The National Coral Reef Institute was established by Congressional mandate in 1998. NCRI's primary objective is the assessment, monitoring, and restoration of coral reefs through basic and applied research and through training and education. NCRI operates at the Nova Southeastern University Oceanographic Center near Ft. Lauderdale, Florida.
Remote Sensing of Coral Reef

Coral reefs and their associated communities cover an estimated 600,000 square kilometers, mostly between the Tropic of Capricorn and the Tropic of Cancer. Coral reefs represent less than 0.2 percent of the total area of oceans. They occur at depths of up to 30 feet, and cover about 30% of the earth’s coastline.

Radar View Of Bora Bora
Coral Reef Formation

Blowing in the Wind: “Our primary reason for this study is to address one of the old chestnuts in coral reef science,” says Hatcher. He explains that one of the ways in which atolls form is the result of a change in sea level. Atolls begin as fringing reefs surrounding a volcanic island (Darwin 1842). Through the process of global warming, glacial melting and/or island subsidence, the level of the sea gradually rises relative to the seabed and water begins to overtake the island. Since most reef-building corals cannot grow easily at depths of more than 150 feet (45 m) below the ocean's surface, they will begin constructing their protective calcium carbonate encasements on top of one another at a rate fast enough to keep up with the sea level rise.

http://earthobservatory.nasa.gov/Study/Maldives/maldives2.html

Another factor influencing atoll growth is the flow of water around the reefs. For example, prevailing winds can agitate water on one side of an island, stimulating coral growth. (Red arrows in the image above indicate the prevailing wind direction.) On the lee side of the island the coral do not receive as many nutrients, resulting in slower growth and a thinner reef.

Coral Atoll And Volcanic Island

Maldives

Typical Structures Of Coral Reef Atolls
Ecosystem Functions And Services Of The Coral Reef

1. Sequesters calcium (Ca$^{2+}$ is a second messenger for most cell surface transduction signals)
2. Sequesters carbon (CaCO$_3$)
3. Maintains biodiversity of ocean life:
   - Reefs hold an estimated 4,000 species of fish and 800 species of reef-building corals; total number of species associated with reefs may be over one million!

Buffer Zones For The Coral Reef

1. Hammocks: Clumps Of Trees In The Everglades
2. Seagrass Meadow
3. Mangroves

Mangroves

Diversity, Diversity, Diversity
Nudibranchs On Parade!

Picasso Trigger Fish

Long-nose Hawk Fish

Cuttlefish
Crinoid

Coral Reefs Are Found In Nutrient-poor Warm Waters, So Why Are They So Productive?

... And Why Are Most Corals Green In Color?

Green Is The Color Of My True Coral Reef's Hair
Zooxanthellae are unicellular yellow-brown (dinoflagellate) algae which live symbiotically in the gastrodermis of reef-building corals. It is the nutrients supplied by the zooxanthellae that make it possible for the corals to grow and reproduce quickly enough to create reefs. Zooxanthellae provide the corals with food in the form of photosynthetic products. In turn, the coral provides protection and access to light for the zooxanthellae.

Because They Have An Intracellular Photosynthetic Symbiont

Without Grazers, The Coral Reef Would Soon Become Overwhelmed With Filamentous Algae

So Who Are The Grazers?

Grazers Of The Coral Reef

The Coral Reef Is A Battle Ground In Which Mixed Species Of Coral Fight For Space For The Same Reason That Tropical Trees Vie For the Canopy
Symbiotic Relationships

Cleaner Wrasse At Work
Wrasses comprise a large group of colorful cigar-shaped fishes. Some species are known as cleaners, and set up cleaning stations along the reef. When a larger fish aligns itself at one of these cleaning stations, a cleaner wrasse removes parasites from the fish.
Great Barrier Reef

The Great Barrier Reef contains at least 1500 species of fish, 350 types of hard coral and 5000 varieties of molluscs.

Six of the world's seven species of marine turtle live there

Greater in area than the United Kingdom

Longer than the west coast of the USA

More than 2900 individual reefs

The largest green turtle breeding area in the world

More than 3,000 sq kms of seagrass meadow

Barrier Reef Factoids:

Heron Island, Great Barrier Reef

Research Laboratories

Heron Island Research Station
University of Queensland
Great Barrier Reef via Gladstone QLD 4680
Telephone: (+61 7) 4978 1399
Facsimile: (+61 7) 4972 4173
Email: hirs@mailbox.uq.edu.au
A Cool Way To See The Great Barrier Reef

1. Declining regional catches
2. Decreased average size of fish
3. Increased fishing effort
4. Excess capacity in the fishery
5. The impacts of fishing on the marine habitat
6. The increased significance of the recreational fishery
7. Indigenous use and rights to the resource
8. Issues associated with compliance of fisheries and marine park management regulations.

Predators
Stealth And Cunning Wins The Day
Barracuda

Moray Eel With Yellow Tang

Decorated Crab
**Ambush!**

Weedy Sea Dragon

QuickTime™ and a TIFF (uncompressed) decompressor are needed to see this picture.
Euprymna scolopes

Now You See Me, Now You Don't!
My, What Big Eyes You Have!

My, What Big Teeth You Have!

White-tipped Reef Shark

White-tipped Reef Shark

Eugenie Clark With Friend*

Survival Tactics: Part I

*Bull Shark: Do Not Try This At Home!
Don’t Touch!

Angler Fish

Lion Fish

Sea Snake

Blue Ringed Octopus

Tetrodotoxin Is Its Only Defense.
1 Milligram Kills An Adult Human.
Survival Tactics: Part II
Camouflage And Protective Associations

Razor Fish

Safety In Numbers Strategy

QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.
Leaf Fish
Causes Of Coral Reef Decline:
1. Sea Surface Temperature Rises
2. Over-fishing
3. Sedimentation From Agricultural Runoff
4. De-forestation
5. Urban Pollution Runoff
Encroachment

Agricultural Runoff Due To De-forestation

Crown-Of-Thorns Star Fish

Crown-Of-Thorns Sea Star Grazing On Barin Coral

Cyanide Fishing

Over-fishing and Dismantling The Predator-Prey Relationships
Diseases Of Coral

The recent emergence of diseases in corals may be interpreted as the consequence of (1) changing coastal ocean water quality favoring the proliferation, attachment and colonization of microbes, and (2) reduced efficiency of the coral’s normal defenses.