encourage free and open access to biodiversity data, via the Internet. Through a global network of countries and organizations, GBIF promotes and facilitates the mobilization, access, discovery and use of information about the occurrence of organisms over time and across the planet (source: http://www.gbif.org/).

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• Required fields: Data Publisher and Dataset

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• Geospatial: Country, Country (interpreted), Locality, County, State/Province, Min depth, Max depth, Min altitude, Max altitude and Altitude precision.

All non-georeferenced records were eliminated, resulting in a database with occurrences of species that may be represented in a Geographic Information System (GIS). Thereafter, the species were classified and grouped by taxa, generating layers (Qgis 1.8.0-Lisboa, WGS 84 / Latlong) of species occurrence as defined taxonomic groups such as the case of Arthropods.

**Data type:** Vector (point)

**Source:** The Global Biodiversity Information Facility (GBIF). Data available from: <http://www.gbif.org/>

**References:**

1.4.Layer Title: Ascidians

Title Qgis: Ascidians

Figure 1.4. Map of ascidians species occurrence

General description:

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• Geospatial: Country, Country (interpreted), Locality, County, State/Province, Min depth, Max depth, Min altitude, Max altitude and Altitude precision.

All non-georeferenced records were eliminated, resulting in a database with occurrences of species that may be represented in a Geographic Information System (GIS). Thereafter, the species were classified and grouped by taxa, generating layers (Qgis 1.8.0-Lisboa, WGS 84 / Latlong) of species occurrence as defined taxonomic groups such as the case of Ascidians.

Data type: Vector (point)


References:
Figure 1.5. Map of birds species occurrence

General description:

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• Required fields: Data Publisher and Dataset

• Dataset: Date collected, Institution code, Collection code, Catalogue number and Basis of record

• Taxonomy: Scientific name, Scientific name (interpreted), Kingdom, Phylum, Class, Order, Family and Genus.

• Geospatial: Country, Country (interpreted), Locality, County, State/Province, Min depth, Max depth, Min altitude, Max altitude and Altitude precision.

All non-georeferenced records were eliminated, resulting in a database with occurrences of species that may be represented in a Geographic Information System (GIS). Thereafter, the species were classified and grouped by taxa, generating layers (Qgis 1.8.0-Lisboa, WGS 84 / Latlong) of species occurrence as defined taxonomic groups such as the case of Birds.

**Data type:** Vector (point)

**Source:** The Global Biodiversity Information Facility (GBIF). Data available from: <http://www.gbif.org/>

**References:**

1.6. Layer Title: Coral & Jellyfish

Title Qgis: Coral jellyfish

Figure 1.6. Map of coral & jellyfish species occurrence

General description:

The Global Biodiversity Information Facility (GBIF) was established by governments in 2001 to encourage free and open access to biodiversity data, via the Internet. Through a global network of countries and organizations, GBIF promotes and facilitates the mobilization, access, discovery and use of information about the occurrence of organisms over time and across the planet (source: http://www.gbif.org/).

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• Required fields: Data Publisher and Dataset

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• Geospatial: Country, Country (interpreted), Locality, County, State/Province, Min depth, Max depth, Min altitude, Max altitude and Altitude precision.

All non-georeferenced records were eliminated, resulting in a database with occurrences of species that may be represented in a Geographic Information System (GIS). Thereafter, the species were classified and grouped by taxa, generating layers (Qgis 1.8.0-Lisboa, WGS 84 / Latlong) of species occurrence as defined taxonomic groups such as the case of Coral & Jellyfish.

**Data type:** Vector (point)

**Source:** The Global Biodiversity Information Facility (GBIF). Data available from: [http://www.gbif.org/](http://www.gbif.org/)

**References:**

General description:

Maps of coral reefs in vector format are the basis for the coral reef map for the region. These data were of multiple scale ranging and from multiple sources (Burke and Maidens 2004b).

The Reefs at Risk in the Caribbean project brings together the best available knowledge on the Caribbean region’s coral reefs, as a basis for a region-wide analysis using a consistent method. Wide-ranging information is consolidated within a geographic information system (GIS), including data on coral reef locations (maps); pressures on coral reefs (observed threats, pollution, physical impacts); changes in condition; observations of coral bleaching and disease; and information on the management of coral reefs. The project then attempts to fill in some of the information gaps through inferential modeling of threats to coral reefs from human activities, including overfishing pressure, coastal development, and pollution and sediment from...
land-based and marine-based sources (Burke and Maidens 2004a, Burke and Maidens 2004b).

**Data type:** Vector (point)

**Source:** Reefs at Risk in the Caribbean. Data available from: <http://www.wri.org/publication/reefs-risk-caribbean#data>

**References:**

Burke L. and Maidens J. 2004a. Reefs at Risk in the Caribbean Data CD. World Resources Institute (WRI), Washington, DC.


Burke L. and Maidens J. 2004c Reefs at Risk in the Caribbean. Executive summary. World Resources Institute (WRI), Washington, DC.

Burke L. and Maidens J. 2004 Reefs at Risk in the Caribbean. Land Base. World Resources Institute (WRI), Washington, DC.

Burke L. and Maidens J. 2004 Reefs at Risk in the Caribbean. World Resources Institute (WRI), Washington DC
1.8. Layer Title: Echinoderms

Title Qgis: Echinoderms

Figure 1.8. Map of echinoderms species occurrence

General description:

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**Data type:** Vector (point)

**Source:** The Global Biodiversity Information Facility (GBIF). Data available from: <http://www.gbif.org/>

**References:**

Figure 1.9. Map of Ferns, Mosses & Hepatic species occurrence

General description:

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Data type: Vector (point)


References:
1.10. Layer Title: Fish

Title Qgis: Fish

**Figure 1.10. Map of fish species occurrence**

**General description:**

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All non-georeferenced records were eliminated, resulting in a database with occurrences of species that may be represented in a Geographic Information System (GIS). Thereafter, the species were classified and grouped by taxa, generating layers (Qgis 1.8.0-Lisboa, WGS 84 / Latlong) of species occurrence as defined taxonomic groups such as the case of Fish.

Data type: Vector (point)


References:
1.11. Layer Title: Flatworms

Title Qgis: Flatworms

Figure 1.11. Map of Flatworms species occurrence

General description:

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Data type: Vector (point)


References:
1.12. Layer Title: Fungus

Title Qgis: Fungus

Figure 1.12. Map of fungus species occurrence

General description:

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**Data type:** Vector (point)

**Source:** The Global Biodiversity Information Facility (GBIF). Data available from: [http://www.gbif.org/](http://www.gbif.org/)

**References:**
1.13. Layer Title: Mammals

Title Qgis: Mammals

Figure 1.13. Map of mammals species occurrence

General description:

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Data type: Vector (point)


References:
1.14. Layer Title: Molluscs

Title Qgis: Molluscs

Figure 1.14. Map of molluscs species occurrence

General description:

The Global Biodiversity Information Facility (GBIF) was established by governments in 2001 to encourage free and open access to biodiversity data, via the Internet. Through a global network of countries and organizations, GBIF promotes and facilitates the mobilization, access, discovery and use of information about the occurrence of organisms over time and across the planet (source: http://www.gbif.org/).

GBIF was used to find data on species occurrences recorded in the Antigua and Barbuda, Bahamas, Barbados, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Republic of Trinidad and Tobago, Commonwealth of Dominica, Grenada and Jamaica, through the browser by country (Explore Countries). The information consists of the species occurrence recorded in each country, including records shared by publishers from throughout the GBIF network. Downloaded information includes:
• Required fields: Data Publisher and Dataset

• Dataset: Date collected, Institution code, Collection code, Catalogue number and Basis of record

• Taxonomy: Scientific name, Scientific name (interpreted), Kingdom, Phylum, Class, Order, Family and Genus.

• Geospatial: Country, Country (interpreted), Locality, County, State/Province, Min depth, Max depth, Min altitude, Max altitude and Altitude precision.

All non-georeferenced records were eliminated, resulting in a database with occurrences of species that may be represented in a Geographic Information System (GIS). Thereafter, the species were classified and grouped by taxa, generating layers (Qgis 1.8.0-Lisboa, WGS 84 / Latlong) of species occurrence as defined taxonomic groups such as the case of Molluscs.

**Data type:** Vector (point)

**Source:** The Global Biodiversity Information Facility (GBIF). Data available from: <http://www.gbif.org/>

**References:**
1.15. Layer Title: Plants

Title Qgis: Plants

Figure 1.15. Map of plants species occurrence

General description:

The Global Biodiversity Information Facility (GBIF) was established by governments in 2001 to encourage free and open access to biodiversity data, via the Internet. Through a global network of countries and organizations, GBIF promotes and facilitates the mobilization, access, discovery and use of information about the occurrence of organisms over time and across the planet (source: http://www.gbif.org/).

GBIF was used to find data on species occurrences recorded in the Antigua and Barbuda, Bahamas, Barbados, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Republic of Trinidad and Tobago, Commonwealth of Dominica, Grenada and Jamaica, through the browser by country (Explore Countries). The information consists of the species occurrence recorded in each country, including records shared by publishers from throughout the GBIF network. Downloaded information includes:
• Required fields: Data Publisher and Dataset

• Dataset: Date collected, Institution code, Collection code, Catalogue number and Basis of record

• Taxonomy: Scientific name, Scientific name (interpreted), Kingdom, Phylum, Class, Order, Family and Genus.

• Geospatial: Country, Country (interpreted), Locality, County, State/Province, Min depth, Max depth, Min altitude, Max altitude and Altitude precision.

All non-georeferenced records were eliminated, resulting in a database with occurrences of species that may be represented in a Geographic Information System (GIS). Thereafter, the species were classified and grouped by taxa, generating layers (Qgis 1.8.0-Lisboa, WGS 84 / Latlong) of species occurrence as defined taxonomic groups such as the case of Plants.

Data type: Vector (point)


References:
1.16. **Layer Title: Protists**

*Title Qgis: Protists*

![Map of protists species occurrence](image)

**Figure 1.16. Map of protists species occurrence**

**General description:**

The Global Biodiversity Information Facility (GBIF) was established by governments in 2001 to encourage free and open access to biodiversity data, via the Internet. Through a global network of countries and organizations, GBIF promotes and facilitates the mobilization, access, discovery and use of information about the occurrence of organisms over time and across the planet (source: http://www.gbif.org/).

GBIF was used to find data on species occurrences recorded in the Antigua and Barbuda, Bahamas, Barbados, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Republic of Trinidad and Tobago, Commonwealth of Dominica, Grenada and Jamaica, through the browser by country (Explore Countries). The information consists of the species occurrence recorded in each country, including records shared by publishers from throughout the GBIF network. Downloaded information includes:
• Required fields: Data Publisher and Dataset

• Dataset: Date collected, Institution code, Collection code, Catalogue number and Basis of record

• Taxonomy: Scientific name, Scientific name (interpreted), Kingdom, Phylum, Class, Order, Family and Genus.

• Geospatial: Country, Country (interpreted), Locality, County, State/Province, Min depth, Max depth, Min altitude, Max altitude and Altitude precision.

All non-georeferenced records were eliminated, resulting in a database with occurrences of species that may be represented in a Geographic Information System (GIS). Thereafter, the species were classified and grouped by taxa, generating layers (Qgis 1.8.0-Lisboa, WGS 84 / Latlong) of species occurrence as defined taxonomic groups such as the case of Protists.

**Data type**: Vector (point)

**Source**: The Global Biodiversity Information Facility (GBIF). Data available from: <http://www.gbif.org/>

**References**:
1.17. Layer Title: Reptiles

Title Qgis: Reptiles

Figure 1.17. Map of reptiles species occurrence

General description:

The Global Biodiversity Information Facility (GBIF) was established by governments in 2001 to encourage free and open access to biodiversity data, via the Internet. Through a global network of countries and organizations, GBIF promotes and facilitates the mobilization, access, discovery and use of information about the occurrence of organisms over time and across the planet (source: http://www.gbif.org/).

GBIF was used to find data on species occurrences recorded in the Antigua and Barbuda, Bahamas, Barbados, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Republic of Trinidad and Tobago, Commonwealth of Dominica, Grenada and Jamaica, through the browser by country (Explore Countries). The information consists of the species occurrence recorded in each country, including records shared by publishers from throughout the GBIF network. Downloaded information includes:
• Required fields: Data Publisher and Dataset

• Dataset: Date collected, Institution code, Collection code, Catalogue number and Basis of record

• Taxonomy: Scientific name, Scientific name (interpreted), Kingdom, Phylum, Class, Order, Family and Genus.

• Geospatial: Country, Country (interpreted), Locality, County, State/Province, Min depth, Max depth, Min altitude, Max altitude and Altitude precision.

All non-georeferenced records were eliminated, resulting in a database with occurrences of species that may be represented in a Geographic Information System (GIS). Thereafter, the species were classified and grouped by taxa, generating layers (Qgis 1.8.0-Lisboa, WGS 84 / Latlong) of species occurrence as defined taxonomic groups such as the case of Reptiles.

**Data type:** Vector (point)

**Source:** The Global Biodiversity Information Facility (GBIF). Data available from: <http://www.gbif.org/>

**References:**
1.18. Layer Title: Seaweeds

Title Qgis: Seaweeds

Figure 1.18. Map of seaweeds species occurrence

General description:

The Global Biodiversity Information Facility (GBIF) was established by governments in 2001 to encourage free and open access to biodiversity data, via the Internet. Through a global network of countries and organizations, GBIF promotes and facilitates the mobilization, access, discovery and use of information about the occurrence of organisms over time and across the planet (source: http://www.gbif.org/).

GBIF was used to find data on species occurrences recorded in the Antigua and Barbuda, Bahamas, Barbados, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Republic of Trinidad and Tobago, Commonwealth of Dominica, Grenada and Jamaica, through the browser by country (Explore Countries). The information consists of the species occurrence recorded in each country, including records shared by publishers from throughout the GBIF network. Downloaded information includes:
• Required fields: Data Publisher and Dataset

• Dataset: Date collected, Institution code, Collection code, Catalogue number and Basis of record

• Taxonomy: Scientific name, Scientific name (interpreted), Kingdom, Phylum, Class, Order, Family and Genus.

• Geospatial: Country, Country (interpreted), Locality, County, State/Province, Min depth, Max depth, Min altitude, Max altitude and Altitude precision.

All non-georeferenced records were eliminated, resulting in a database with occurrences of species that may be represented in a Geographic Information System (GIS). Thereafter, the species were classified and grouped by taxa, generating layers (Qgis 1.8.0-Lisboa, WGS 84 / Latlong) of species occurrence as defined taxonomic groups such as the case of Seaweeds.

Data type: Vector (point)


References:

1.19. Layer Title: Sponges

Title Qgis: Sponges

Figure 1.19. Map of sponges species occurrence

General description:

The Global Biodiversity Information Facility (GBIF) was established by governments in 2001 to encourage free and open access to biodiversity data, via the Internet. Through a global network of countries and organizations, GBIF promotes and facilitates the mobilization, access, discovery and use of information about the occurrence of organisms over time and across the planet (source: http://www.gbif.org/).

GBIF was used to find data on species occurrences recorded in the Antigua and Barbuda, Bahamas, Barbados, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Republic of Trinidad and Tobago, Commonwealth of Dominica, Grenada and Jamaica, through the browser by country (Explore Countries). The information consists of the species occurrence recorded in each country, including records shared by publishers from throughout the GBIF network. Downloaded information includes:
• Required fields: Data Publisher and Dataset

• Dataset: Date collected, Institution code, Collection code, Catalogue number and Basis of record

• Taxonomy: Scientific name, Scientific name (interpreted), Kingdom, Phylum, Class, Order, Family and Genus.

• Geospatial: Country, Country (interpreted), Locality, County, State/Province, Min depth, Max depth, Min altitude, Max altitude and Altitude precision.

All non-georeferenced records were eliminated, resulting in a database with occurrences of species that may be represented in a Geographic Information System (GIS). Thereafter, the species were classified and grouped by taxa, generating layers (Qgis 1.8.0-Lisboa, WGS 84 / Latlong) of species occurrence as defined taxonomic groups such as the case of Sponges.

**Data type:** Vector (point)

**Source:** The Global Biodiversity Information Facility (GBIF). Data available from: 
<http://www.gbif.org/>

**References:**
1.20. Layer Title: Others Taxa

Title Qgis: Other Taxa

Figure 1.20. Map of other taxa species occurrence

General description:

The Global Biodiversity Information Facility (GBIF) was established by governments in 2001 to encourage free and open access to biodiversity data, via the Internet. Through a global network of countries and organizations, GBIF promotes and facilitates the mobilization, access, discovery and use of information about the occurrence of organisms over time and across the planet (source: http://www.gbif.org/).

GBIF was used to find data on species occurrences recorded in the Antigua and Barbuda, Bahamas, Barbados, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Republic of Trinidad and Tobago, Commonwealth of Dominica, Grenada and Jamaica, through the browser by country (Explore Countries). The information consists of the species occurrence recorded in each country, including records shared by publishers from throughout the GBIF network. Downloaded information includes:
• Required fields: Data Publisher and Dataset

• Dataset: Date collected, Institution code, Collection code, Catalogue number and Basis of record

• Taxonomy: Scientific name, Scientific name (interpreted), Kingdom, Phylum, Class, Order, Family and Genus.

• Geospatial: Country, Country (interpreted), Locality, County, State/Province, Min depth, Max depth, Min altitude, Max altitude and Altitude precision.

All non-georeferenced records were eliminated, resulting in a database with occurrences of species that may be represented in a Geographic Information System (GIS). Thereafter, the species were classified and grouped by taxa, generating layers (Qgis 1.8.0-Lisboa, WGS 84 / Latlong) of species occurrence as defined taxonomic groups such as the case of Others Taxa.

**Data type:** Vector (point)

**Source:** The Global Biodiversity Information Facility (GBIF). Data available from: <http://www.gbif.org/>

**References:**
1.21. Layer Title: Mangrove Areas for Mangrove Alliance

Title Qgis: Mangrove MA areas

Figure 1.21. Map of mangrove areas

General description:

This GIS dataset for mangrove distributions was produced for the publication, World Atlas of Mangroves (2010) as joint initiatives of the International Tropical Timber Organization (ITTO), International Society for Mangrove Ecosystems (ISME), United Nations Environment Programme-World Conservation Monitoring Centre (UNEP-WCMC), United Nations Education, Scientific and Cultural Organization-Man and Biosphere (UNESCO-MAB), United Nations University-Institute for Water, Environment and Health (UNU-INWEH), The Nature Conservancy (TNC) and The Food and Agriculture Organization of the United Nations (FAO). Major funding was provided by ITTO through a Japanese Government project grant and the project was implemented by ISME (source: http://www.unep-wcmc.org/medialibrary/2012/12/17/4afb91d6/WA_Mangroves_2010_meta.pdf)

In the World Atlas of Mangroves, status and distributions of global mangroves have
been mapped using recently available Global Land Survey (GLS) data and the Landsat archive. The purpose of The World Atlas of Mangroves (2010) is to show global extent of mangroves, information that in most cases is not available (source: http://www.unep-wcmc.org/medialibrary/2013/01/08/51d9d8c6/mangroves_usgs.pdf).

The UNEP World Conservation Monitoring Centre (UNEP-WCMC) is a collaboration between the United Nations Environment Programme, the world's foremost intergovernmental environmental organization, and WCMC, a UK-based charity. UNEP-WCMC is UNEP’s specialist biodiversity assessment arm, and the Centre for UNEP’s collaboration with WCMC (source: http://www.unep-wcmc.org/about-us_17.html).

**Data type:** Vector (polygon)

**Source:** United Nations Environment Programme - World Conservation Monitoring Centre (UNEP-WCMC). Data available from: <http://www.unep-wcmc.org>

**References:**

Downloaded on 18 February 2013
General description:

The seagrass dataset, Global Seagrass Distribution (2005), has been compiled by UNEP-WCMC in collaboration with Dr Frederick T. Short, University of New Hampshire, USA. It has been compiled from multiple sources and was used in the creation of the “World Atlas of Seagrasses” (2003) (source: http://www.unep-wcmc.org/globalseagrassdistn2005_563.html)

The purpose of this dataset is to assist environmental researchers in understanding the global distribution, and the intricate spatial and ecological relationships between seagrasses and other ecosystems. The dataset has been developed alongside the publication “World Atlas of Seagrasses, Green, E. and Short, F. 2003” and reflects the opinions of the world’s leading seagrass experts with regards to the global distribution of the ecosystem (source: http://www.unep-wcmc.org/globalseagrassdistn2005_563.html).
The UNEP World Conservation Monitoring Centre (UNEP-WCMC) is a collaboration between the United Nations Environment Programme, the world's foremost intergovernmental environmental organization, and WCMC, a UK-based charity. UNEP-WCMC is UNEP’s specialist biodiversity assessment arm, and the Centre for UNEP’s collaboration with WCMC (source: http://www.unep-wcmc.org/about-us_17.html).

**Data type:** Vector (point)

**Source:** United Nations Environment Programme - World Conservation Monitoring Centre (UNEP-WCMC). Data available from: <http://www.unep-wcmc.org>

**References:**

Downloaded on 18 February 2013
1.23. Layer Title: Seaweeds Areas for Mangrove Alliance

**Title Qgis:** Seaweeds MA areas

**Figure 1.23.** Map of seaweeds areas

**General description:**

The seagrass dataset, Global Seagrass Distribution (2005), has been compiled by UNEP-WCMC in collaboration with Dr Frederick T. Short, University of New Hampshire, USA to show the global distribution of seagrass species. This dataset has been created from multiple sources and was used in the creation of the "World Atlas of Seagrasses" (2003). This polygon feature dataset is an update of the data used in the Atlas and is a unique data holding about the state of the world's seagrasses. For a complete overview of global seagrass distribution this dataset should be displayed together with the associated point dataset. (source: http://www.unep-wcmc.org/globalseagrassdistn2005_563.html)
The purpose of this dataset is to assist environmental researchers in understanding the global distribution, and the intricate spatial and ecological relationships between seagrasses and other ecosystems. The dataset has been developed alongside the publication “World Atlas of Seagrasses, Green, E. and Short, F. 2003” and reflects the opinions of the world’s leading seagrass experts with regards to the global distribution of the ecosystem. (source: http://www.unep-wcmc.org/globalseagrassdistn2005_563.html).

The UNEP World Conservation Monitoring Centre (UNEP-WCMC) is a collaboration between the United Nations Environment Programme, the world's foremost intergovernmental environmental organization, and WCMC, a UK-based charity. UNEP-WCMC is UNEP’s specialist biodiversity assessment arm, and the Centre for UNEP’s collaboration with WCMC (source: http://www.unep-wcmc.org/about-us_17.html).

**Data type:** Vector (polygon)

**Source:** United Nations Environment Programme - World Conservation Monitoring Centre (UNEP-WCMC). Data available from: <http://www.unep-wcmc.org>

**References:**


1.24. Layer Title: Marine Species for OBIS

Title Qgis: Marine species OBIS

Figure 1.24. Map of marine species occurrence

General description:

The Ocean Biogeographic information System (OBIS) provides a portal or gateway to many datasets containing information on where and when marine species have been recorded. OBIS seeks to absorb, integrate, and assess isolated datasets into a larger, more comprehensive pictures of life in our oceans.

OBIS was used to find data on marine species occurrences recorded in the Antigua and Barbuda, Bahamas, Barbados, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Republic of Trinidad and Tobago, Commonwealth of Dominica, Grenada and Jamaica. The data search was made by Region, using the Exclusive Economic Zone (EEZ) of each country like Pre-fixed region. Downloaded information includes:

- Taxonomy: Scientific name and Scientific name (interpreted) and Life Stage.
• Dataset: Date collected, Institution code, Collection code, Basis of record and Date of the Last Catch.

• Geospatial: Latitude, Longitude, Depth, Depth precision, Temperature, Salinity, Nitrate, Oxygen, Phosphate and Silicate

All records were georeferenced (WGS 84 / LatLong). These records were used to generate layers for occurrence of marine species (QGIS 1.8.0-Lisboa).

**Data type:** Vector (point)

**Source:** The Ocean Biogeographic information System (OBIS). Data available from: <http://www.iobis.org/>

**References:**

2. Country

2.1. Layer Title: Administrative areas countries

Title Qgis: Administrative areas countries

Figure 2.1. Map of countries

General description:

GADM database of Global Administrative Areas, is a spatial database of the location of the countries world's administrative areas for use in GIS and similar software. GADM describes where these administrative areas are (the "spatial features"), and for each area it provides some attributes, such as the name and variant names (source: http://www.gadm.org/home).

The geographic (GIS) data, country outlines, was downloaded by country from the Free Spatial Data section of DIVA-GIS (http://www.diva-gis.org/gdata).
Data type: Vector (polygon)


References:
GADM, 2012 Global Administrative Areas (v. 2.0). <http://www.gadm.org/> Downloaded on 11 February 2013
2.2. Layer Title: Administrative subdivisions areas

Title Qgis: Administrative subdivisions areas

Figure 2.2. Map of administrative subdivisions areas

General description:

GADM database of Global Administrative Areas, is a spatial database of the location of the world's administrative areas (or administrative boundaries) for use in GIS and similar software. Administrative areas in this database are lower level subdivisions such as provinces, departments and others (level of subdivision varies between countries). GADM describes where these administrative areas are (the "spatial features"), and for each area it provides some attributes, such as the name and variant names (source: http://www.gadm.org/home).

The geographic (GIS) data, administrative subdivisions, was downloaded by country from the Free Spatial Data section of DIVA-GIS (http://www.diva-gis.org/gdata). The level of subdivision varies between countries.

Data type: Vector (polygon)
Source: GADM database of Global Administrative Areas. Data available from:
<http://www.diva-gis.org/gdata>

References:
Downloaded on 11 February 2013
2.3. Layer Title: Rails

Title Qgis: Rails

Figure 2.3. Map of railroads

General description:

The Digital Chart of the World (DCW) is a comprehensive 1:1,000,000 scale vector basemap of the world. The primary source for this database is the US Defense Mapping Agency’s (DMA) Operational Navigation Chart (ONC) series produced by the United States, Australia, Canada, and the United Kingdom. The data currency varies from place to place, ranging from the mid 1960s to the early 1990s. The database is divided into 2,094 tiles that represent 5-degree by 5-degree areas of the globe (source: http://www-sul.stanford.edu/depts/gis/DCW.html).

The geographic (GIS) data, Railroads, was downloaded by country from the Free Spatial Data section of DIVA-GIS (http://www.diva-gis.org/gdata). The level of subdivision varies between countries.

Data type: Vector (lines)

References:

2.4. Layer Title: Roads

Title Qgis: Roads

Figure 2.4. Map of roads

General description:

The Digital Chart of the World (DCW) is a comprehensive 1:1,000,000 scale vector basemap of the world. The primary source for this database is the US Defense Mapping Agency's (DMA) Operational Navigation Chart (ONC) series produced by the United States, Australia, Canada, and the United Kingdom. The data currency varies from place to place, ranging from the mid 1960s to the early 1990s. The database is divided into 2,094 tiles that represent 5-degree by 5-degree areas of the globe (source: http://www-sul.stanford.edu/depts/gis/DCW.html)

The geographic (GIS) data, Roads, was downloaded by country from the Free Spatial Data section of DIVA-GIS (http://www.diva-gis.org/gdata). The level of subdivision varies between countries.

Data type: Vector (lines)

References:

General description:

The Digital Chart of the World (DCW) is a comprehensive 1:1,000,000 scale vector basemap of the world. The primary source for this database is the US Defense Mapping Agency's (DMA) Operational Navigation Chart (ONC) series produced by the United States, Australia, Canada, and the United Kingdom. The data currency varies from place to place, ranging from the mid 1960s to the early 1990s. The database is divided into 2,094 tiles that represent 5-degree by 5-degree areas of the globe (source: http://www-sul.stanford.edu/depts/gis/DCW.html)

The geographic (GIS) data, Rivers, was downloaded by country from the Free Spatial Data section of DIVA-GIS (http://www.diva-gis.org/gdata). The level of subdivision varies between countries.

Data type: Vector (lines)
**Source:** Digital Chart of the World (DCW). Data available from: <http://www.diva-gis.org/gdata>

**References:**

2.6. Layer Title: Places & Cities

Title Qgis: Places & Cities

Figure 2.6. Map of places & cities

General description:


All records were georeferenced (WGS 84 / LatLong). These records were used to generate layers of places and cities of each country (QGIS 1.8.0-Lisboa).

Data type: Vector (point)


References:
2.7. Layer Title: Water Areas

General description:

The Digital Chart of the World (DCW) is a comprehensive 1:1,000,000 scale vector basemap of the world. The primary source for this database is the US Defense Mapping Agency's (DMA) Operational Navigation Chart (ONC) series produced by the United States, Australia, Canada, and the United Kingdom. The data currency varies from place to place, ranging from the mid 1960s to the early 1990s. The database is divided into 2,094 tiles that represent 5-degree by 5-degree areas of the globe (source: http://www-su1.stanford.edu/depts/gis/DCW.html).

The geographic (GIS) data, Water Areas, was downloaded by country from the Free Spatial Data section of DIVA-GIS (http://www.diva-gis.org/gdata). The level of subdivision varies between countries.

Data type: Vector (polygon)

References:

2.8. Layer Title: Cruise Ports

Title Qgis: Ports cruise

Figure 2.8. Map of cruise ports

General description:

The information is the location of the infrastructure and ports generated by the Reefs at Risk in the Caribbean project. The project’s modeling approach involves identifying sources of stress that can be mapped for each threat category. These “stressors” include simple population and infrastructure features, such as ports (Burke and Maidens 2004b).

The Reefs at Risk in the Caribbean project brings together the best available knowledge on the Caribbean region’s coral reefs, as a basis for a region-wide analysis using a consistent method. Wide-ranging information is consolidated within a geographic information system (GIS), including data on coral reef locations (maps); pressures on coral reefs (observed threats, pollution, physical impacts); changes in condition; observations of coral bleaching and disease; and information on the management of coral reefs. The project then attempts to fill in some of the information.
gaps through inferential modeling of threats to coral reefs from human activities, including overfishing pressure, coastal development, and pollution and sediment from land-based and marine-based sources (Burke and Maidens 2004a, Burke and Maidens 2004b).

**Data type:** Vector (point)

**Source:** Reefs at Risk in the Caribbean. Data available from: [http://www.wri.org/publication/reefs-risk-caribbean#data](http://www.wri.org/publication/reefs-risk-caribbean#data)

**References:**

Burke L. and Maidens J. 2004a. Reefs at Risk in the Caribbean Data CD. World Resources Institute (WRI), Washington, DC.


Burke L. and Maidens J. 2004c. Reefs at Risk in the Caribbean. Executive summary. World Resources Institute (WRI), Washington, DC.


Burke L. and Maidens J. 2004. Reefs at Risk in the Caribbean. World Resources Institute (WRI), Washington DC
2.9. Layer Title: Watersheds boundaries

Title Qgis: Watersheds

![Map of watersheds boundaries](image)

Figure 2.9. Map of watersheds boundaries

General description:

The Watershed layer was delineated at WRI from U.S. Geological Survey (USGS) HYDRO1K digital elevation model, 2000 (1-km resolution for the entire Caribbean region), and U.S. National Aeronautics and Space Administration (NASA) Shuttle Radar Topography Mission (SRTM) data (90-m resolution for the Eastern Caribbean) (Burke and Maidens 2004a). This information was downloaded from the database of Reefs at Risk in the Caribbean project.

Data type: Vector (polygon)


References:
Burke L. and Maidens J. 2004a. Reefs at Risk in the Caribbean Data CD. World Resources Institute (WRI), Washington, DC.


Burke L. and Maidens J. 2004c. Reefs at Risk in the Caribbean. Executive summary. World Resources Institute (WRI), Washington, DC.

Burke L. and Maidens J. 2004. Reefs at Risk in the Caribbean. Land Base. World Resources Institute (WRI), Washington, DC.

Burke L. and Maidens J. 2004. Reefs at Risk in the Caribbean. World Resources Institute (WRI), Washington DC
3. Conservation

3.1. Layer Title: Protected Areas

Title Qgis: Protected Areas

Figure 3.1. Map of Protected Areas

General description:

The World Database on Protected Areas (WDPA) has been in existence since 1981, and is the most comprehensive and extensive dataset on protected areas, including both nationally designated protected areas, such as national parks, and internationally designated protected areas, such as World Heritage sites and Ramsar Wetlands of International Importance.

The WDPA is a joint project between the United Nations Environment Programme - World Conservation Monitoring Centre (UNEP-WCMC) and the International Union for Nature Conservation (IUCN) World Commission on Protected Areas (WCPA). Its
humble beginnings started 30 years ago as a basic global list of national parks and has evolved into the only global, spatially referenced information source on parks and protected areas (source: http://protectedplanet.net/).

**Data type:** Vector (polygon)

**Source:** The World Database on Protected Areas (WDPA). Data available from: <http://protectedplanet.net/>

**References:**

3.2. Layer Title: Marine Protected Areas

Title Qgis: Marine Protected Areas

Figure 3.2. Map of Marine Protected Areas (MPAs)

General description:

The dataset includes a simple measure of management effectiveness for each Marine Protected Areas (MPAs) in the Wider Caribbean based on four broad criteria: existence of management activity, existence of a management plan, availability of resources, and extent of enforcement (Burke and Maidens 2004b).

The Reefs at Risk in the Caribbean project brings together the best available knowledge on the Caribbean region’s coral reefs, as a basis for a region-wide analysis using a consistent method. Wide-ranging information is consolidated within a geographic information system (GIS), including data on coral reef locations (maps); pressures on coral reefs (observed threats, pollution, physical impacts); changes in condition; observations of coral bleaching and disease; and information on the management of coral reefs. The project then attempts to fill in some of the information gaps through inferential modeling of threats to coral reefs from human activities.
including overfishing pressure, coastal development, and pollution and sediment from land-based and marine-based sources (Burke and Maidens 2004a, Burke and Maidens 2004b).

**Data type:** Vector (polygon)

**Source:** Reefs at Risk in the Caribbean. Data available from: <http://www.wri.org/publication/reefs-risk-caribbean#data>

**References:**

Burke L. and Maidens J. 2004a. Reefs at Risk in the Caribbean Data CD. World Resources Institute (WRI), Washington, DC.


Burke L. and Maidens J. 2004c Reefs at Risk in the Caribbean. Executive summary. World Resources Institute (WRI), Washington, DC.

Burke L. and Maidens J. 2004 Reefs at Risk in the Caribbean. Land Base. World Resources Institute (WRI), Washington, DC.

Burke L. and Maidens J. 2004 Reefs at Risk in the Caribbean. World Resources Institute (WRI), Washington DC
3.3. Layer Title: Threatened species

Figure 3.3. Map of threatened species occurrence

General description:

Threatened species of the IUCN Red List were mapped by country (Qgis 1.8.0-Lisboa, WGS 84 / Latlong), using species occurrences dataset obtained from GBIF (primarily terrestrial species) and OBIS (marine species). GBIF was used to find data on species occurrences recorded in the Antigua and Barbuda, Bahamas, Barbados, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Republic of Trinidad and Tobago, Commonwealth of Dominica, Grenada and Jamaica, through the browser by country (Explore Countries. OBIS was used to find data on marine species occurrences recorded in the countries listed above, using the Exclusive Economic Zone (EEZ) of each country like Pre-fixed region. Some of the species included in the IUCN Red List could not be included in this layer, because there were no records of occurrences of these endangered species in the databases consulted (GBIF and OBIS).
The IUCN Red List of Threatened Species™ is widely recognized as the most comprehensive, objective global approach for evaluating the conservation status of plant and animal species. The IUCN Red List is underpinned by information management tools (the Species Information Service) which facilitate the collection, management and processing of species data from workshop to publication on the IUCN Red List. The goal of the IUCN Red List is to provide information and analyses on the status, trends and threats to species in order to inform and catalyse action for biodiversity conservation (source: http://www.iucnredlist.org).

Data type: Vector (point)


The Ocean Biogeographic information System (OBIS). Data available from: http://www.iobis.org/

References:


3.4. Layer Title: Endemic species

Title Qgis: Endemic species

Figure 3.4. Map of endemic species occurrence

General description:

The list of Endemic species was obtained from Living Natural Treasures and FishBase, and were mapped by country (Qgis 1.8.0-Lisboa, WGS 84 / Latlong), using species occurrences dataset obtained from GBIF (primarily terrestrial species) and OBIS (marine species). GBIF was used to find data on species occurrences recorded in the Antigua and Barbuda, Bahamas, Barbados, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Republic of Trinidad and Tobago, Commonwealth of Dominica, Grenada and Jamaica, through the browser by country (Explore Countries). OBIS was used to find data on marine species occurrences recorded in the countries listed above, using the Exclusive Economic Zone (EEZ) of each country like Pre-fixed region. Some of the species included in the Endemic list could not be included in this layer, because there were no records of occurrences of these species in the databases consulted (GBIF and OBIS).
Natural Living Treasures is a database of endemic species, with information on species of plants and animals whose survival depends solely on the actions of a single nation. The list and description of the endemic species are sorted by country (source: http://lntreasures.com).

FishBase is a global information system about fishes. FishBase is a relational database with information to cater to different professionals such as research scientists, fisheries managers, zoologists and many more. FishBase was developed at the WorldFish Center in collaboration with the Food and Agriculture Organization of the United Nations (FAO) and many other partners, and with support from the European Commission (EC) (Froese and Pauly, 2012).

Data type: Vector (point)

Source: Living Natural Treasures. Data available from: http://lntreasures.com

FishBase. Data available from: http://www.fishbase.org/search.php


The Ocean Biogeographic information System (OBIS). Data available from: http://www.iobis.org

References:


4. Threats for coral reefs

4.1. Layer Title: Coastal development

General description:

Poorly managed coastal development can threaten coral reefs through dredging, land reclamation, mining of sand and limestone, dumping of spoils, and runoff from construction. Sewage discharge from human settlements increases nutrient and bacteria levels in coastal waters and can have an adverse impact on reef health. In addition, poorly managed tourism can harm coral reefs both through poorly planned and implemented construction and through careless recreation on reefs (Burke and Maidens 2004b). The Reefs at Risk in the Caribbean project identify “stressors” include simple population and infrastructure features, as well as Coastal development (estimate coastal development adjusted by coastal management effectiveness) that
can be mapped (Burke and Maidens 2004b).

The Reefs at Risk in the Caribbean project brings together the best available knowledge on the Caribbean region’s coral reefs, as a basis for a region-wide analysis using a consistent method. Wide-ranging information is consolidated within a geographic information system (GIS), including data on coral reef locations (maps); pressures on coral reefs (observed threats, pollution, physical impacts); changes in condition; observations of coral bleaching and disease; and information on the management of coral reefs. The project then attempts to fill in some of the information gaps through inferential modeling of threats to coral reefs from human activities, including overfishing pressure, coastal development, and pollution and sediment from land-based and marine-based sources (Burke and Maidens 2004a, Burke and Maidens 2004b).

Data type: Vector (polygon)


References:

Burke L. and Maidens J. 2004a. Reefs at Risk in the Caribbean Data CD. World Resources Institute (WRI), Washington, DC.


Burke L. and Maidens J. 2004c Reefs at Risk in the Caribbean. Executive summary. World Resources Institute (WRI), Washington, DC.

Burke L. and Maidens J. 2004 Reefs at Risk in the Caribbean. Land Base. World Resourcecse Institute (WRI), Washington, DC.

Burke L. and Maidens J. 2004 Reefs at Risk in the Caribbean. World Resources Institute (WRI), Washington DC
4.2. Layer Title: Marine pollution

**Title Qgis:** Marine pollution

**Figure 4.2.** Map of marine pollution affecting coral reefs

**General description:**

Agriculture and other land use activities far inland can have an adverse impact on coral reefs through the increased delivery of sediment and pollution to coastal waters. A watershed-based analysis of land-based sources of pollution was implemented to develop a preliminary estimate of this threat (Burke and Maidens 2004b). The Reefs at Risk in the Caribbean project identify “stressors” include simple population and infrastructure features, as well as Marine pollution (estimated threat for all areas from marine-based threats), that can be mapped (Burke and Maidens 2004b).

The Reefs at Risk in the Caribbean project brings together the best available knowledge on the Caribbean region’s coral reefs, as a basis for a region-wide analysis using a consistent method. Wide-ranging information is consolidated within a geographic information system (GIS), including data on coral reef locations (maps); pressures on coral reefs (observed threats, pollution, physical impacts); changes in
condition; observations of coral bleaching and disease; and information on the management of coral reefs. The project then attempts to fill in some of the information gaps through inferential modeling of threats to coral reefs from human activities, including overfishing pressure, coastal development, and pollution and sediment from land-based and marine-based sources (Burke and Maidens 2004a, Burke and Maidens 2004b).

**Data type:** Vector (polygon)

**Source:** Reefs at Risk in the Caribbean. Data available from: <http://www.wri.org/publication/reefs-risk-caribbean#data>

**References:**

Burke L. and Maidens J. 2004a. Reefs at Risk in the Caribbean Data CD. World Resources Institute (WRI), Washington, DC.


Burke L. and Maidens J. 2004c. Reefs at Risk in the Caribbean. Executive summary. World Resources Institute (WRI), Washington, DC.

Burke L. and Maidens J. 2004. Reefs at Risk in the Caribbean. Land Base. World Resources Institute (WRI), Washington, DC.

Burke L. and Maidens J. 2004. Reefs at Risk in the Caribbean. World Resources Institute (WRI), Washington DC
Overfishing can be a major pressure on coral reef systems, reducing levels of biodiversity and typically resulting in shifts in fish size, abundance, and species composition, altering the ecological balance on the reef. Overfishing occurs as a result of a combination of an overabundance of fishers and overcapitalization of the fishing fleet relative to the available fish stock (Burke and Maidens 2004b). The Reefs at Risk in the Caribbean project identify “stressors” include simple population and infrastructure features, as well as Over fishing (estimate coastal population fishing pressure adjusted by coastal management effectiveness), that can be mapped (Burke and Maidens 2004b).
The Reefs at Risk in the Caribbean project brings together the best available knowledge on the Caribbean region’s coral reefs, as a basis for a region-wide analysis using a consistent method. Wide-ranging information is consolidated within a geographic information system (GIS), including data on coral reef locations (maps); pressures on coral reefs (observed threats, pollution, physical impacts); changes in condition; observations of coral bleaching and disease; and information on the management of coral reefs. The project then attempts to fill in some of the information gaps through inferential modeling of threats to coral reefs from human activities, including overfishing pressure, coastal development, and pollution and sediment from land-based and marine-based sources (Burke and Maidens 2004a, Burke and Maidens 2004b).

**Data type:** Vector (polygon)

**Source:** Reefs at Risk in the Caribbean. Data available from: [http://www.wri.org/publication/reefs-risk-caribbean#data](http://www.wri.org/publication/reefs-risk-caribbean#data)

**References:**

Burke L. and Maidens J. 2004a. Reefs at Risk in the Caribbean Data CD. World Resources Institute (WRI), Washington, DC.


Burke L. and Maidens J. 2004c Reefs at Risk in the Caribbean. Executive summary. World Resources Institute (WRI), Washington, DC.

Burke L. and Maidens J. 2004 Reefs at Risk in the Caribbean. Land Base. World Resources Institute (WRI), Washington, DC.

Burke L. and Maidens J. 2004 Reefs at Risk in the Caribbean. World Resources Institute (WRI), Washington DC
4.4. Layer Title: Sedimentation

Title Qgis: Sedimentation

Figure 4.4. Map of sedimentation affecting coral reefs

General description:

Agriculture and other land use activities far inland can have an adverse impact on coral reefs through the increased delivery of sediment and pollution to coastal waters. (Burke and Maidens 2004b). The Reefs at Risk in the Caribbean project identify “stressors” include simple population and infrastructure features, as well as Sedimentation (relative sediment delivery estimate at river mouths), that can be mapped (Burke and Maidens 2004b).

The Reefs at Risk in the Caribbean project brings together the best available knowledge on the Caribbean region’s coral reefs, as a basis for a region-wide analysis using a consistent method. Wide-ranging information is consolidated within a geographic information system (GIS), including data on coral reef locations (maps); pressures on coral reefs (observed threats, pollution, physical impacts); changes in condition; observations of coral bleaching and disease; and information on the
management of coral reefs. The project then attempts to fill in some of the information

gaps through inferential modeling of threats to coral reefs from human activities,

including overfishing pressure, coastal development, and pollution and sediment from

land-based and marine-based sources (Burke and Maidens 2004a, Burke and

Maidens 2004b).

**Data type:** Vector (polygon)

**Source:** Reefs at Risk in the Caribbean. Data available from:

<http://www.wri.org/publication/reefs-risk-caribbean#data>

**References:**

Burke L. and Maidens J. 2004a. Reefs at Risk in the Caribbean Data CD. World

Resources Institute (WRI), Washington, DC.

Burke L. and Maidens J. 2004b. Technical Notes on the Reefs at Risk Caribbean

Threat Analysis. World Resources Institute (WRI), Washington, DC.

Burke L. and Maidens J. 2004c Reefs at Risk in the Caribbean. Executive summary.

World Resources Institute (WRI), Washington, DC.

Burke L. and Maidens J. 2004 Reefs at Risk in the Caribbean. Land Base. World

Resources Institute (WRI), Washington, DC.

Burke L. and Maidens J. 2004 Reefs at Risk in the Caribbean. World Resources

Institute (WRI), Washington DC
4.5. **Layer Title: Threat integrated**

**Title Qgis: Threat integrated**

**Figure 4.5. Map of threat integrated for coral reefs**

**General description:**

The Reefs at Risk Threat Index is based on the four individual threats at each location: Coastal development, Marine pollution, Overfishing and Sedimentation (Burke and Maidens 2004b).

The Reefs at Risk in the Caribbean project brings together the best available knowledge on the Caribbean region’s coral reefs, as a basis for a region-wide analysis using a consistent method. Wide-ranging information is consolidated within a geographic information system (GIS), including data on coral reef locations (maps); pressures on coral reefs (observed threats, pollution, physical impacts); changes in condition; observations of coral bleaching and disease; and information on the management of coral reefs. The project then attempts to fill in some of the information gaps through inferential modeling of threats to coral reefs from human activities, including overfishing pressure, coastal development, and pollution and sediment from
land-based and marine-based sources (Burke and Maidens 2004a, Burke and Maidens 2004b).

**Data type:** Vector (polygon)

**Source:** Reefs at Risk in the Caribbean. Data available from: <http://www.wri.org/publication/reefs-risk-caribbean#data>

**References:**

Burke L. and Maidens J. 2004a. Reefs at Risk in the Caribbean Data CD. World Resources Institute (WRI), Washington, DC.


Burke L. and Maidens J. 2004c Reefs at Risk in the Caribbean. Executive summary. World Resources Institute (WRI), Washington, DC.

Burke L. and Maidens J. 2004 Reefs at Risk in the Caribbean. Land Base. World Resources Institute (WRI), Washington, DC.

Burke L. and Maidens J. 2004 Reefs at Risk in the Caribbean. World Resources Institute (WRI), Washington DC
5. Fisheries

5.1. Layer Title: Commercial Fish

Title Qgis: Commercial fish

![Map of commercial fish species occurrence](image)

**Figure 5.1. Map of commercial fish species occurrence**

**General description:**

The list of Commercial Fish was obtained from FishBase, and were mapped by country (Qgis 1.8.0-Lisboa, WGS 84 / Latlong), using species occurrences dataset obtained from GBIF (primarily terrestrial species) and OBIS (marine species). GBIF was used to find data on species occurrences recorded in the Antigua and Barbuda, Bahamas, Barbados, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Republic of Trinidad and Tobago, Commonwealth of Dominica, Grenada and Jamaica, through the browser by country (Explore Countries. OBIS was used to find data on marine species occurrences recorded in the countries listed above, using the Exclusive Economic Zone (EEZ) of each country like Pre-fixed region. Some of the
species included in the IUCN Red List could not be included in this layer, because there were no records of occurrences of these endangered species in the databases consulted (GBIF and OBIS).

FishBase is a global information system about fishes. FishBase is a relational database with information to cater to different professionals such as research scientists, fisheries managers, zoologists and many more. FishBase was developed at the WorldFish Center in collaboration with the Food and Agriculture Organization of the United Nations (FAO) and many other partners, and with support from the European Commission (EC) (Froese and Pauly, 2012).

**Data type:** Vector (point)

**Source:** Living Natural Treasures. Data available from: <http://lntreasures.com>

FishBase. Data available from: <http://www.fishbase.org/search.php>


The Ocean Biogeographic information System (OBIS). Data available from: <http://www.iobis.org/>

**References:**


6. Base Layers

6.1. Layer Title: Countries Economic Exclusive Zone

Title Qgis: Countries EEZ

Figure 6.1. Map of the Economic Exclusive Zone to Antigua and Barbuda, Bahamas, Barbados, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Republic of Trinidad and Tobago, Commonwealth of Dominica, Grenada, Jamaica

General description:

The database includes a global GIS-layers that represent the Exclusive Economic Zone of Antigua and Barbuda, Bahamas, Barbados, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Republic of Trinidad and Tobago, Commonwealth
of Dominica, Grenada, Jamaica. Maritime Boundaries are important for many applications. In biogeography for example, a layer of EEZ-polygons could be used for the creation of species distribution lists per country (Claus et al. 2013).

Marine Regions is an integration of the VLIMAR Gazetteer and the VLIZ Maritime Boundaries Geodatabase. The VLIMAR Gazetteer is a database with geographic, mainly marine names such as seas, sandbanks, seamounts, ridges, bays or even standard sampling stations used in marine research (Claus et al. 2013). The geographic cover of the VLIMAR gazetteer is global. Marine Regions is managed by the Flanders Marine Institute. The purpose of Marine Regions is therefore to create a standard, relational list of geographic names, coupled with information and maps of the geographic location of these features. This will improve access and clarity of the different geographic, marine names such as seas, sandbanks, ridges and bays and display univocally the boundaries of marine biogeographic or managerial marine areas (Claus et al. 2013).

Data type: Vector (polygon)


References: