

Assessing, Monitoring, and Defending Coral Reefs with GIS

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It is estimated that 60% of Earth's coral reefs are at risk and that bleaching already has damaged 90% of living reefs. Regionally, the occurrence of coral bleaching will be highest in the Caribbean over the course of the next 30-50 years.



Brain coral and sea fan

Efficient monitoring requires the assessment of various coastal data baselines and the evaluation of subsequent alterations in spatial patterns. Relevant aspects include changes in coastal land use, wetlands, and shoreline configuration.



A shallow water reef scene in Florida

The objective of this research is to demonstrate that GIS is an efficient instrument for conducting surveys and inventories of coral reefs in order to assess those ecosystems at higher risk and develop appropriate mitigation strategies.



Flower coral

Louis Agassiz conducted his first studies of coral reefs in 1851 when he was commissioned by the Coast Survey to study the Florida Reefs as related to navigation of the Florida Straits



Today, coral reefs are studied as indicators of global change and as highly endangered ecosystems that suffer from bleaching episodes related to warming of the global ocean, pollution from chemicals and sediment, and destructive fishing practices.



Barrel sponges

Coral reefs are in danger of destruction due to over exploitation, degradation of habitat and changes in global climate. Globally, the resulting loss of income from fisheries is estimated to be billions of dollars a year and affects many millions of people.



Glassy sweepers and elkhorn coral off the Florida Keys

Few figures are available to indicate the sustainable yields that might be extracted for different reef types, current and potential yields of different reef species, how yields are affected by declining reef health and loss of productive capacity, and the value of non-extractive uses of reefs such as tourism.



Keys reef scene with a sergeant major fish and an angelfish

Sophisticated methods to quantify the deterioration of coral reefs have been initiated in some areas, while hardly any assessment or monitoring activities exist in others. Information from these activities is usually published in the primary scientific literature and may not be readily available or understood by a non-technical reader.



French angelfish in the Keys

A larger body of information has been compiled in technical reports, which are generally for limited distribution. This makes it difficult for the people tasked with managing coral reefs to obtain the information needed for good management even when comprehensive information exists.



A scrawled filefish

What is needed is a GIS that gathers available knowledge about coral reefs into one easily accessible information repository. Such a GIS could facilitate analysis and monitoring of coral reef health while offering support for informed decisions about coral reef use and management.



Closeup of staghorn coral with polyps extended

**ReefBase is the official database of the
Global Coral Reef Monitoring Network (GCRMN) and
the International Coral Reef Action Network (ICRAN).**

**ReefBase is housed at the “World Fish Center” in Malaysia
with funding through ICRAN from the United Nations.**



An elkhorn coral colony

ReefBase Objectives

Develop a relational database and information system for structured information on coral reefs and their resources that will serve as a computerized encyclopedia and analytical tool for use in reef management, conservation, and research.



Florida Keys sponge and seafan

ReefBase Objectives

Provide key information to support decision-making by fisheries and environmental managers in developing countries, especially those concerned with improving the livelihoods of poor fishers.



Elkhorn coral and a club tip finger coral in the foreground

ReefBase Objectives

Collaborate with other national, regional, and international databases, and GIS facilities relating to reefs, and provide a means of comparing and interpreting information at the global level.



Horse conch in sand and coral rubble

ReefBase Objectives

Define criteria for reef health and use them to refine procedures for coral reef assessments and to determine coral reef status at the regional and global level. And examine the relationships among coral reef health, fishery production, and the quality of life of people dependent on reefs.



Two four-eyed butterfly fish in the Keys

ReefBase: A Global Information System For Coral Reefs

Full Screen View | Logout | Email | Bookmark | Comments | Download | Print | Help

Zoom to country
Find place

Map | Layers | Legend

- Location of Coral Reefs
- Coral Diseases
- Coral Bleaching & SST
- Reefs At Risk
- Asia Tourism 2004
- Bismarck Post-Quarantine
- Coral Reef Monitoring
- Marine Protected Areas
- CRM Sites
- Reefs from Space
- Photos
- OEF Lessons Learned

Lat: -2.191 Lon: 71.775 Scale: 1:450,000,000

Transferring data from reefgis.reefbase.org...

The image shows a screenshot of the ReefBase GIS Base Map. The interface includes a title bar, navigation tools, a search bar, a sidebar with a list of layers, a main map area, and a status bar at the bottom. A red box highlights the sidebar area. The map displays a world map with coral reef locations marked in dark blue. The sidebar contains a list of layers with checkboxes and icons. The status bar shows coordinates and scale information.

ReefBase GIS Base Map

ReefBase :: A Global Information System For Coral Reefs

Zoom to country
Find place



Maps Layers Legend

- Location of Coral
- Coral Diseases
- Coral Bleaching &
- Reefs At Risk
- Asia Tsunami
- Solomon's
- Coral Reef
- Marine Protected
- ICRAN Sites
- Reefs from Space
- Photos
- GEF Lessons



Zoom to country

add place Go

Map Layers Legend

Location of Coral Reefs

Reef Basemap

- Coral Reefs

Reef by Type

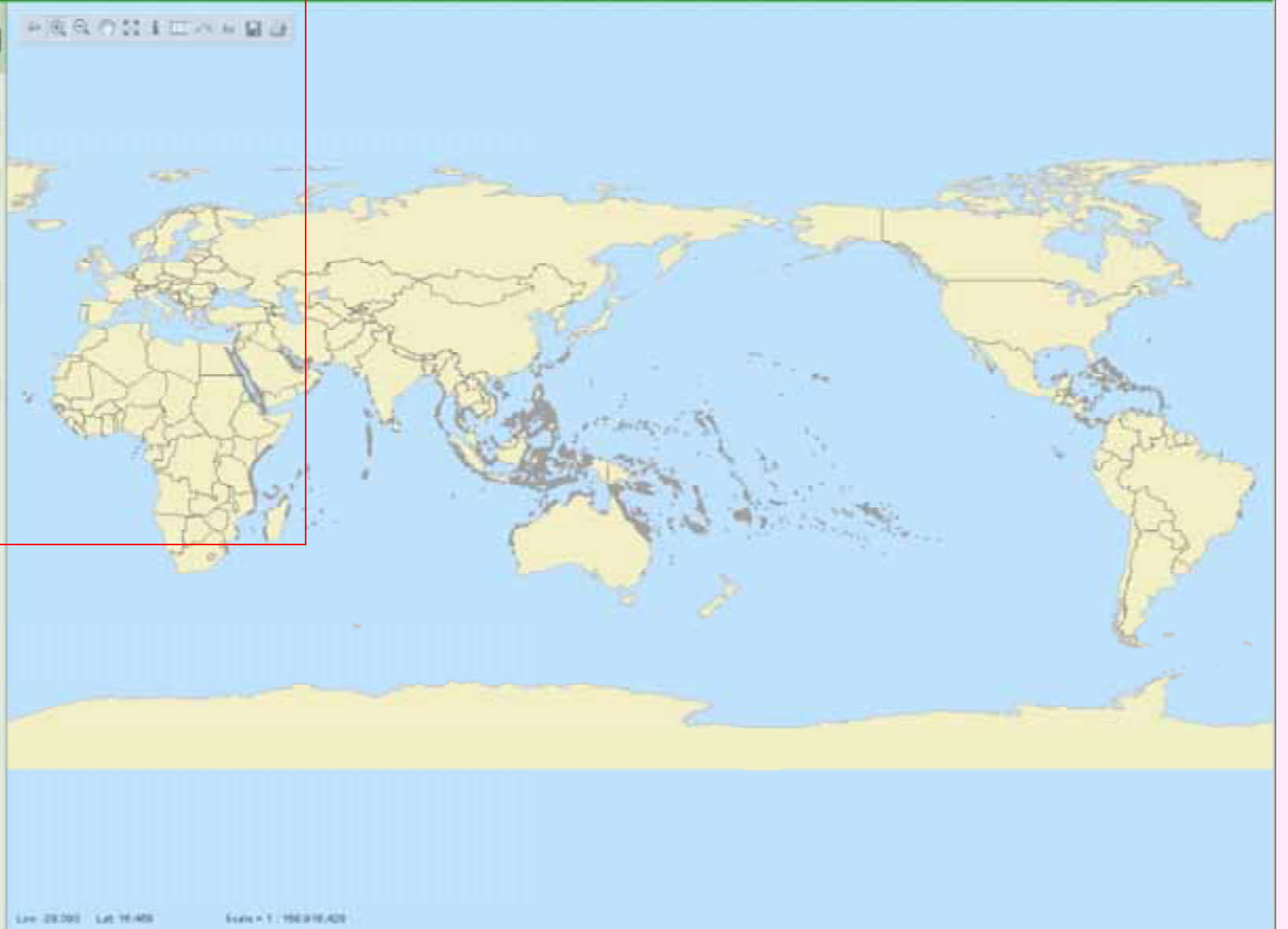
- Barrier Reef
- Fringing Reef
- Patch Reef
- Shelf

Reef by Geomorphology

- Atoll / Bank
- Island
- Continental

Reef by Depth

- Shallow Reef
- Mixed Reef
- Deep Reef



Lon: 29.000 Lat: 16.400 Scale: 1 : 190916,426




ReefBase :: A Global Information System For Coral Reefs

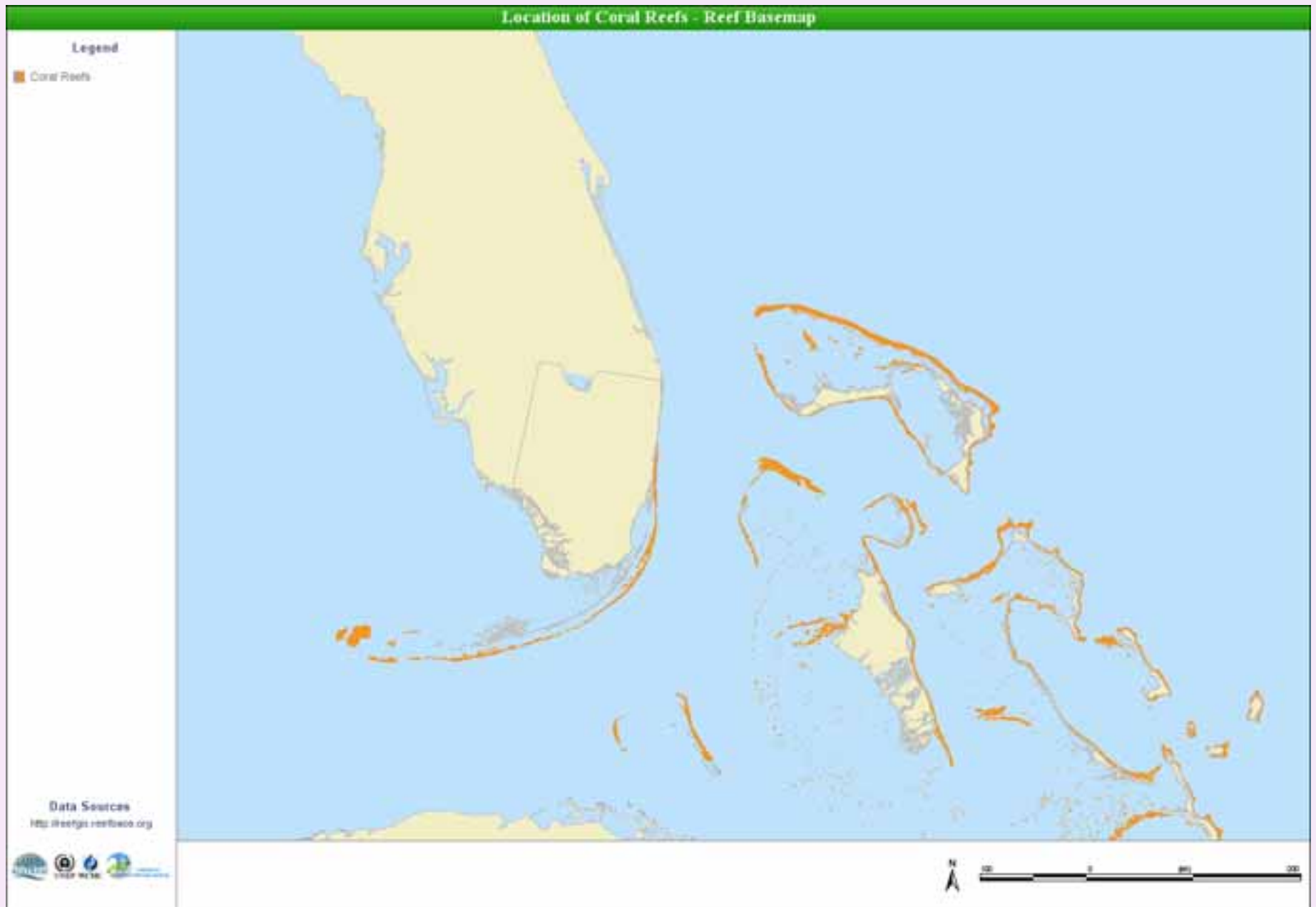
Zoom to country Find place

Maps Layers Legend

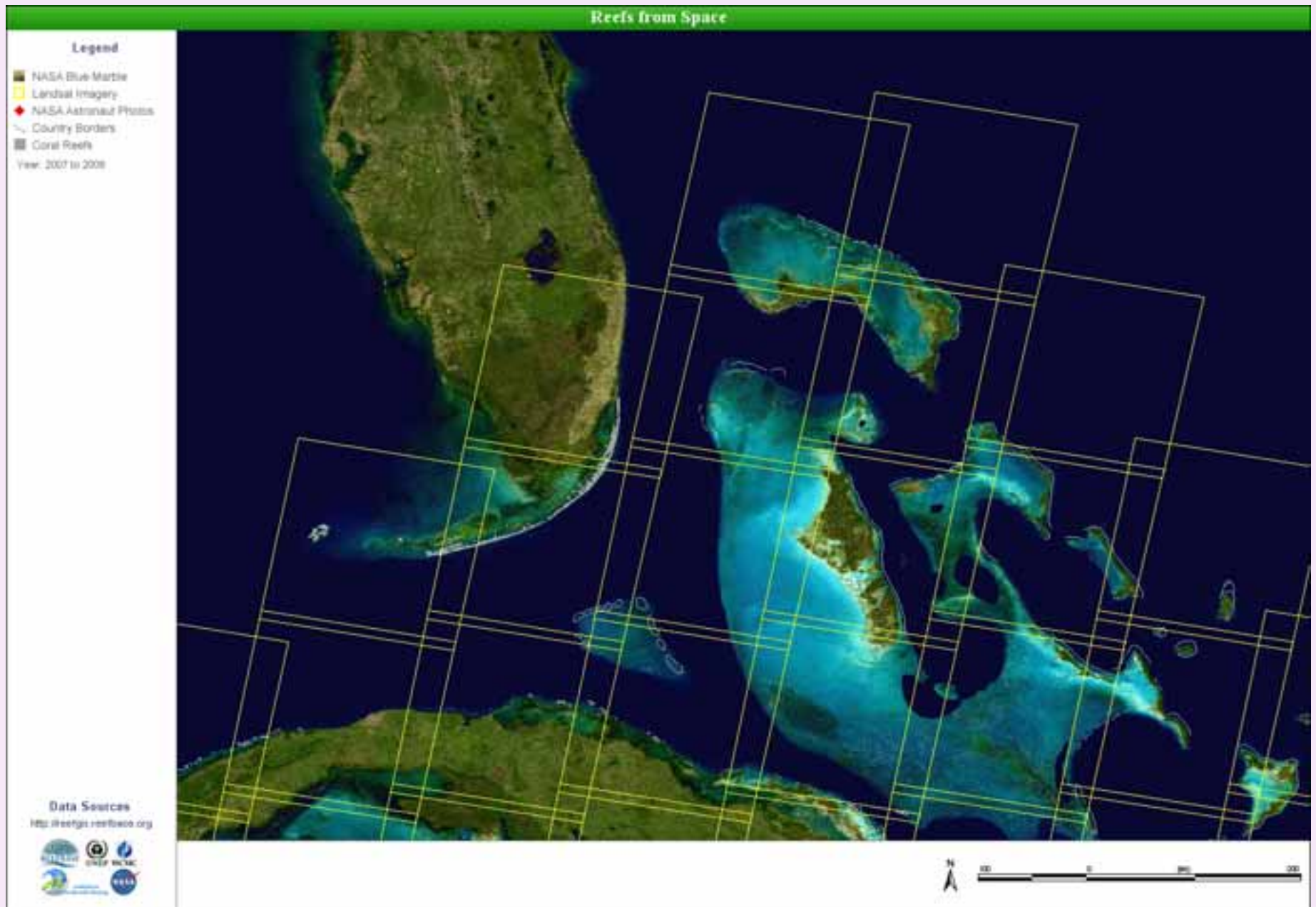
Location of Coral Reefs

- Reef Basemap
 - Coral Reefs
- Reef by Type
 - Barrier Reef
 - Fringing Reef
 - Patch Reef
 - Shelf
- Reef by Geomorphology
 - Atoll / Bank
 - Island
 - Continental
- Reef by Depth
 - Shallow Reef
 - Mixed Reef
 - Deep Reef

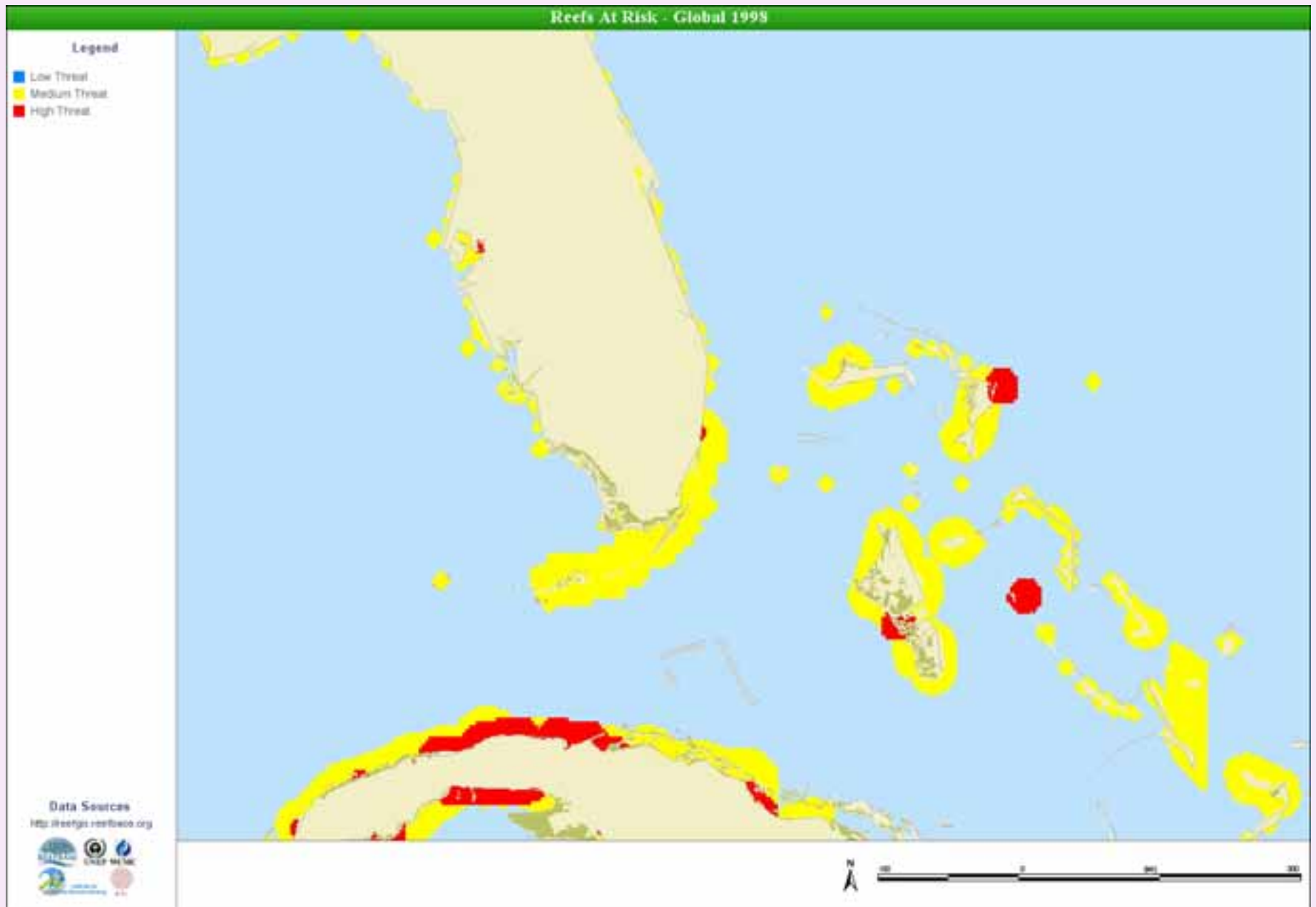
A world map showing the distribution of coral reefs. The map is centered on the Indian Ocean, with Africa and Australia visible. Coral reefs are highlighted in orange, primarily along the eastern coast of Africa and the northern coast of Australia. The map interface includes a search bar at the top, a legend on the left, and navigation controls at the top right.



Florida and Bahamas coral reef locations



Florida and Bahamas reefs from space



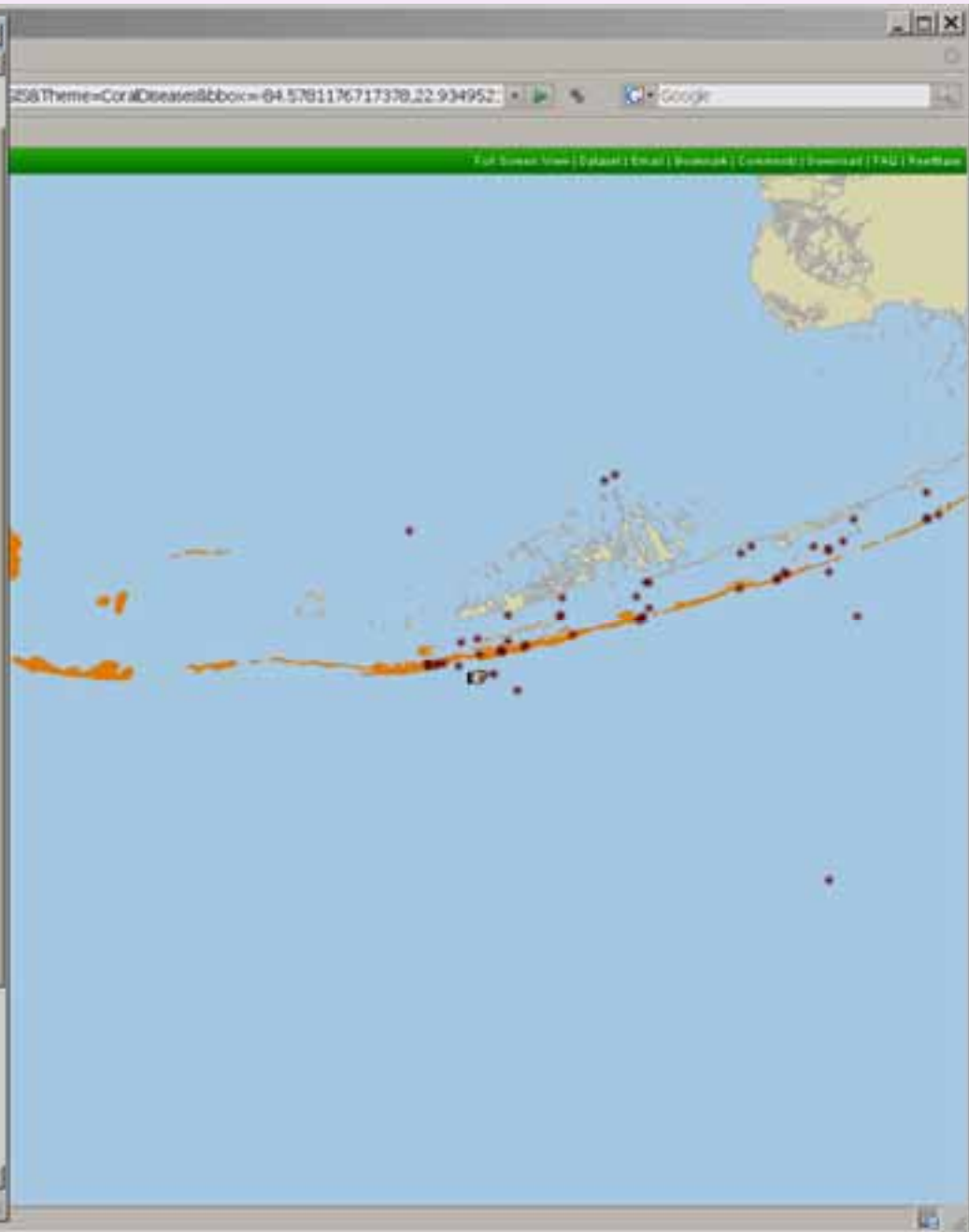
Florida and Bahamas reefs at risk

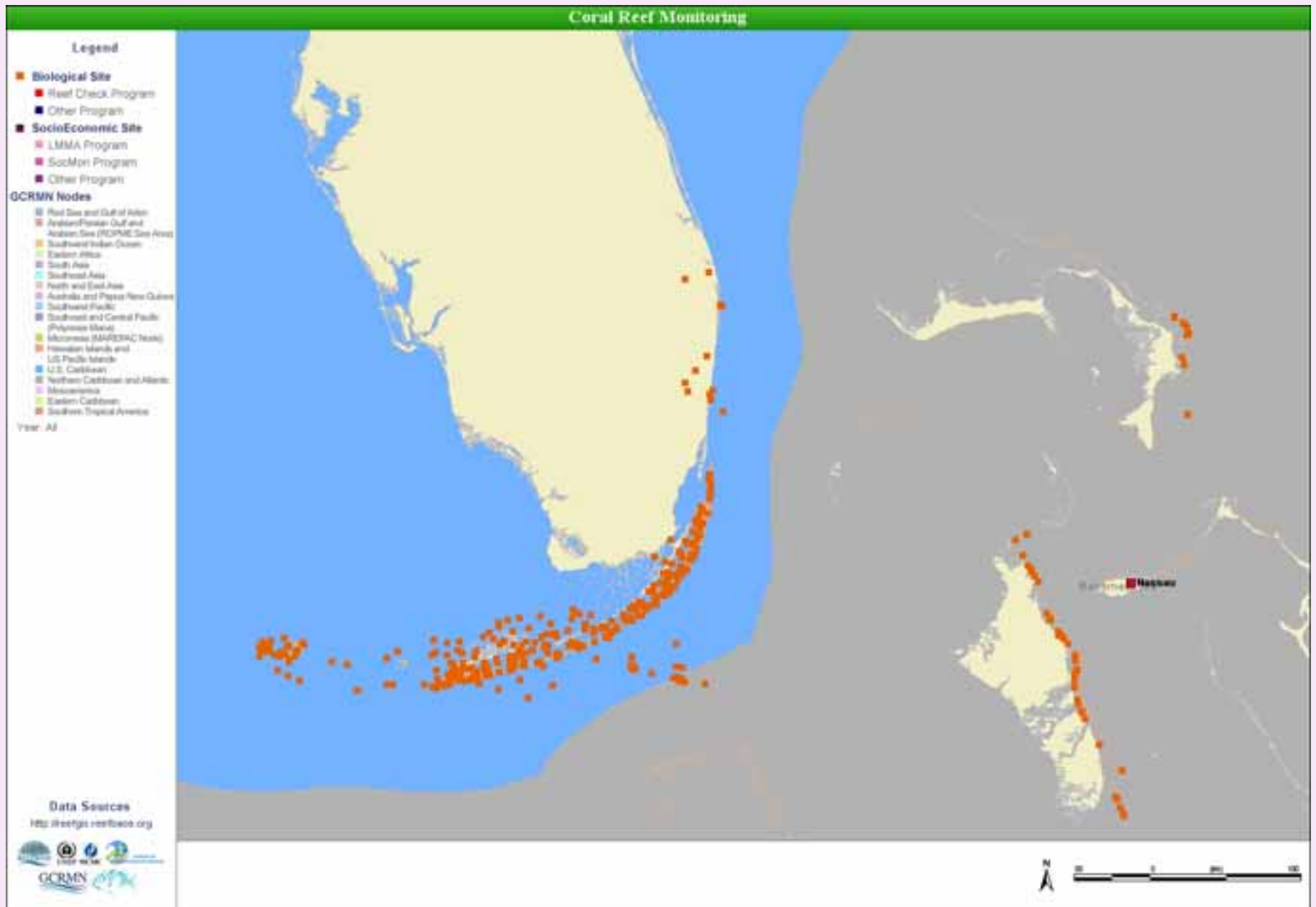
https://reefGIS.zooxbase.org - ReefGIS Query Info - Mozilla Firefox

Hide all 4 records

No.	Location
1	Key West, Florida (USA)
Disease	Red-band disease
Year	
Location	Key West, Florida (USA)
Latitude	24.4333
Longitude	-81.7333
Species	<i>Ourgonia verticaria</i>
Scale	Many (50+) colonies
Notes	no record
Source	p. 55-68. In: H.A. Lessios and I.O. Macintyre (eds.) Proceedings of the 8th International Coral Reef Symposium Vol. 1. Smithsonian Tropical Research Institute, Panama
Additional info	ReefBase
2	Key West, Florida (USA) (1980)
Disease	White line disease
Year	1980
Location	Key West, Florida (USA)
Latitude	24.4333
Longitude	-81.7333
Species	<i>Montastrea</i> spp.
Scale	no record
Notes	no record
Source	
Additional info	ReefBase
3	Key West, Florida (USA) (1980)
Disease	White pox
Year	1980
Location	Key West, Florida (USA)
Latitude	24.4333
Longitude	-81.7333
Species	<i>Acropora</i> spp.
Scale	no record
Notes	Severe (>50%) mortality
Source	SCIENCE, 1986, Vol. 274, p.2017.
Additional info	ReefBase
4	Key West, Florida (USA) (1980)
Disease	White plague type II
Year	1980
Location	Key West, Florida (USA)

Done





Florida and Bahamas monitored reefs

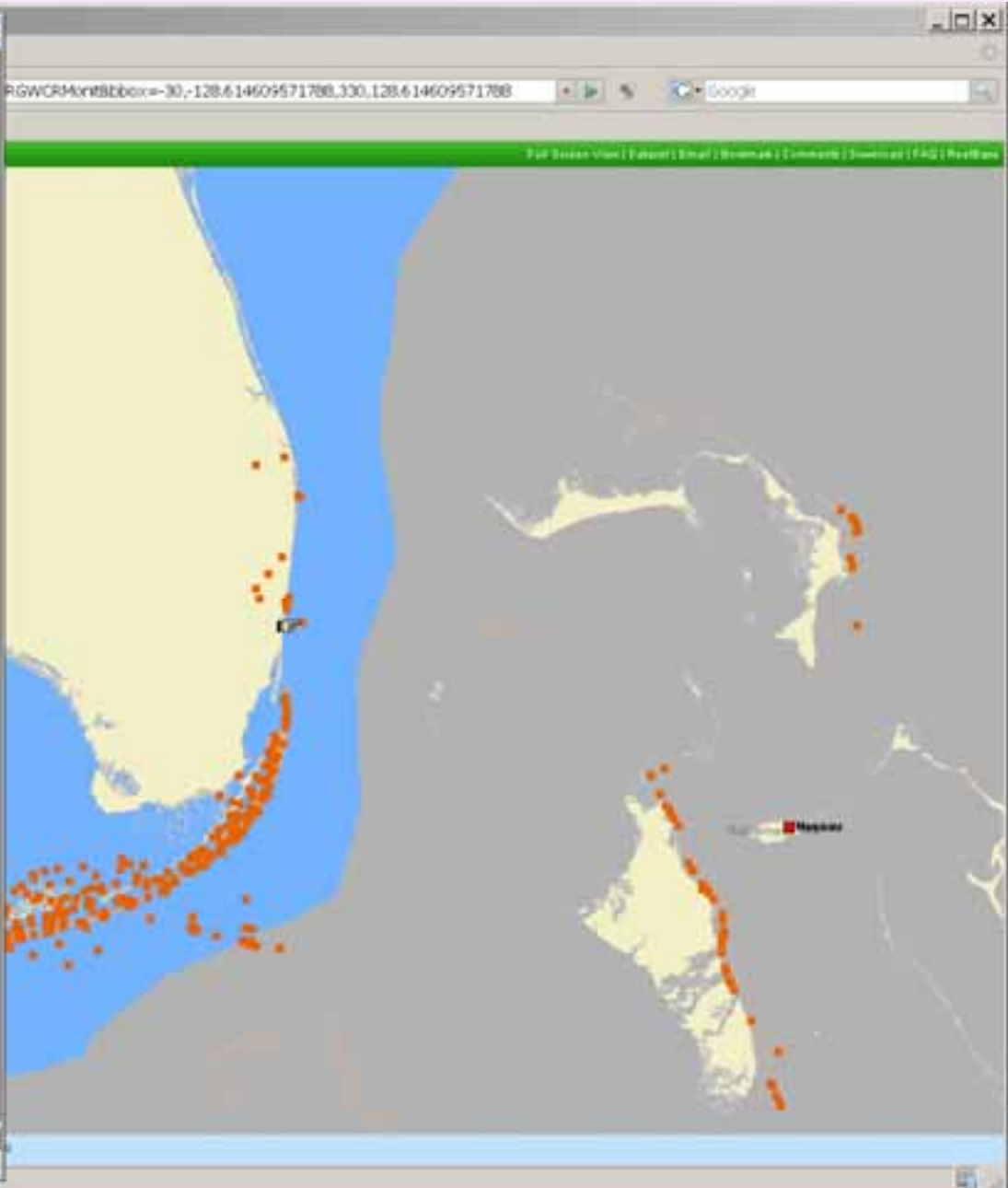
http://reefinfo.reefbase.org - ReefGIS Query Info - 13008...
Identified Layer: Monitoring Sites

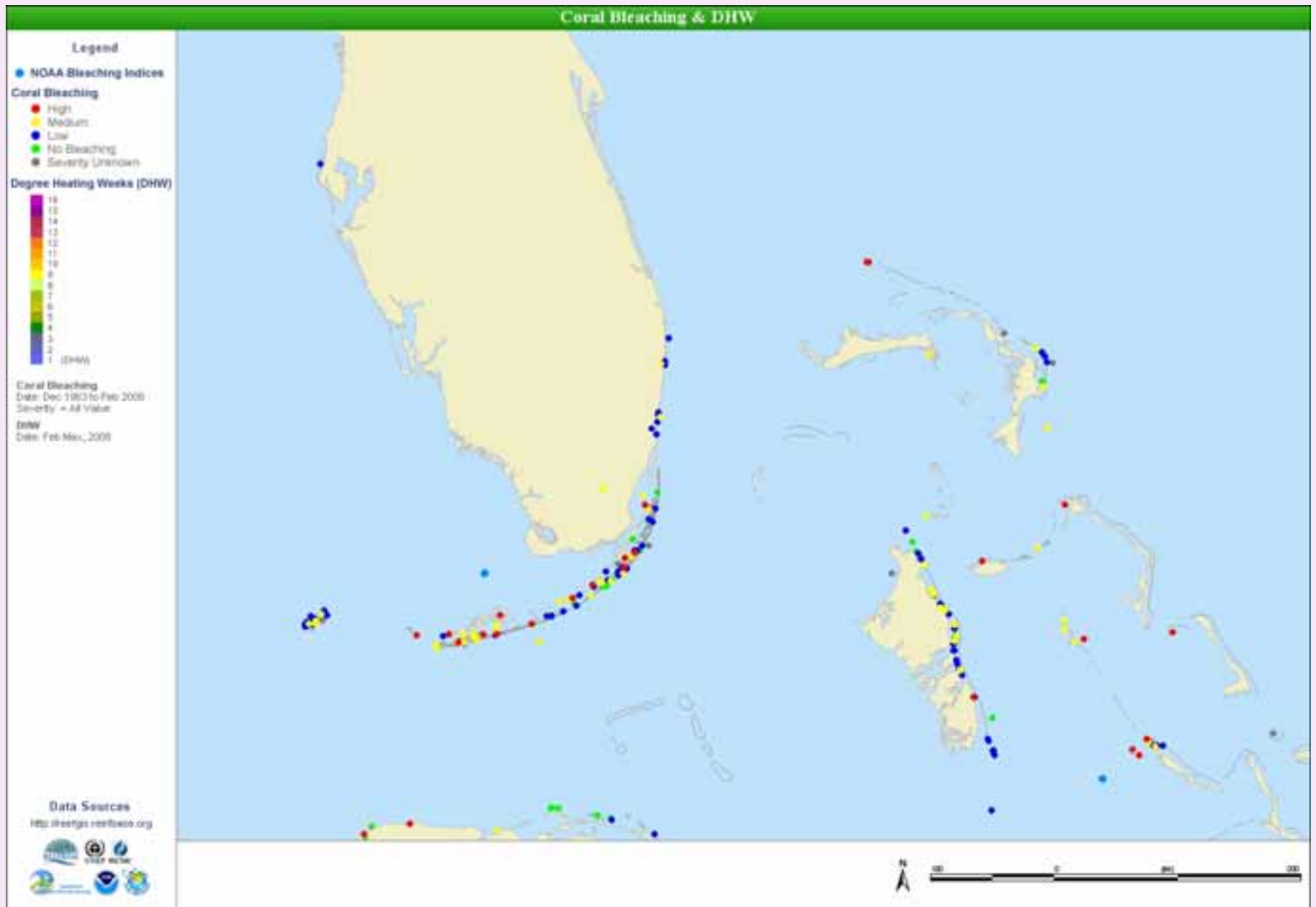
Monitoring Sites

No.	Location
1	Barracuda Reef, Florida (USA)

Program: Reef Check
Type: Biological
Location: Barracuda Reef, Florida (USA)
Latitude: 26.0744724273682
Longitude: -80.0095555555556
Depth:
Year: 3/19/2001
About: Reef Check was founded in 1998 to answer the question: "What is the health of the world's reefs?" To do this on a global scale, a simple, rapid monitoring program was designed that relies on volunteers, trained and led by marine scientists. The goal was to train volunteers to collect scientifically valid data on reef health. The Reef Check concept is to create an international network of regional, national and local volunteer coordinators who are responsible for Reef Check activities in their area. The coordinators raise funds, organize media events and match teams of divers with marine scientists who provide training and lead the teams during the actual surveys. Reef Check is the largest international coral reef monitoring program involving recreational divers and marine scientists.
Contact: Gregor Hodgson, gregorh@ucis.edu
Additional info: ReefBase

• We invite you to become part of a collaborative effort to assess reef monitoring activities around the world by filling out a Monitoring Questionnaire.





Florida and Bahamas coral bleaching

http://reef.gis.reefbase.org - ReefGIS Query Info - Map

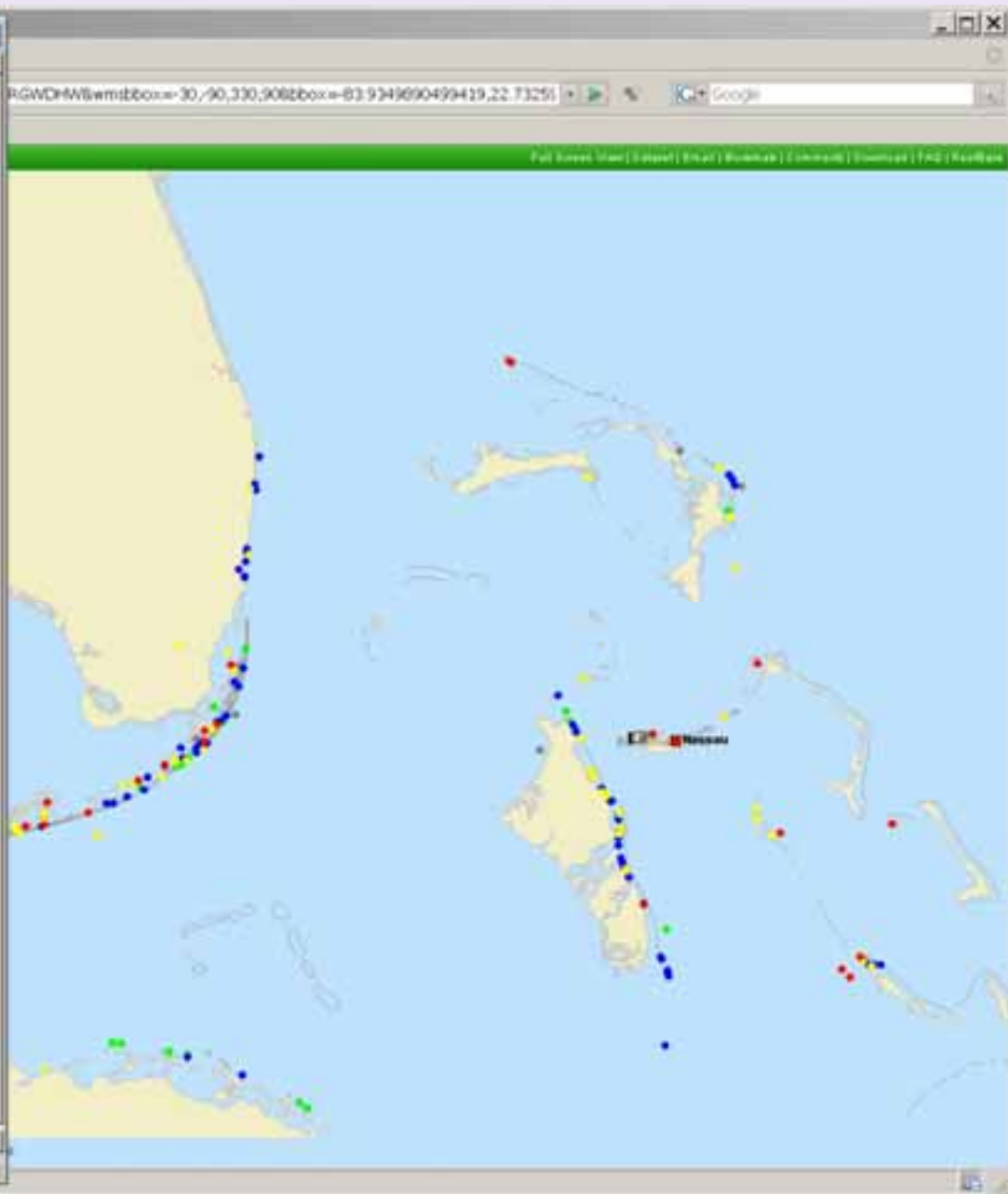
Close

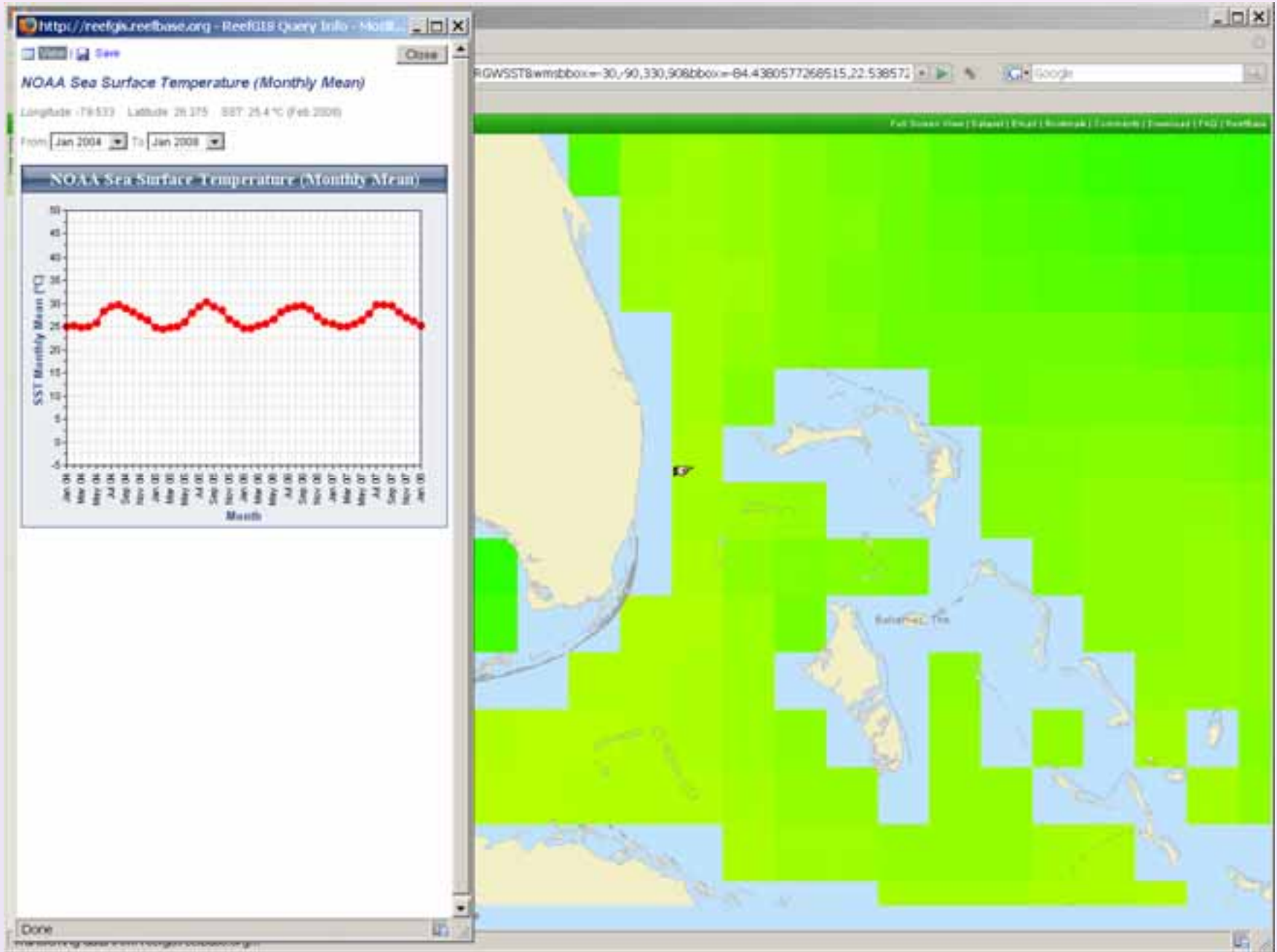
Coral Bleaching

Show all 2 records

No.	Location
1	New Providence Island, Bahamas
Severity	HIGH
Notes	60% bleached
Date	August 1999 (Aug 99)
Location	New Providence Island, Bahamas
Latitude	26.5851
Longitude	-77.4737
Depth	15-20
Duration	
Percentage	
Species	Not Montastrea cavernosa
Mortality	
Recovery	
Source	Wilkinson, http://coral.aoml.noaa.gov/bulletin/bleaching.html Close
Additional info	ReefBase
	<ul style="list-style-type: none">Fill out a bleaching report and become part of an international initiative to monitor this important phenomenon
2	New Providence, Bahamas

Done





Sea surface temperatures SST

http://reefGIS.reefbase.org - ReefGIS Query Info - Map...

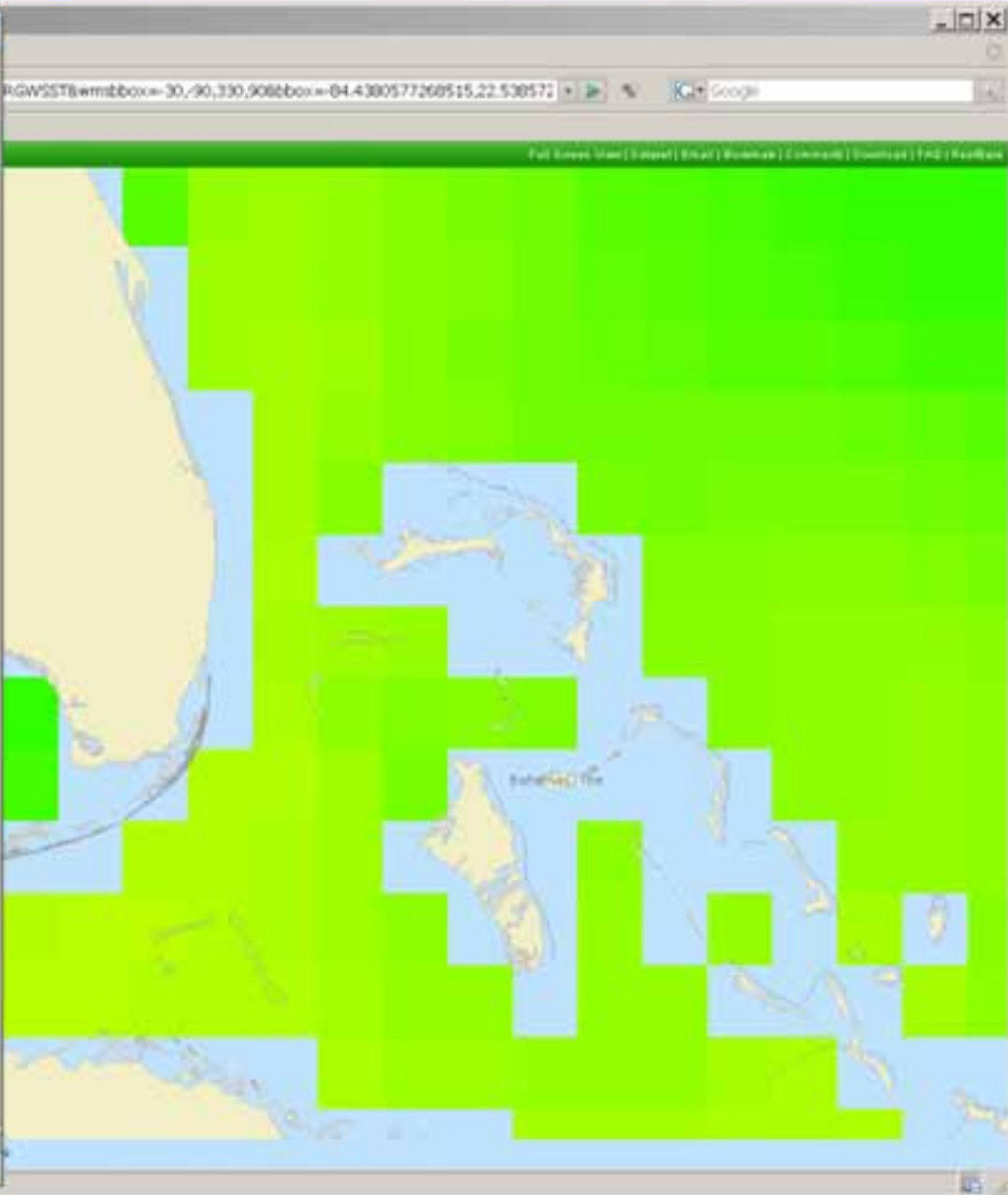
View | Edit | Close

NOAA Sea Surface Temperature (Monthly Mean)

File Format

- Microsoft Excel (*.XLS)
- Microsoft Word (*.DOC)
- Comma Separated Values (*.CSV)
- Tabi Delimited (*.TXT)
- HTML (*.HTML)
- Graph (*.GIF)

Done



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Much of the datasets in ReefBase can be downloaded here. Datasets are provided either by country or by theme.

Country Datasets

Country datasets are zip-files containing all available data for individual countries (i.e. coastline, mpa's, coral bleaching etc.). These datasets are available in GIS, Excel, and Text formats, as well as a Data License and Data Description file.

Thematic Datasets

Thematic datasets contain all records for a specific topic (i.e. coral bleaching, monitoring, mpa's, etc.) for the entire world or by region, and are available in GIS, Excel, and Text formats. These zip files also contain a Data License and Data Description file.

Please make your selection below and click the "Download" button.

Note: Use of this data is subject to the terms and conditions outlined in the ReefBase Data License.

Download By: **Country** Theme

Download Data By Country

1. Select Country

Country datasets contain all available information (i.e. all thematic layers) for a particular country in GIS (shapefile), XLS, and TXT format.

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You may use these datasets for non-commercial purposes, including research, education, presentations, and non-commercial publications.

Conclusion

This study of ReefBase is meant to demonstrate that GIS plays an integral role in defending coral reefs from climate change and other threats while providing the collective tool to integrate multifaceted data and transform them into a meaningful medium for informed decision-making.



Green moray eel

Reefs At Risk data provided by World Resources Institute (WRI)

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Fax: +60 (0)4 626-5530

Email: reefbase@cgiar.org

Website: <http://www.reefbase.org>

Images courtesy of the NOAA Photo Gallery

<http://www.photolib.noaa.gov/reef/>





11th  **International**
Coral Reef
SYMPOSIUM Fort Lauderdale, Florida, USA
July 7-11, 2008

