

Mitigation role of nation parks in assisting coral reef resistance to ocean change: a 30-year study on coral communities of the Kenting National Park, Taiwan

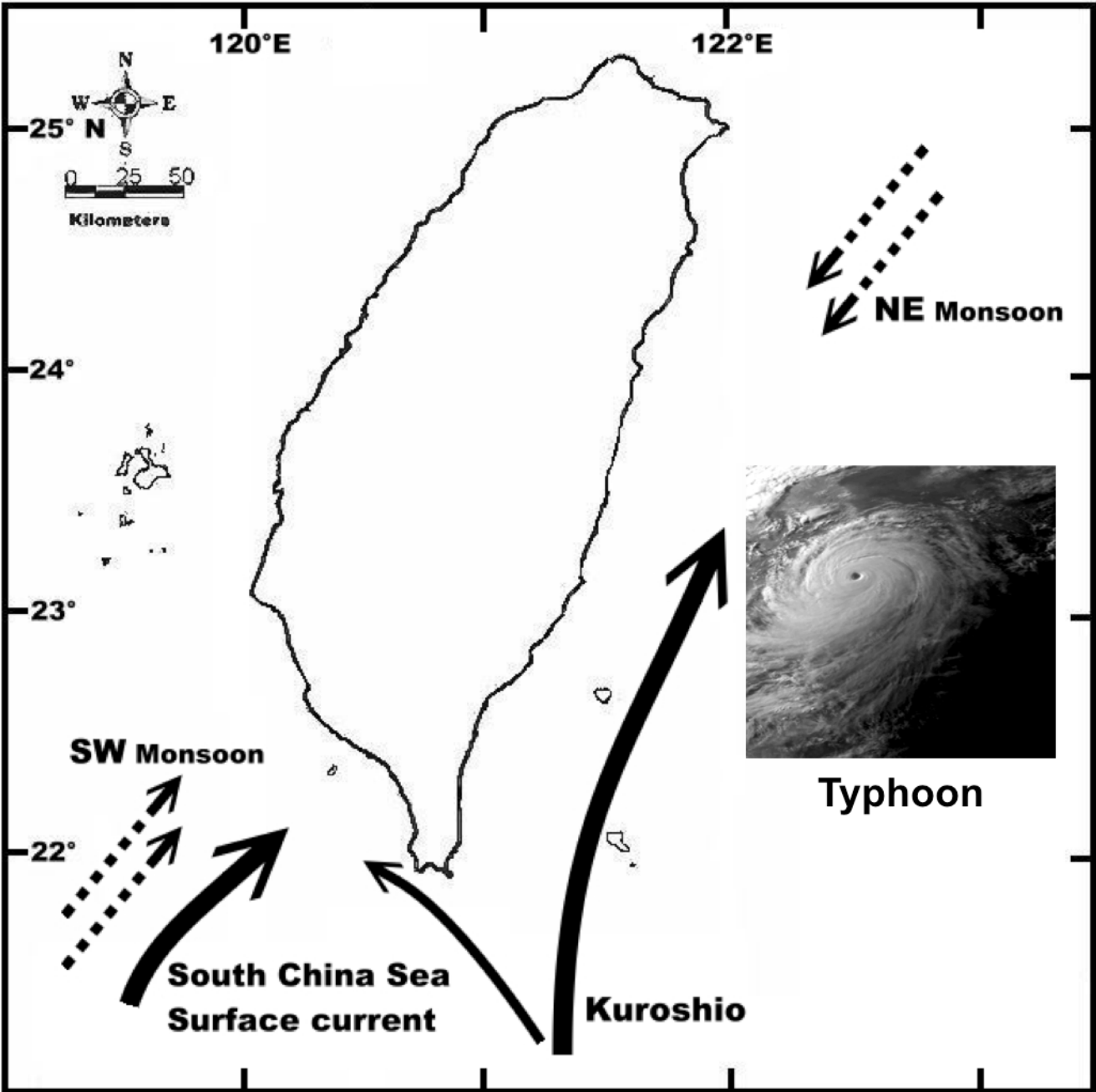


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Shieh-Chun Ma, Chiao-Lian Tsai, Hsing-Chih Chang, Wen-Hsin Hsu,
Chaolun Allen Chen

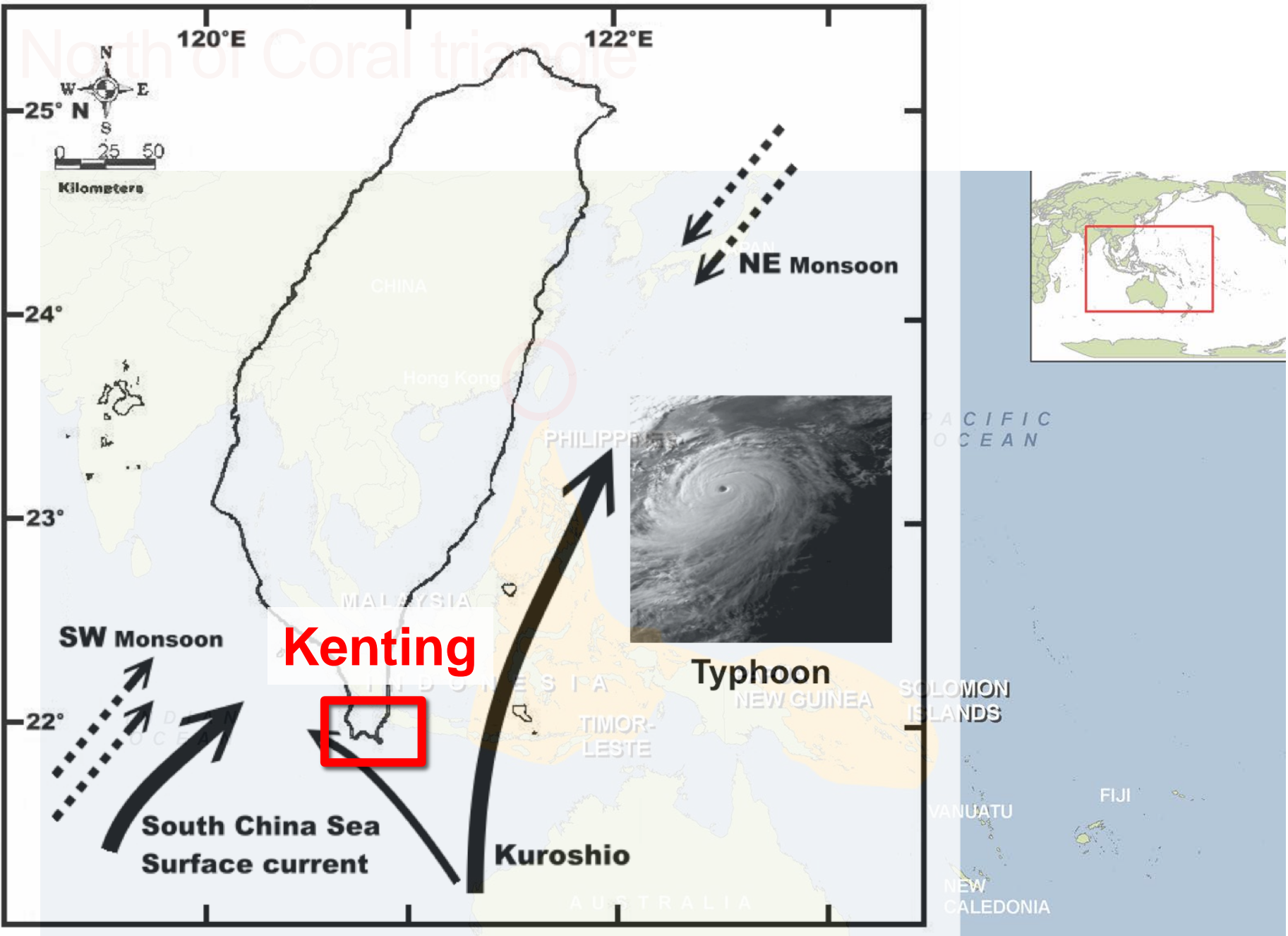
www.coralcoe.org.au

- Background of Kenting National Park (KTNP)
- Zoning system
- Supporting research
- Supporting management and local population
- Research gap in the future

Background of KTNP



Background of KTNP



Tiny but high diversity reef

Reef area, $< 1/1000$ of the reef in the world

1500 reef fish, $1/3$ of the world

340 coral, $1/3$ of the world



Kenting National Park (KTNP)

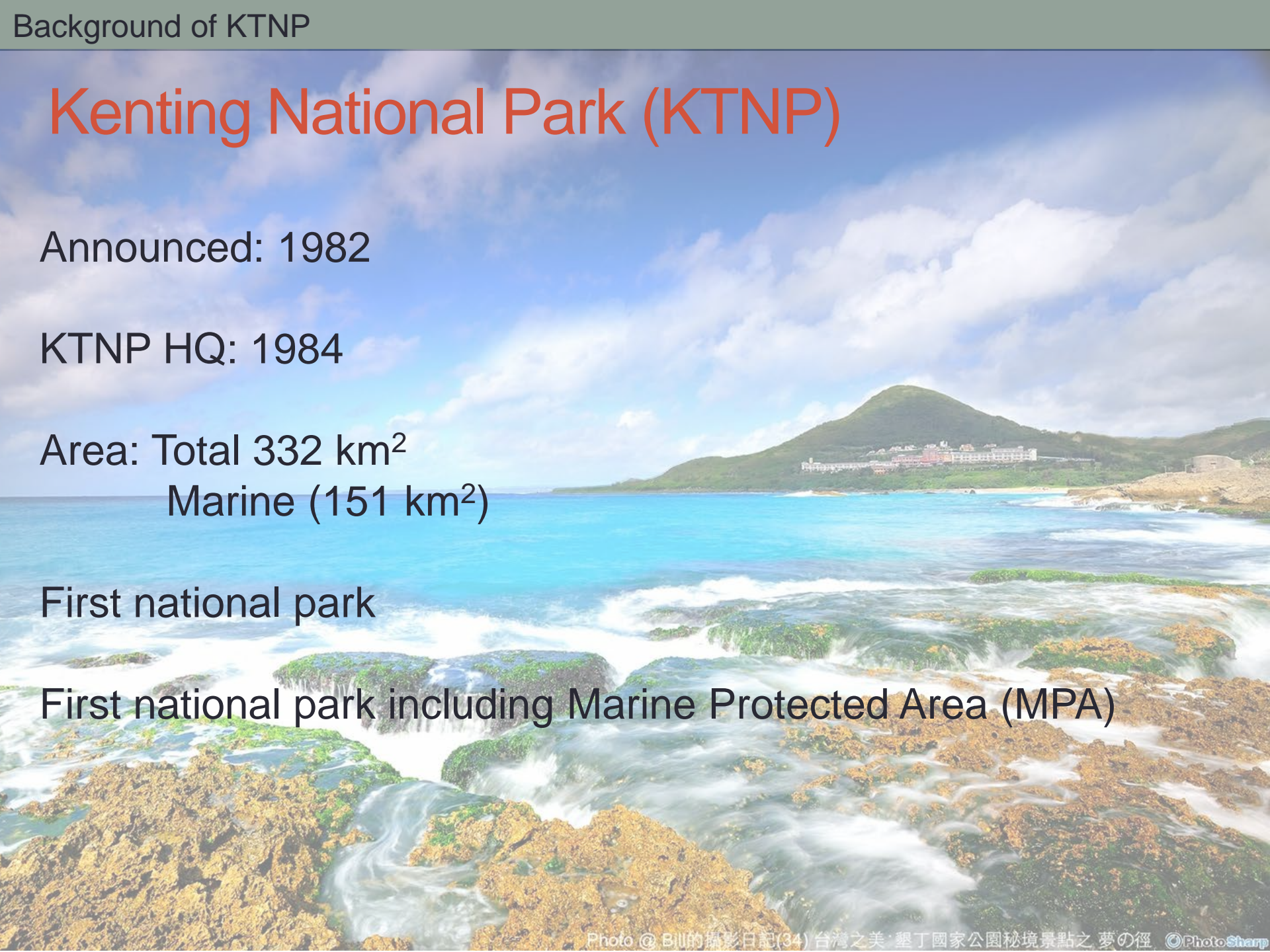
Announced: 1982

KTNP HQ: 1984

Area: Total 332 km²
Marine (151 km²)

First national park

First national park including Marine Protected Area (MPA)



Principles of KTNP

• Conservation

後壁湖海洋資源保護示範區

禁止事項

- 一. 禁止採摘、撈捕(垂釣)魚類、海膽、寄居蟹、貝類等海洋生物。
- 二. 禁止採摘或焚燬海岸植物、盜採砂石、珊瑚礁石等行為。
- 三. 禁止改變地形地貌或破壞海洋棲地環境行為。
- 四. 禁止電魚、毒魚、炸魚，任意傾倒廢棄物，污染水源。

如違反上述規定經查獲者，依國家公園法規定最高可處新台幣 3,000 元罰鍰。發現違法者，請速打電話報案。

報案電話08-8861331國家公園警察大隊墾丁警察隊

08-8861321墾丁國家公園管理處



後壁湖海洋資源保護示範區範圍圖

Houbi Lake Marine Resources Reserve Exhibition Zone

Please follow the cautions below:

1. Do not seize, collect, or pick up any fish, sea urchin, hermit crab, crab, seashell and other ocean creatures.
2. Do not pick or incinerate shoreline plants. Illegal sandstone mining and coral picking is prohibited.
3. Any conduct that may alter the landform or endanger the marine ecology is prohibited.
4. Do not electric shock, poison, blow up marine animals or plants. Do not dump garbage or waste, or pollute the water sources.

In case of violation of the above, maximum penalty of NT \$ 3,000 may be enforced in accordance to National Park Regulations.

To report case of violation, please call (08)8861331 or (08)8861321.

Kenting National Park Headquarters



馬糞海膽



條紋蓋刺魚



海牛



小丑魚



金口蝶螺

墾丁國家公園管理處

Principles of KTNP

- **Conservation**

- **Recreational activities**



Principles of KTNP

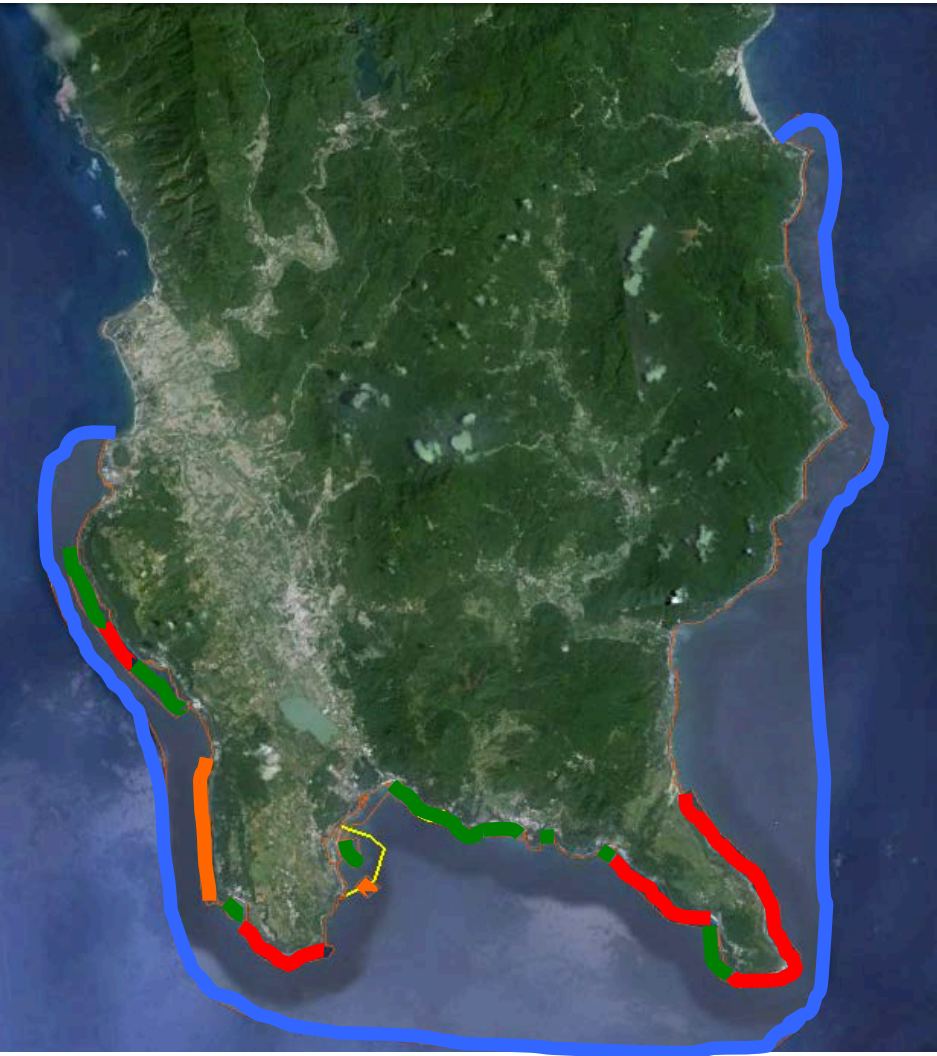
- **Conservation**

- **Recreational activities**

- **Research**



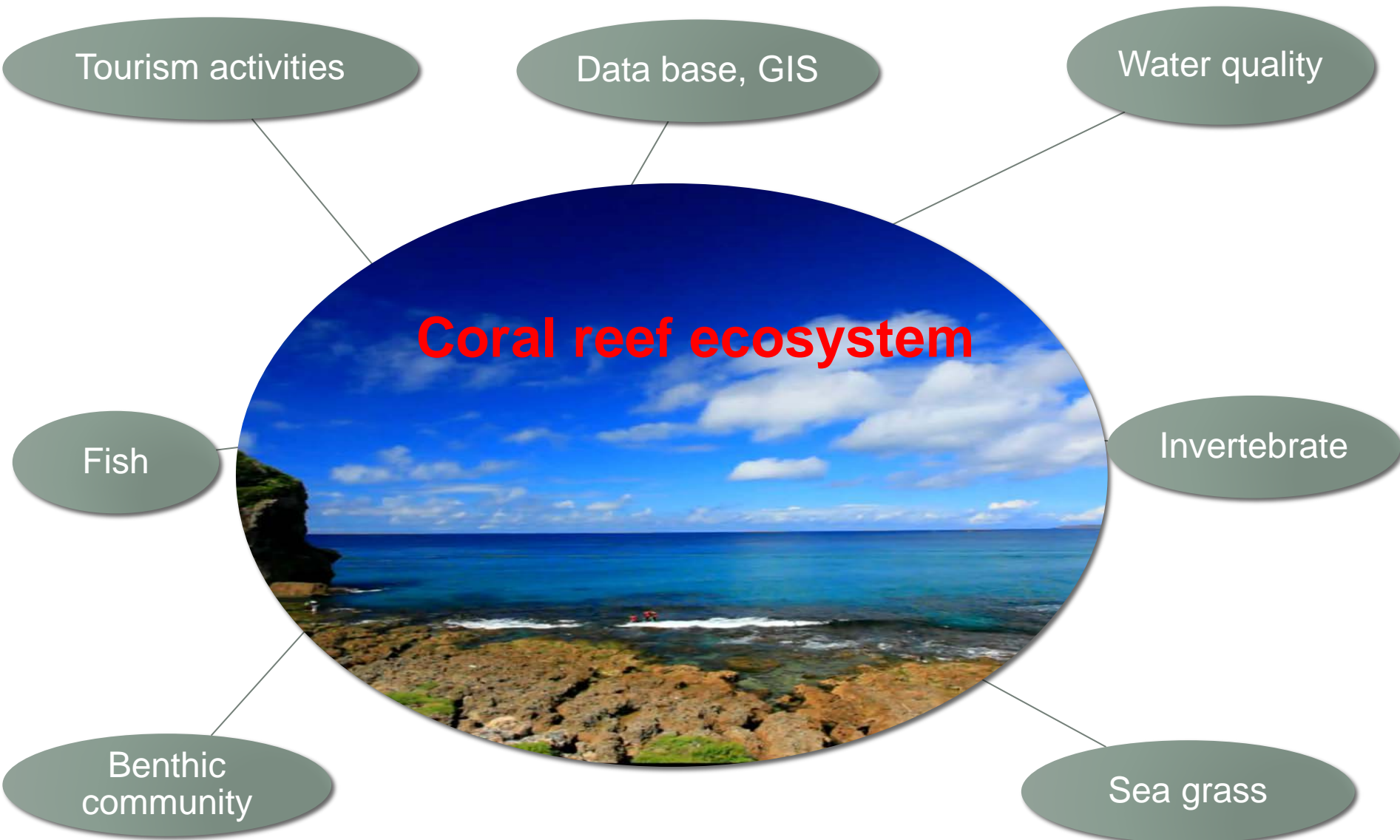
Zoning system in marine area in KTNP₍₂₀₁₁₎

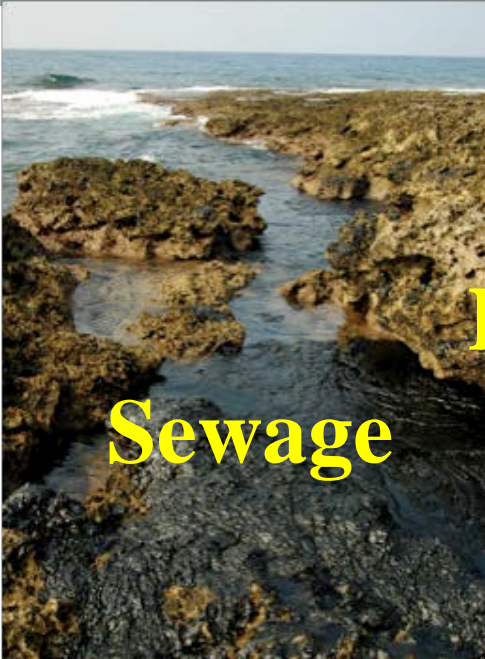


- Marine area (151.85 km²) :
 - General protection area (92.78%)
 - Recreation area (2.72%)
 - Scenic area (1.35%)
 - Marine protected area (3.13%)

Comprehensive review: Every 5 years

Long-Term Ecological Research (LTER) 2003~





Sewage



Habitat destruction

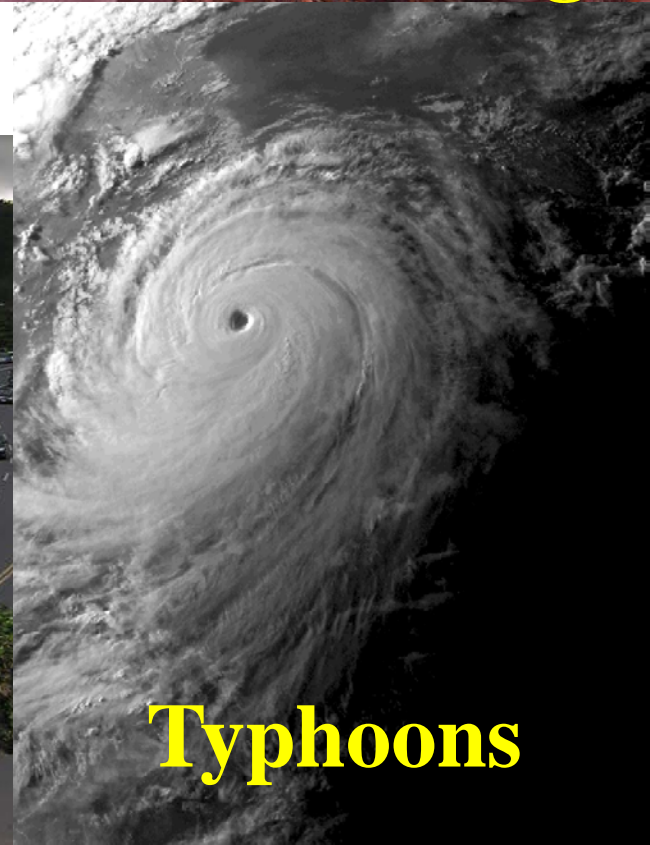


Overfishing

Threats



Human impacts



Typhoons

Accidents

WO-BUDMO (2009)



ColomboQueen (2009)



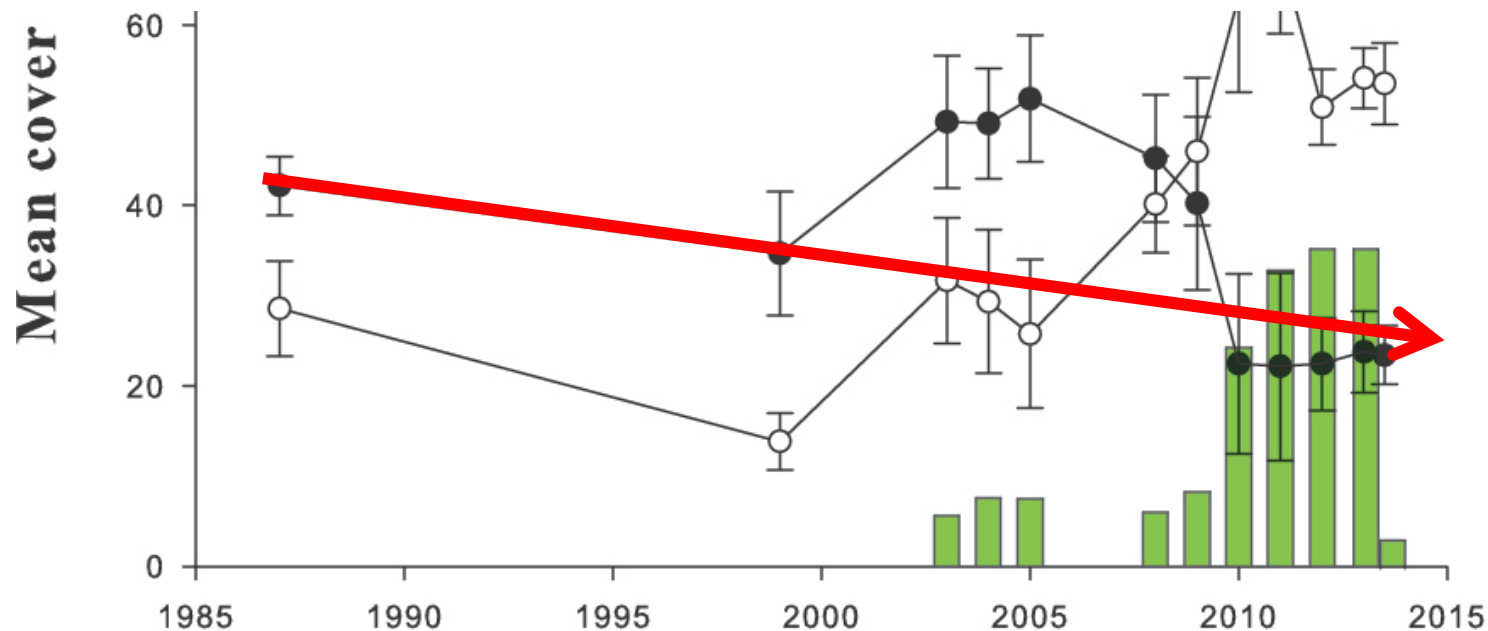
Amorgos (2001)



30-years change of coral and macroalgae cover



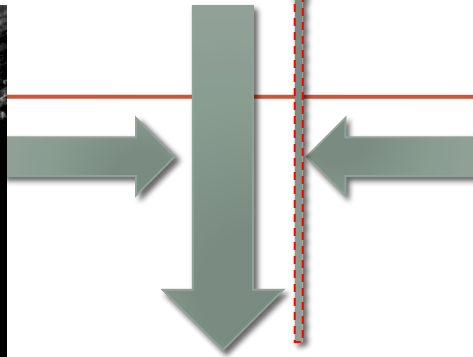
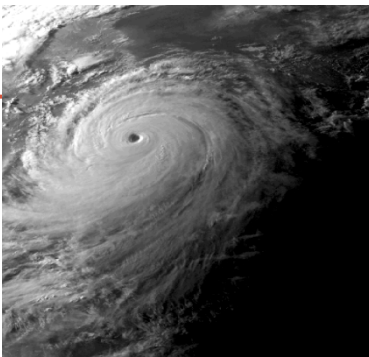
Shift of benthic community structure



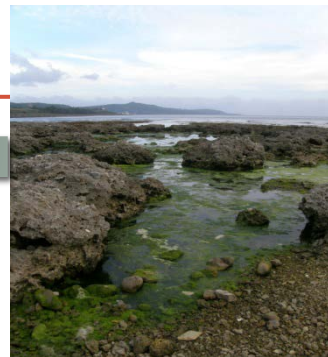
Reshaped benthic community



Natural
disturbances



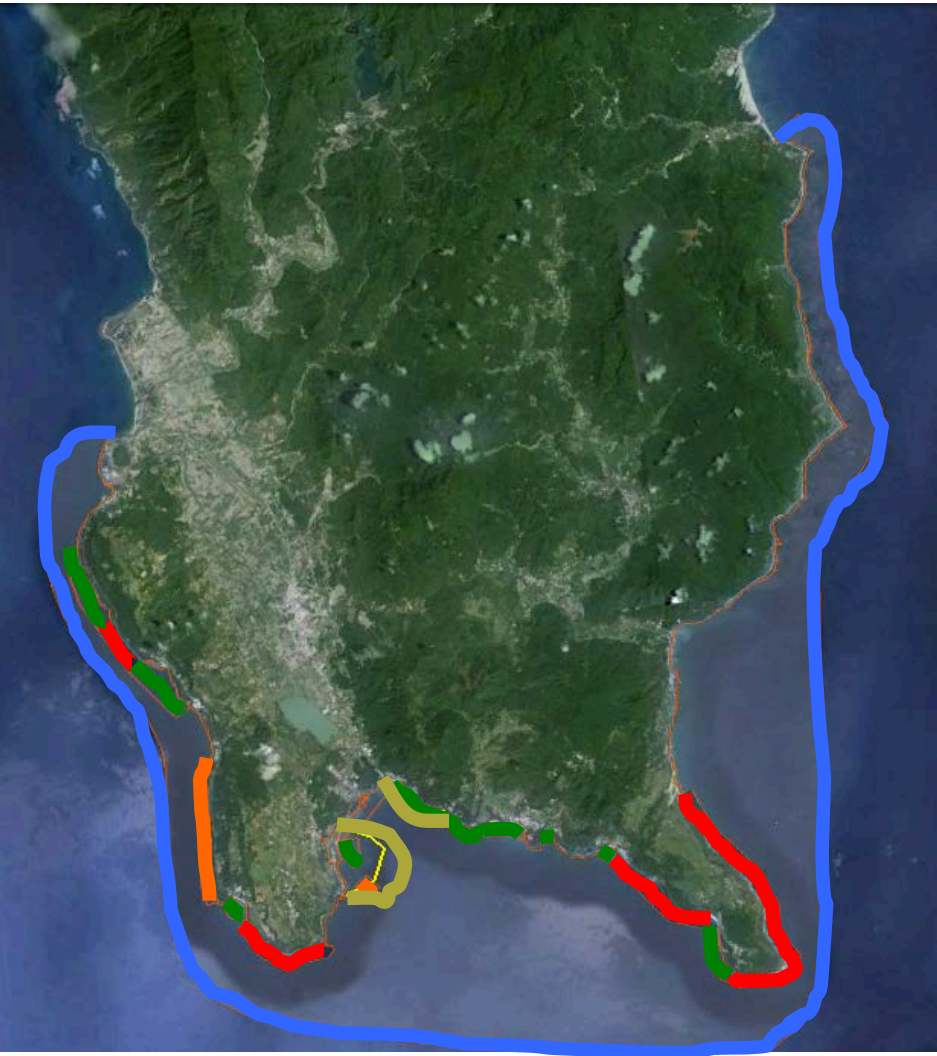
Reduced water
quality
Overfishing
(Herbivores)



Responses from KTNP HQ

- Reduce human impacts on coral reef ecosystems
 - From fishing to recreational activities
- Improve water quality
 - Sewage facilities
- Maintain the resilience ability of coral reefs
 - Review and redesign zones, expending current MPAs and considering to establish two more potential MPAs

Zoning system in marine area in KTNP (Under design)



- Marine area (151.85 km²) :
 - Recreation area (2.72%)
 - Scenic area (1.35%)
 - Marine protected area (3.13%)
 - General protection area (92.78%)
 - Pre-MPA

Comprehensive review: Every 5 years

Two more Marine National Parks

South Penghu Marine National Park

- June 2014
- 354 km²



Dongsha Atoll National Park

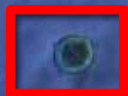
- Jan. 2007

3,534 km²

11.32% of territorial waters



Photo @ Marine National Park HQ, Taiwan



263 km

Data SIO, NOAA, U.S. Navy, NGA, GEBCO

Facing the intense natural and human impacts

- Crossed ecosystems, integrated research project from land used to marine ecosystem
- Sewage facilities of water-based recreational activities
- Proper reinforcement

Acknowledgements

National Science Council
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Ministry of the Interior
JJ's Diving

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Photo @ Edward Roberts



ROFAS



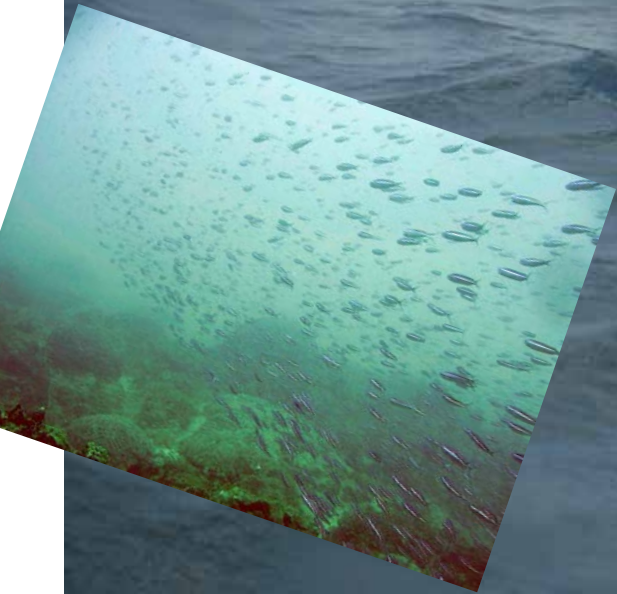




Academia Sinica
National Science Council
Kenting National Park
National Museum of Marine Biology & Aquarium
JJ's Diving

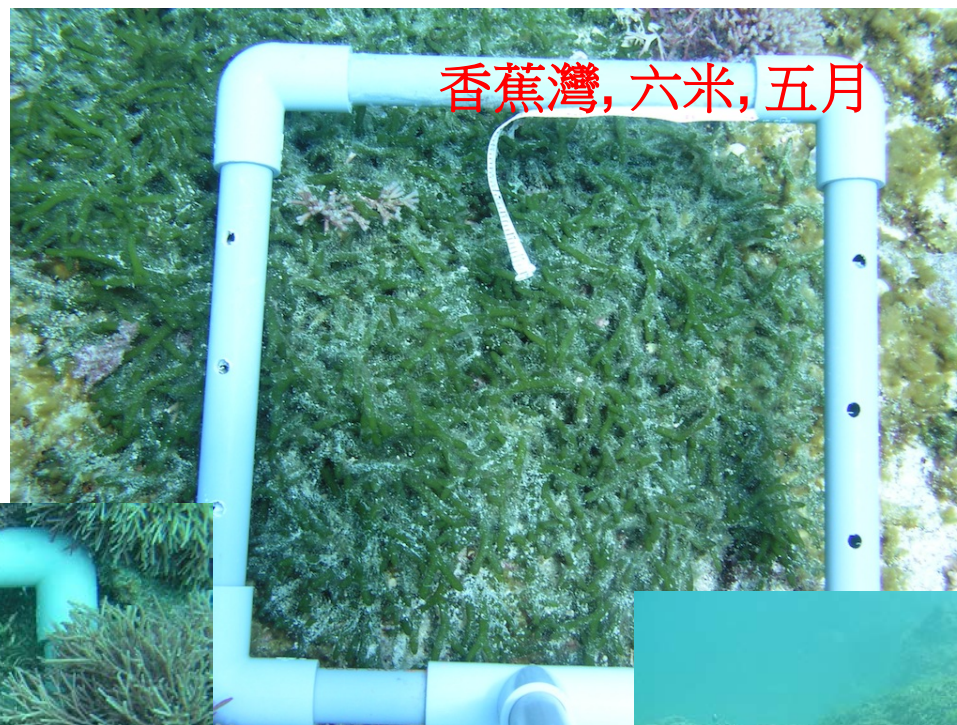


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2011墾丁海域大型藻類繁生現象

季節性變化？
水質？
食藻性生物？



香蕉灣, 六米, 五月

萬里桐, 四米, 五月



乳節藻

後壁湖, 六米, 六月

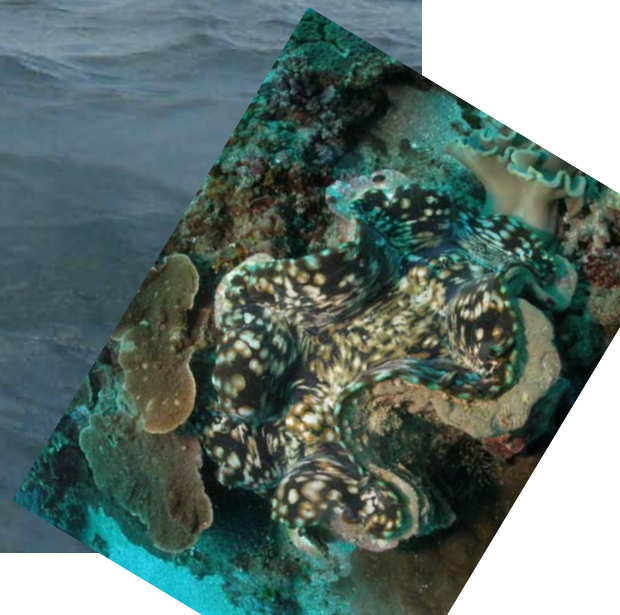
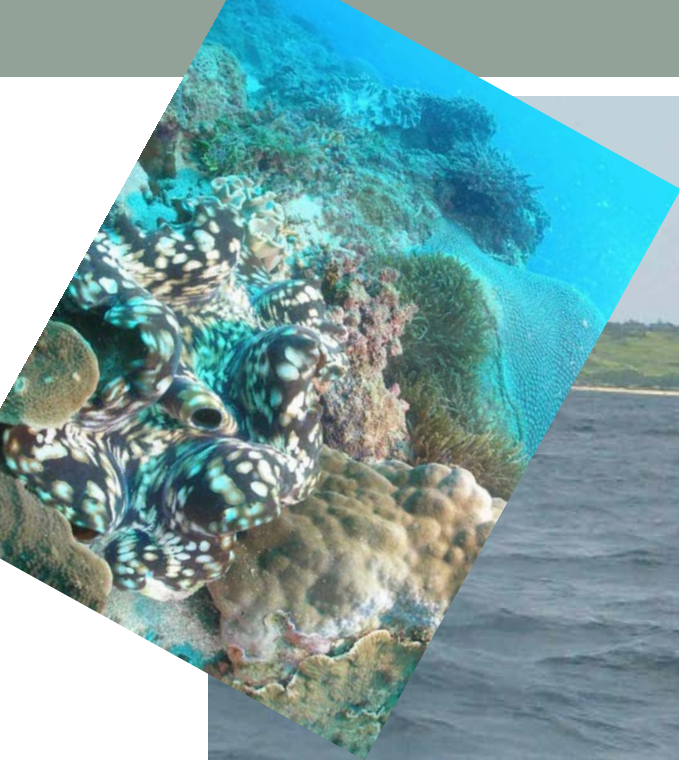


松藻

但受到超量使用

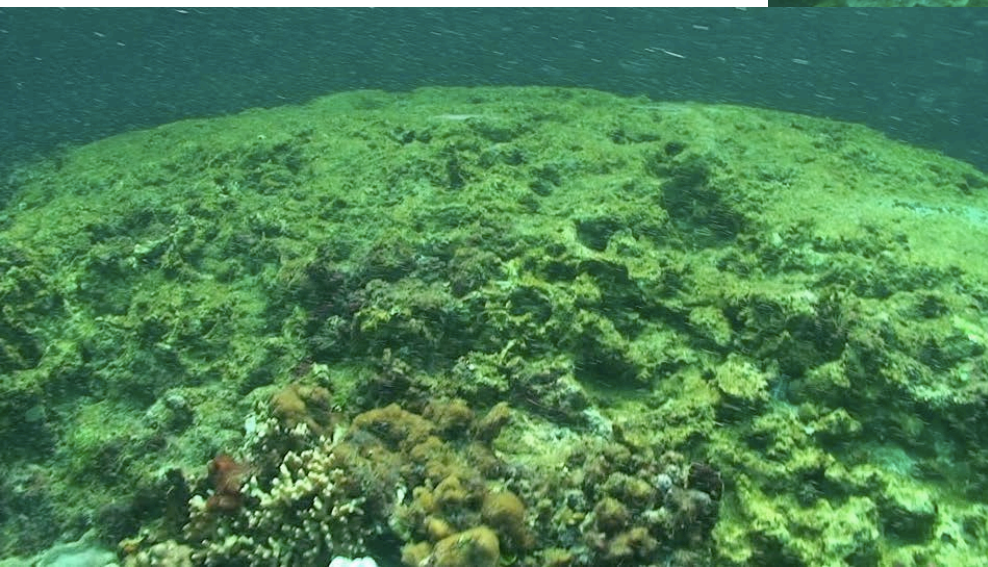


繼續加油！！



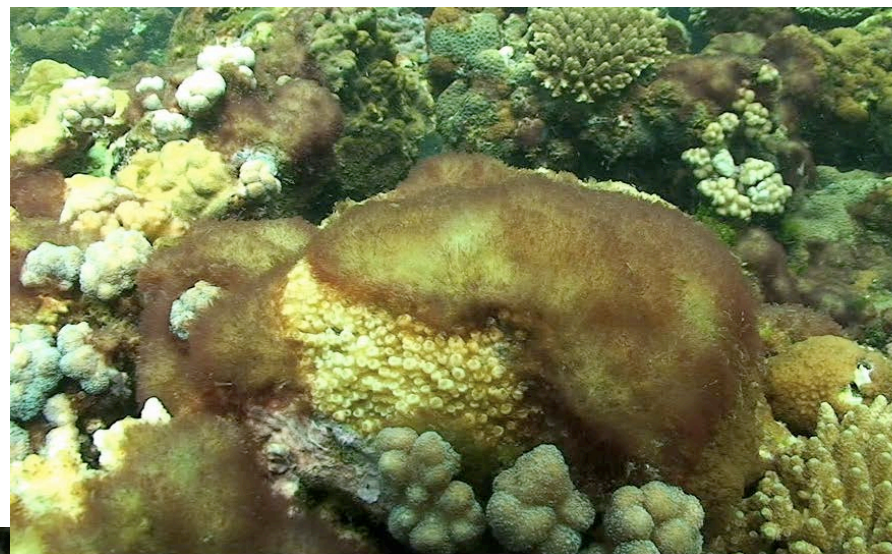
船隻撞擊的物理性破壞

遭撞擊破裂的礁石



表面遭刮除的礁石
與周圍未受影響區

受影響珊瑚



白化的
列孔珊瑚
-生態指標
物種



最近死亡的離
枝軸孔珊瑚



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Multiple disturbances

