

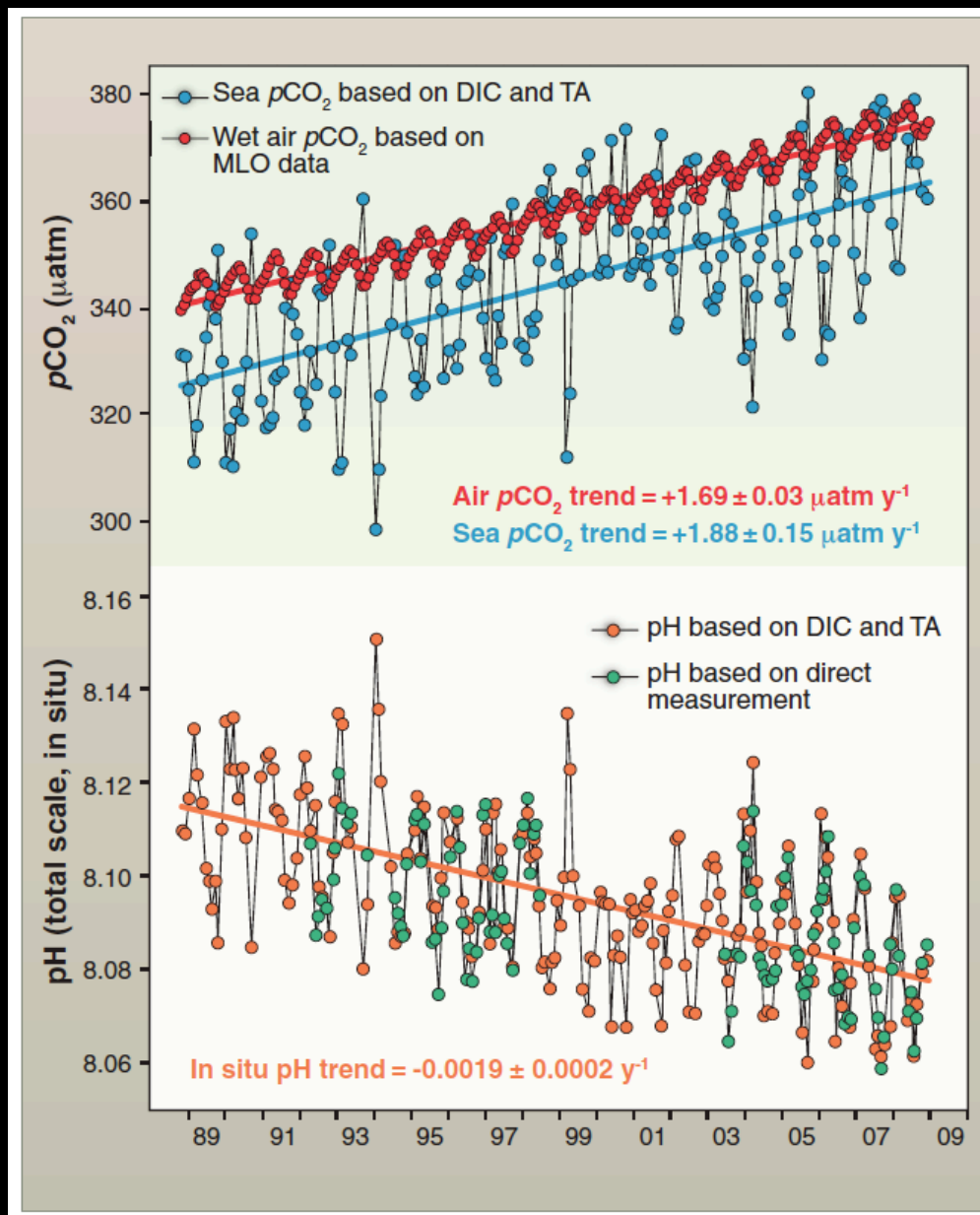


The Science of Ocean Acidification

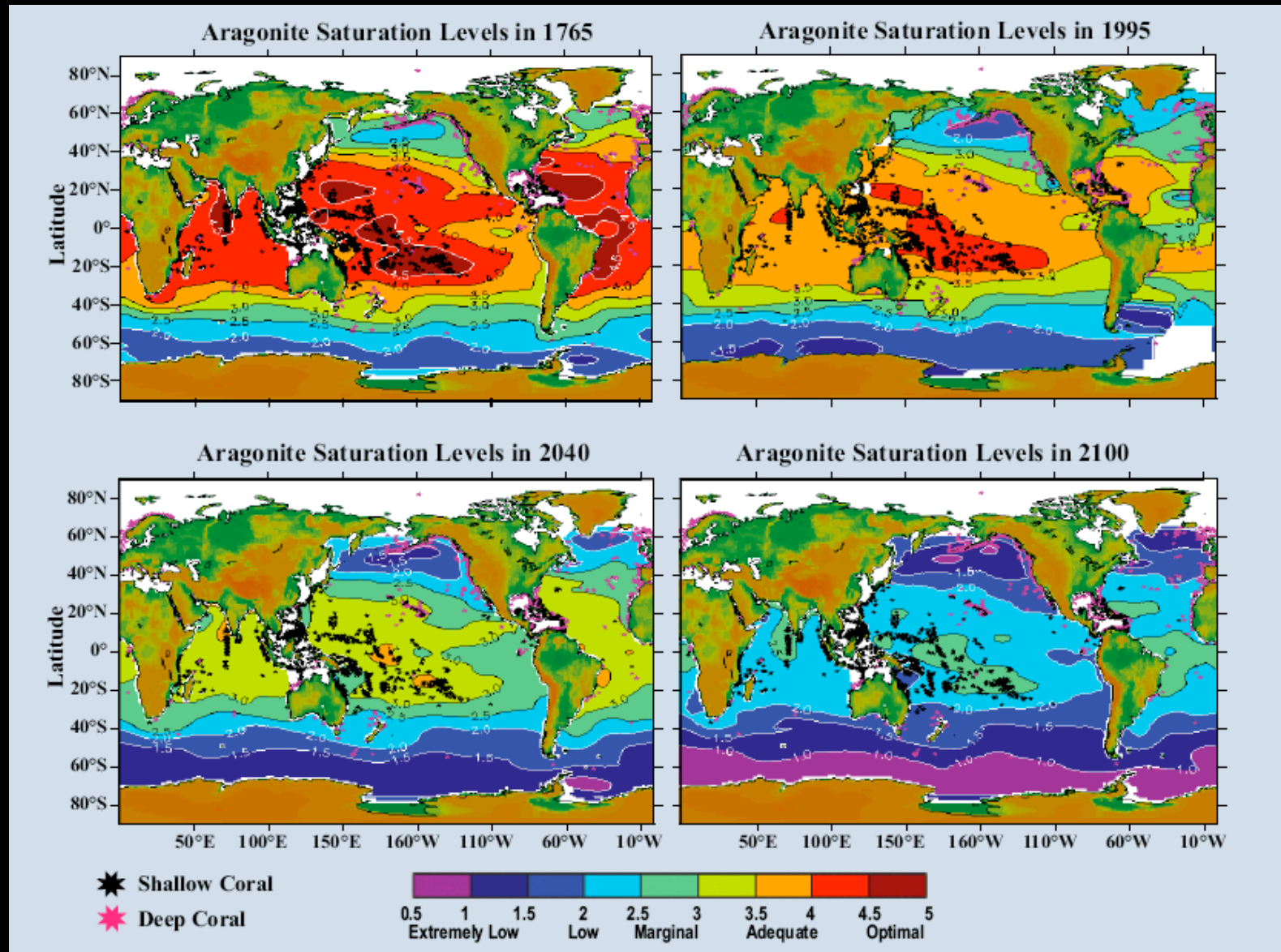
Nancy Knowlton

National Museum of
Natural History
Smithsonian Institution

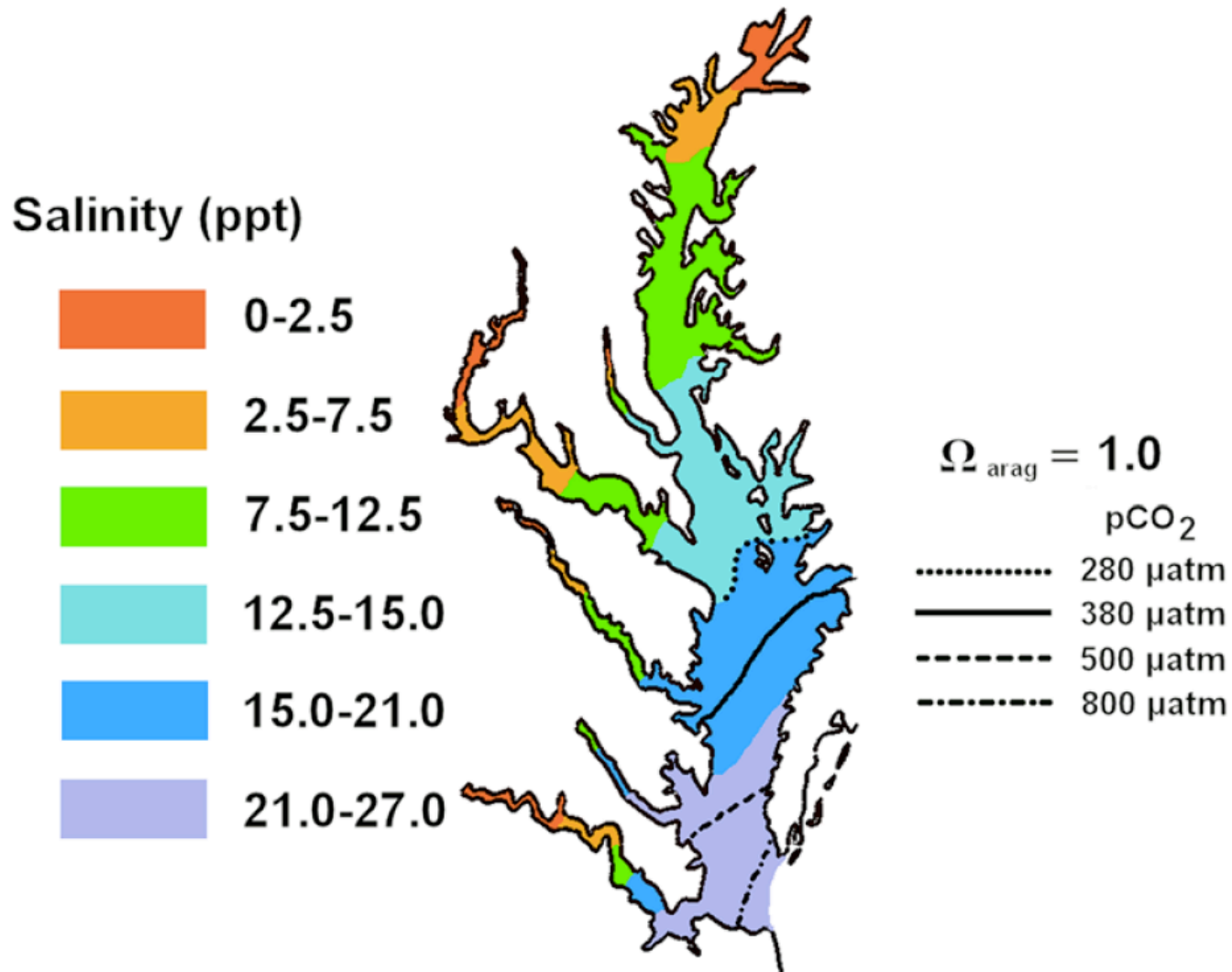
Recent Trends: Atmospheric CO₂ and Ocean pH

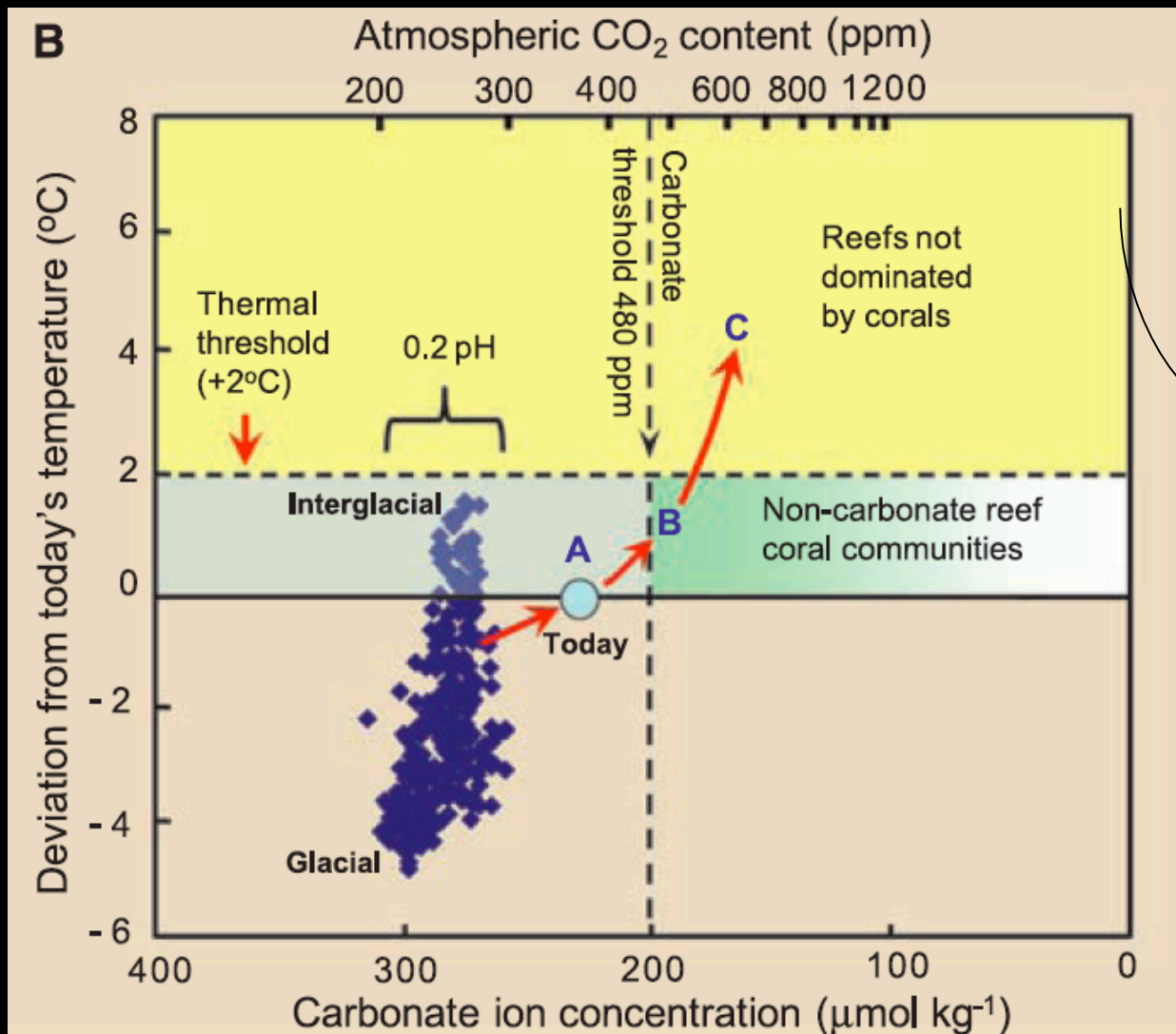


Ocean Acidification Scenarios



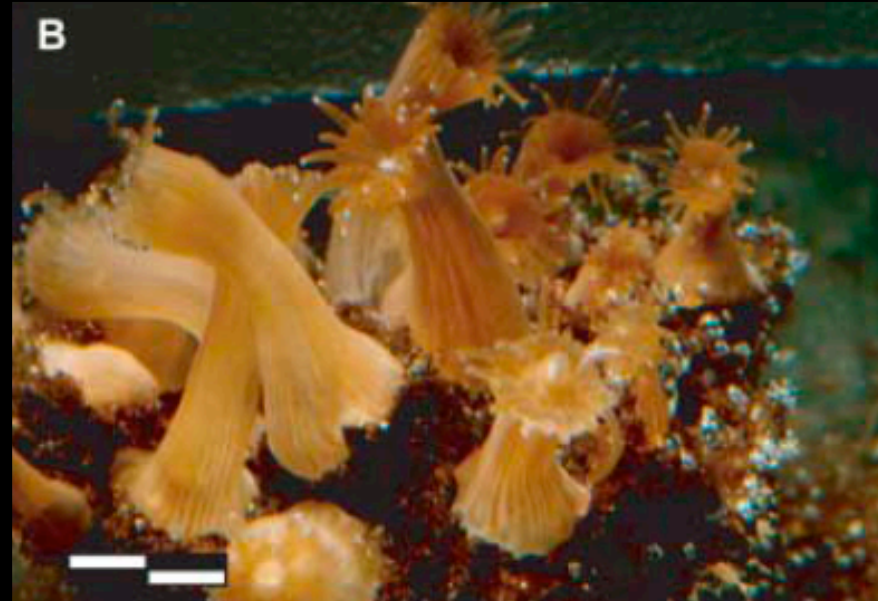
Bringing it closer to home...





Uncharted Waters!

Coral Osteoporosis



Coral to “sea anemone”
in acidified water

But sea anemones
cannot build reefs

Reefs of the future



375 ppm
+1°C



450-500 ppm
+2°C



> 500 ppm
>+3°C

Remember

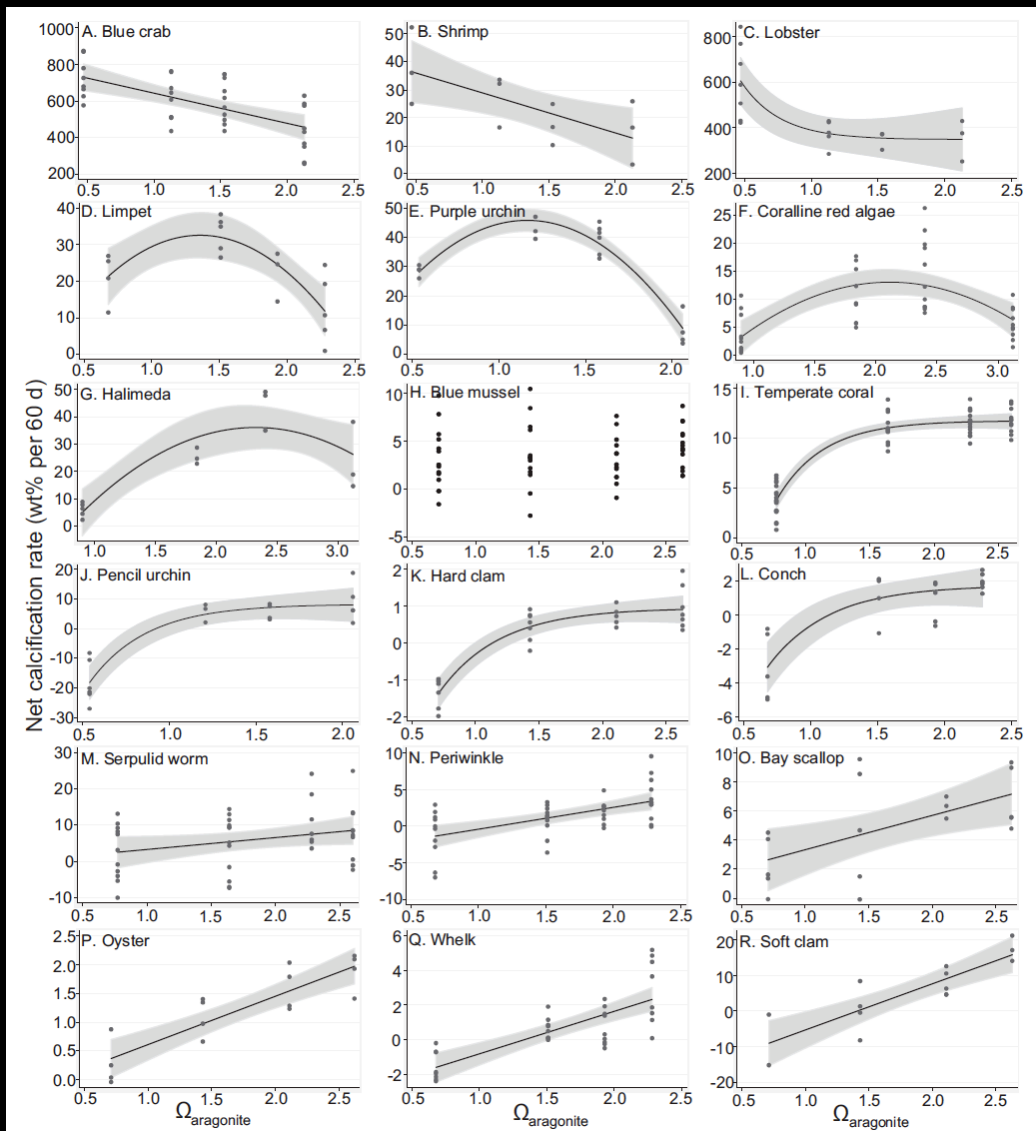
Business as usual = 650 ppm

Double pre-industrial CO₂ = 550 ppm

CO₂ lasts for centuries in the atmosphere

pH and Other Marine Organisms





10x 3x 2x Now

10x 3x 2x Now

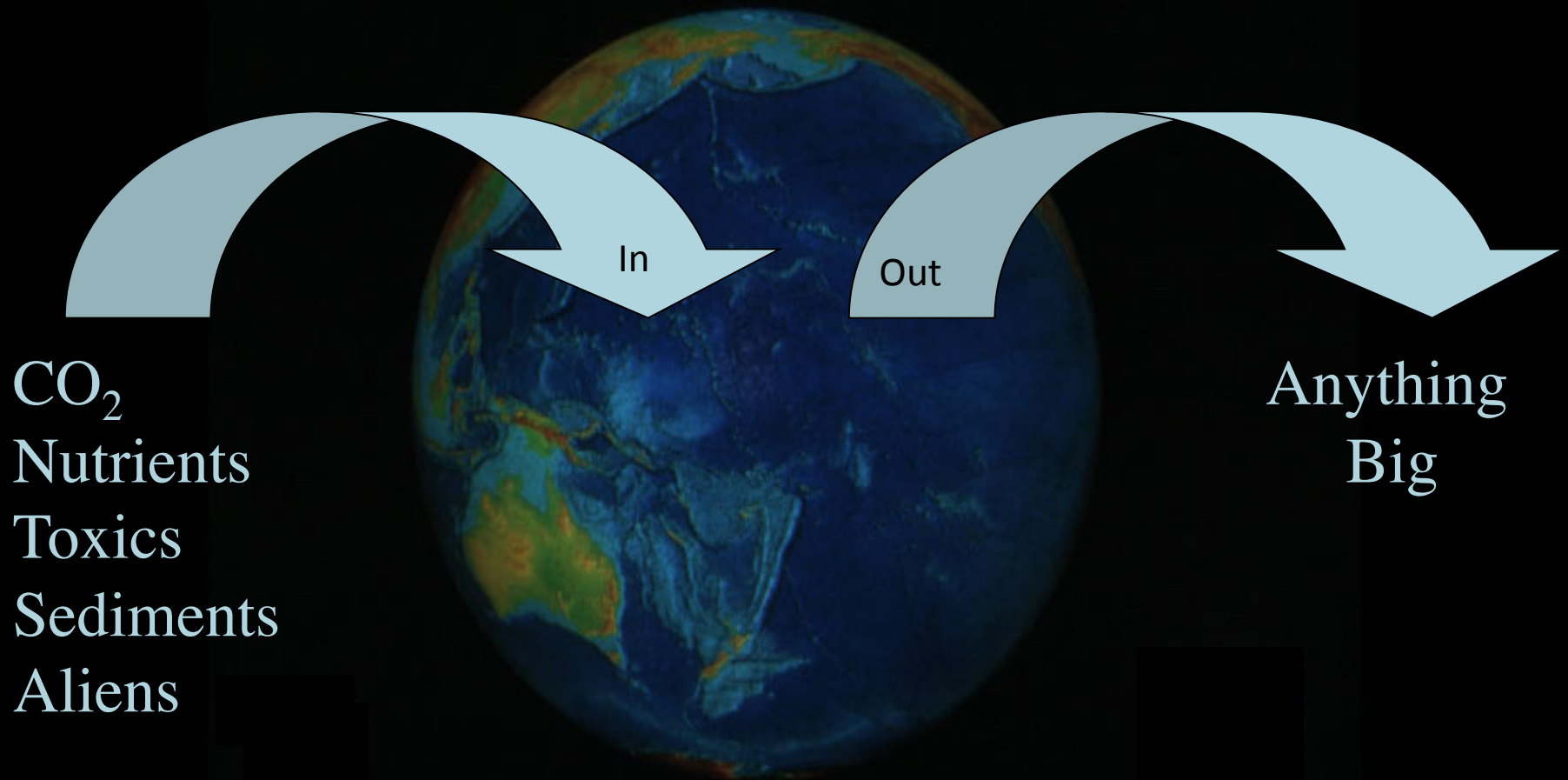
10x 3x 2x Now

(2856 ppm 903 ppm 606 ppm 409 ppm)

Bottom Line:
It's Complicated

And these are
simple studies:
Single species
One measure

Ocean Crises



CO₂
Nutrients
Toxics
Sediments
Aliens

Anything
Big

An ever growing list of calamities