



# Potential effects of ocean acidification on coral reefs

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## Shallow coral reefs

Depth <300 ft

Warm temperatures

Lots of light

Slow-moderate growth

Coastal, near shore

Zooxanthellate - can 'feed' on light

Restricted to tropics



## Deep coral reefs

Depth 350 to 10,000 ft  
Cold water temperatures  
Little or no light  
Offshore and high seas  
Very slow growth

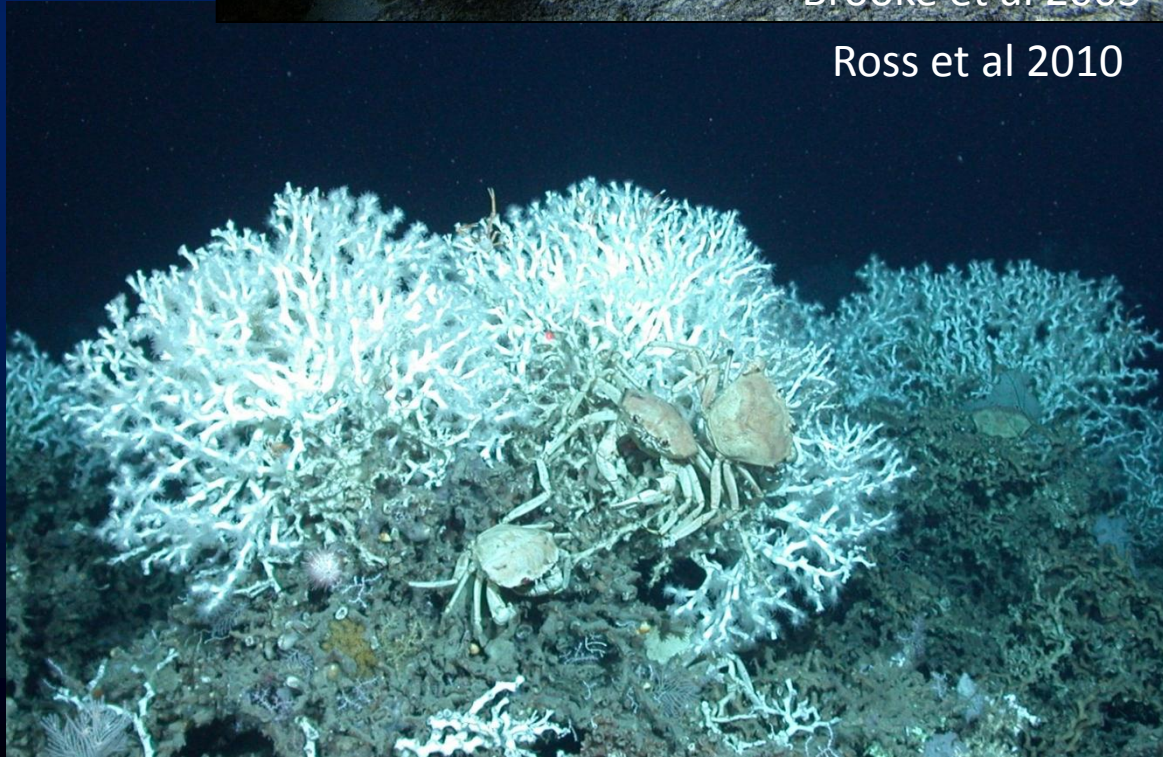
Azooxanthellate

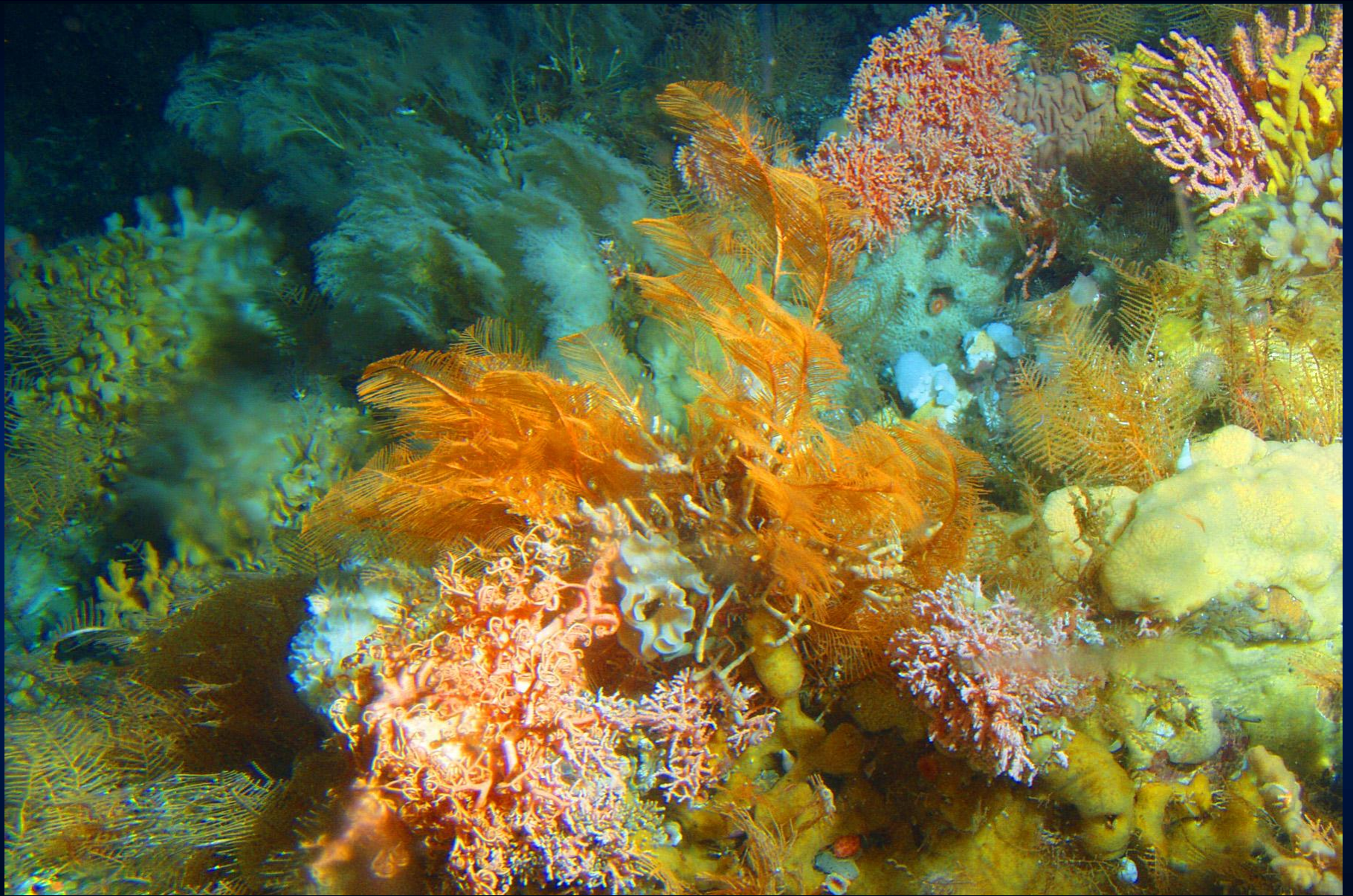
Globally distributed



Brooke et al 2005

Ross et al 2010





# Distribution of tropical and cold water corals

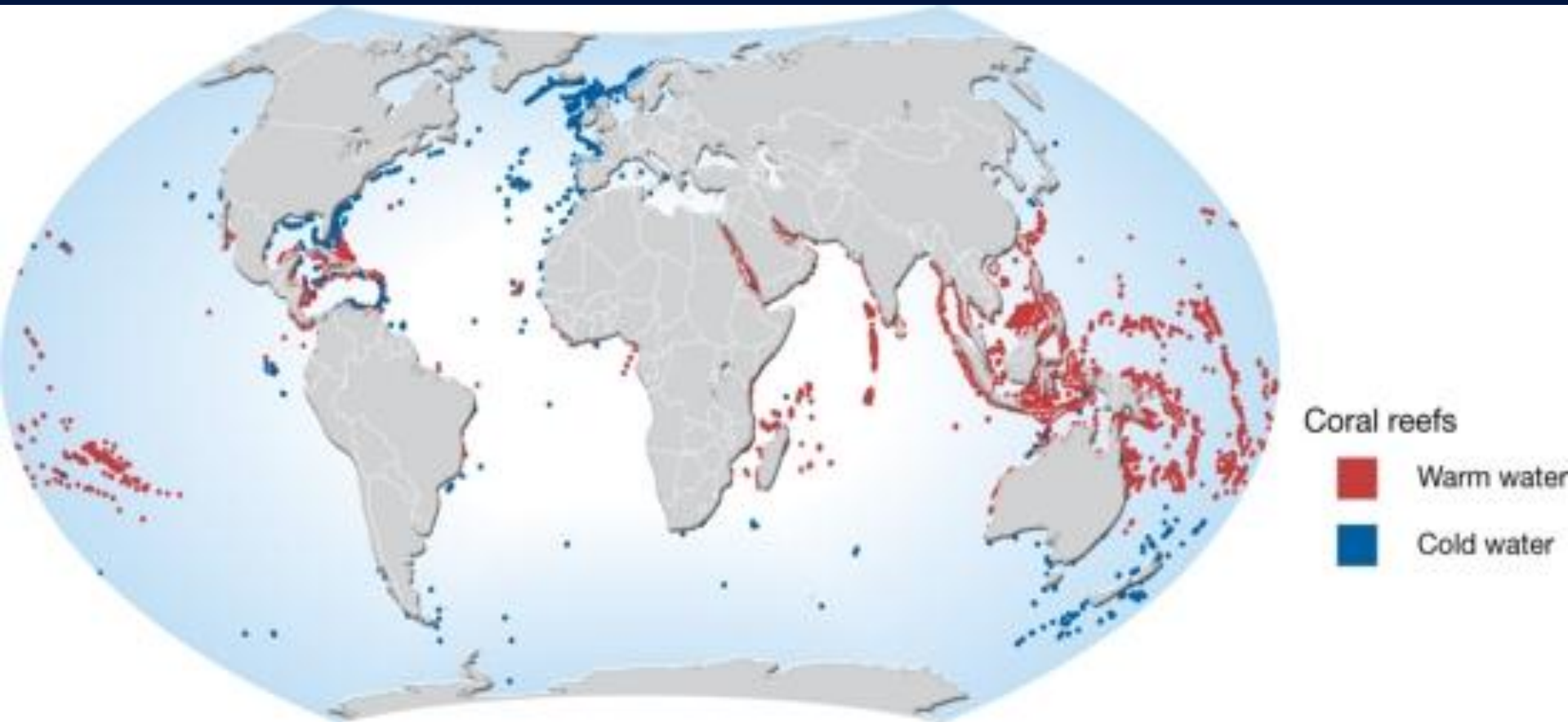


Image: UNEP

# Shallow coral communities: Aragonite in surface waters

Projected 2040

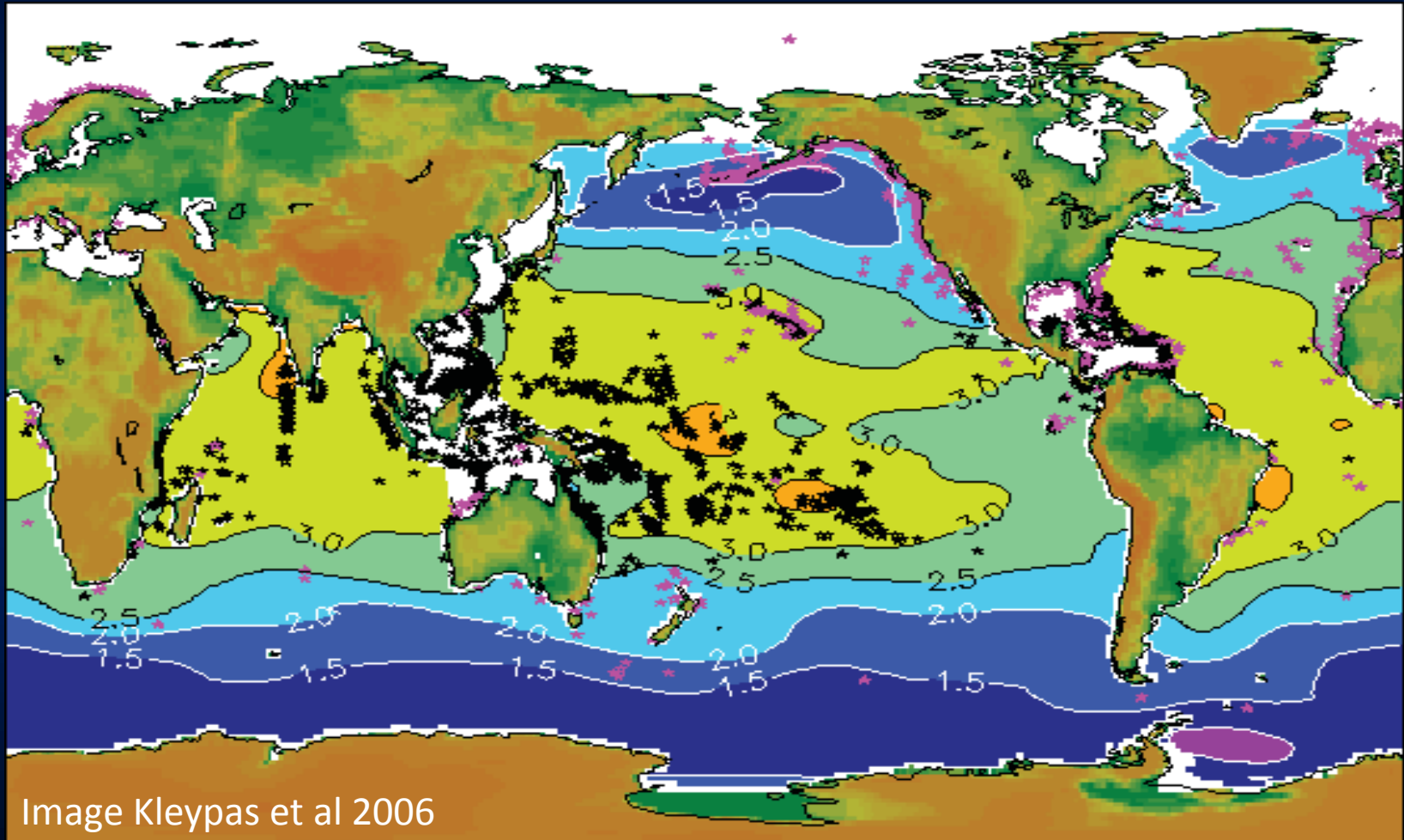
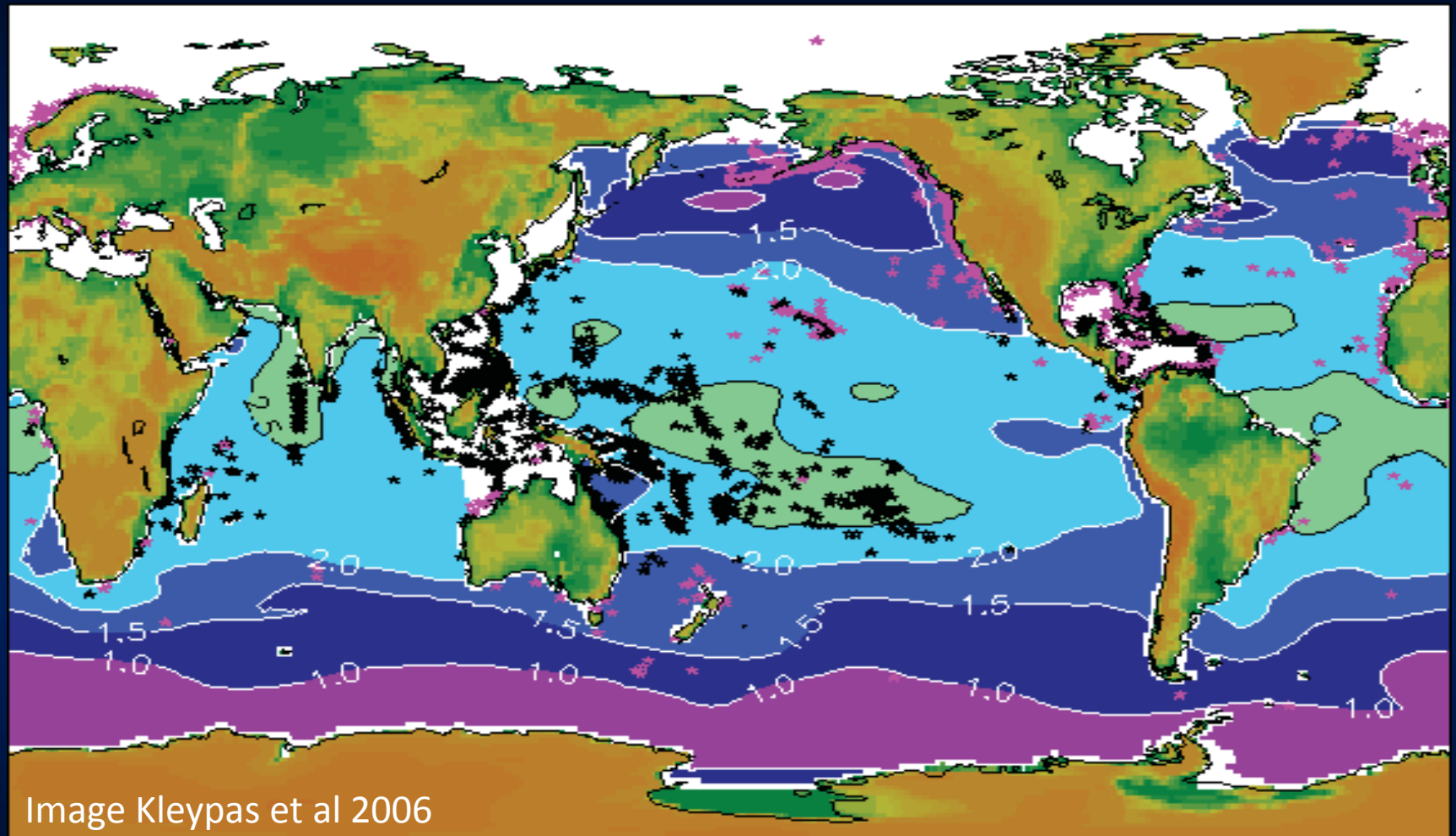


Image Kleypas et al 2006



# Projected 2100

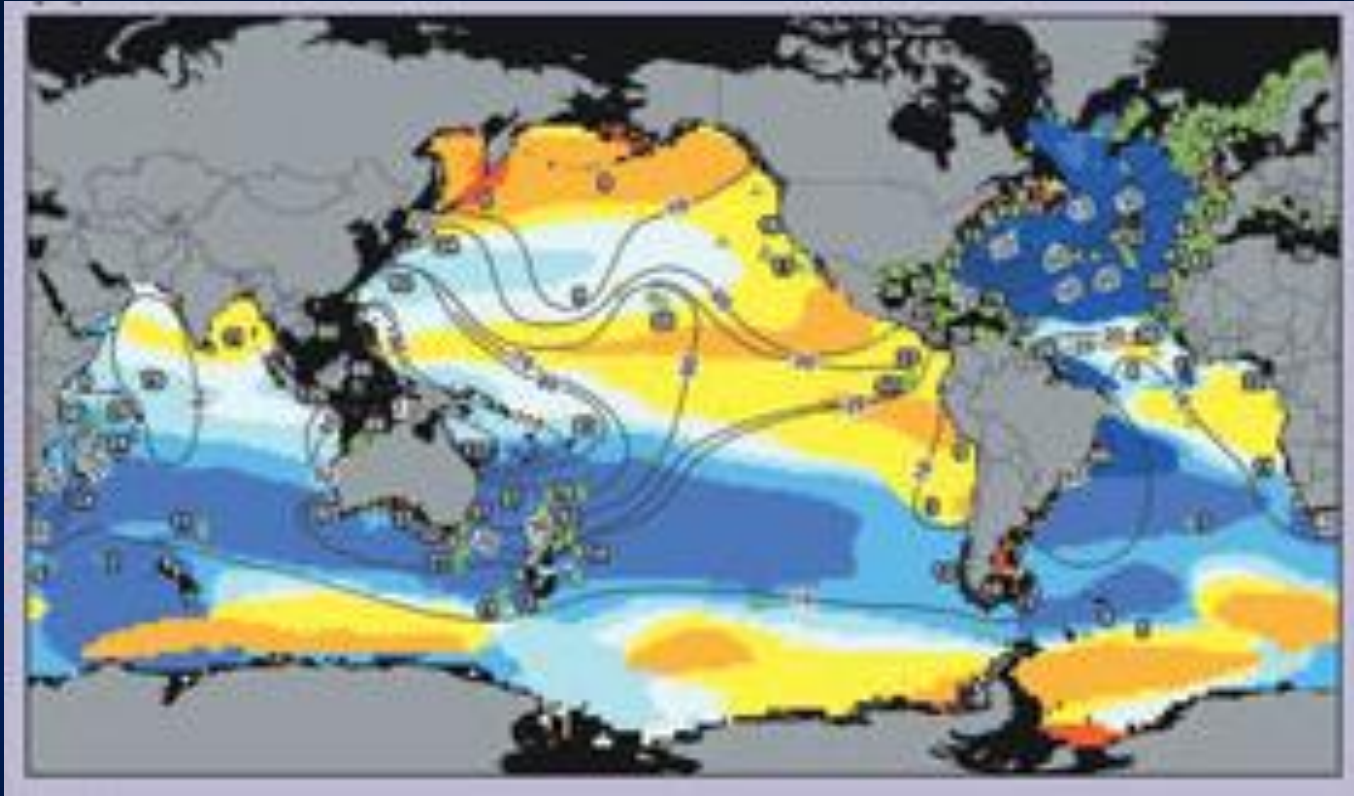


- ★ Shallow Coral
- ★ Deep Coral



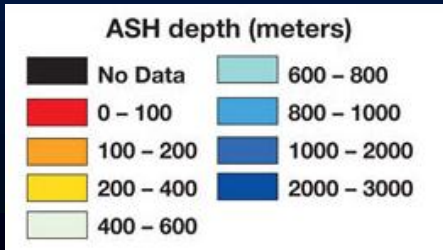
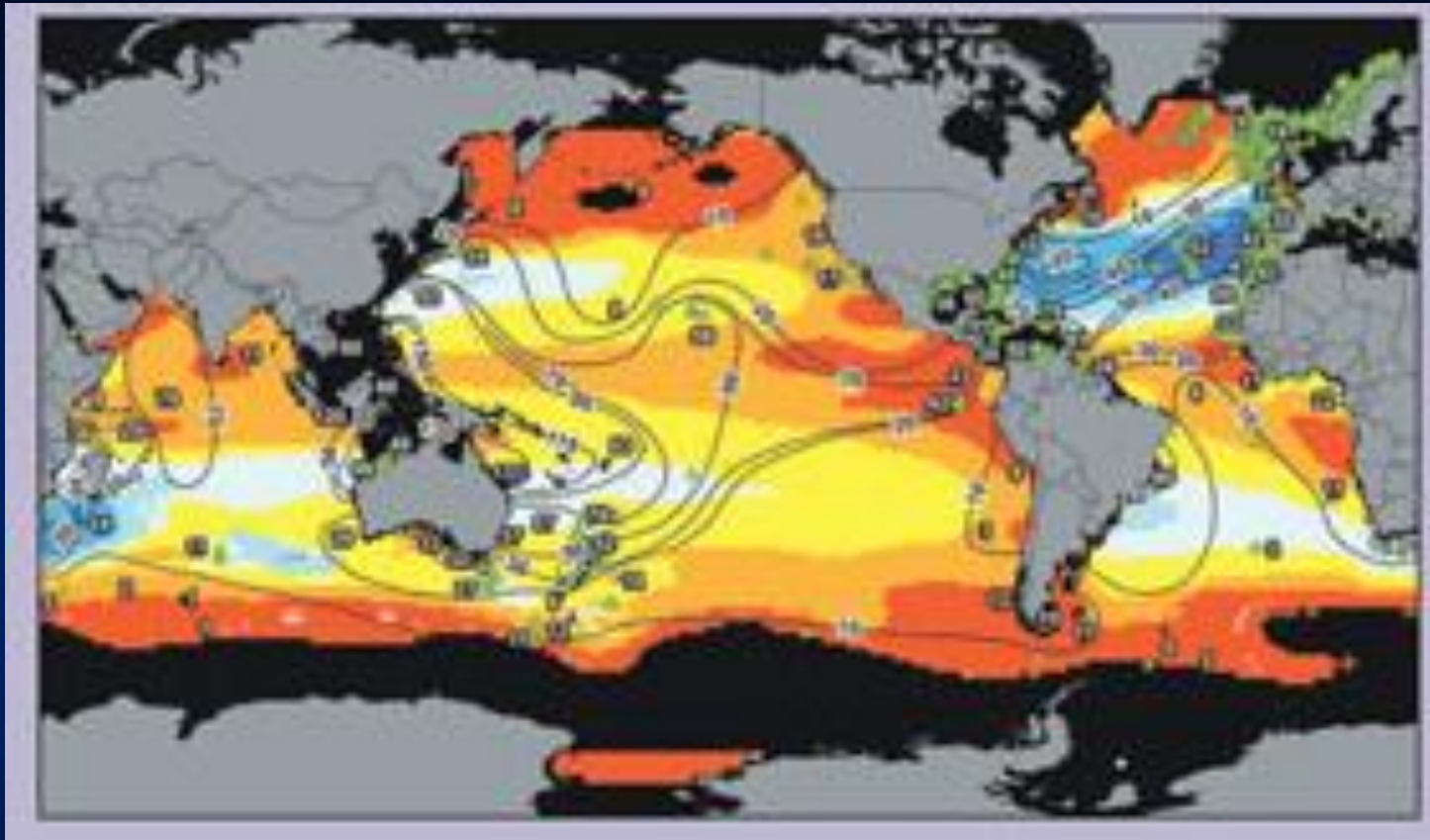


# Deep coral communities: Depth of aragonite saturation horizon



Projected 2020

Image J. Guinotte Marine Conservation Institute



Projected 2099

# Possible effects of OA on shallow and deep coral communities

Reduced calcification rates

Changes in community composition

Changes in food supply to deep corals

Reduced long term viability



Loss of global biodiversity

## The good news

Warm tropical waters where most shallow coral reefs live will be the last to become under-saturated

Some deep corals can survive in naturally under-saturated conditions

Building skeletons requires energy, so if corals have plenty of food they may be able to overcome OA stress

Some corals may be able to adapt to changes in aragonite concentration

Some corals use different types of calcium carbonate to build skeleton (eg calcite instead of aragonite)

## The bad news

Humans have already set the OA process in motion so we will have to face the consequences of past actions

Tropical reefs are also being impacted by increased SST, which causes coral bleaching, reducing energy for the coral

There will be limits to coral adaptation and resilience, even with no other stress and plenty of food

Many corals will not be able to adapt to changes in aragonite concentration, and species will be lost

Nearly all deep reefs are currently above the ASH, these will probably be lost as the ASH becomes shallower

Dead coral skeleton provides reef structure but is not protected from dissolving like live corals

# What can we do to mitigate effects of OA on coral reefs

Stop burning fossil fuels !!

Reduce stress from other human impacts

- coastal pollution
- high nutrient input
- physical damage (diving, destructive fishing methods)
- diseases

Better coastal management will improve water quality

Marine Protected Areas can reduce human activities in particularly vulnerable or important sites

Questions?

