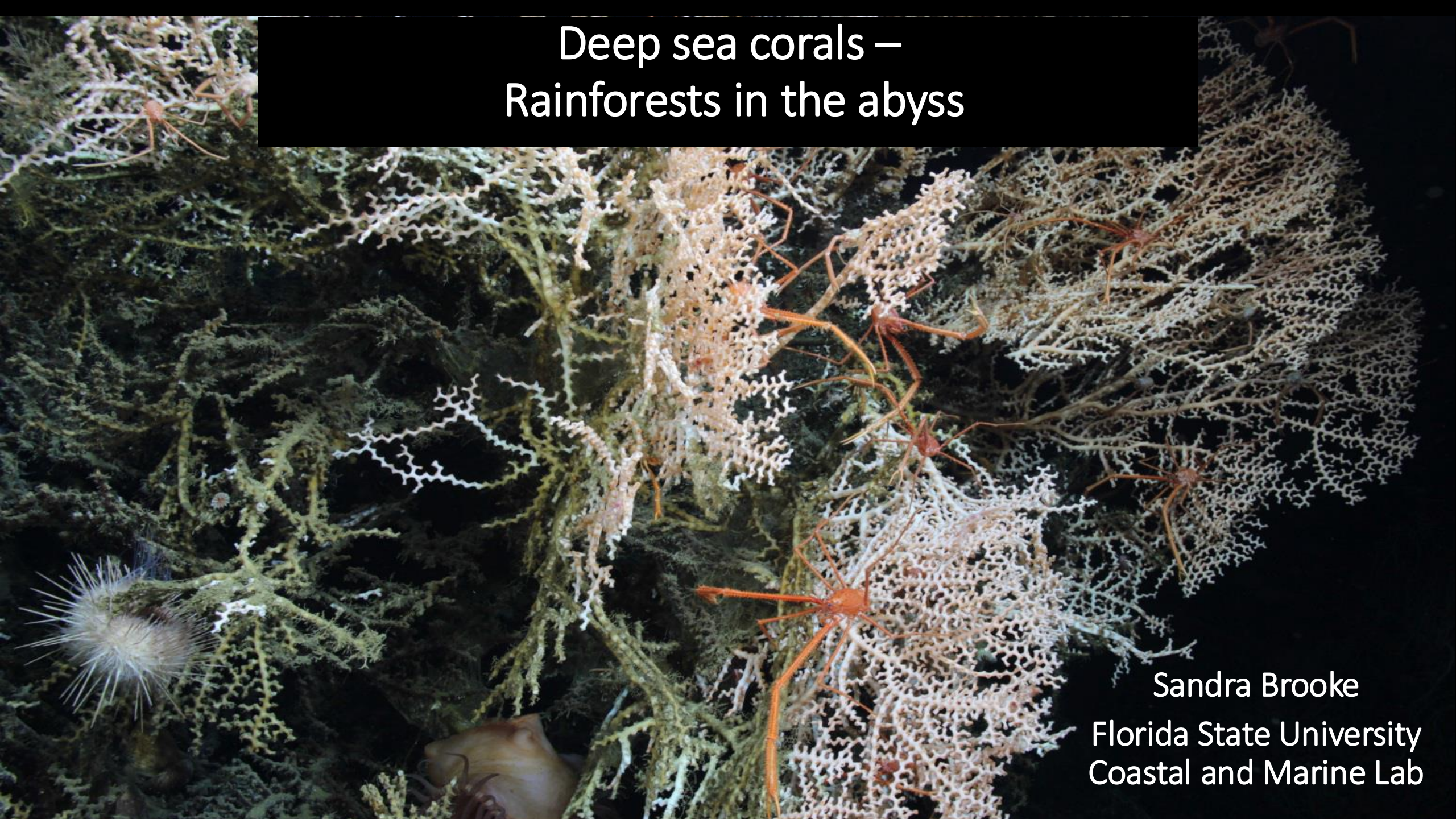
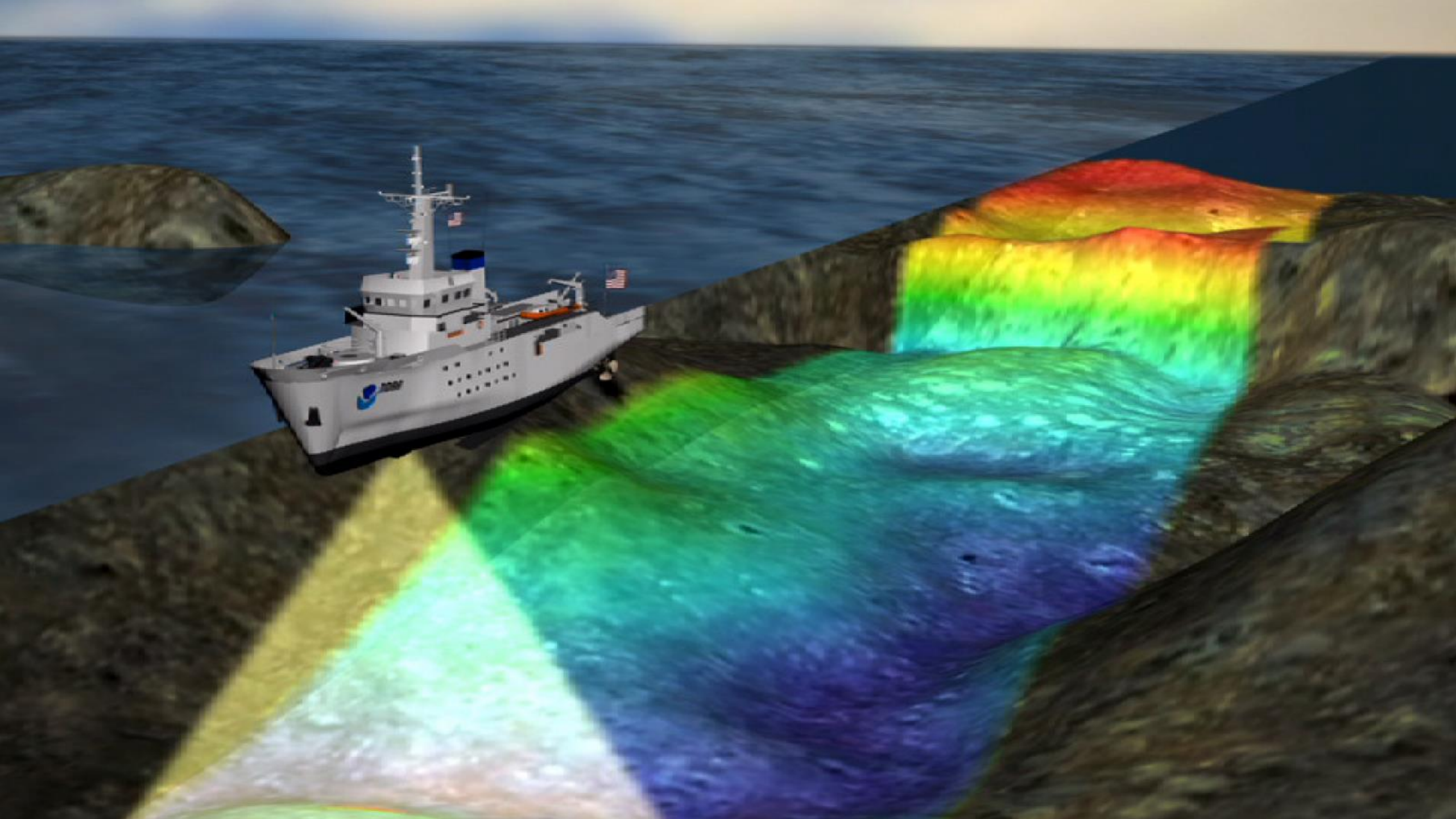
Deep sea corals – Rainforests in the abyss

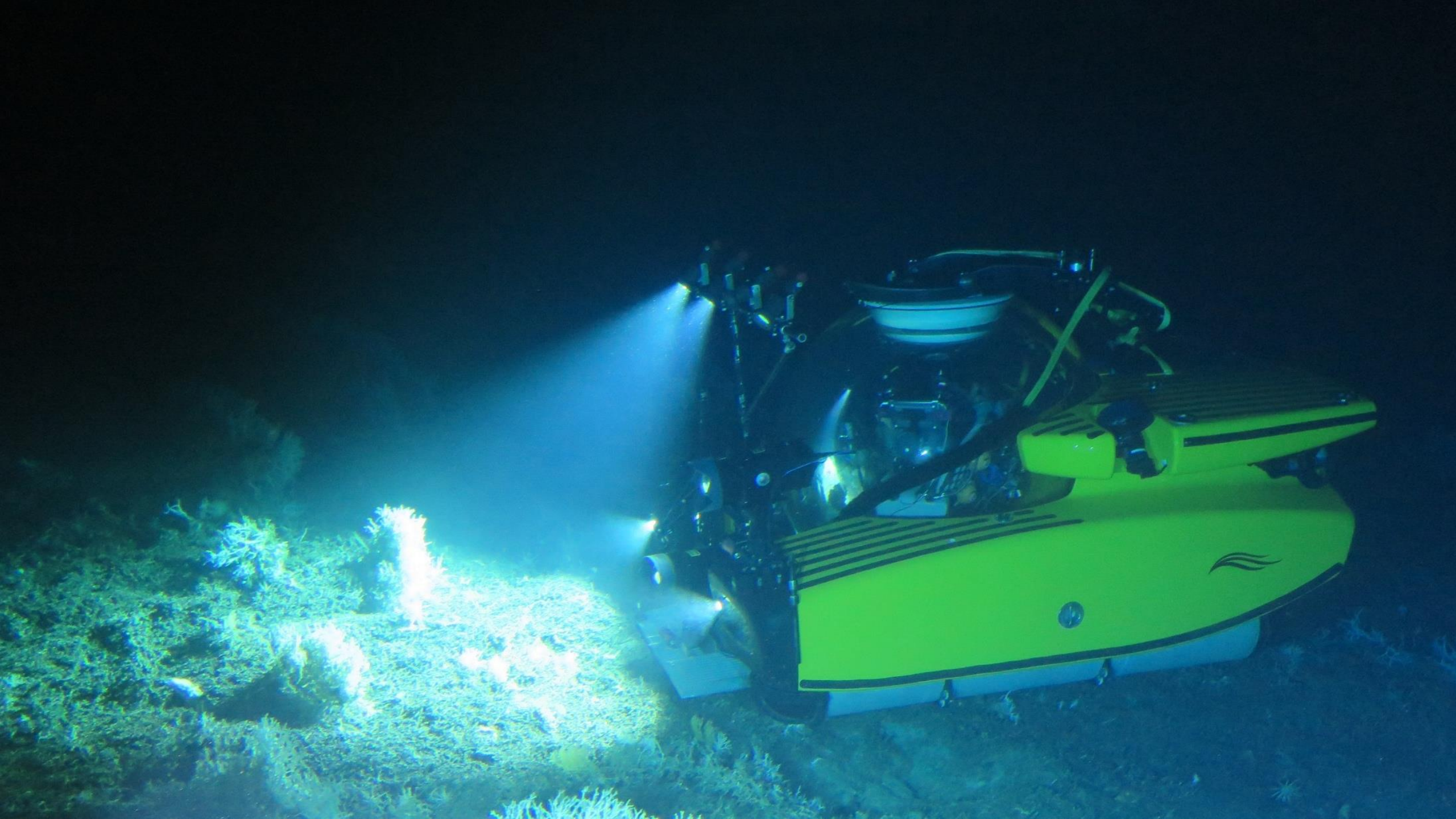


Sandra Brooke

Florida State University
Coastal and Marine Lab


Coral reefs
Warm water
Cold water



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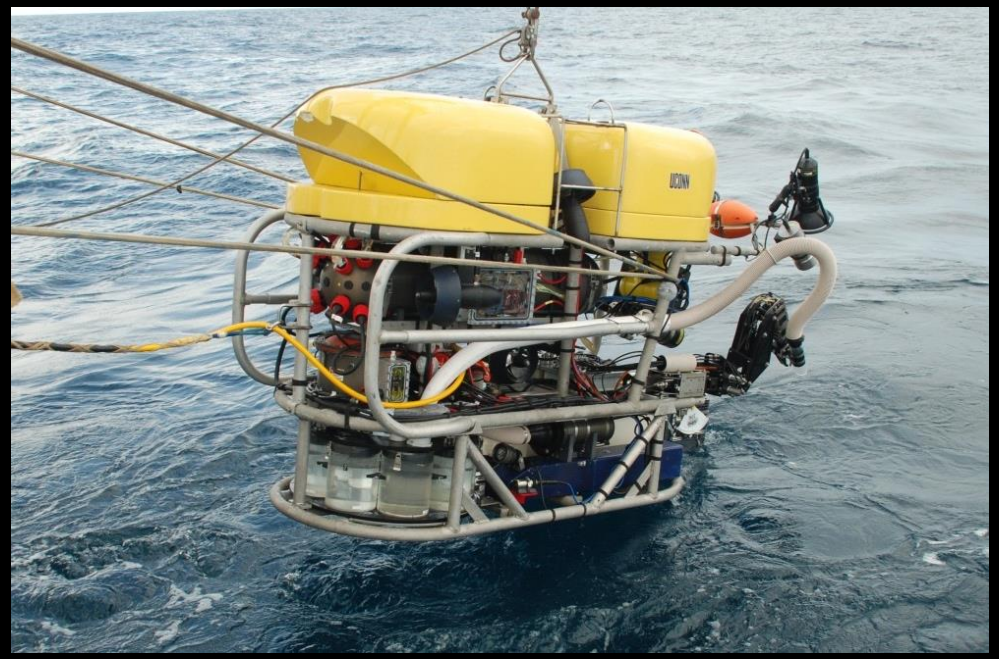
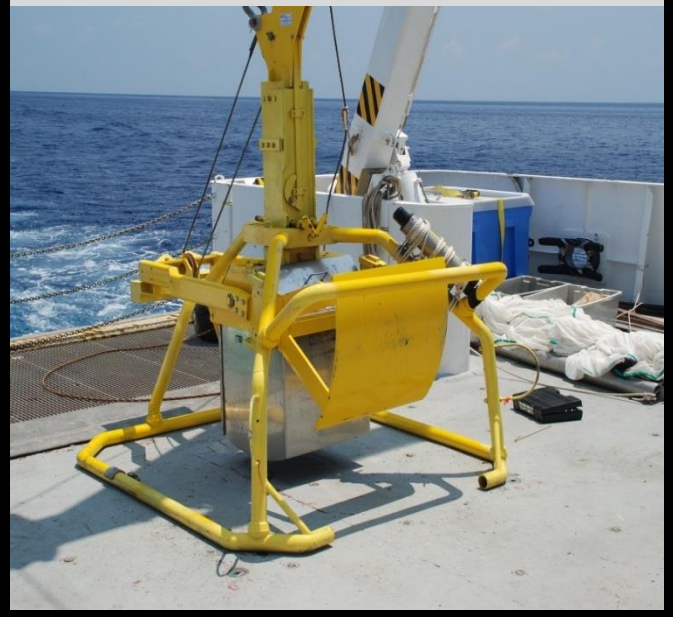


MOCNESS: multiple opening/closing net and environmental sensing system

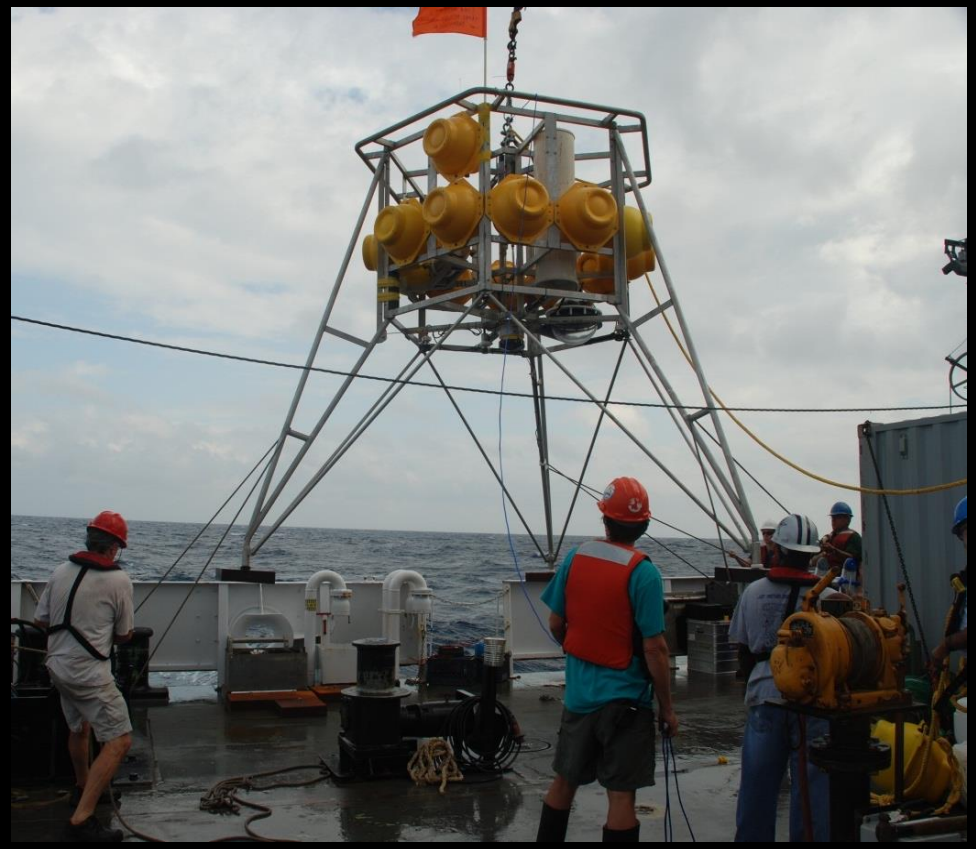
CTD/Niskin rosette

Box core



Benthic landers

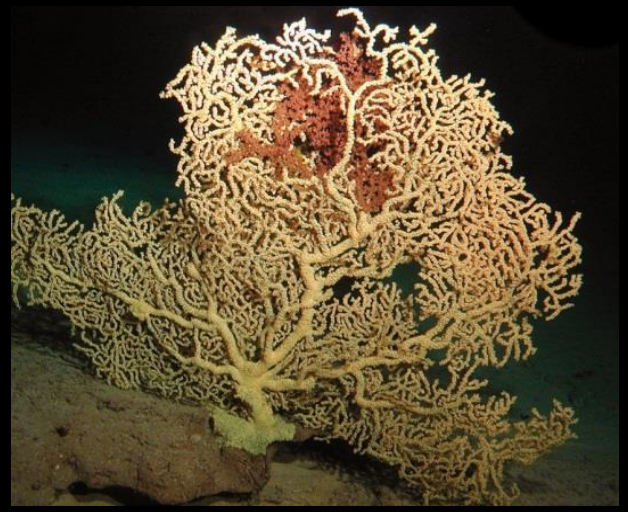
- Environmental sensors
- Time series sediment traps
- Video and still cameras
- Current meters
- Acoustic monitors
- Settling plate experiments
- Live animal experiments



What are corals?

"Animals in the cnidarian classes Anthozoa and Hydrozoa that produce either calcium carbonate (aragonitic or calcitic) secretions resulting in a continuous skeleton or as numerous, usually microscopic, individual sclerites, or that have a black, horn-like, proteinaceous axis"
Stephen Cairns (2007)






There are seven taxa within the Cnidaria that fit this definition but only those that occur at depths > 50 m are considered the deep-water corals.

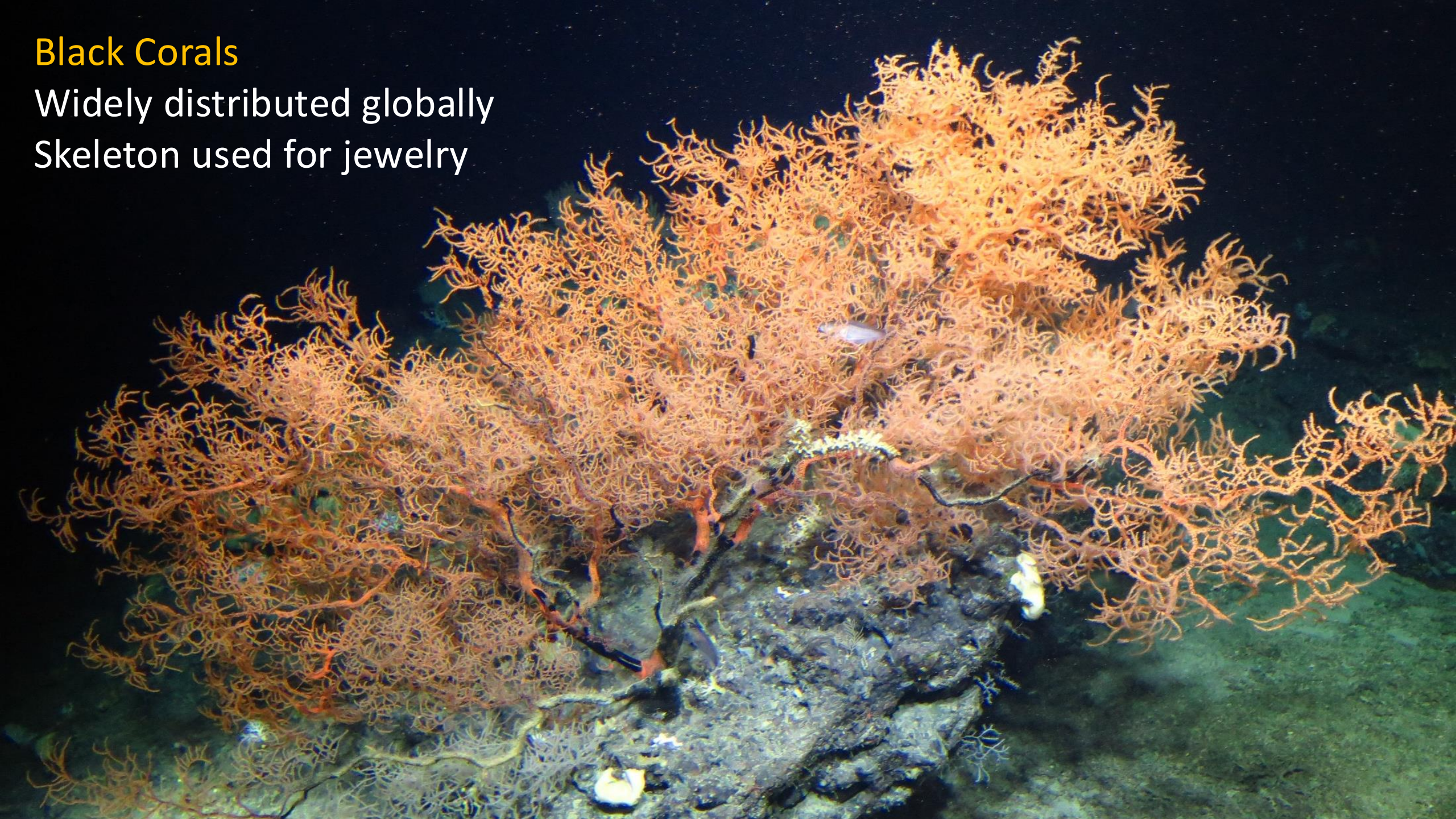

Stony Corals
Six species build reefs
Others add diversity
Provide habitat for many other species


Gorgonian 'Tree-Corals'
Most speciose group
Widely distributed globally
Structurally important

Black Corals

Widely distributed globally

Skeleton used for jewelry



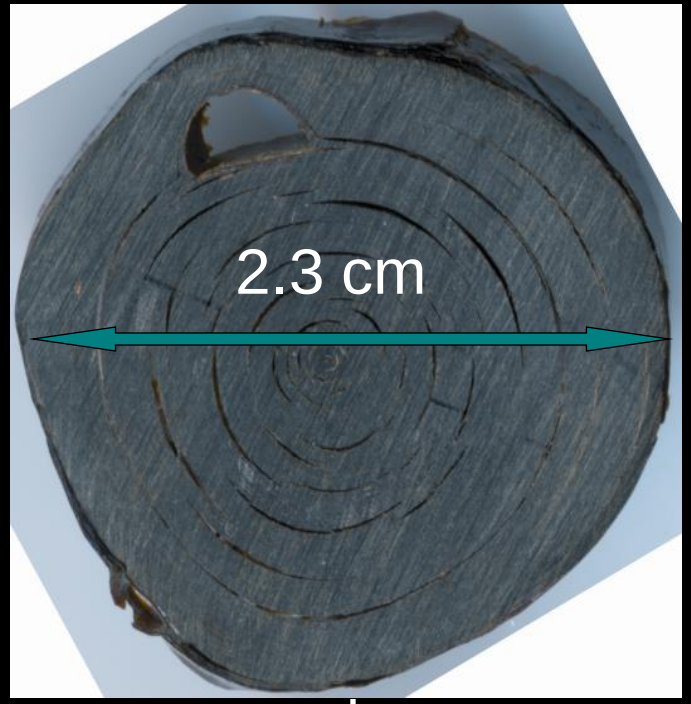
Hydrocorals

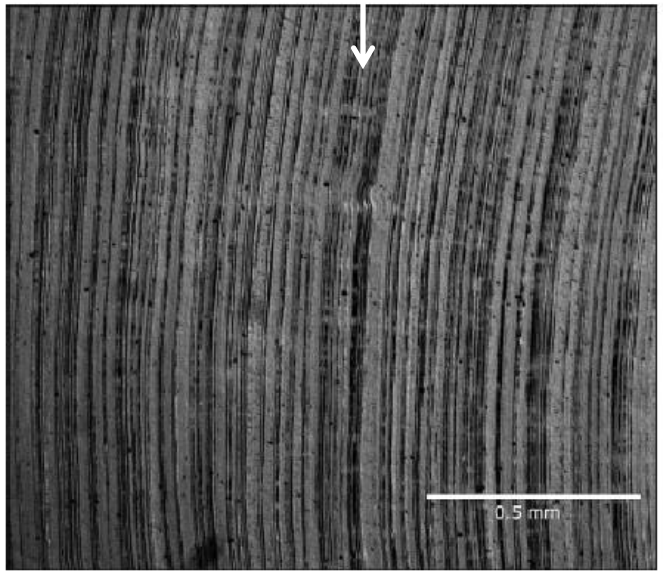
Individual colonies small but can be dense

Provide important habitat in some locations

Deep corals are slow growing and long-lived

Black coral 4,270 years old





Williams and others, 2006

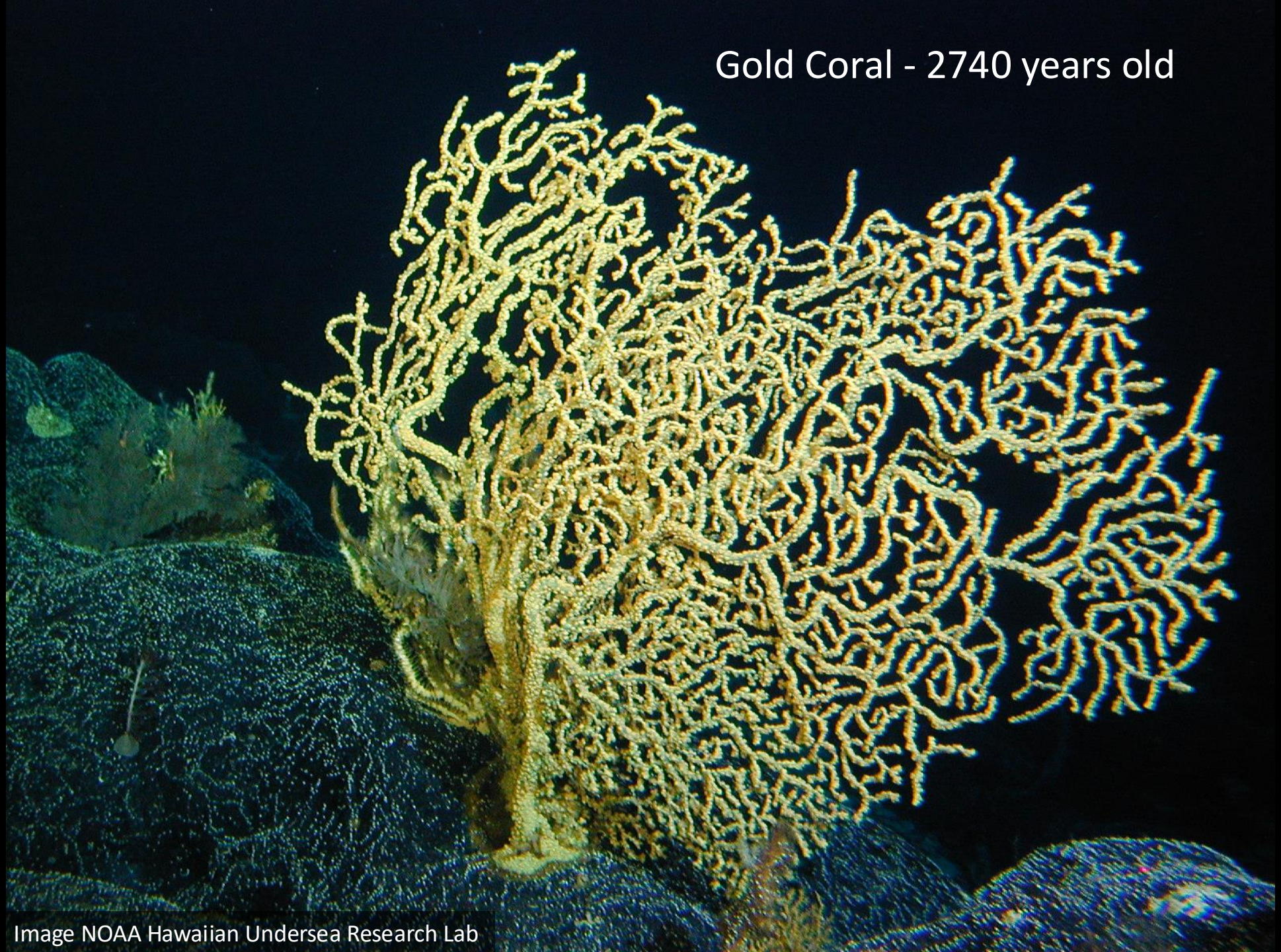


Image NOAA Hawaiian Undersea Research Lab

Sponges

Important component of deep ecosystems

Most species undescribed

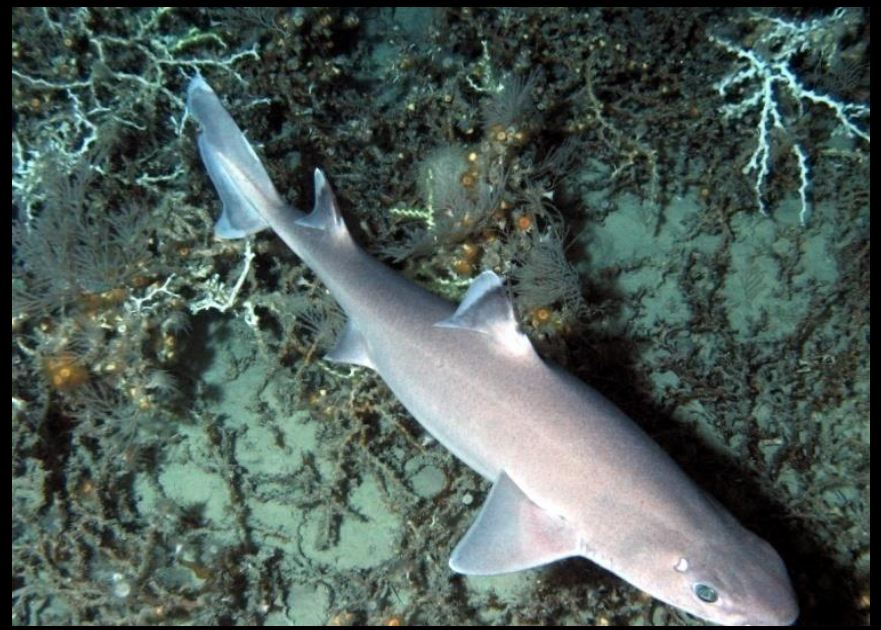
Potential source of medicines

Deep coral ecosystems are extremely diverse




New species from many taxonomic groups have been discovered in deep coral habitats






Threats to deep-water corals

Destructive Fishing

Deep corals are destroyed by industrial fishing and recovery may take centuries

Harvesting precious corals

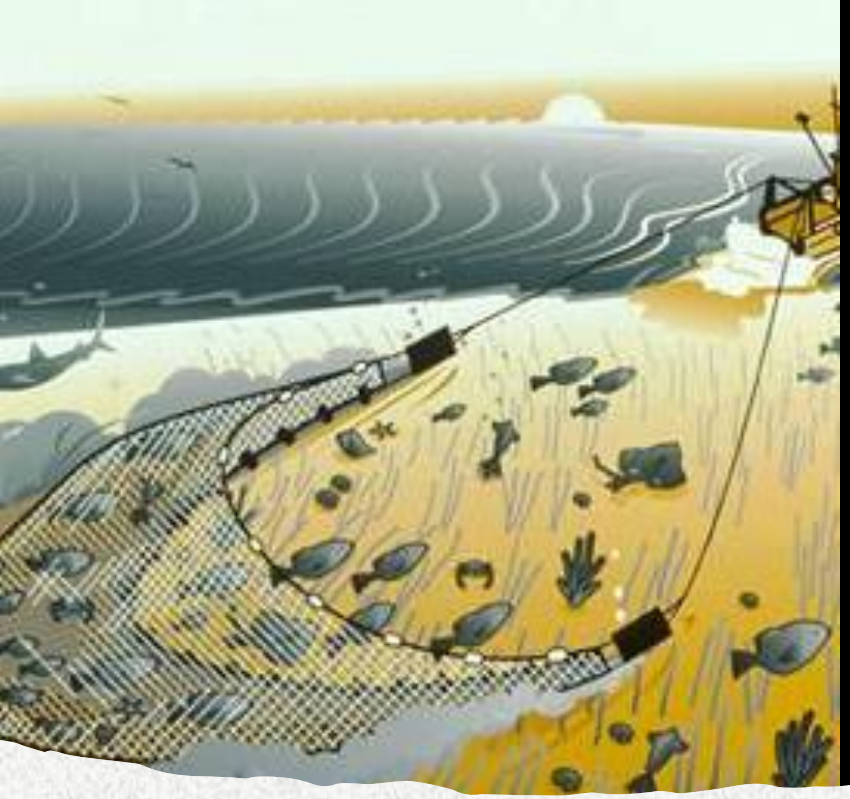
Corals that are hundreds to thousands of years old are being harvested for jewelry and curios

Deep-sea industries

Includes fossil fuel extraction, mineral mining and deployment of pipelines and communication cables.

Climate change

Increased carbon dioxide in the atmosphere dissolves in the oceans and lowers pH. The consequences are not well understood



Bottom trawling

- Bottom trawls fish down to 1,500 m
- Trawls weigh several tons and destroy complex habitats
- Occurs in international waters that are difficult to govern
- Deep-sea trawling is not sustainable as it destroys essential habitat and removes long-lived slow-growing fish.

Other fishing gears can also damage coral habitats

Precious coral harvesting

Deep Sea industries

- Oil and gas exploration and extraction
- Deep-sea cables and pipelines

Deep-sea mining for valuable metals (gold silver manganese, cobalt, zinc) from nodule fields, seamount crusts and hydrothermal vents

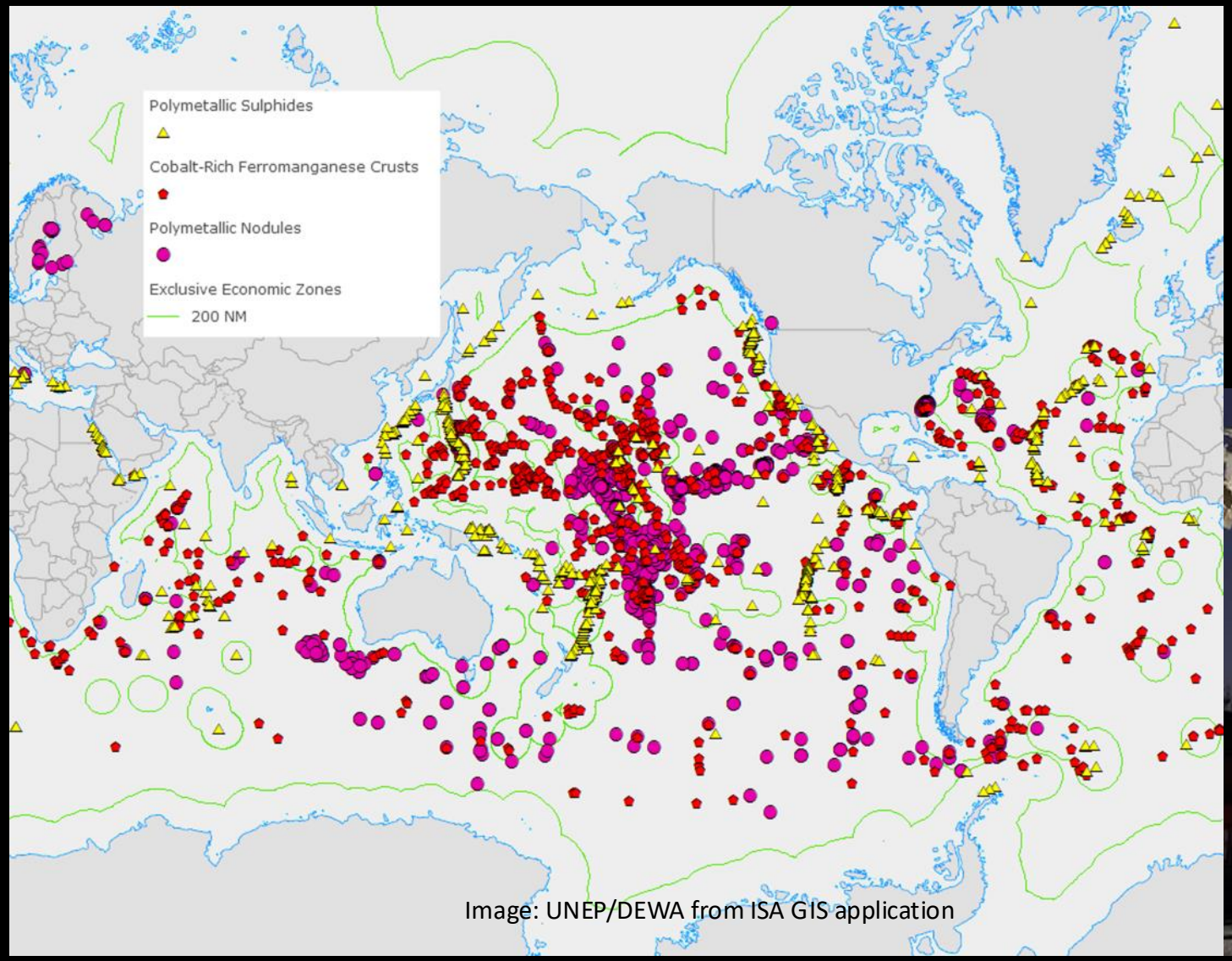
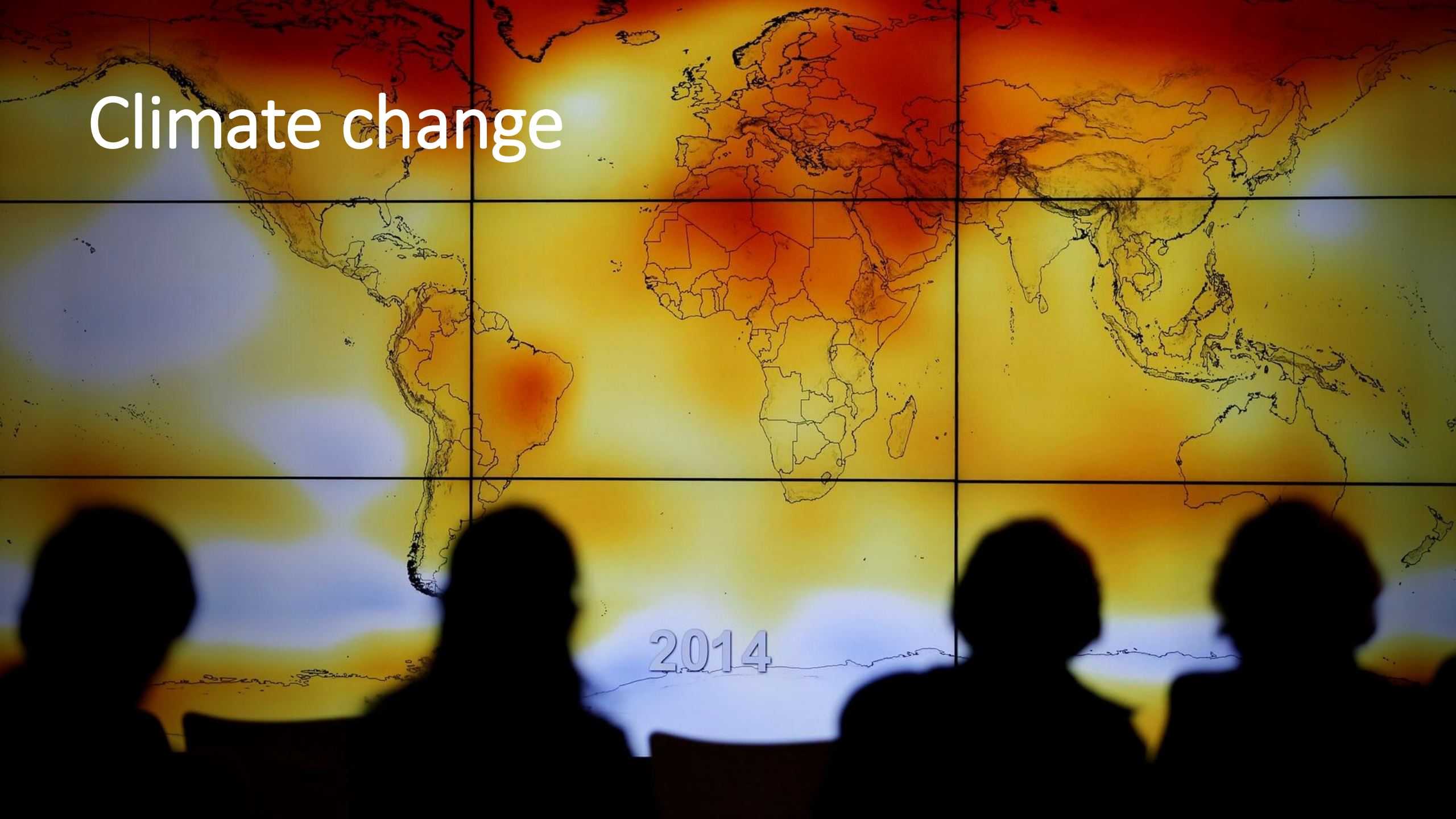


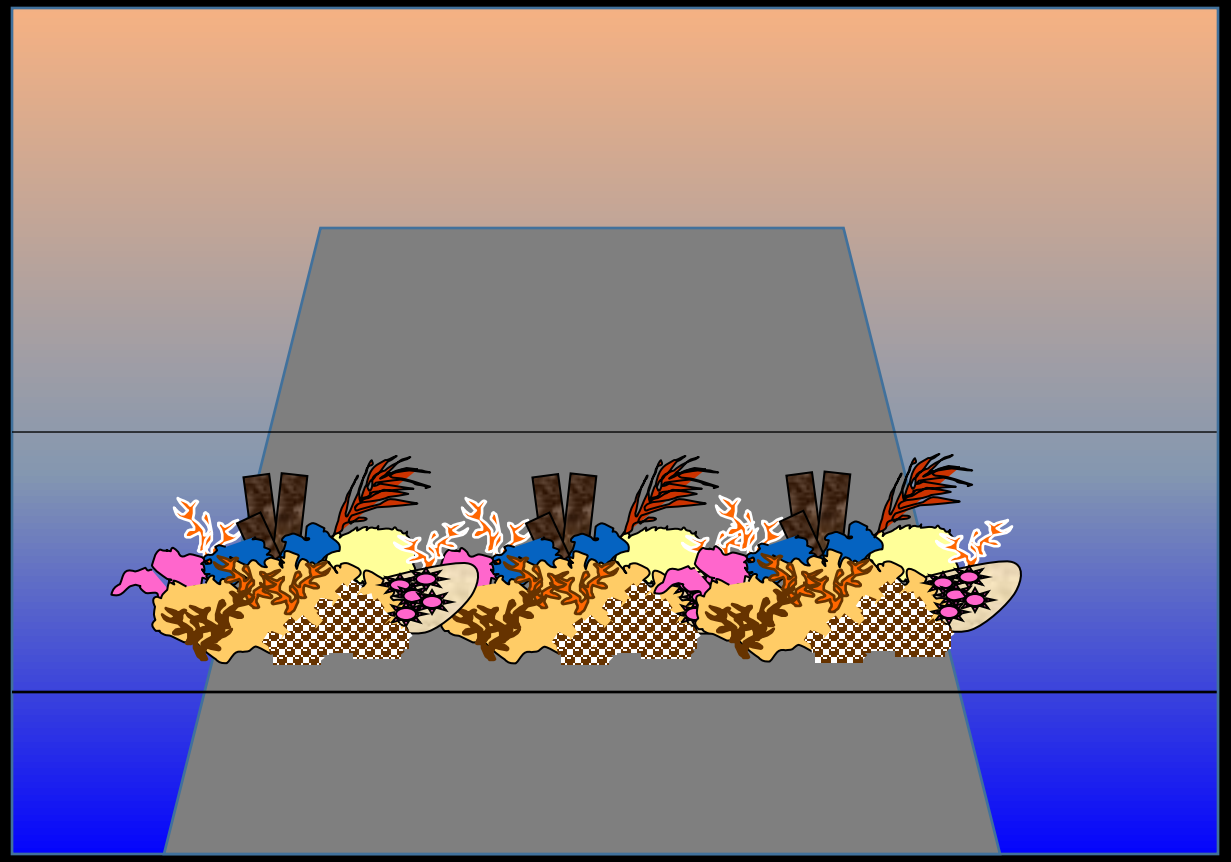
Image: UNEP/DEWA from ISA GIS application

Climate change



Two aspects of climate change may affect deep sea corals

1. Increasing water temperature
2. Decreasing pH (ocean acidification)



There is evidence that corals can tolerate some level of temperature increase and pH reduction
BUT resilience has species-specific limits and extreme conditions will cause mortality

There is some good news…

- Public awareness has increased greatly over the past two decades
- Several Nations are attempting to regulate deep-sea fisheries
- Some Nations have established protected areas and fisheries closures to protect deep corals
- There are some regional and global efforts to protect sensitive deep-sea ecosystems on the high seas.