

REGIONAL SCIENTIFIC MEETING

April 18-19, 2017

Marco Polo Hotel, Cebu City

CLIMATE CHANGE AND FISHERIES

RUBEN M UNGUI



CEBU TECHNOLOGICAL UNIVERSITY
DAANBANTAYAN CAMPUS
Daanbantayan, Cebu



DID THE HOLY BIBLE MENTION ABOUT CLIMATE CHANGE?

SOME END-TIME PROPHECIES:

Luke 21:11 ESV

There will be great earthquakes, and in various places famines and pestilences. And there will be terrors and great signs from heaven.

Matthew 24:29 ESV

“Immediately after the tribulation of those days the sun will be darkened, and the moon will not give its light, and the stars will fall from heaven, and the powers of the heavens will be shaken.

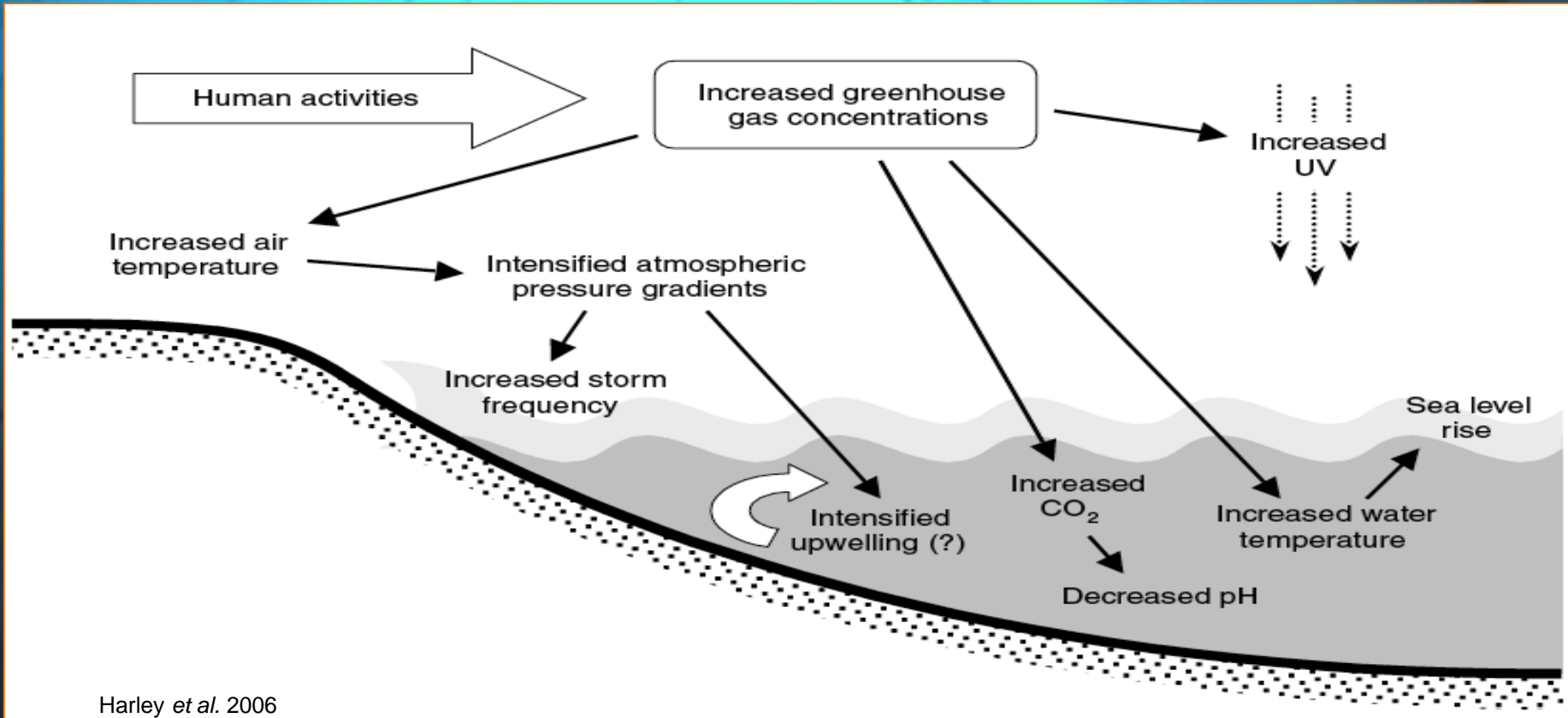
Psalms 46:2-3 ESV

Therefore we will not fear though the earth gives way, though the mountains be moved into the heart of the sea, though its waters roar and foam, though the mountains tremble at its swelling.

WHAT DO SCIENTISTS SAY ABOUT CLIMATE CHANGE?

- ▣ **The last decade was the warmest in the Northern Hemisphere over the past 1000 years and air temperature is predicted to increase even more in the future, especially in winter.**
- ▣ **The World ocean is also warming and not just near surface water (Levitus 2006).**
- ▣ **Oceans are warming from surface to bottom**

If the predictions are right – Will Climate Change contribute to:



Sea level rise?

Increased sea temperature?

Increased ocean acidity? Changes in plankton & food chains?

LET'S TALK ABOUT CLIMATE CHANGE AND FISHERIES

WE HAVE MET THE
ENEMY AND IT IS
CLIMATE CHANGE.

CLIMATE CHANGE

Why talk about climate change?

SURE I WAS WARNED, BUT THE REMEDY SOUNDED DIFFICULT.

Noah, 2020

HE HAS GATHERED INSTEAD TWO OF EVERY EXCUSE...



UNIVERSAL UCLIFOR
REPROD THE WASHINGTON POST

5.27.10



WHY TALK ABOUT CLIMATE CHANGE?

**Maybe Abu Sayaff
will stop their
kidnapping activities
or stop beheading
people if we explain
to them how they
really should be
focusing on climate
change**



Why talk about climate change ?



We should not wait this to happen!

WHY DOES CLIMATE CHANGE OCCUR?

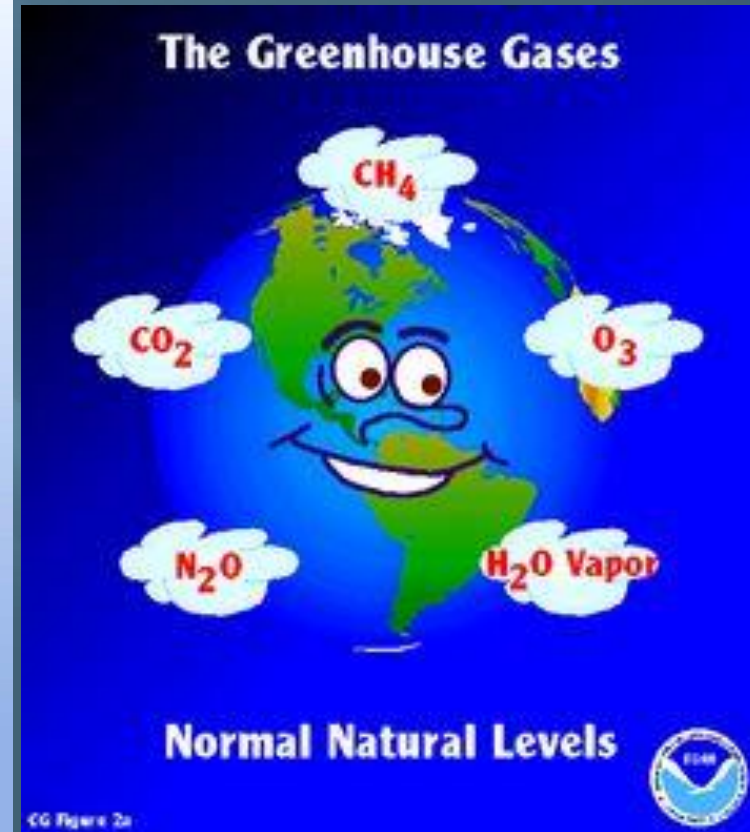
Fact 1: CO₂ traps heat and plays a vital role in our climate

Fact 2: Increasing the CO₂ results in more heat being trapped

Fact 3: We have roughly doubled the CO₂ in the atmosphere

Conclusion: Therefore, we are causing the climate to warm

This is a deductive logical argument. Unless you can show that one of the premises is false or that a logical fallacy has been committed, you *must* accept the conclusion.



1. What is at stake?

- Over **500 million** people depend – directly or indirectly – on fisheries and aquaculture for their livelihoods
- Aquatic foods provide essential nutrition for **4 billion people** and at least 50% of animal protein and minerals to 400 million people in the poorest countries.
- Fish products are among the most **widely-traded foods**, with more than 37% by volume of world production traded internationally. (FAO/UN)



WHY? WHAT ARE THE EFFECTS OF CLIMATE CHANGE ON FISHERIES?

Increase in sea water temperature

- ❖ resulted to disappearance of coral reefs



Today



Before

WHY? WHAT ARE THE EFFECTS OF CLIMATE CHANGE ON FISHERIES?

Increase in sea water temperature

❖ resulted to mass coral bleaching



Today

Before

WHY? WHAT ARE THE EFFECTS OF CLIMATE CHANGE ON FISHERIES?

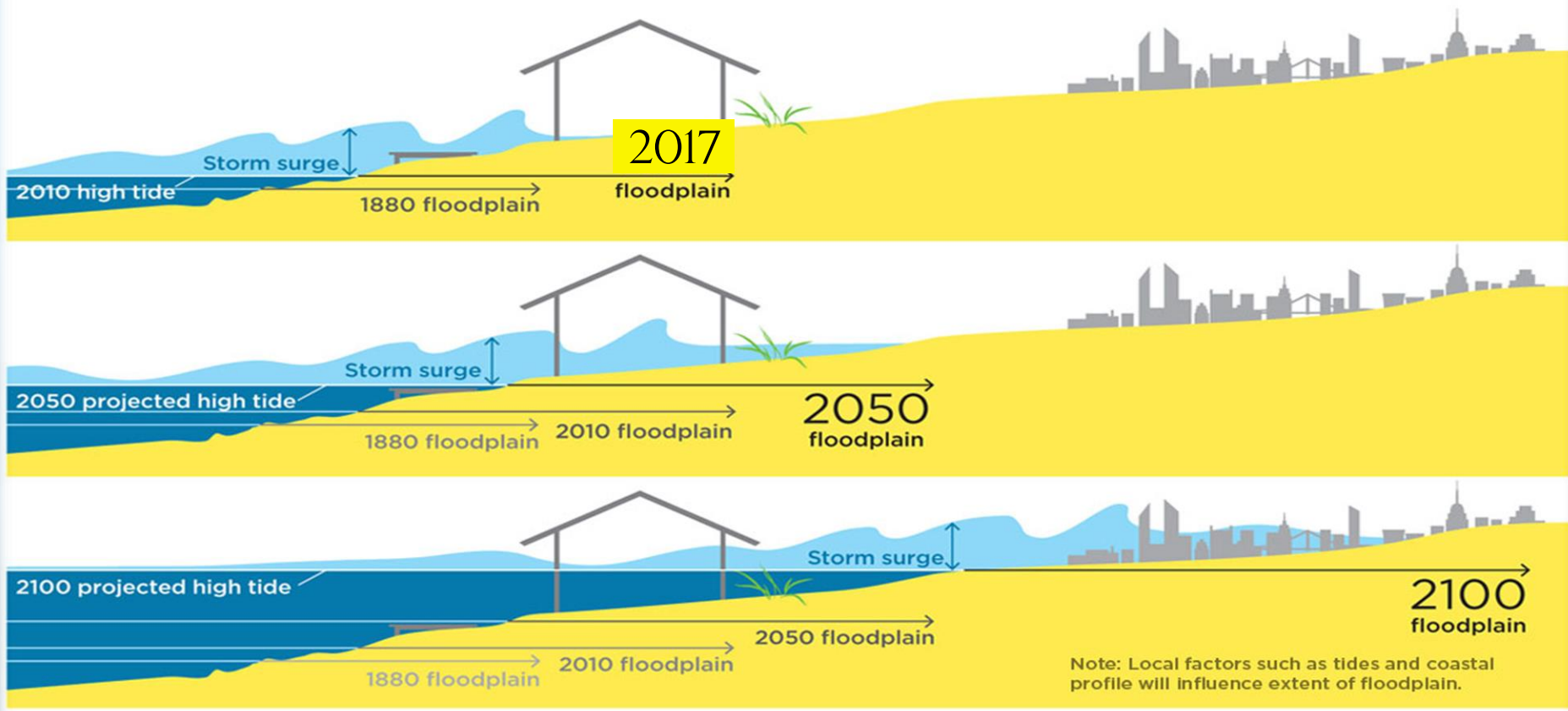
Increase in sea water temperature

- ❖ resulted to rise in sea water level – inundation



WHY? WHAT ARE THE EFFECTS OF CLIMATE CHANGE ON FISHERIES?

Storm Surge and High Tides Magnify the Risks of Local Sea Level Rise

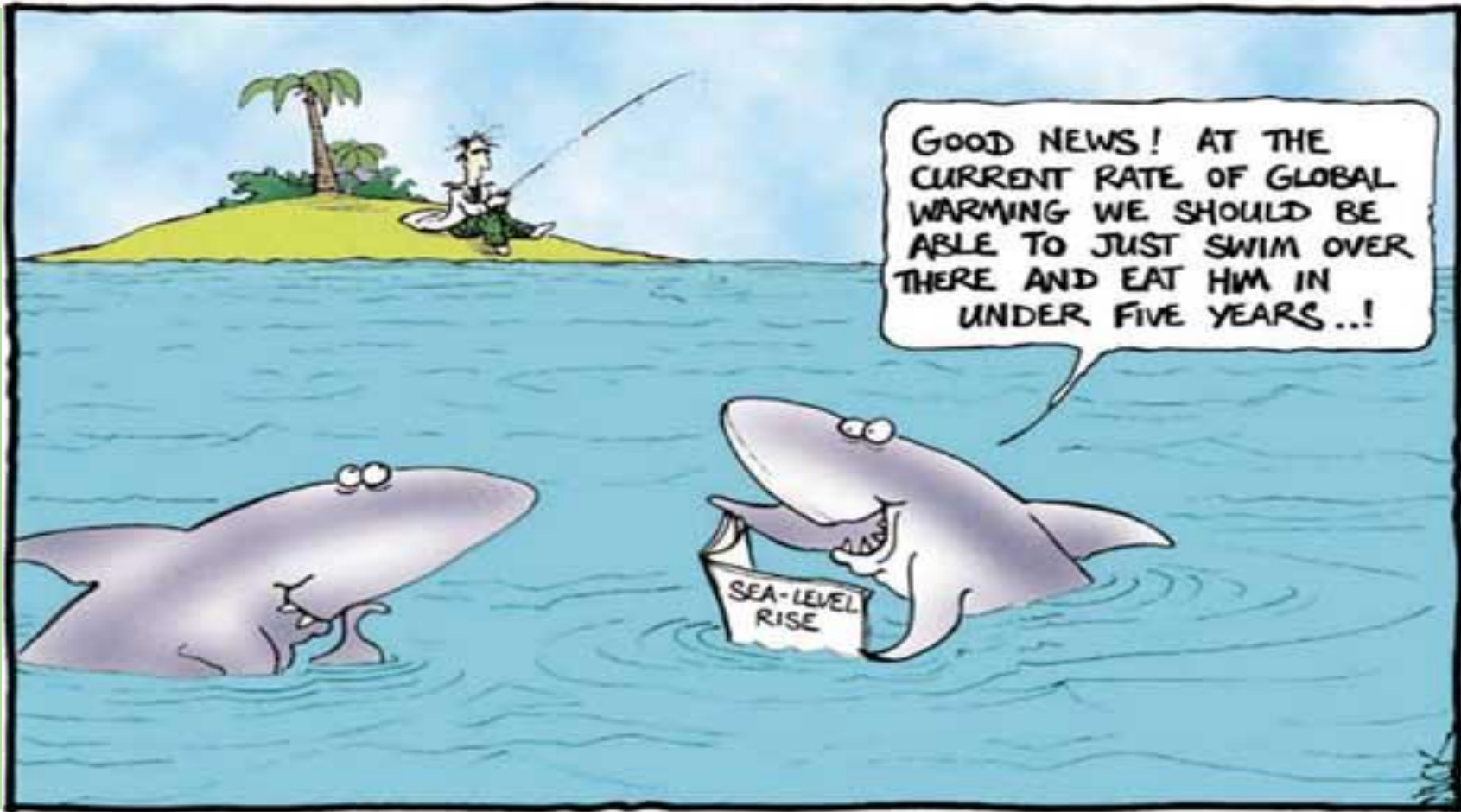


Increase in sea water temperature
❖ resulted to rise in sea water level

WHY? WHAT ARE THE EFFECTS OF CLIMATE CHANGE ON FISHERIES?

C
L
I
M
A
T
E

C
H
A
N
G
E



Increase in sea water temperature

- ❖ resulted to rise in sea water level

EFFECTS OF INCREASED TEMPERATURE ON FISH BIOLOGY

- Since fish are cold blooded, when the surrounding water warms up, metabolism speeds up
 - Digest food more rapidly,
 - Grow more quickly
 - Have more energy to reproduce.
- But fish need more food and more oxygen to support this higher metabolism.
- Warmer fish tend to mature more quickly,
- This speedy lifestyle is often a smaller body size and a smaller brood.
- At higher temperatures sex determination will be affected (e.g. more females)

WHY? WHAT ARE THE EFFECTS OF CLIMATE CHANGE ON FISHERIES?

Seawater becomes more acidic

- ❖ resulted to massive fish kill



Today

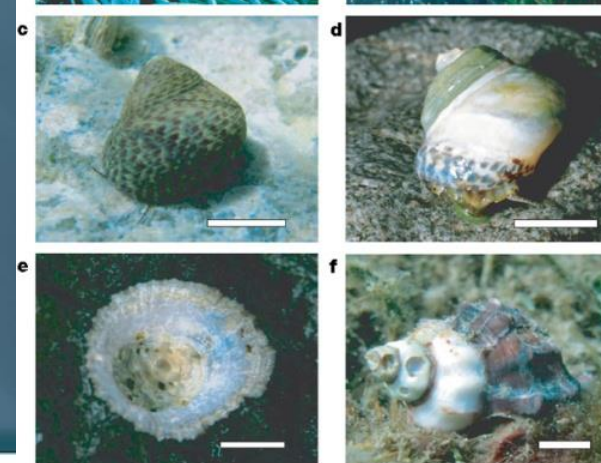


Before

WHY? WHAT ARE THE EFFECTS OF CLIMATE CHANGE ON FISHERIES?

Seawater becomes more acidic

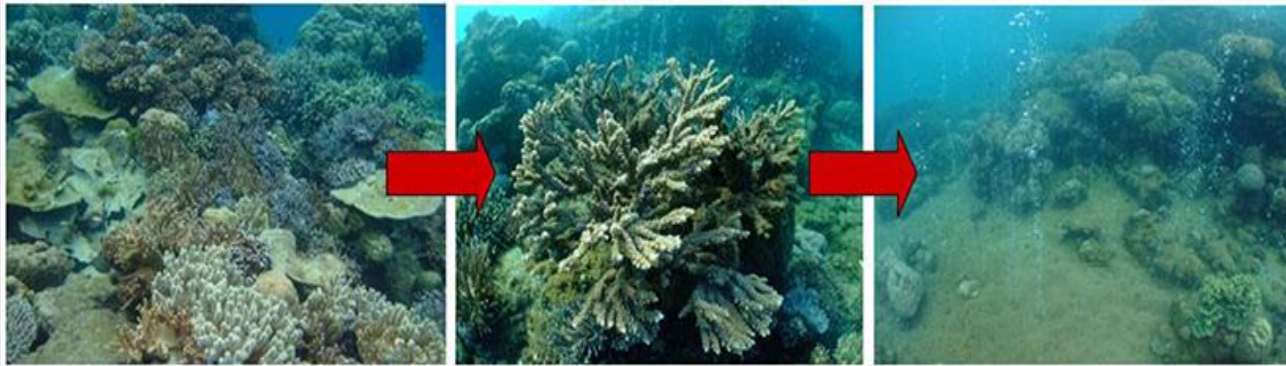
- Reduction of animals ability to produce shell & skeleton, and interference with fish navigation
- Shellfish growth affected by shell thinning & increased mortality
- Coral reef damage will affect fishery production in tropical regions



pH 8.05: Today

pH 7.95: ~ year 2050

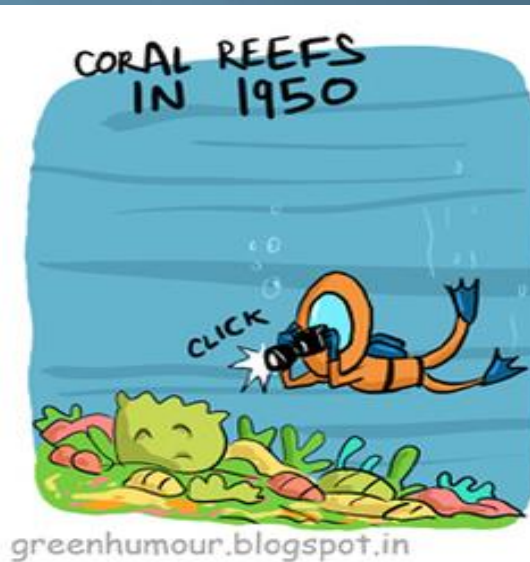
pH 7.8: ~ year 2100



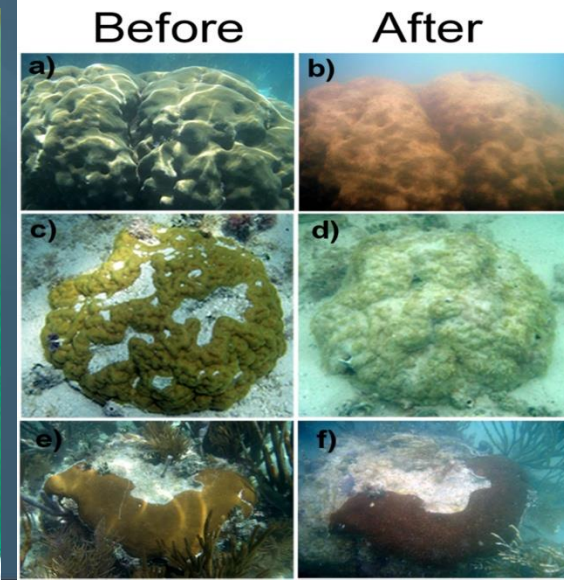
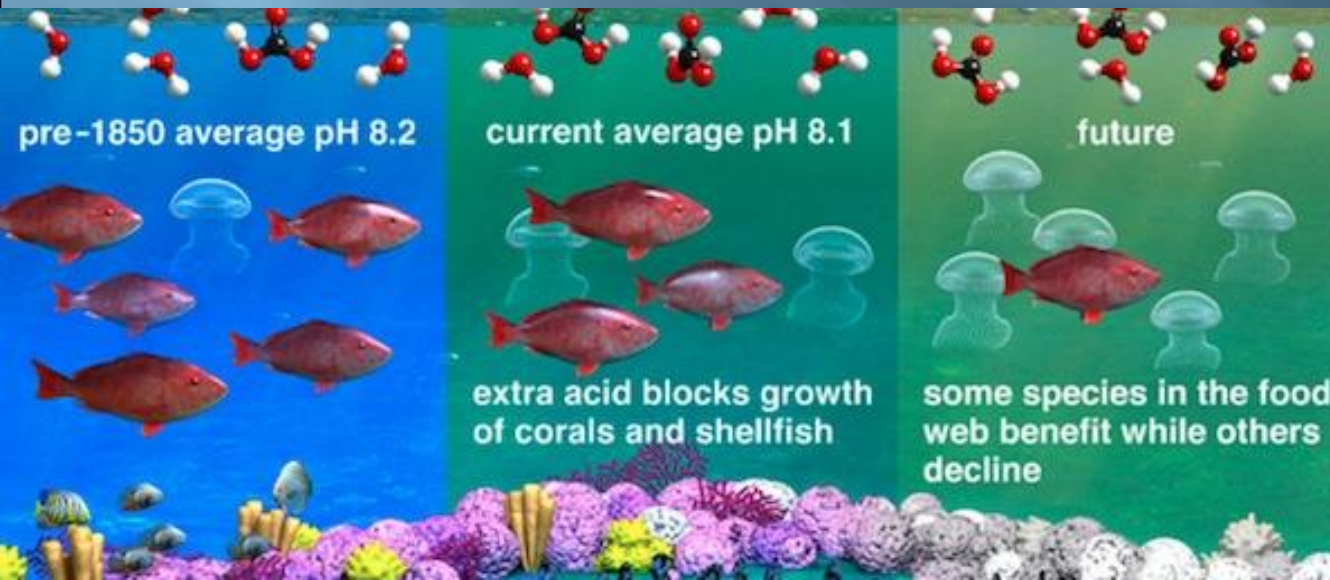
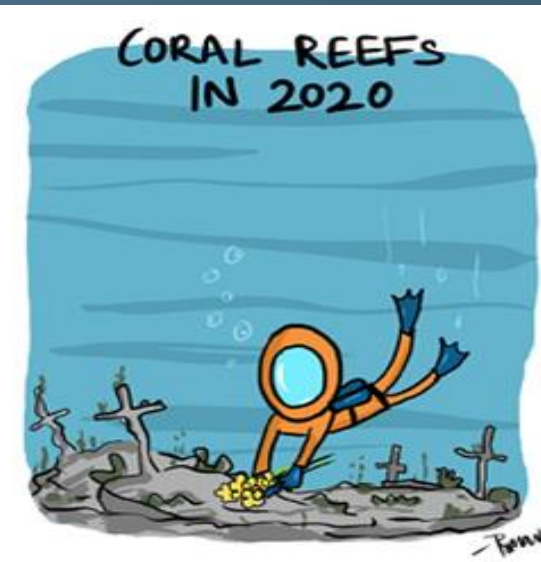
WHY? WHAT ARE THE EFFECTS OF CLIMATE CHANGE ON FISHERIES?

Ocean acidification

Ocean acidification reduces the levels of calcium carbonate - the chemical which helps in the formation of shellfish and coral reefs. This threatens the existence of many marine species.

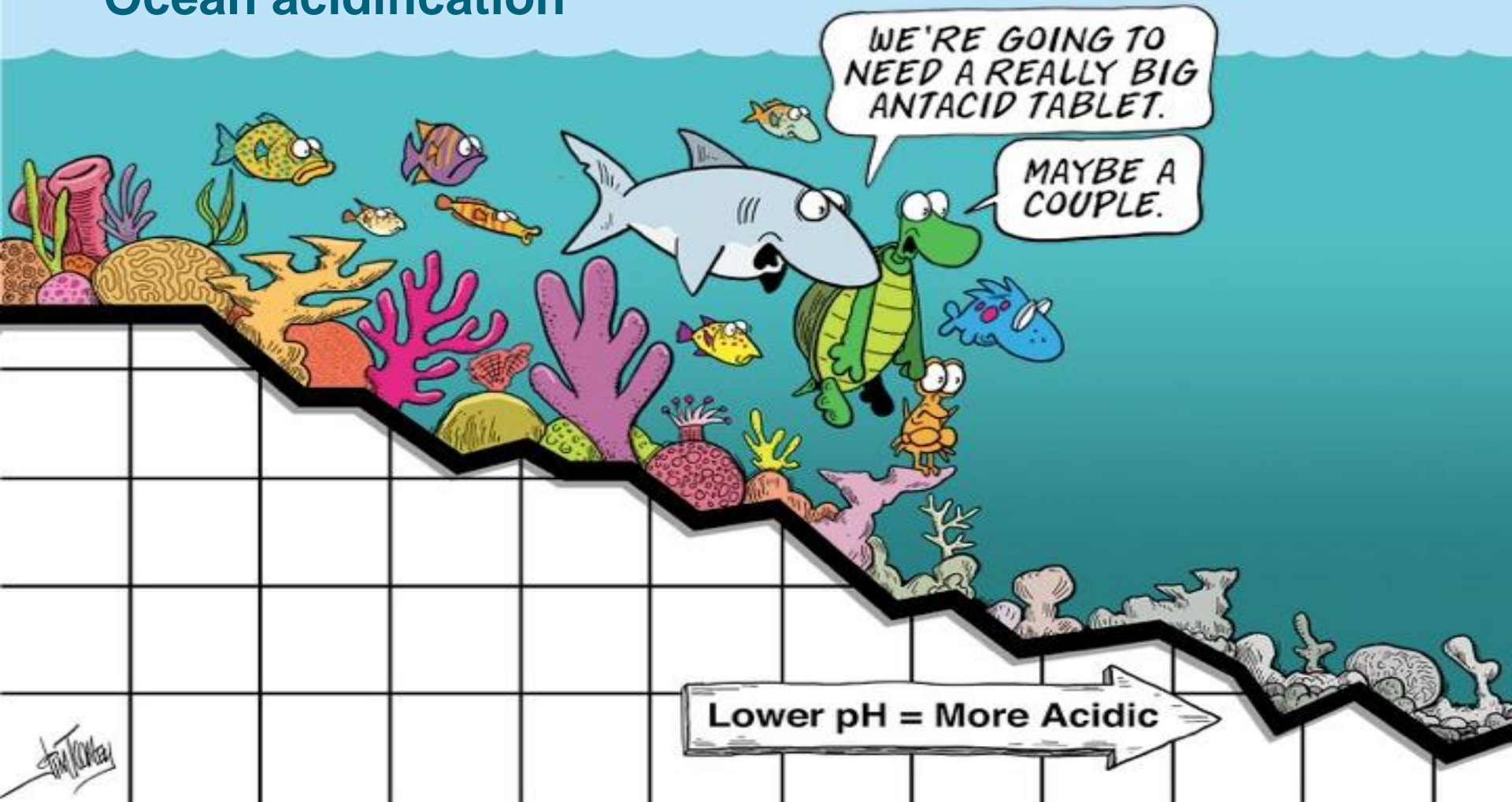


greenhumour.blogspot.in



WHY? WHAT ARE THE EFFECTS OF CLIMATE CHANGE ON FISHERIES?

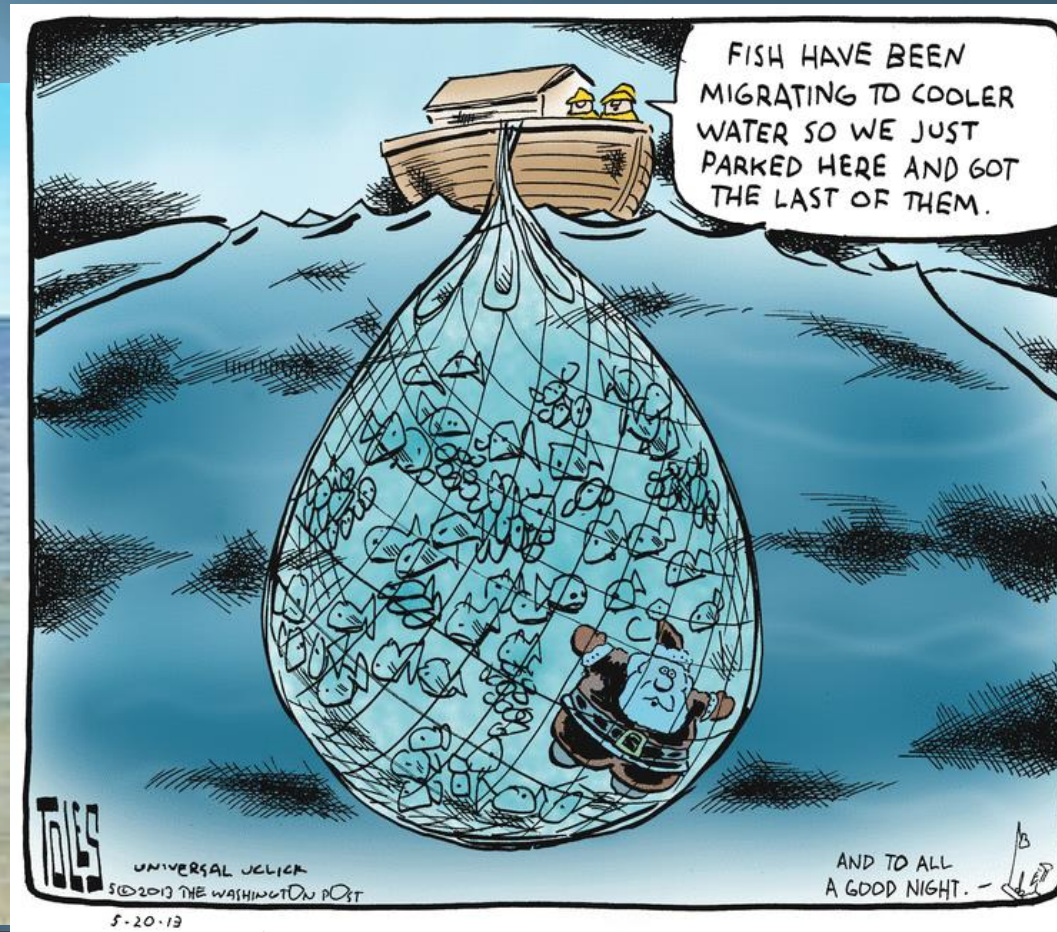
Ocean acidification



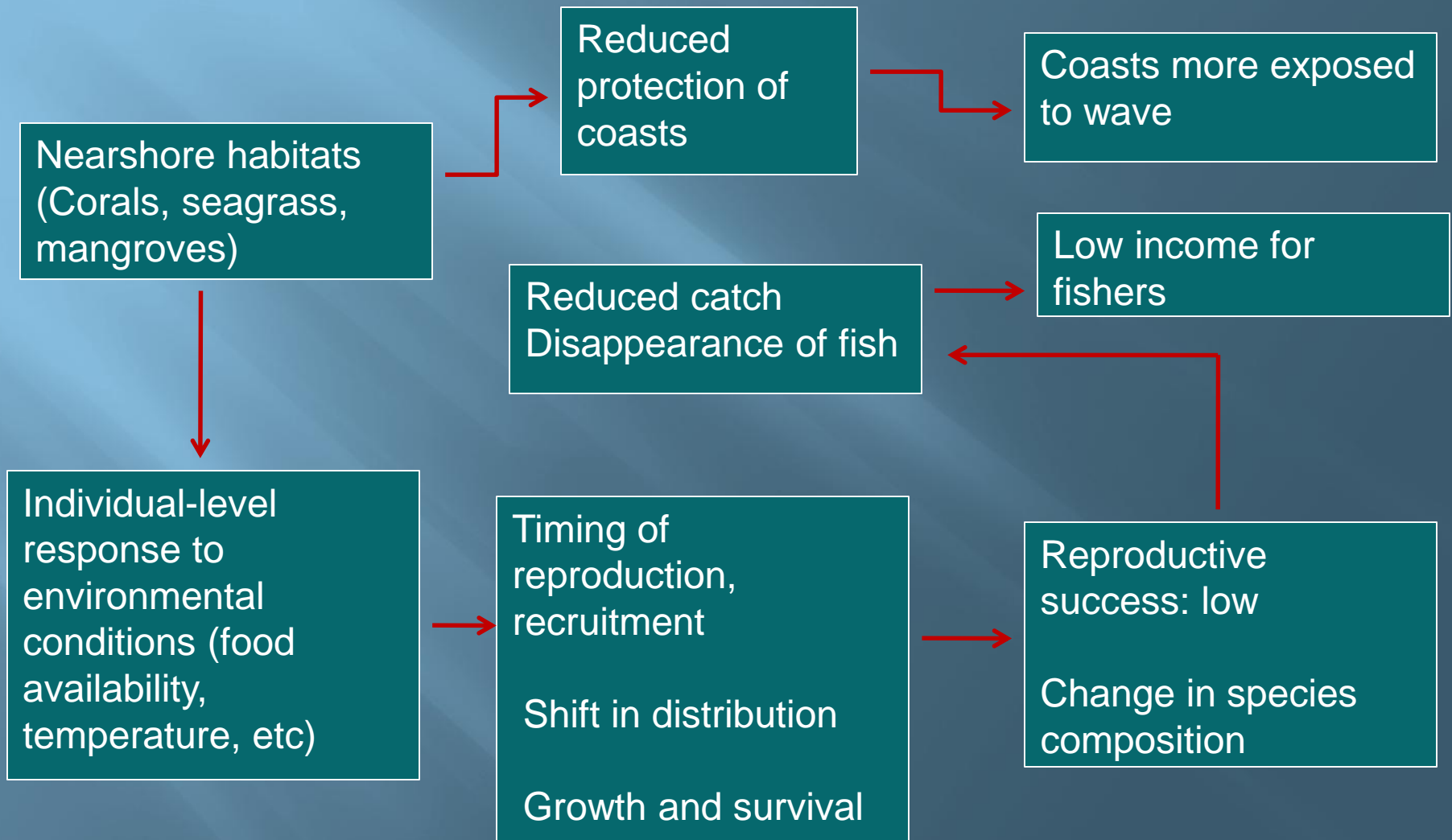
IMPACTS OF CLIMATE CHANGE ON FISHERIES

- decline of fish stocks and other important fisheries commodities

❖ migration of fish to cooler regions



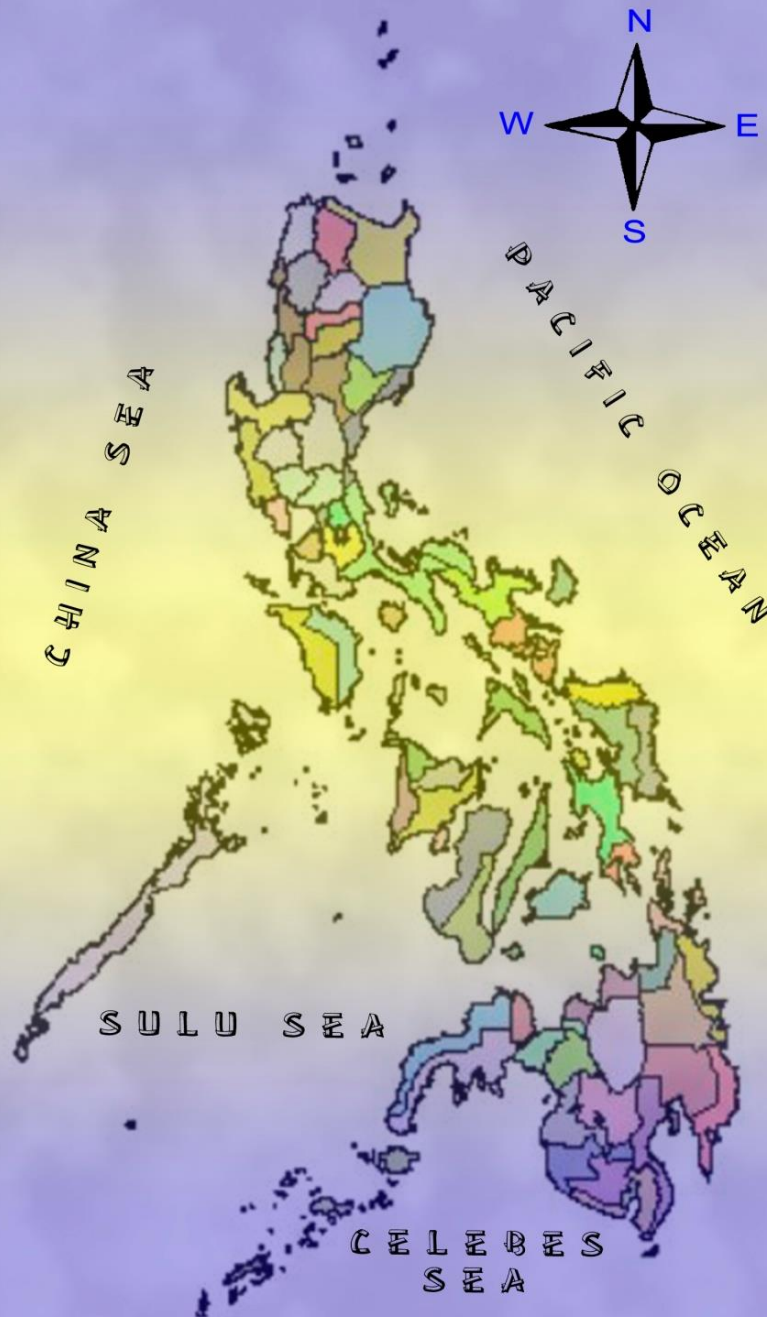
IMPACTS OF CLIMATE CHANGE TO FISHERIES



HOW WILL FISHERIES CHANGE?

- ▣ Fisheries resources may become less predictable as extreme weather hits more often.
- ▣ Events like the El Niño might cause a greater impact on warm water fisheries and reef fisheries.
- ▣ Many fisheries resources will permanently shift location as water temperatures rise.
- ▣ Small-scale fishermen were the most affected who will have to adapt their gear and methods, travel farther, and fish longer to continue providing enough food for their families and local markets.

The Philippines



7,107 islands

total area: ~ 300,000 km²

total coastline : 33,900 km.

total forest lands: 15 million hectares

wetlands: 14,100 km²

groundwater resources: 50,000 km²

CLIMATE CHANGE AND THE PHILIPPINE FISHERIES

- Nearly 60% of the population is dependent on fisheries
- Fishers are the poorest of the poor sector
- Fish stocks in major fishing grounds in the Philippines have been reduced to less than 10% of 1950s level
- Average catch rate of Filipino fisherfolks is less than $\frac{1}{2}$ of what they catch in 1970s

The Philippines

Coastal resources

Its vulnerability :

- 10 cm/decade Sea Level Rise (SLR) in some coastal cities
- long history of storm surges (48 known occurrences in 50 years with as much as 9-m or higher storm surge height)
- some areas already partially inundated

Coastal resources *(continued)*

- ✓ endangered access to clean water during floods
- ✓ intrusion of saltwater in its agricultural areas
- ✓ aggravated flooding potential esp. in low-lying areas
- ✓ higher risks to lives and damages in coastal areas
- ✓ impacts on marine ecosystems (reefs, corals, etc.)
 - more frequent episodes of toxic red tides
 - migration of fish to areas with more favorable conditions leading to diminished harvest
(coastal fishing = 40 – 60% of total fish catch)

AND SO, WHAT CAN WE DO?

ADAPTATION STRATEGIES FOR SUSTAINABLE FISHERIES

- **R** educing fishing mortality
- **E** nhancing stock recovery
- **S** ustainable fisheries use
- **T** hreat reduction on ecosystems
- **O** rganizing fisher communities
- **R** estoring resiliency & connectivity
- **E** quitable development
- **D** iversifying livelihood options

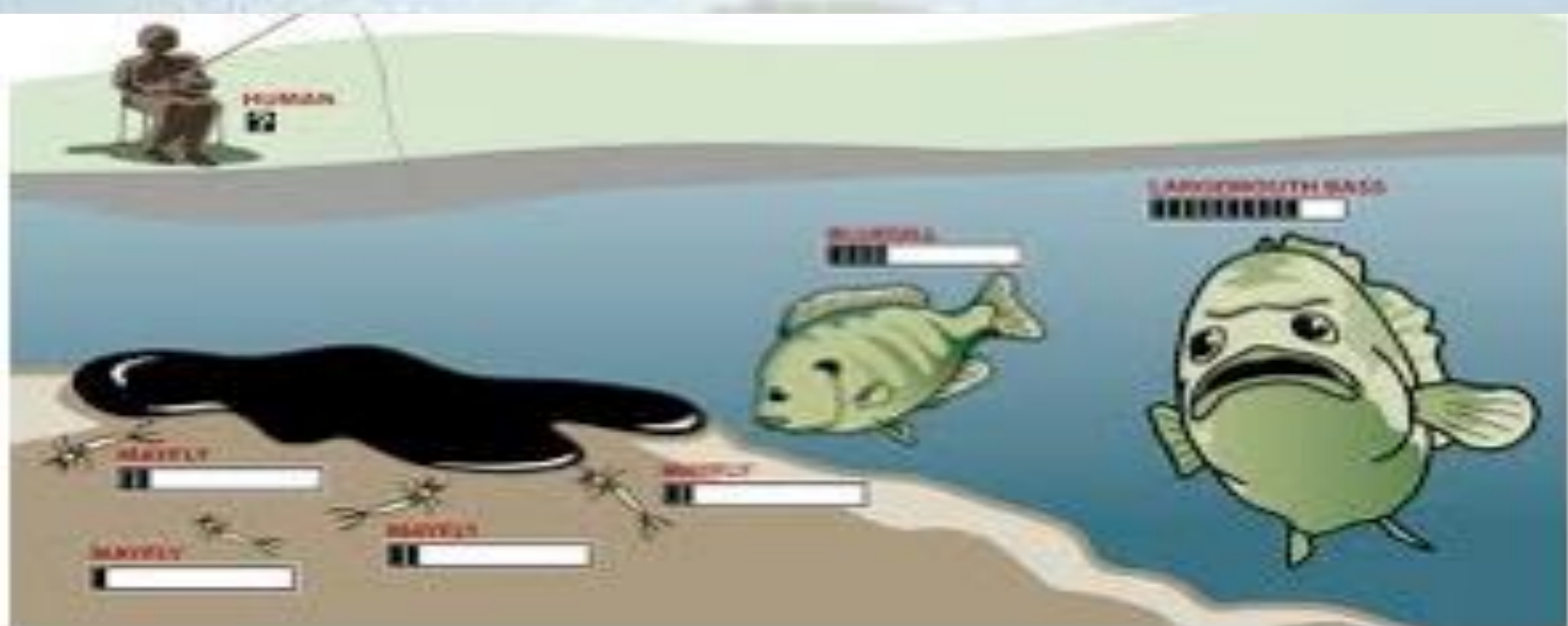
AND SO, WHAT CAN WE DO?

- ▣ Identify temperature tolerant species or more adaptable species, populations, varieties, etc.
- ▣ Develop temperature tolerant species through captivity breeding (through line breeding)
- ▣ Culture or fattening of fish in off shore floating cages

AND SO, WHAT CAN WE DO?

- **Be Informed!**
- **Be Heard!**
- **Be Committed!**

"To survive today, other animals must endure global warming, pollution, and fewer habitats. More tragically, they must endure the silence of human hearts."



proof of climate change



THANK YOU