



CORAL
REEF ALLIANCE

Coral Reef Threats

A Global Crisis

Coral Reefs: Ecological Sentinels

- Coral reefs are excellent indicators of ecological change AKA “canaries in the coal mine.”
- If coral reefs are in trouble, so are we.



The Coral Reef Crisis

The Coral Reef Crisis: Global Status

- 75% of the world's coral reefs are threatened.
- 27% of the world's coral reefs have already been lost.
- 50% of reef-building corals have disappeared over the past 30 years.
- One third of reef-building corals are at risk of extinction due to climate change and local threats.



The Coral Reef Crisis: Caribbean



- Average live coral cover on Caribbean reefs has declined to just 8% of the reef today, compared with more than 50% in the 1970s.
- Between 80 to 98% of the elkhorn and staghorn coral are gone.
- The abundance of reef-building corals has decreased by more than 80%.



Coral Reef Threats

Threat Types



- Natural Threats
- Global Threats
- Direct, Local Threats
- Stress-related Threats

Natural Threats

Natural threats are those that corals have always had to contend with.

These include:

- Predators
- Competition with macroalgae
- Storms
- Variations in temperature



Global Threats: Climate Change

- Climate change is the result of increased carbon dioxide (CO₂) in the atmosphere.
- CO₂ has increased dramatically since the Industrial Revolution, due to humans burning fossil fuels.



Climate Change Impacts: Coral Bleaching



Climate Change Impacts: Coral Bleaching



- There are no records of significant bleaching before the 1980s.
- There have been three global coral bleaching events:
 - 1998
 - 2010
 - 2014-2017.
- Mass bleaching events are expected to increase.

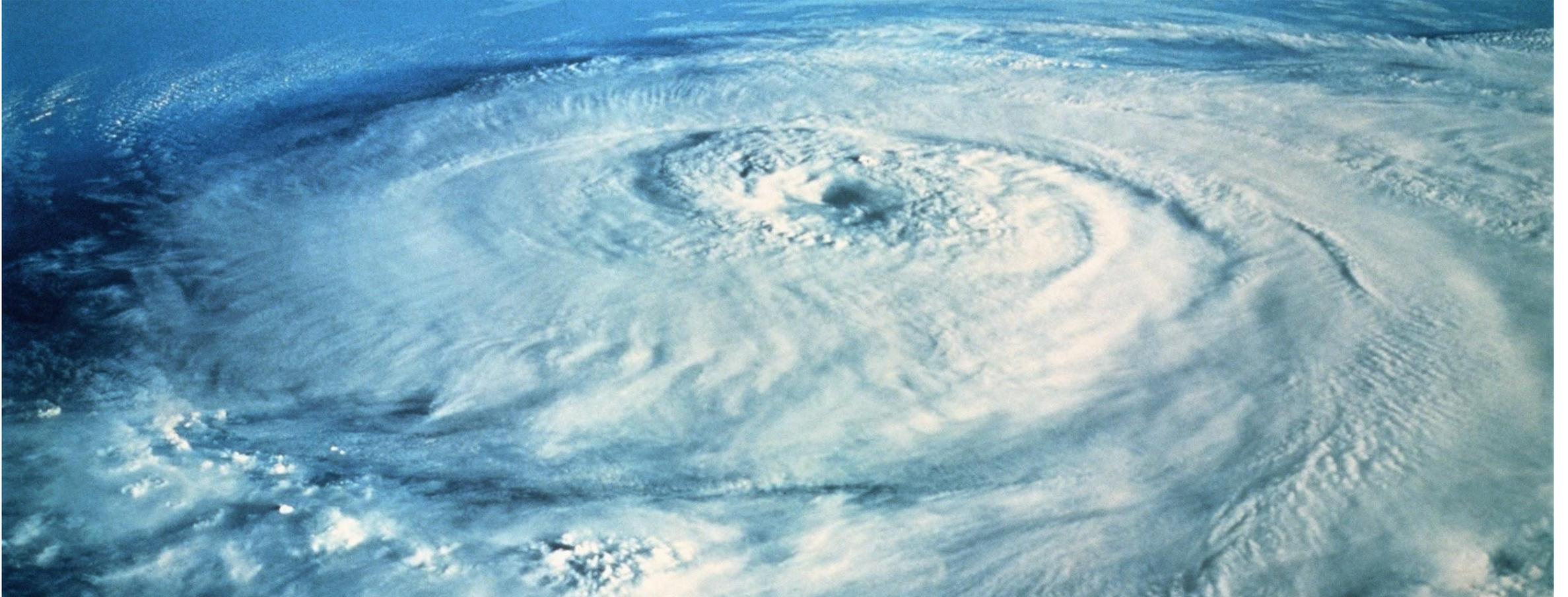
Climate Change Impacts: Rising Sea Levels



Courtesy of Climate Central

How Miami's South Beach could look in 2050 if action isn't taken now.

Climate Change Impacts: Increased Storms



Hurricane Isabel, 2003

Global Threats: Ocean Acidification

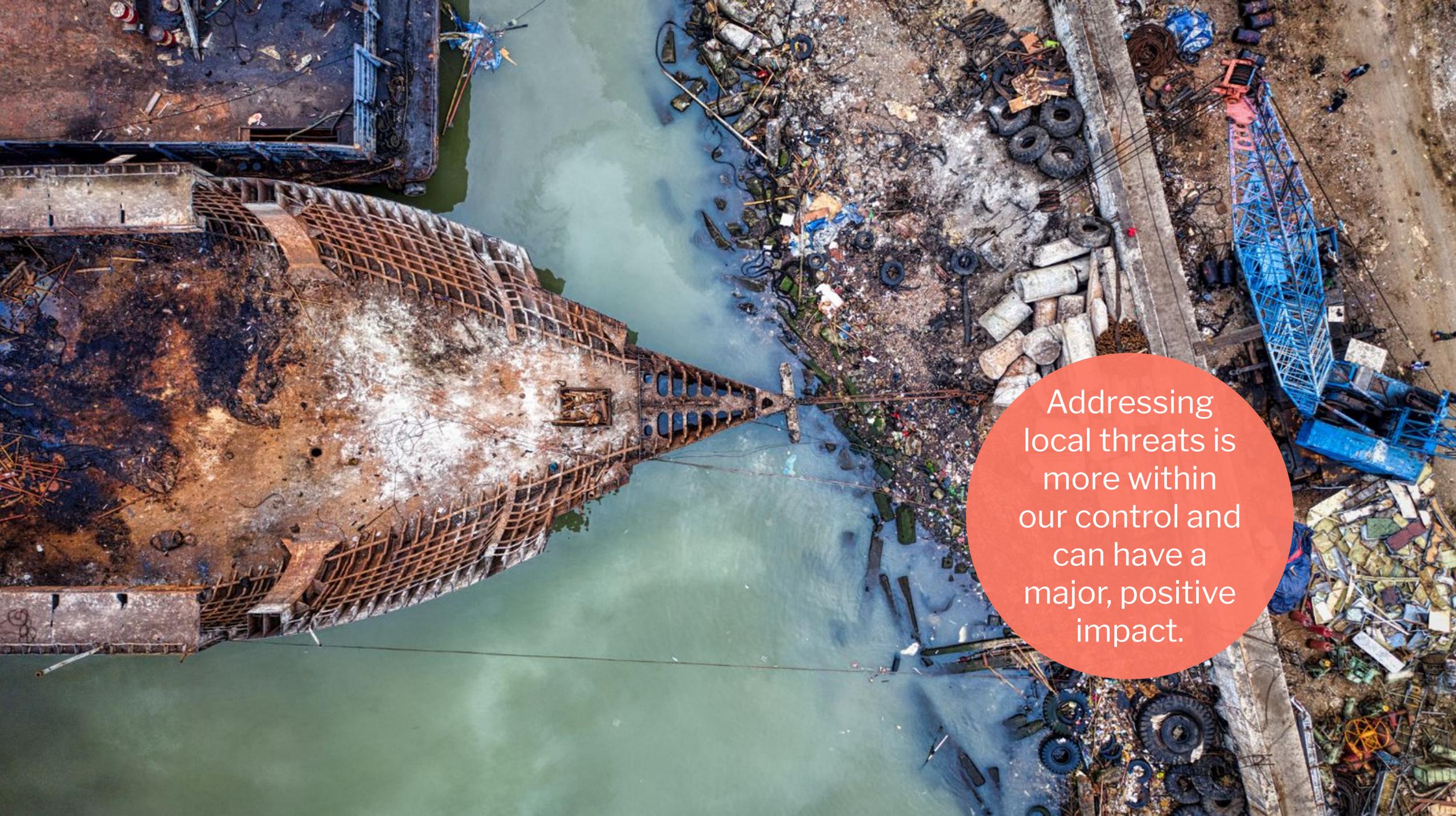
- 25% of all CO₂ emitted is absorbed by the oceans.
- This results in lower pH and higher acid in the ocean.
- Thereby decreasing the ability of calcifying organisms to form their shells and skeletons, increased bioerosion, and crumbling reef framework.



Global Threats: Ozone Depletion

- The ozone layer is like a sunscreen for the Earth. This layer was depleted in the 1980s due to CFCs.
- Corals have a natural sunscreen substance to protect themselves from UV radiation, but at increased levels, UV radiation can damage and kill corals.





Addressing local threats is more within our control and can have a major, positive impact.

Local Threats: Water Pollution

- Increase in sediments and nutrients.
- Nutrient pollution comes from sewage and fertilizers; promotes the overgrowth of algae.
- Sediment pollution comes from mining, logging, and agriculture; blocks coral's access to sunlight.



Local Threats: Marine Debris

- Trash is unsightly and negatively impacts tourism.
- Floating trash entangles animals and block corals from receiving sunlight.
- Reef animals eat plastic and get sick or die.



Courtesy of Karen Kasmauski/LCP

Local Threats: Overfishing

- Due to a growing human population and increased demand for seafood, many reefs are now overfished.
- Overfishing affects more than 55% of the world's coral reefs.
- Local economies, livelihoods, and the tourism industry all suffer.



Local Threats: Unsustainable Fishing

- Fishing too many big fish.
- Fishing juvenile fish that have not yet reached maturity.
- Fishing during the closed or reproductive season.
- Using inappropriate fishing gear such as large nets that can result in by-catch.



Local Threats: Habitat Destruction

- Corals are hundreds – sometimes thousands – of years in the making.
- Most coral species grow less than 1 inch per year.
- Reef destruction and damage can have long-lasting consequences.



Local Threats: Coral Harvesting

Corals are directly harvested for different purposes including:

- Construction material
- Jewelry
- Souvenirs



Local Threats: Mangrove & Seagrass Destruction

- Mangroves and seagrass meadows are also highly threatened ecosystems, linked to coral reefs.
- Mangroves are cut down for firewood or to clear land.
- Seagrass meadows are dredged or damaged by boat propellers and anchors.



Local Threats: Unsustainable Tourism

Direct Damage:

- Improper snorkel and scuba diving practices
- Boat anchors

Indirect Damage:

- Unplanned developments
- Lack of sewage infrastructure
- Poor waste management
- Sunscreen use



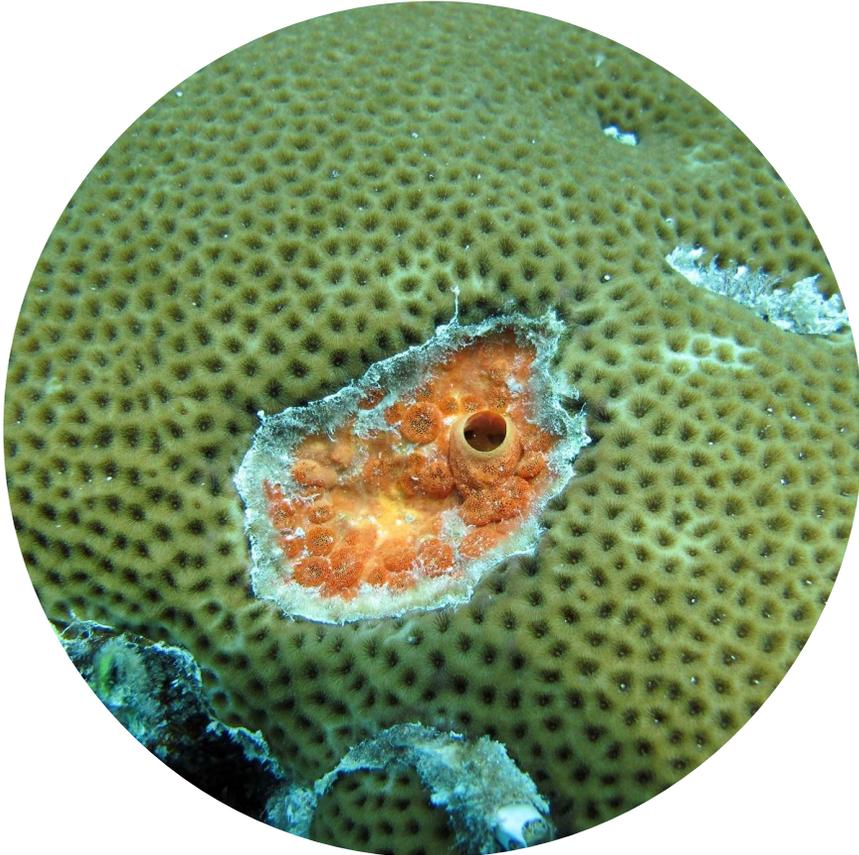
Stress Related Threats: Coral Disease



Coral diseases in the MAR include:

- Stony coral tissue loss disease
- White band disease
- Black band disease

Stress Related Threats: Coral Predator Outbreaks



- Corallivores - coral predators - feed on live coral tissue, causing tissue loss and death.
- Corallivores (coral predators) include:
 - Crustose Clionid Sponges
 - Encrusting (aggressive) Invertebrates

Other Threats: Invasive Species

- Lionfish are native to coral reefs in the Indo-Pacific.
- They were first recorded in the MAR in 2008 and have expanded rapidly since.
- A single lionfish living on a coral reef can reduce recruitment of native reef fish by 79%.



Other Threats: Shifting Baselines



- “Most people under 50 haven’t seen a healthy coral reef.” – Jeremy Jackson, Coral Reef Ecologist
- The standards for what people consider “baseline” for a healthy reef has declined over time.
- This iconic set of photographs shows the degradation of Carysfort Reef in Florida Keys National Marine Sanctuary.



Jamaica:
Discovery Bay
Case Study

Jamaica Case Study

- 1970: The reef experienced an 80% reduction in herbivorous fish biomass (mostly parrotfish) due to overfishing.
- 1980: Hurricane Allen devastated the reef.
- 1983: A die-off of *Diadema* urchins was the final blow.



Death By A Thousand Cuts



Sources

“75% of the world's coral reefs are threatened.”

Source: Reefs at Risk Revisited (Burke et.al., 2011) World Resources Institute ISBN 978-56973-762-0

“27% of the world's coral reefs have already been lost.”

Source: Wilkinson, Clive. (2000) Status of coral reefs of the world: 2000. ISBN 0 642 32209 0.

“50% of reef-building corals have disappeared over the past 30 years.”

Source: Côté, I. M., J. A. Gill, T. A. Gardner, and A. R. Watkinson. 2005.

“Measuring Coral Reef Decline through Meta-Analyses.” Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences 360(February):385–95.

“One third of reef-building corals are at risk of extinction due to climate change and local threats.”

Source: Carpenter, K.E., Abrar, M., et al. (2008). One-third of reef-building corals face elevated extinction risk from climate change and local impacts. Science, 321(5888), pp.560-563.

“Average live coral cover on Caribbean reefs has declined to just 8% of the reef today, compared with more than 50% in the 1970s.”

“Between 80 to 98% of the elkhorn and staghorn coral are gone.”

Source: Tropical Americas Reef Resilience Workshop Report, 2012.

“The abundance of reef-building corals has decreased by more than 80%.”

Source: Gardner, T.A., I.M. Côté, J.A. Gill, A. Grant and A.R. Watkinson, 2003: Long-term region-wide declines in Caribbean corals. Science, 301(5635), 958-960.

“Mass bleaching events are expected to increase.”

Source: Special Report on Global Warming of 1.5°C. Incheon, Republic of Korea: Intergovernmental Panel on Climate Change (IPCC). 8 October 2018.

“Overfishing affects more than 55% of the world's coral reefs.”

Source: Newton, K., I.M. Côté, G.M. Pilling, S. Jennings and N.K. Dulvy, 2007: Current and future sustainability of island coral reef fisheries. Current Biology, 17(7), 655-658.

“[Lionfish] were first recorded in the MAR in 2008”

Source: Healthy Reefs

“A single lionfish living on a coral reef can reduce recruitment of native reef fish by 79%.”

Source: Albins, M.A. and Hixon, M.A., 2008. Invasive Indo-Pacific lionfish *Pterois volitans* reduce recruitment of Atlantic coral-reef fishes. Marine Ecology Progress Series, 367, pp.233-238.

“The reef [in Jamaica's Discovery Bay] experienced an 80% reduction in herbivorous fish biomass (mostly parrotfish) due to overfishing.”

Sources:

Munro, J.L., 1969. The sea fisheries of Jamaica: past, present and future. Jamaica Journal, 3(3), p.16.

Munro, J.L. ed., 1983. Caribbean coral reef fishery resources (Vol. 7). WorldFish.



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Questions?

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