

Efforts and case studies in the research and monitoring of impacts of ocean acidification on coral reef ecosystems

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Outline

1

pH change of Xisha Islands in 2005-2009

2

Ecological status of Xisha coral reef ecosystem

3

Related programs of OA in NMEMC

4

Impact of OA on some sensitive organisms

- In 2004-2005, 18 typical ecoregions were selected as Ecological Monitoring and Control Zones. Monitoring and evaluation have been conducted in Coastal Ecological Monitoring and Control Zones continuously since then.

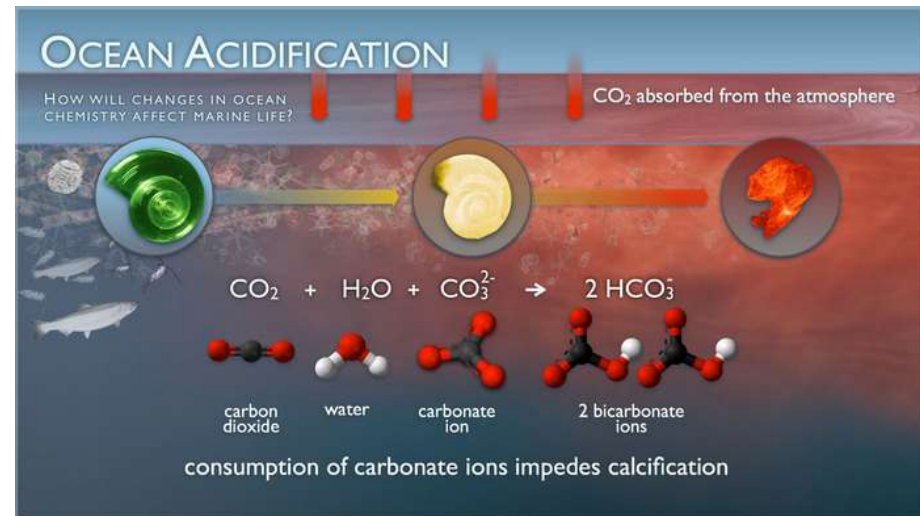
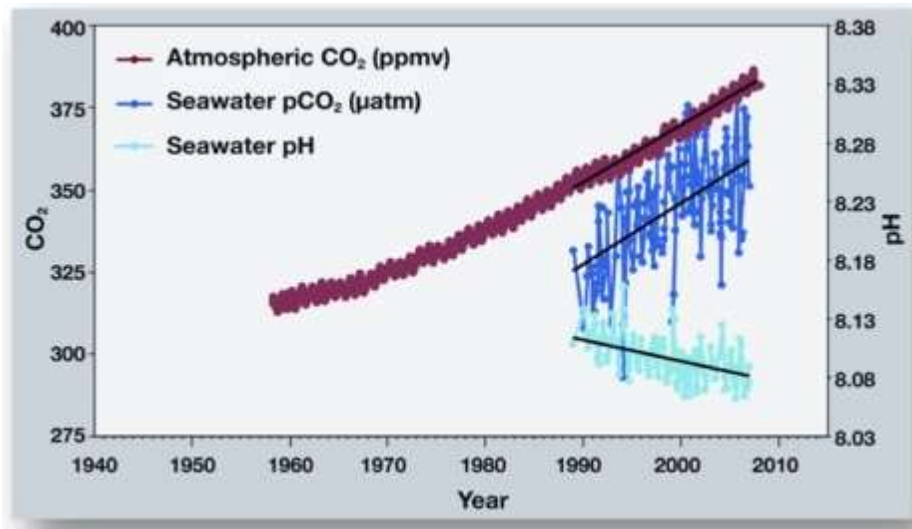


- Ship-based time series stations monitoring and observation have allowed us to understand status and change trend of ecological health of typical marine ecosystems in response to anthropogenic activities and climate change.



Climate Change- Ocean Acidification

- The atmospheric partial pressure of CO₂ will almost certainly be double that of pre-industrial levels by 2100 and will be higher than at any time during the past few millions years.

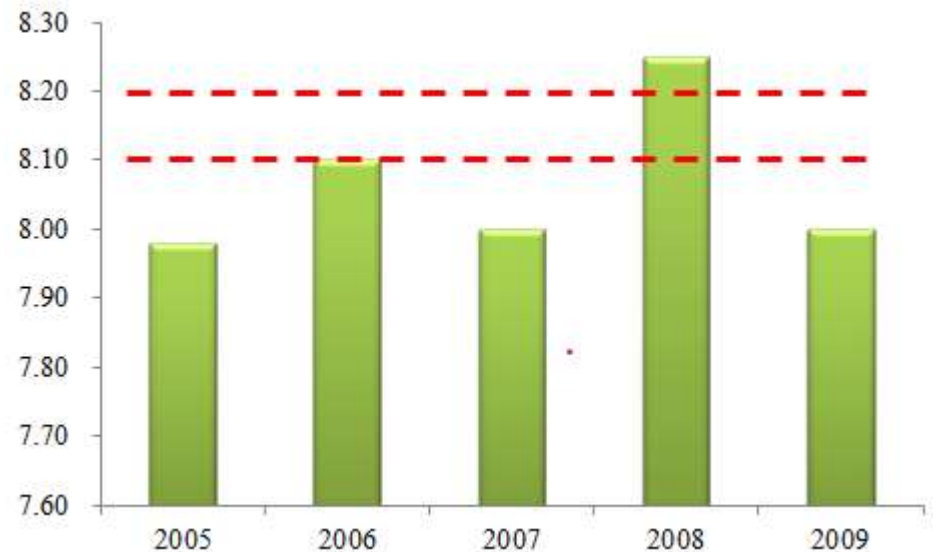


The correlation between rising levels of CO₂ in the atmosphere with rising CO₂ level in the ocean.

As more CO₂ accumulates in the ocean, the pH of ocean decreases.

pH change in Xisha Islands

According to the monitoring results of Xisha Islands monitoring and control zone in 2005-2009, the acidity of seawater is relatively low.

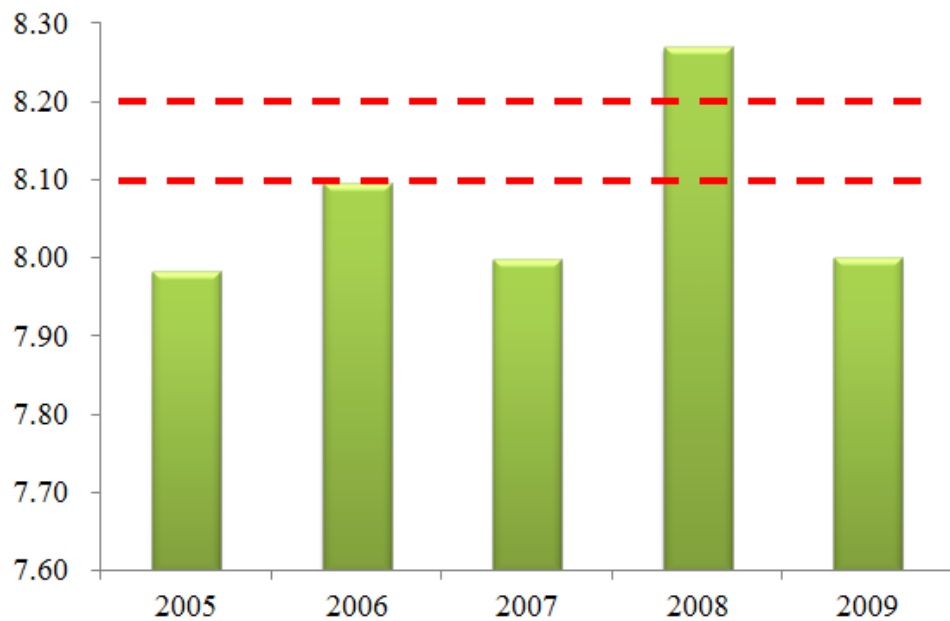


pH of bottom water (5-10 m) in 2005-2009

Analysis of bottom pH at monitoring stations

pH	$8 < \text{pH}$	$8 < \text{pH} < 8.1$	$8.1 < \text{pH} < 8.2$	$\text{pH} > 8.2$
Stations	19	29	11	15
Proportion	25.68%	39.19%	14.86%	20.27%

64.87 %



pH of surface water (0.5 m)

pH	$8 < \text{pH}$	$8 < \text{pH} < 8.1$	$8.1 < \text{pH} < 8.2$	$\text{pH} > 8.2$
Stations	18	31	12	14
Proportion	24.00%	41.33%	16.00%	18.67%

65.33 %

Analysis of surface pH at monitoring stations

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Monitoring indicators of coral reef ecosystem

- **Environmental quality of seawater**

nutrients (inorganic nitrogen and active phosphate), pH, temperature, dissolved oxygen , etc.

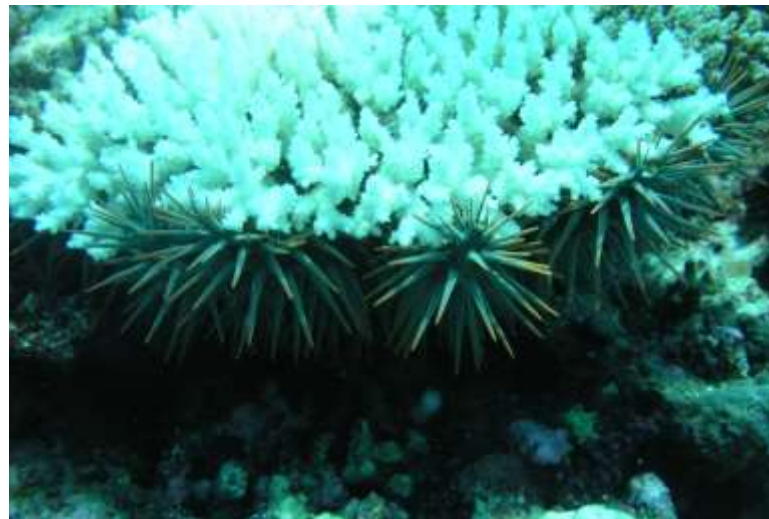
- **Community structure**

number of species, coverage, disease, recruitment, density of coral reef fish, etc.

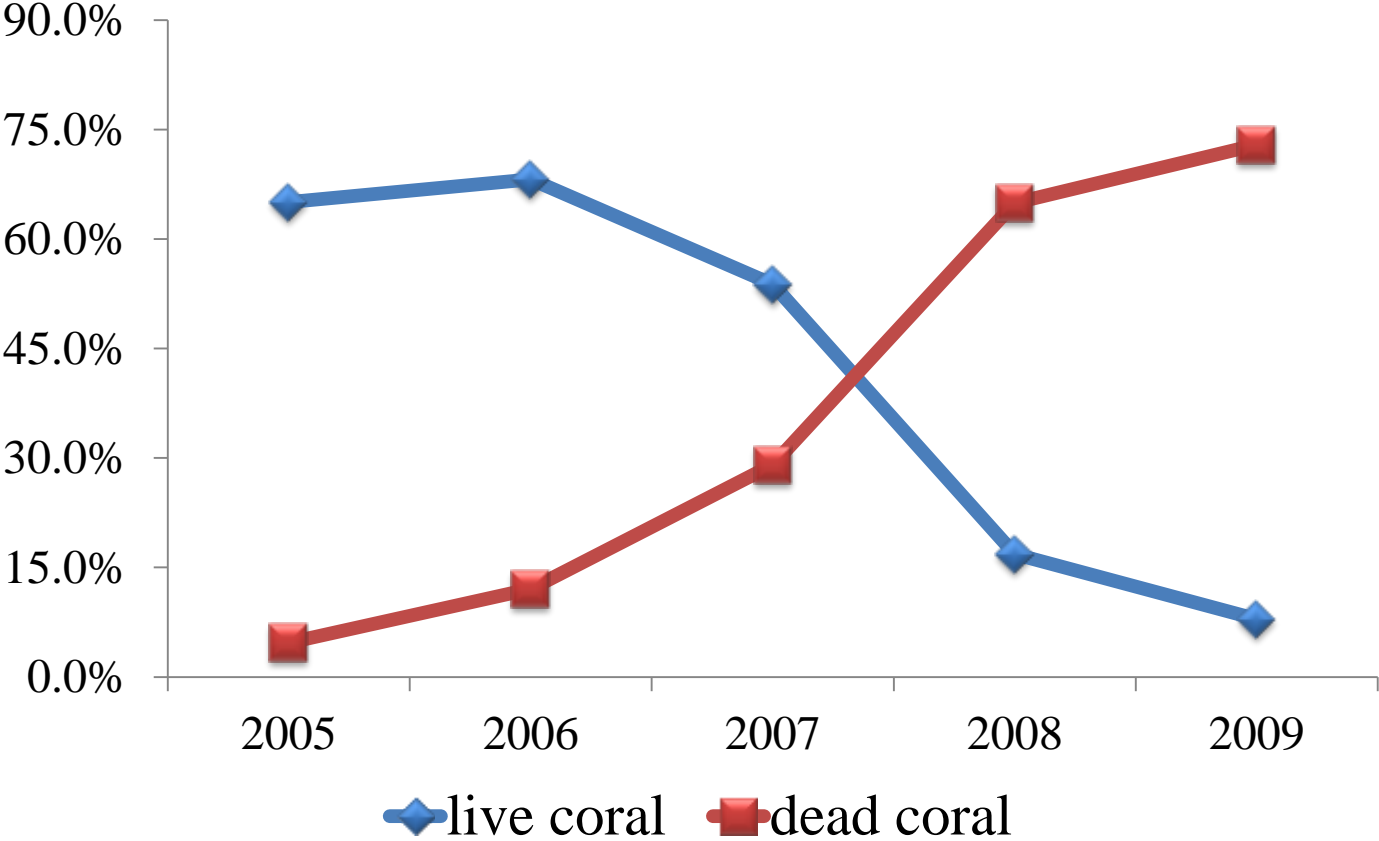
- **Habitat condition**

coverage of macroalgae (seaweed)

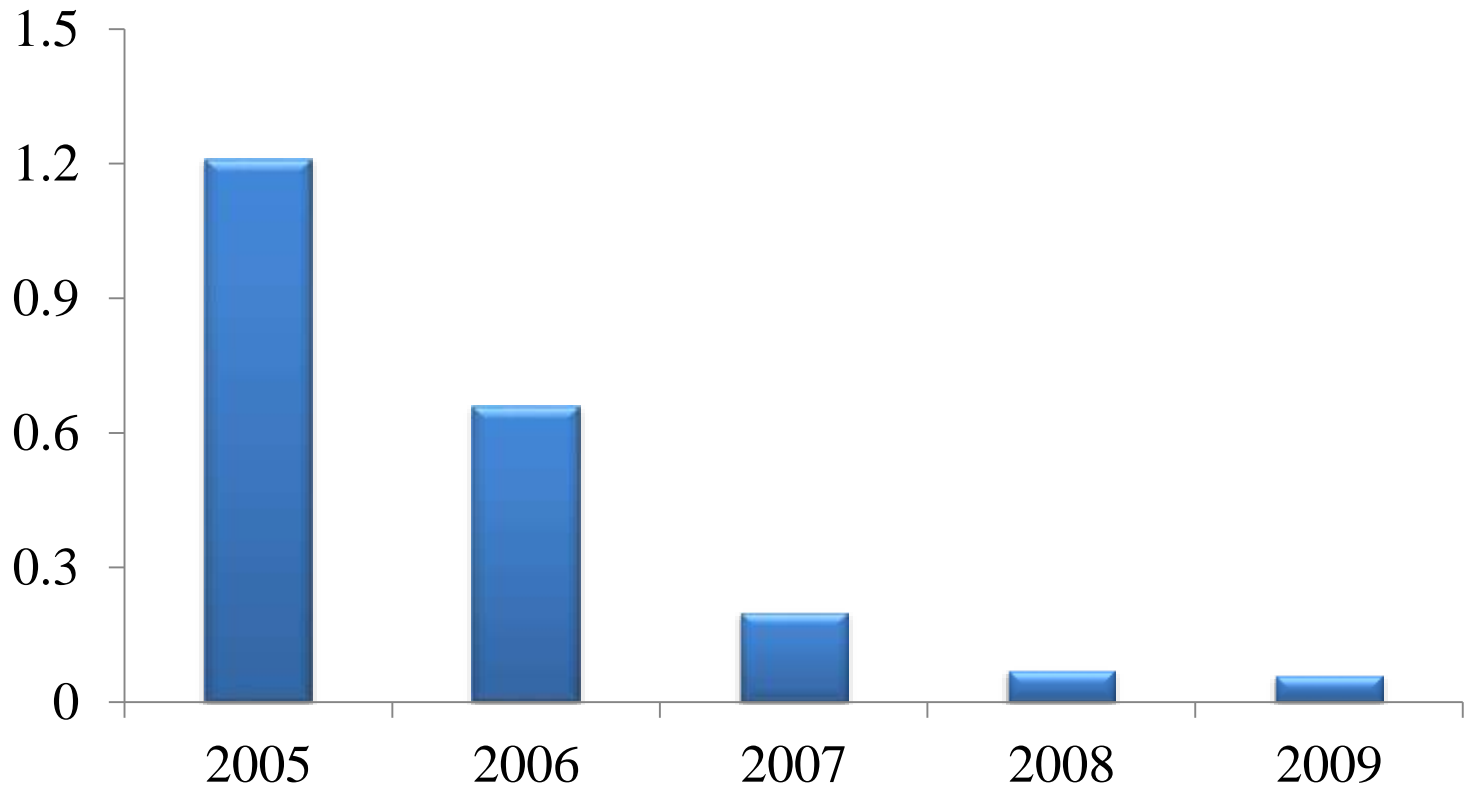
Staghorn Coral bleaching in Xisha Islands



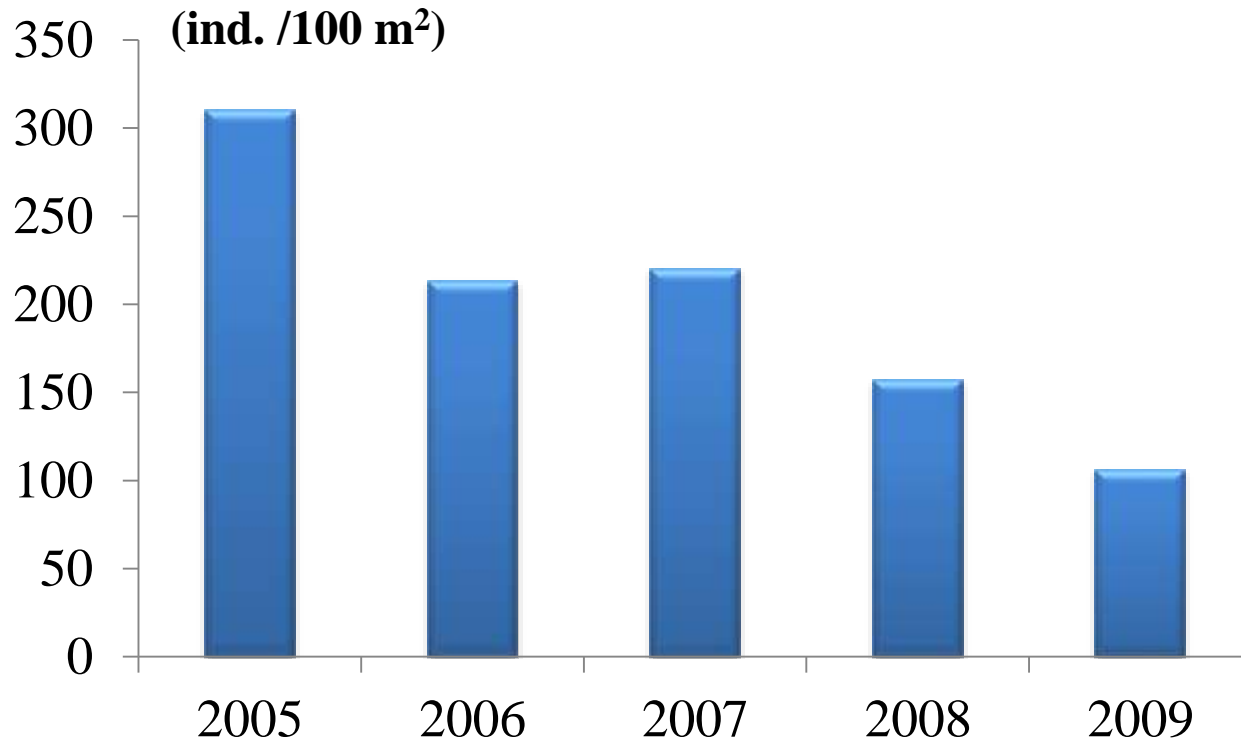
Coral coverage of Xisha Island



Coral recruitment (ind./m²)



Density of coral reef fish in Xisha Islands



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Monitoring

- Coastal Ecological Monitoring and Control Zones
- Sensitivity assessment of marine ecoregion to climate change



Research

- *Emiliana huxleyi* used as proxy in monitoring ocean acidification: based on physiologic and morphologic character
- The effect of ocean acidification on sensitive marine organism
- Assessment of CO₂ sequestration capacity of seabed in China and pre-study of risk control technology

Assessment of CO₂ sequestration capacity of seabed in China and pre-study of risk control technology

- ✓ Focus on the potential capacity of geological storage of CO₂ in the Bohai Sea and South China Sea especially.
- ✓ Assessment of the ecological sensitivity/vulnerability to CO₂ seabed sequestration



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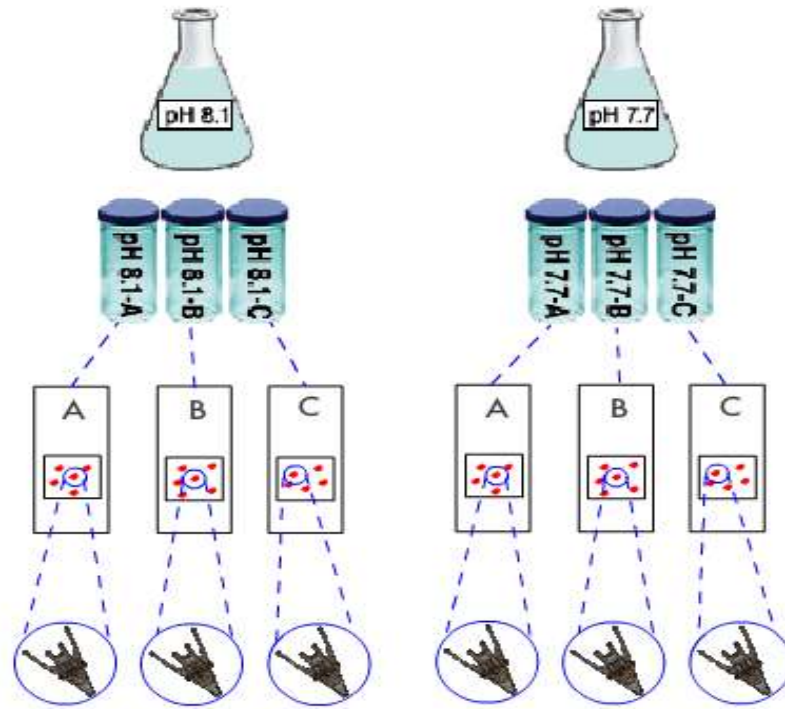
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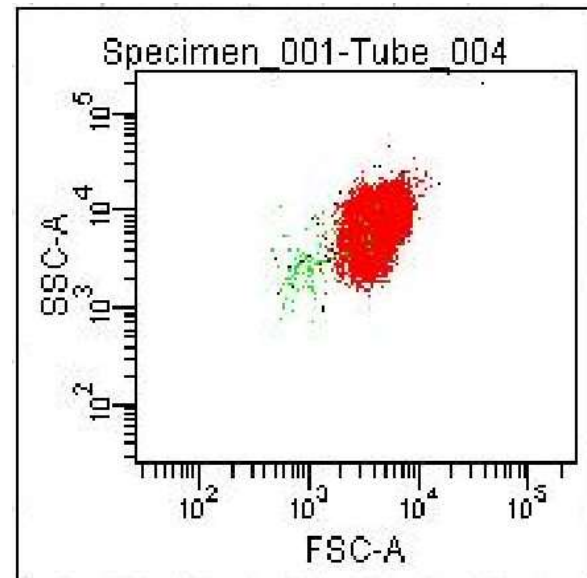
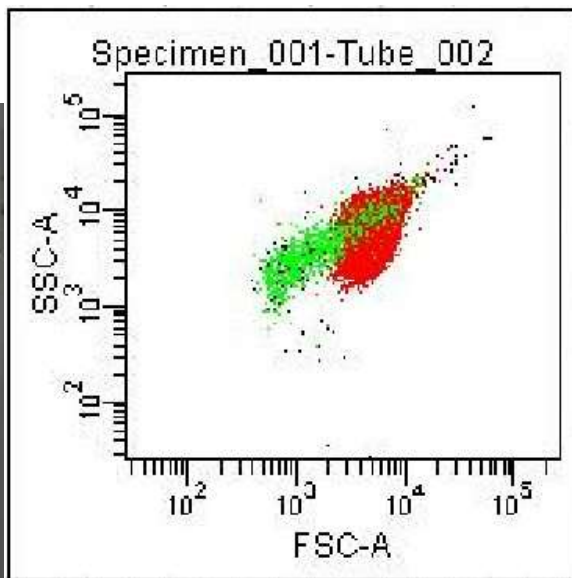
Impact of OA on some sensitive organisms

- Some organisms with structures that made of calcium carbonate would be the first ones to feel the effects.
Calcified algae, Oyster,

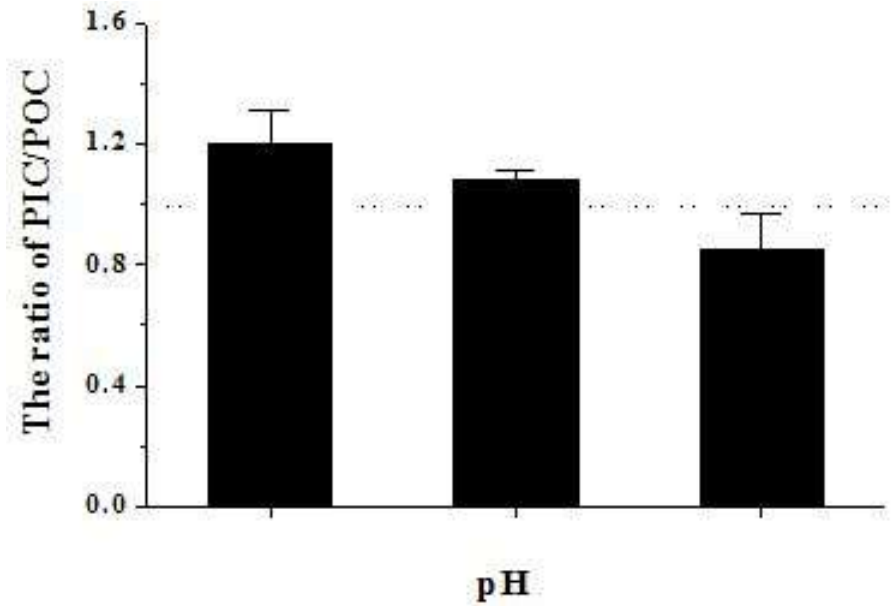
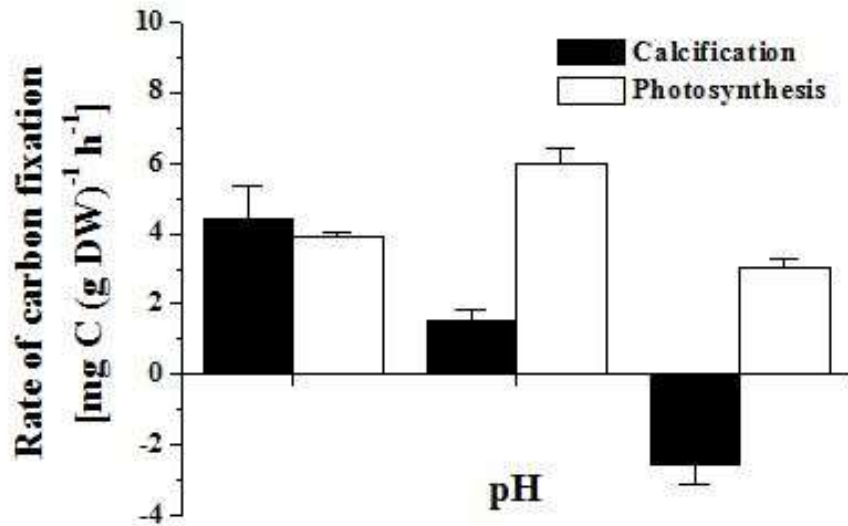


- The whole ocean food chain could be affected.
from plant to herbivore or from herbivore to carnivore





physiological impacts - *Corallina pilulifera*



Impacts of CO₂ vent on marine ecosystems

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Assessment of pH variability at a coastal CO₂ vent for ocean acidification studies

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A unique natural laboratory



Pacific island is natural laboratory to study ocean acidification



Global research efforts are urgently needed.



We need cooperate to investigate the combined impacts of OA and climate change.



Thank you for your attention
and support !

