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

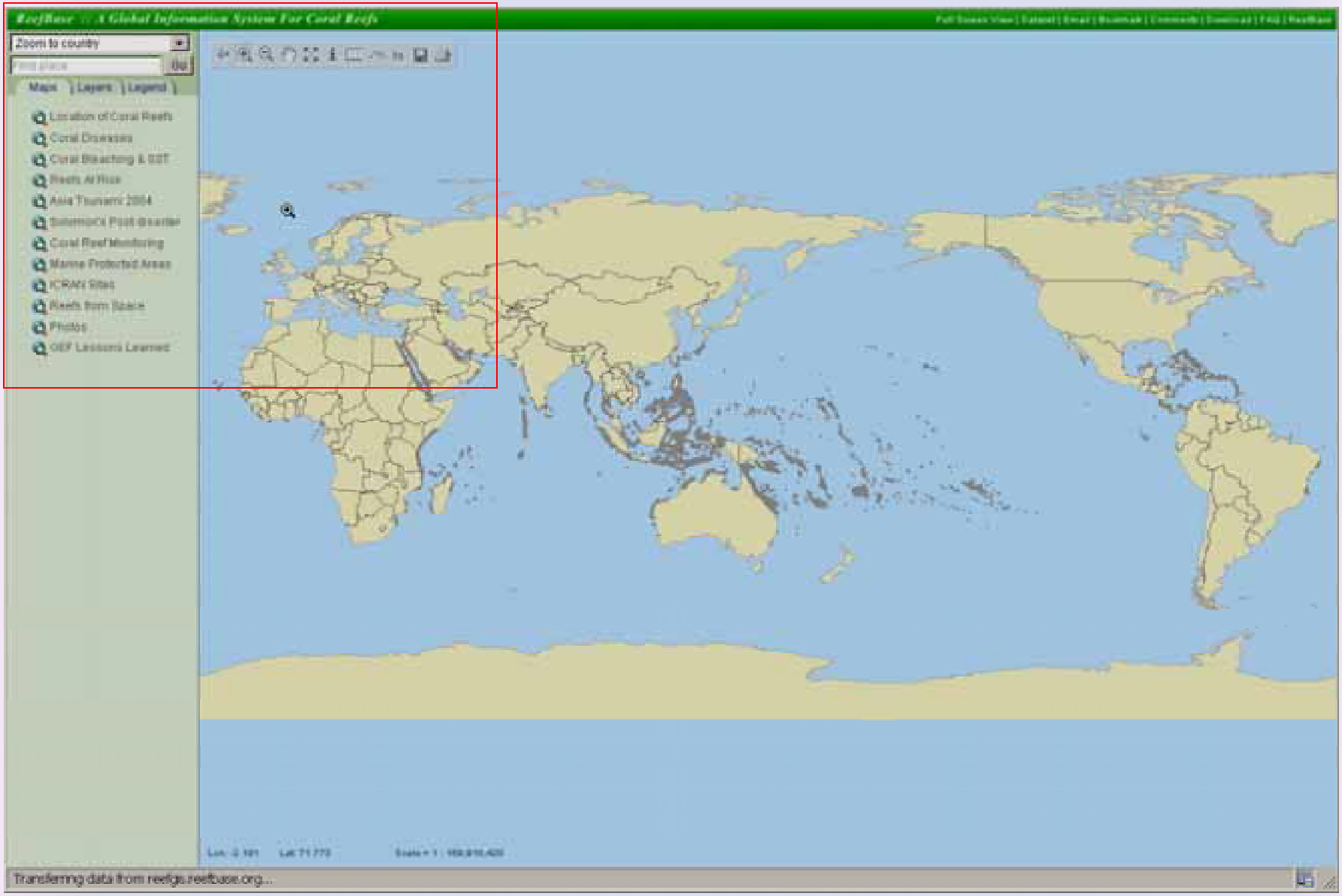
Collaborate with other national, regional, and international databases, and GIS facilities relating to reefs, and provide a means of comparing and interpreting information at the global level.

Horse conch in sand and coral rubble

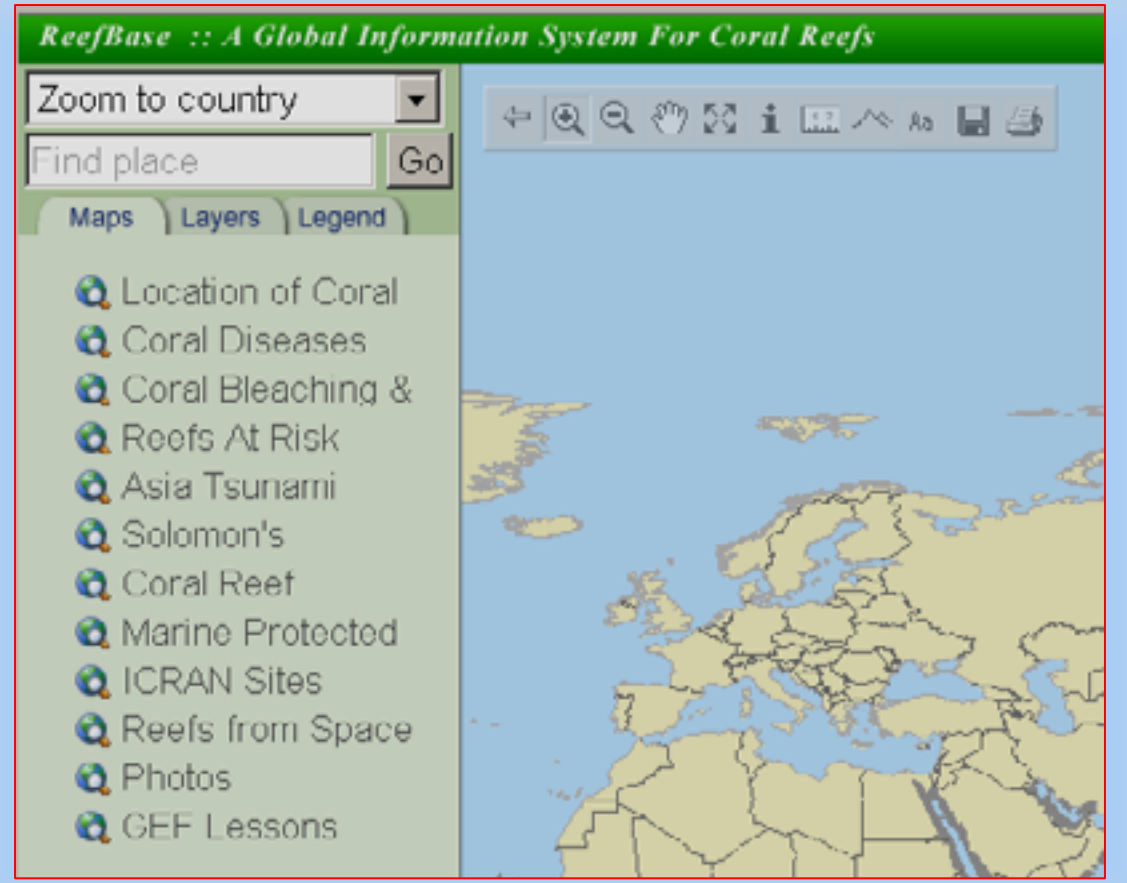
ReefBase Objectives

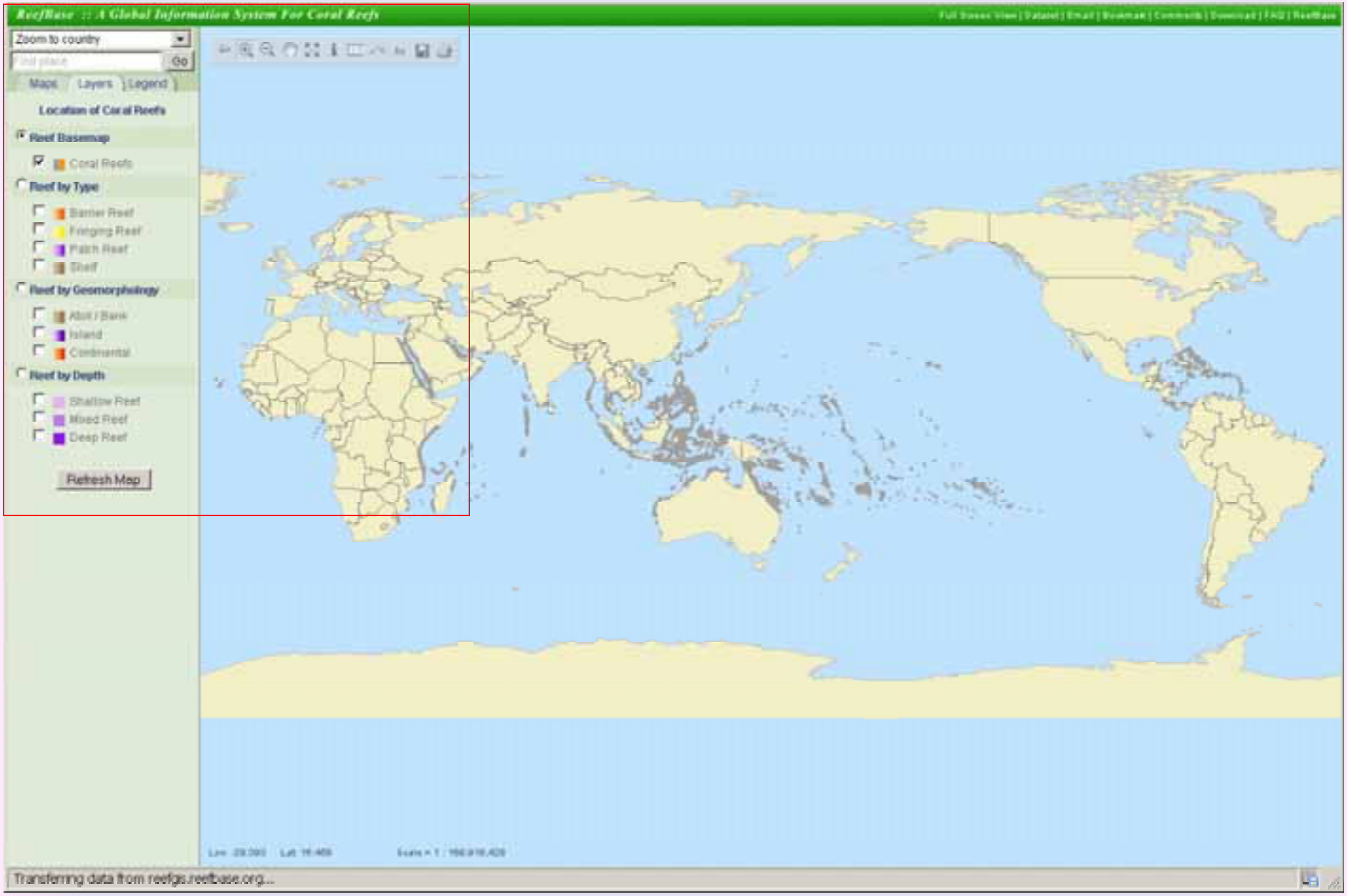
Define criteria for reef health and use them to refine procedures for coral reef assessments and to determine coral reef status at the regional and global level. And examine the relationships among coral reef health, fishery production, and the quality of life of people dependent on reefs.

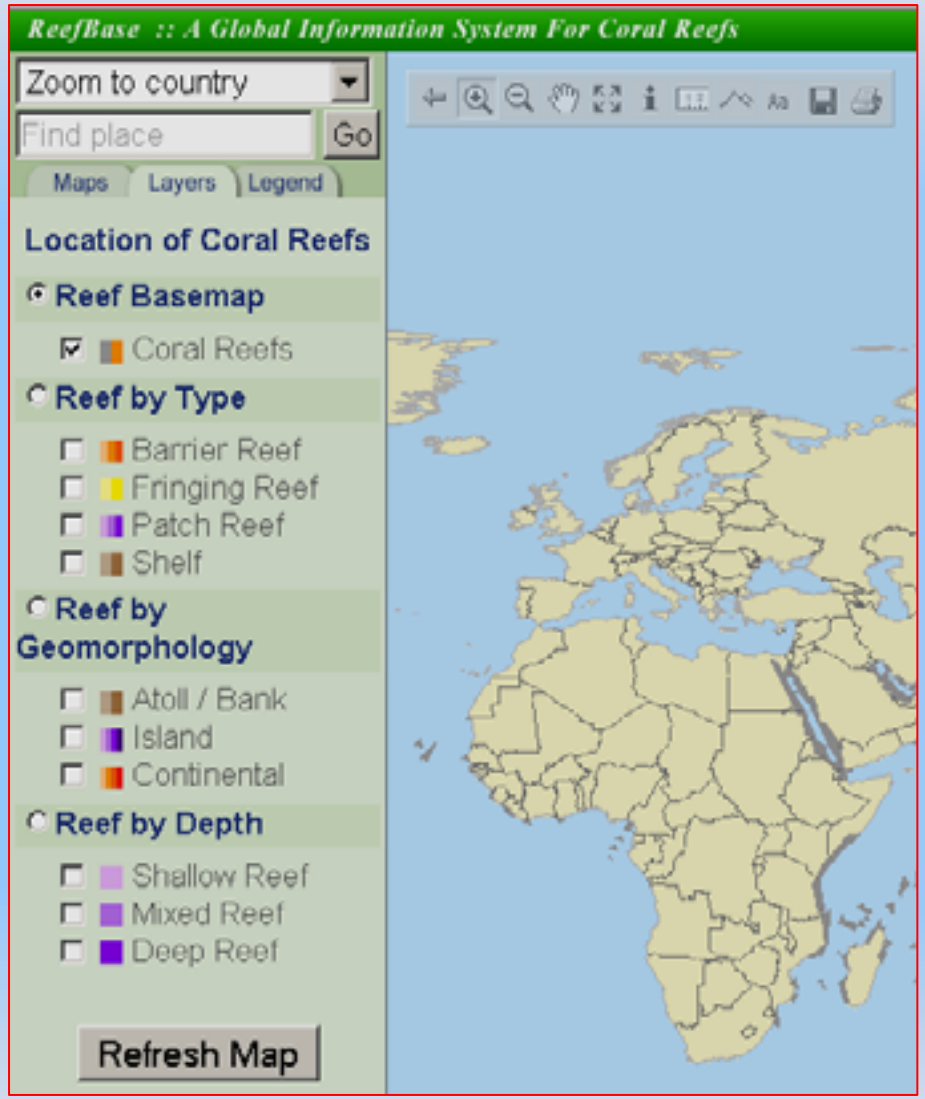
Two four-eyed butterfly fish in the Keys



ReefBase GIS Base Map


ReefBase :: A Global Information System For Coral Reefs
Zoom to country
Find place
Go
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


ReefBase :: A Global Information System For Coral Reefs
Zoom to country
Go
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
Refresh Map
Transferring data from reefgis.reefbase.org...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Location of Coral Reefs
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Shelf
Reef by Geomorphology
Atoll / Bank
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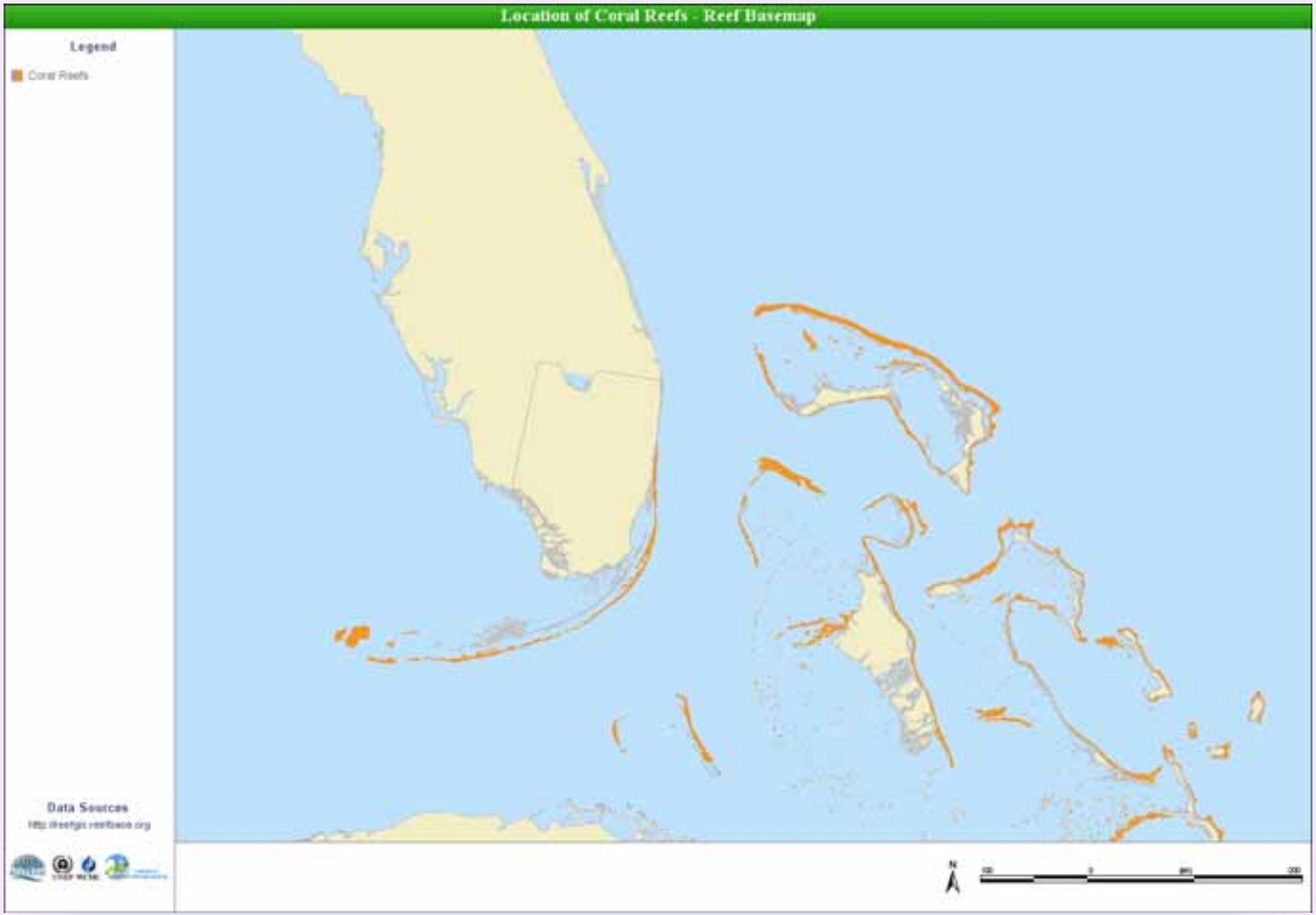
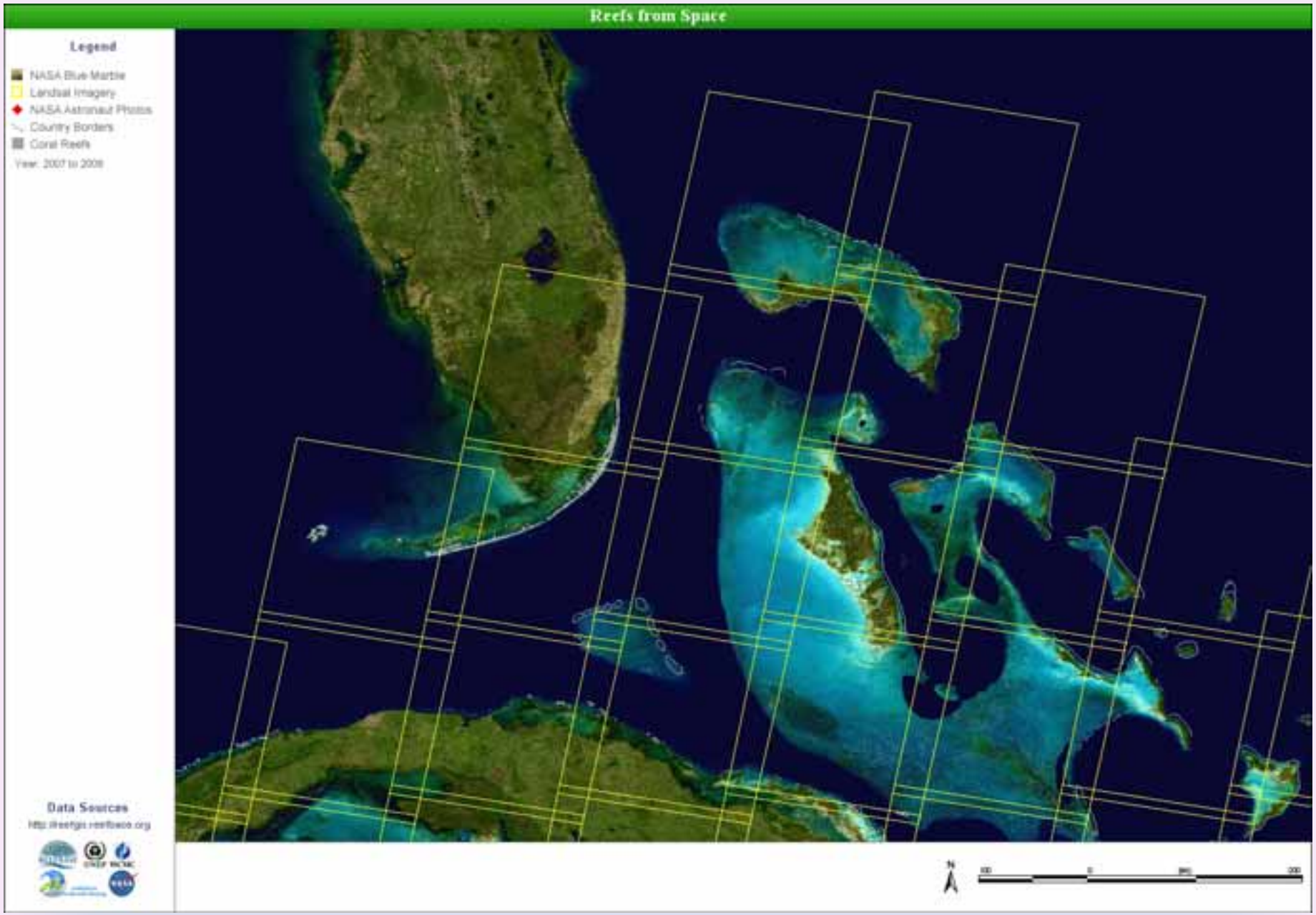
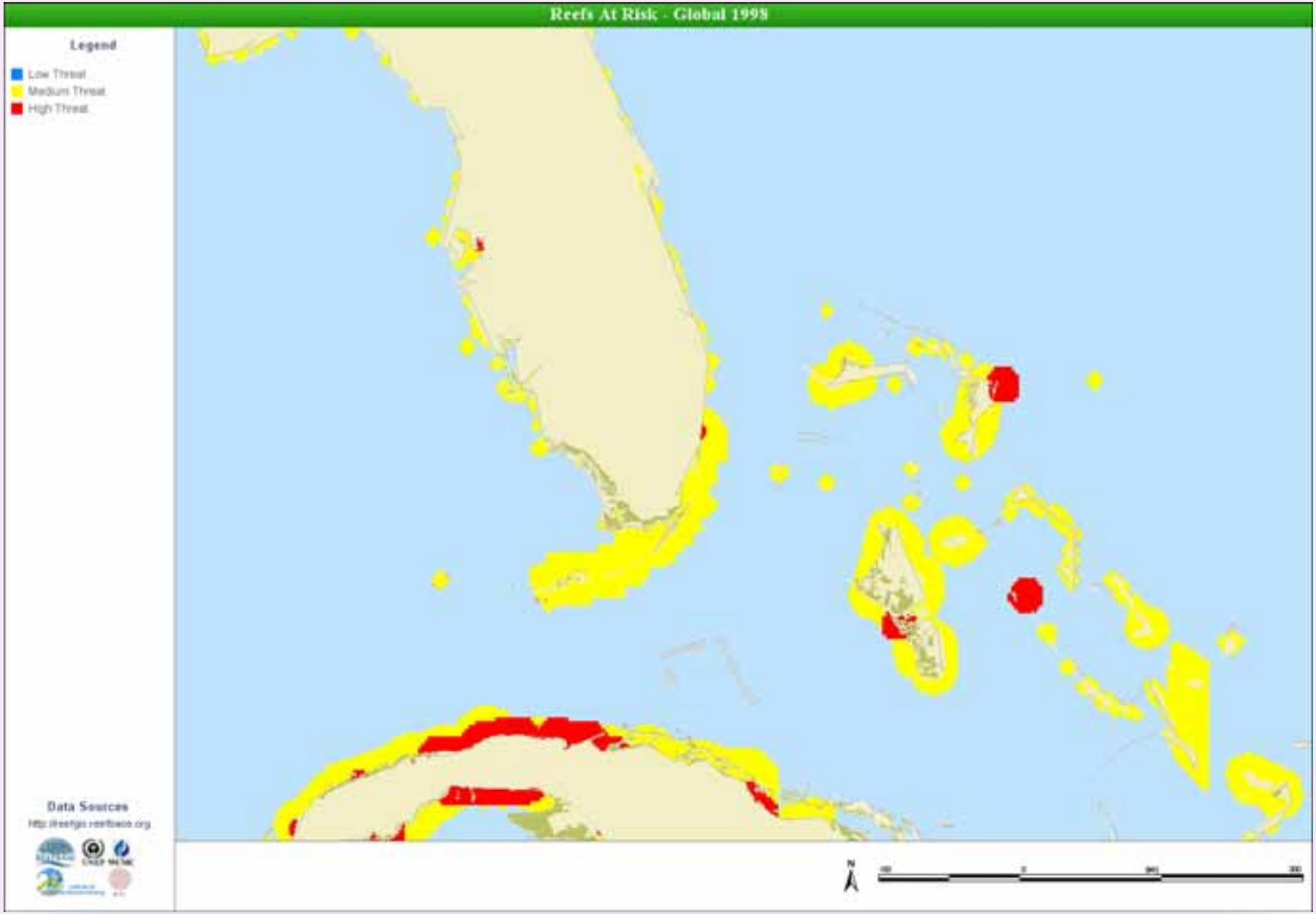
Reef by Depth
Shallow Reef
Mixed Reef
Deep Reef
Refresh Map



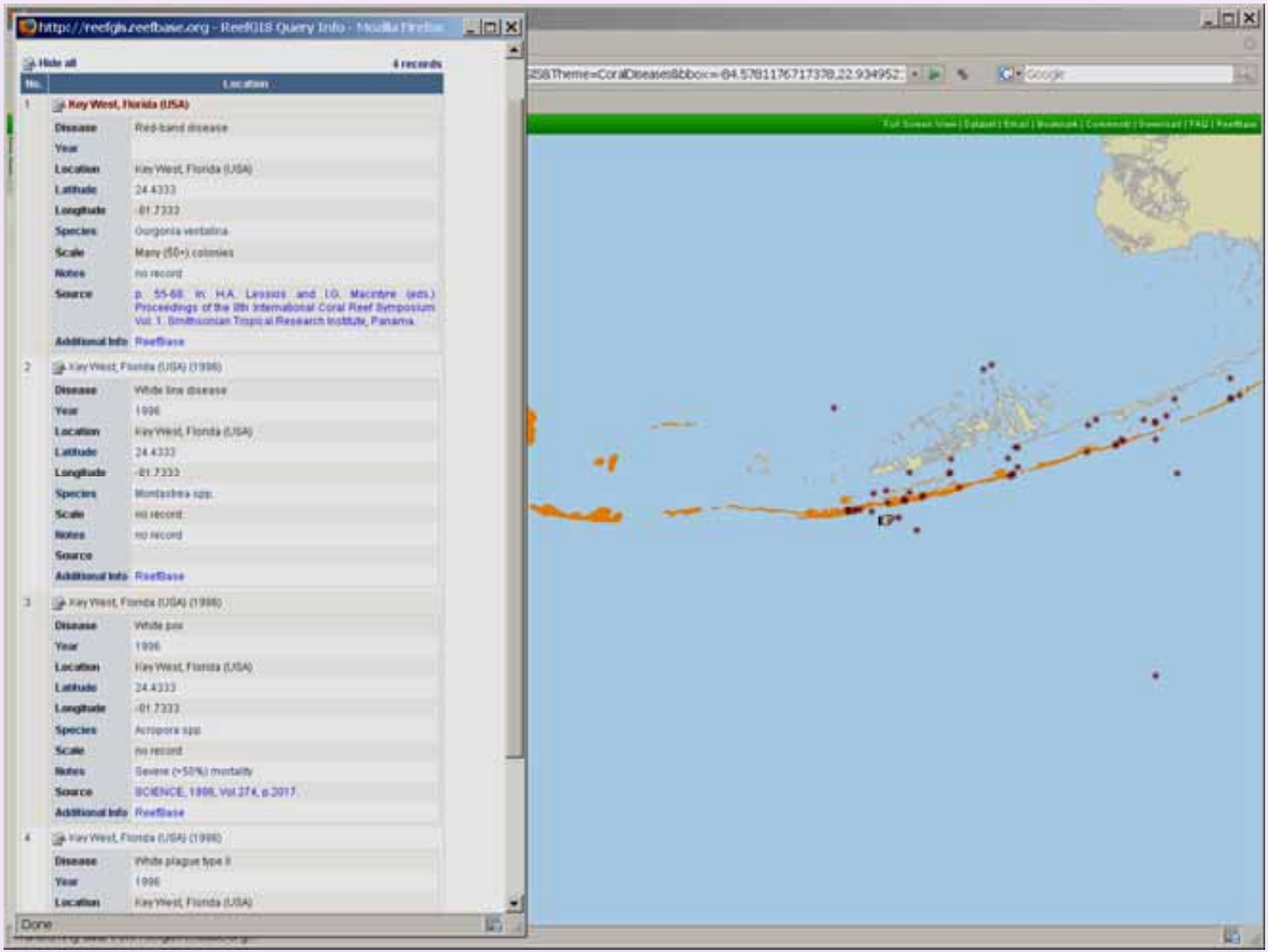
Florida and Bahamas coral reef locations

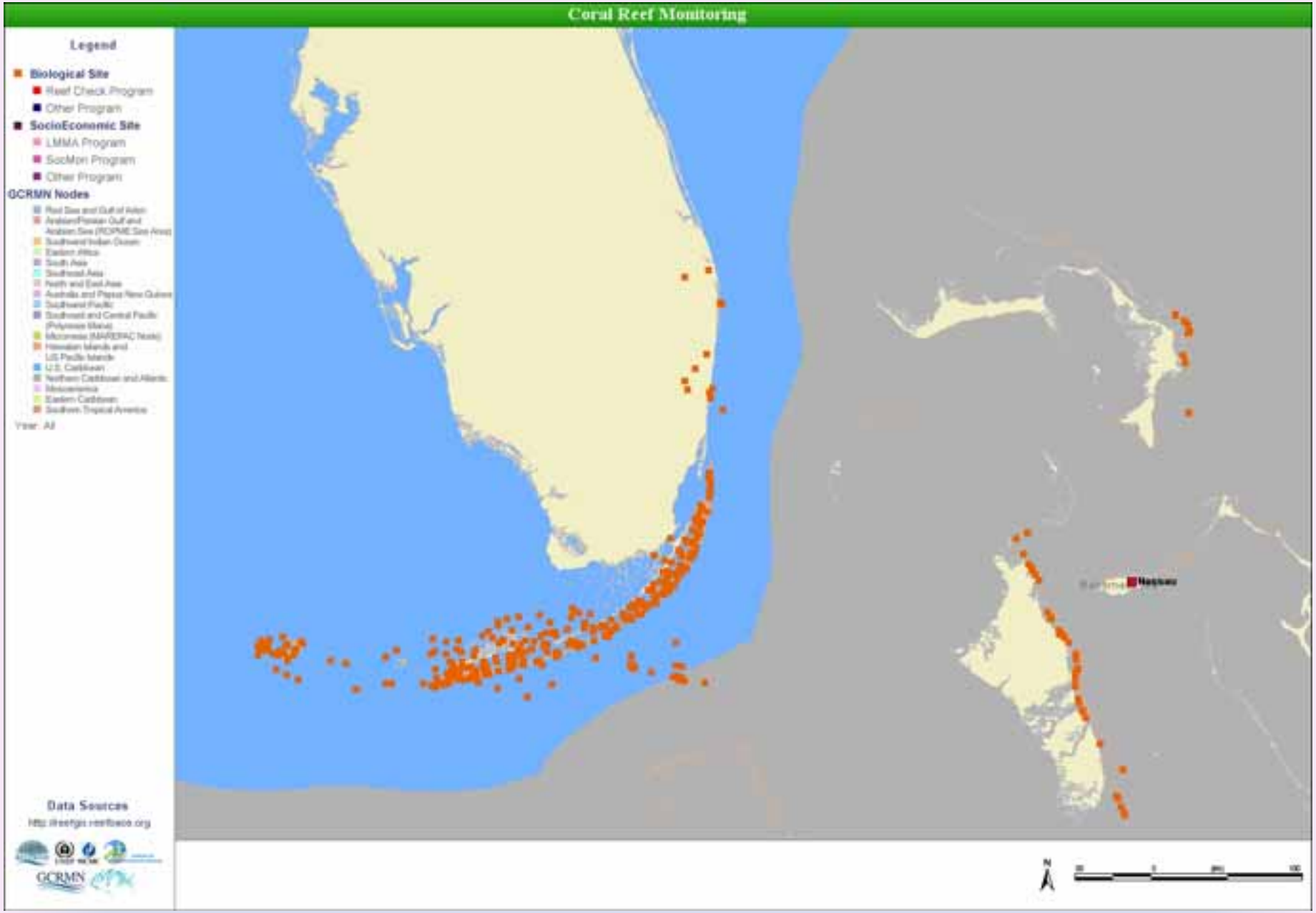


Florida and Bahamas reefs from space

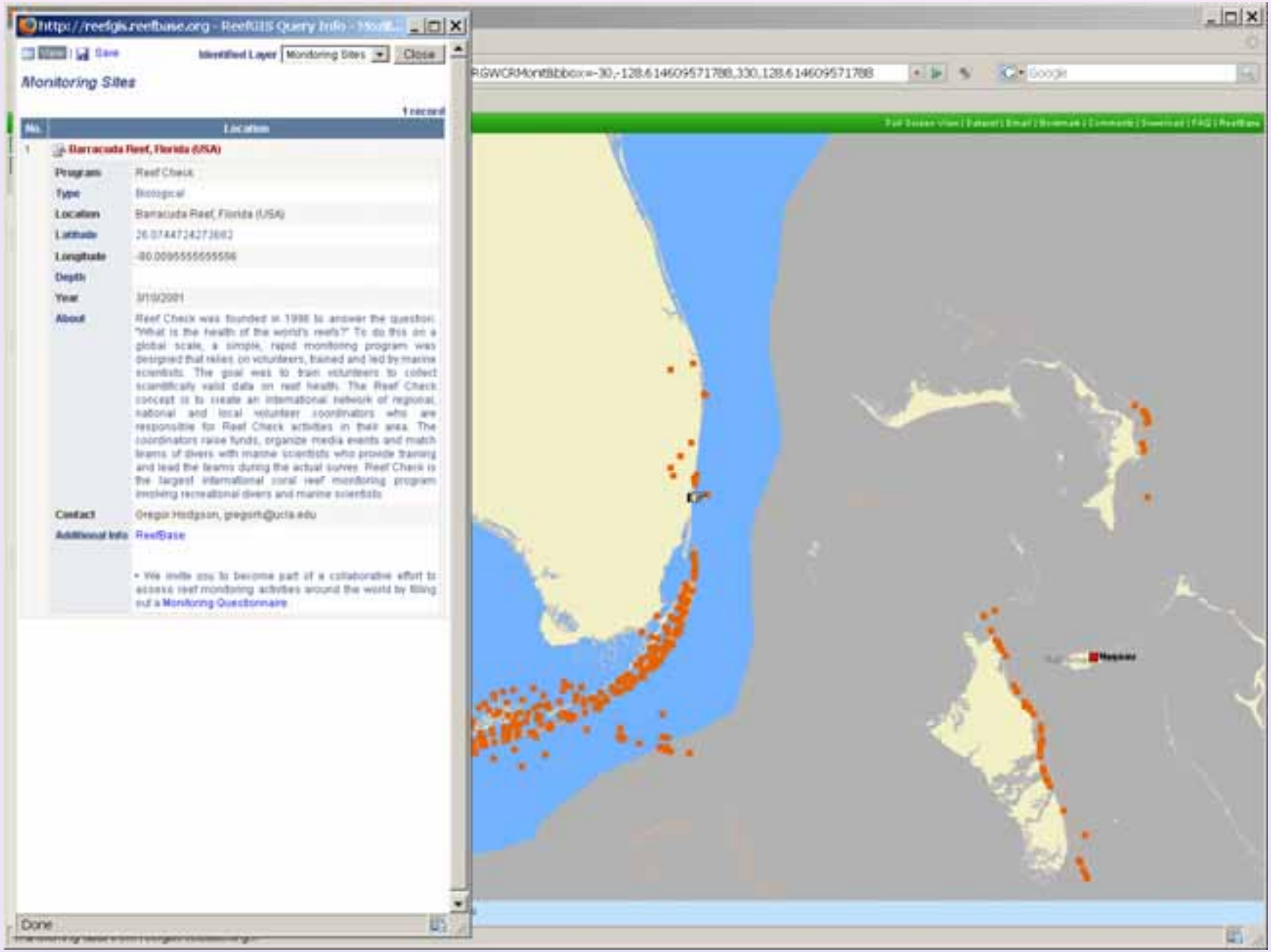


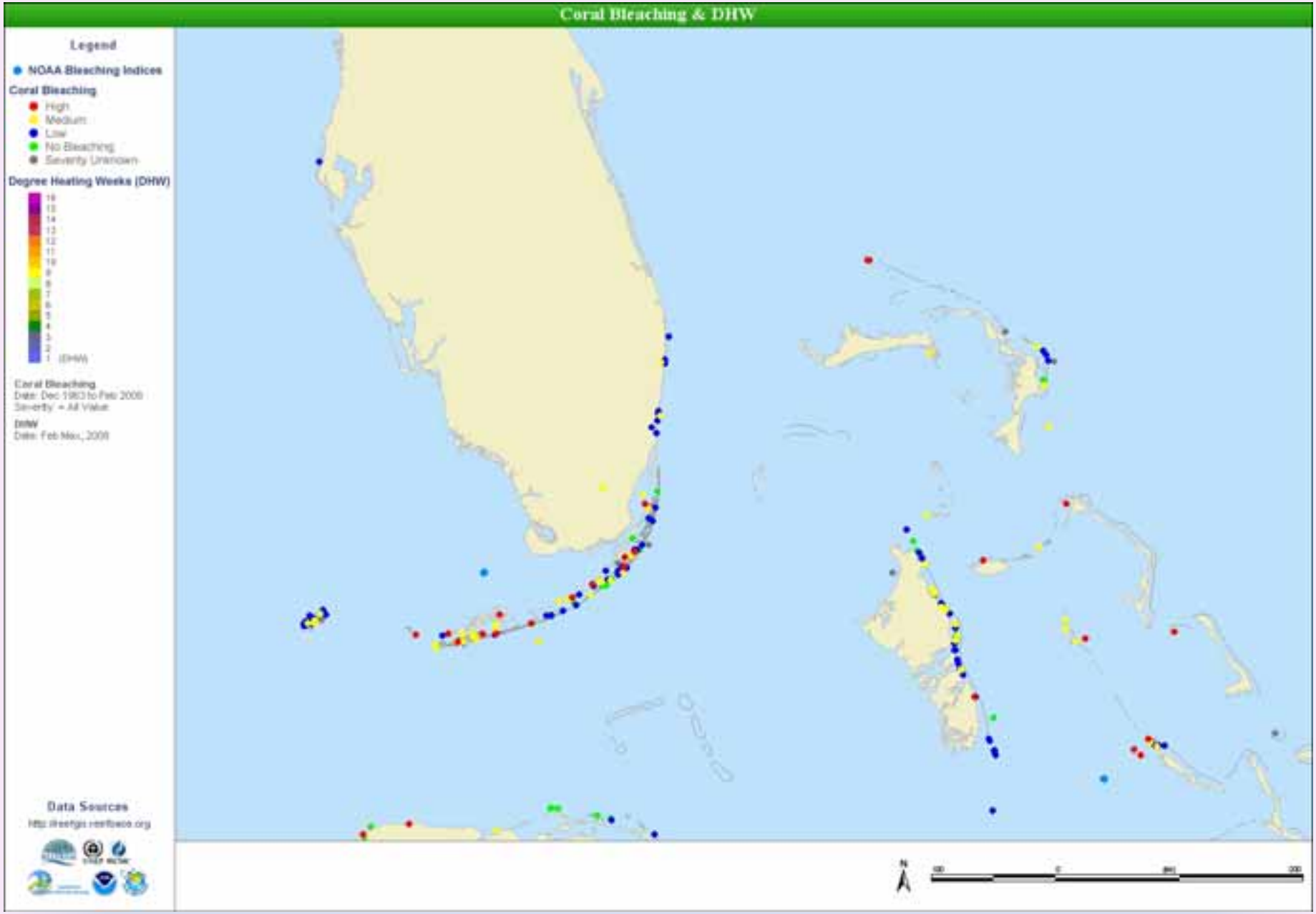
Florida and Bahamas reefs at risk


https://reefgis.reefbase.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
Gorgonia ventalina
Scale
Many (50+) colonies
Notes
no record
Source
p. 55-68. In: H.A. Lessios and I.G. Macintire (eds.) Proceedings of the 8th International Coral Reef Symposium Vol. 1. Smithsonian Tropical Research Institute, Panama.
Additional Info
ReefBase
2
Key West, Florida (USA) (1998)
Disease
White line disease
Year
1998
Location
Key West, Florida (USA)
Latitude
24.4333
Longitude
-81.7333
Species
Montastrea spp.
Scale
no record
Notes
no record
Source
Additional Info
ReefBase
3
Key West, Florida (USA) (1998)
Disease
White pox
Year
1998
Location
Key West, Florida (USA)
Latitude
24.4333
Longitude
-81.7333
Species
Acropora spp.
Scale
no record
Notes
Severe (>50%) mortality
Source
SCIENCE, 1999, Vol.274, p.2017.
Additional Info
ReefBase
4
Key West, Florida (USA) (1998)
Disease
White plague type II
Year
1998
Location
Key West, Florida (USA)
Done
Google

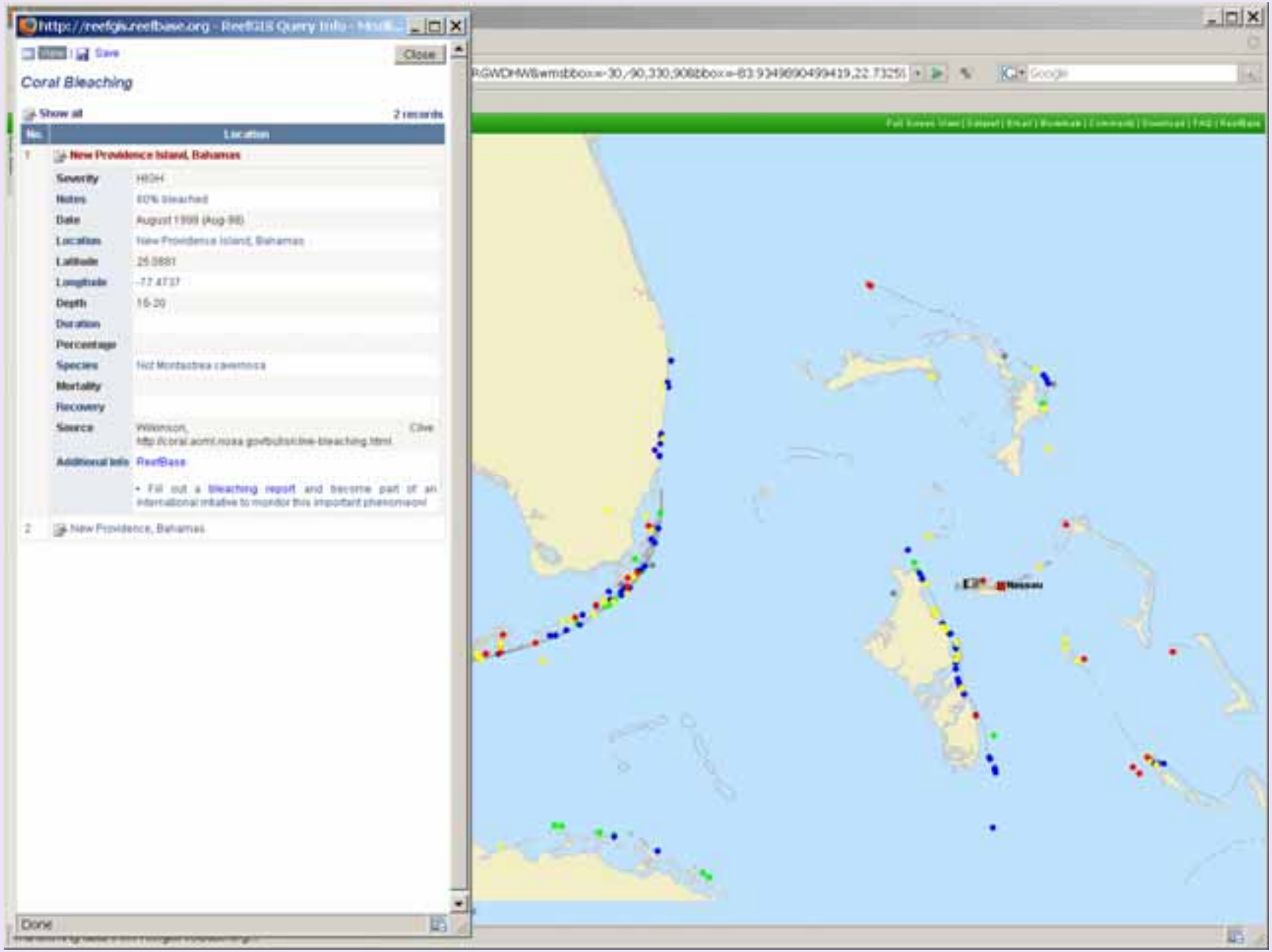


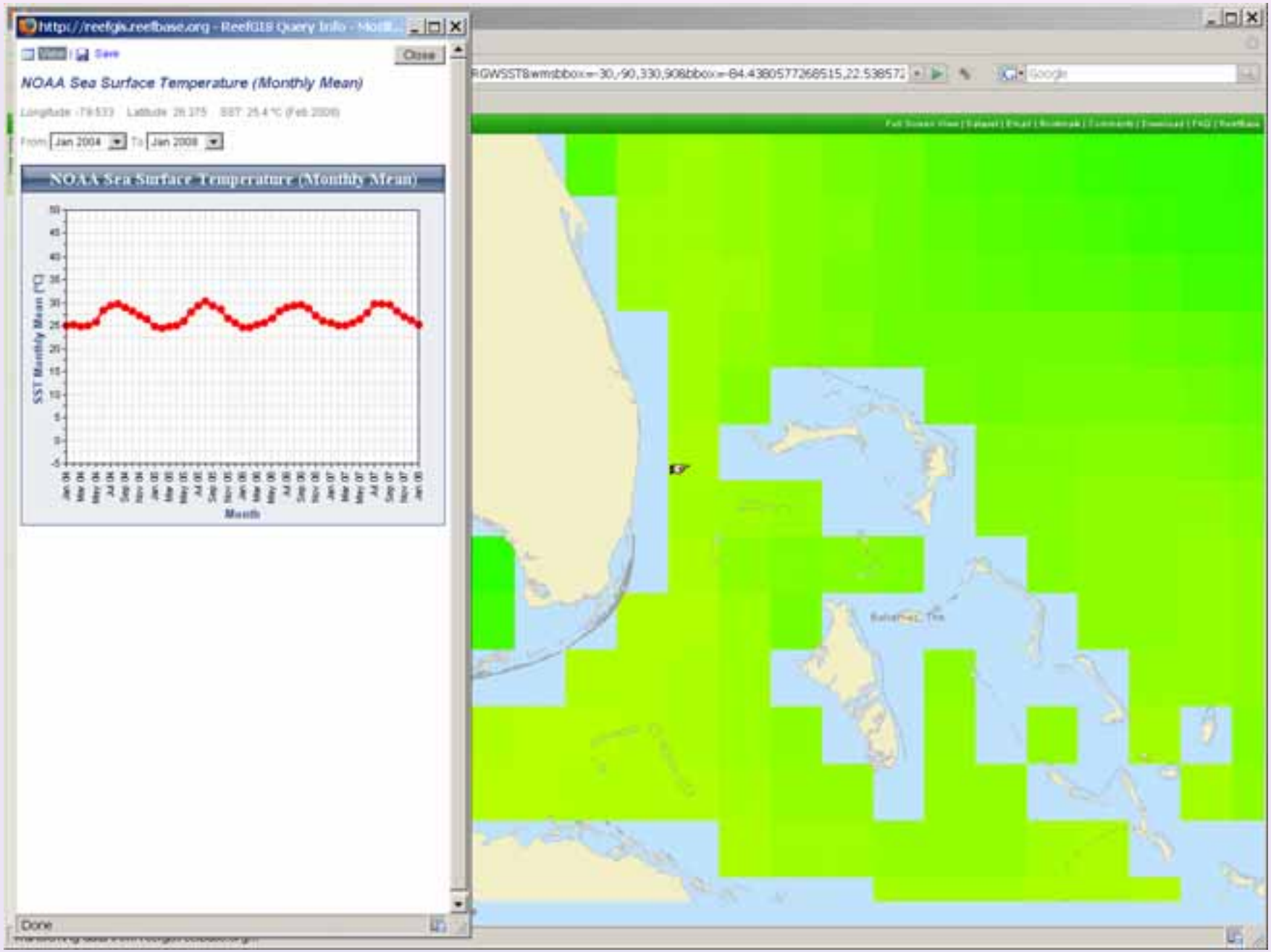
Florida and Bahamas monitored reefs


Monitoring Sites
Barracuda Reef, Florida (USA)
Program
Reef Check
Type
Biological
Location
Barracuda Reef, Florida (USA)
Latitude
Longitude
Depth
Year
About
Reef Check was founded in 1996 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 survey. Reef Check is the largest international coral reef monitoring program involving recreational divers and marine scientists.
Contact
Gregor Hodgson, gregorh@ucla.edu
Additional Info
ReefBase
Monitoring Questionnaire
Done

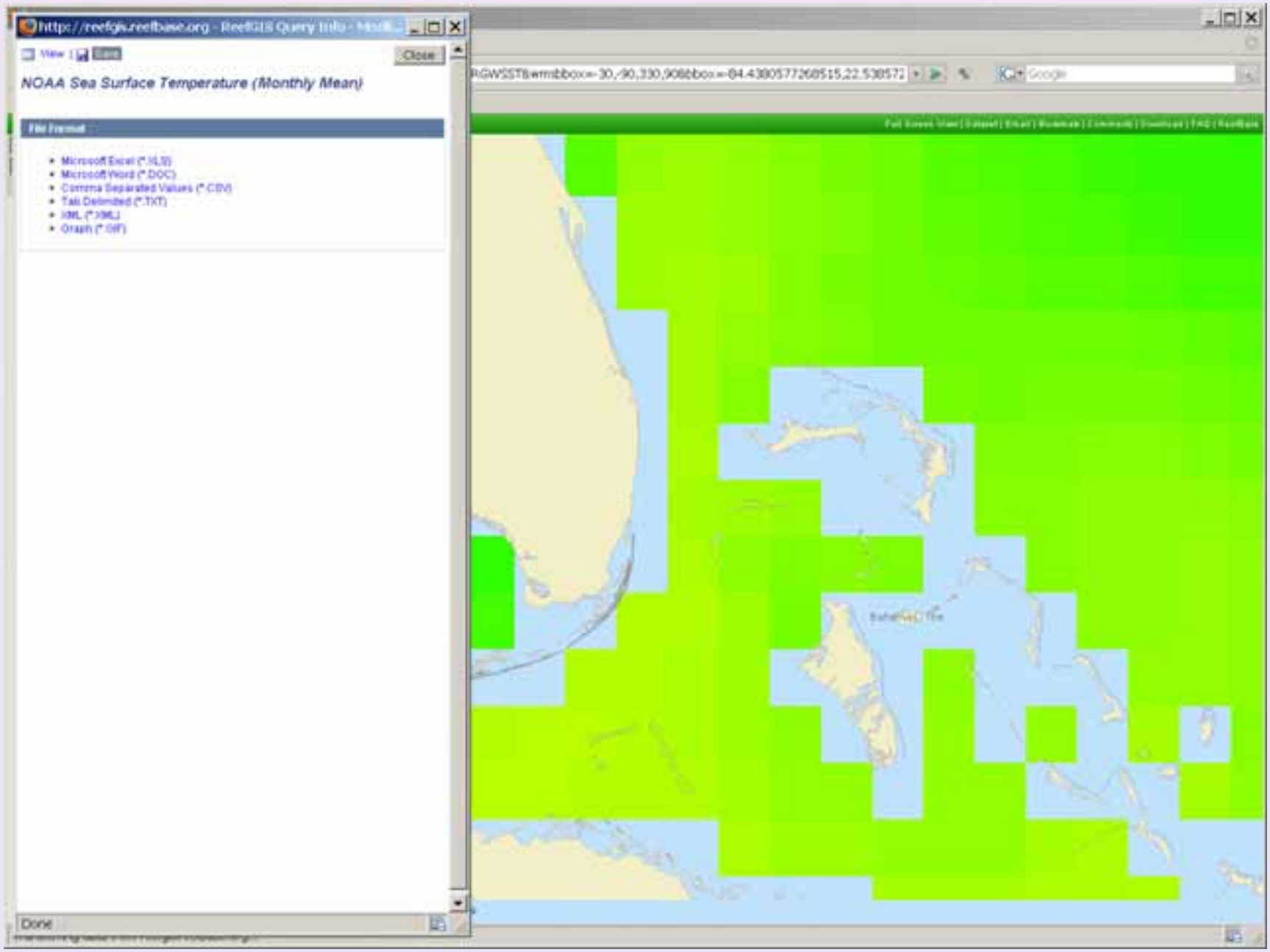


Florida and Bahamas coral bleaching


Coral Bleaching
Show all
2 records
No.
Location
New Providence Island, Bahamas
Severity
HIGH
Notes
60% bleached
Date
August 1998 (Aug 98)
Location
New Providence Island, Bahamas
Latitude
25.0881
Longitude
-77.4737
Depth
15-20
Duration
Percentage
Species
Mortality
Recovery
Source
Wilkinson,
Additional Info
ReefBase
• Fill out a bleaching report and become part of an
New Providence, Bahamas
Close
Done
Nassau



Sea surface temperatures SST


NOAA Sea Surface Temperature (Monthly Mean)
Close
Done

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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Email: reefbase@cgiar.org
Website: http://www.reefbase.org

Images courtesy of the NOAA Photo Gallery
http://www.photolib.noaa.gov/reef/

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