Coast Bordeaux 2017

Tara Pacific Japan Leg: Tropicalization of Marine Ecosystems under Climate Change and Ocean Acidification

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Japanese Association for Marine Biology
JAMBIO
Joint Usage/ Research Center for Marine Biology, MEXT, Japan

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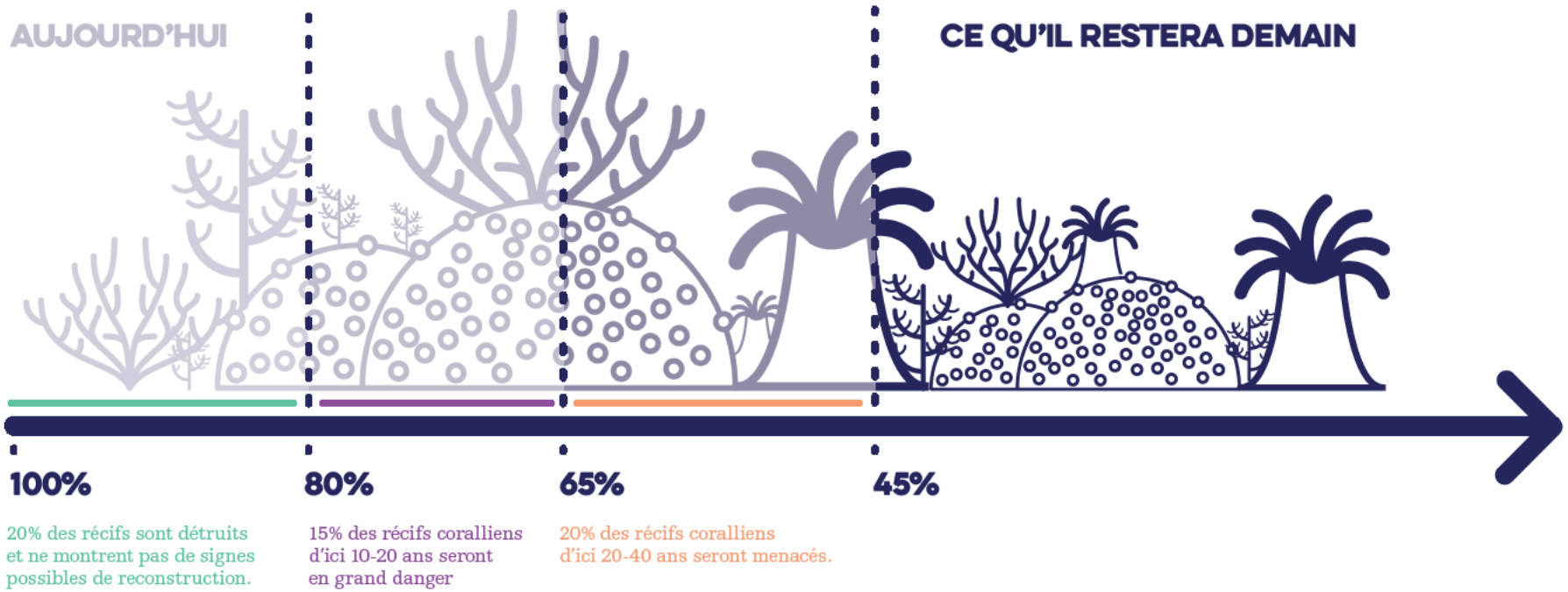
Corals are decreasing around the world



LES MENACES MAJEURES

CHANGEMENTS GLOBAUX

Hausse des températures

Acidification de l'océan

MENACES LOCALES

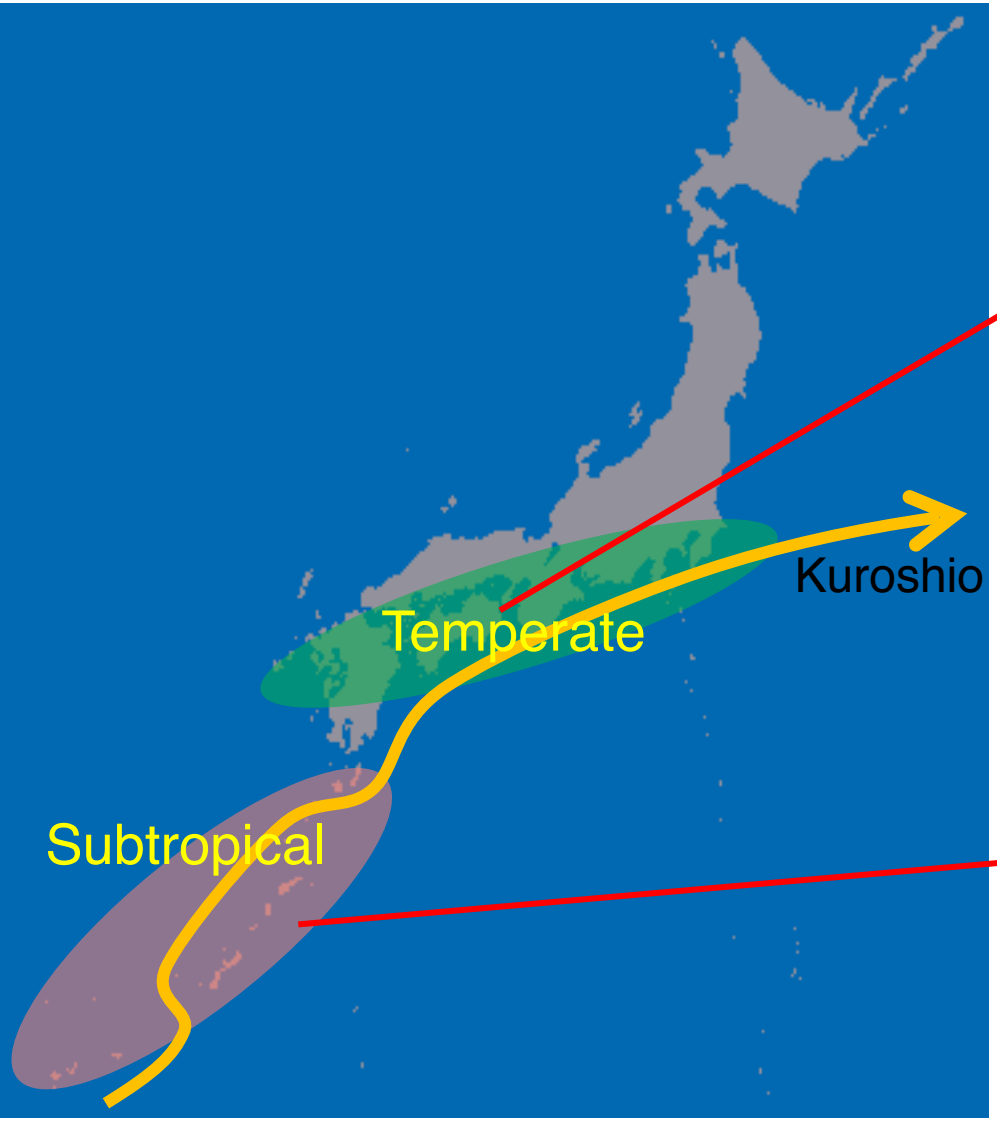
Pollution

Surpêche

Aménagement des côtes

Sédimentation

Can coral survive global warming?.

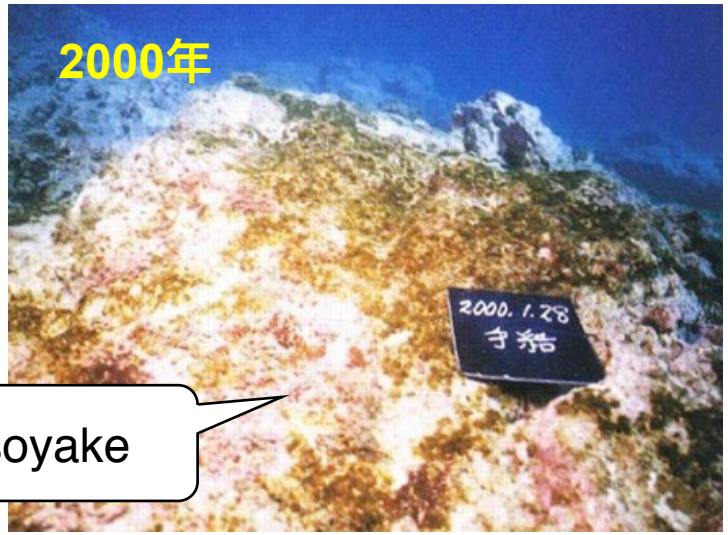


The answer may be found in Japan : Focus on Kuroshio

In Temperate zones: Tropicalization

Kochi

High temp due to El Nino and high grazing rates

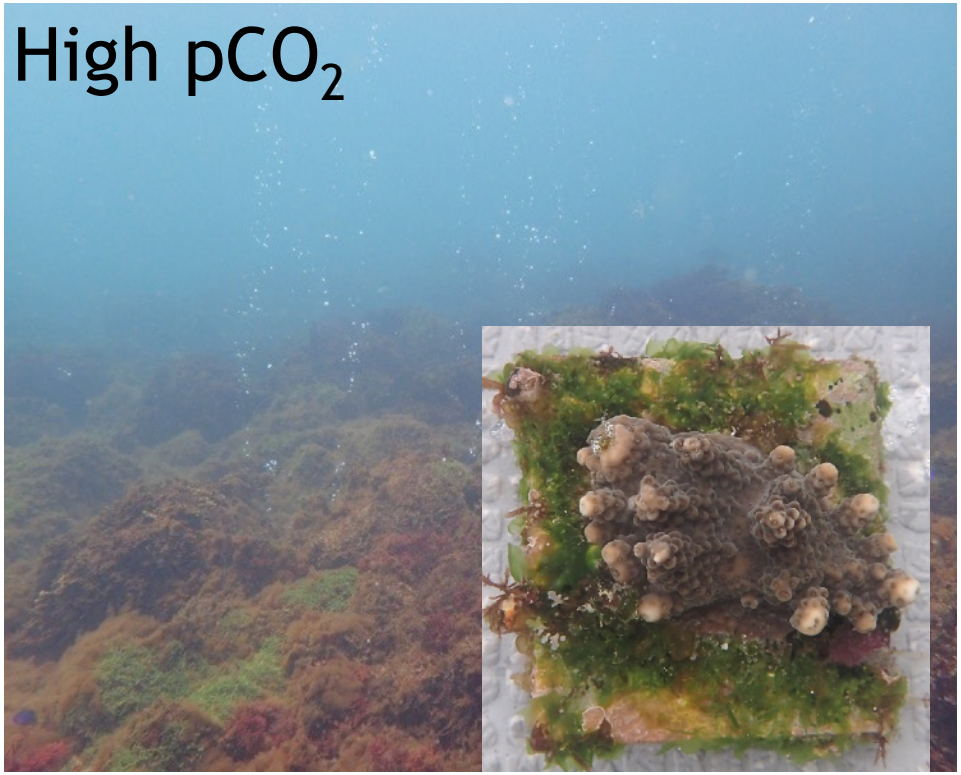


Isoyake

Some locations have already shifted from Kelp to corals…
A refuge for corals but at the cost of an ecosystem!

But…The evil twin: Ocean Acidification

- As atmospheric CO_2 increased, seawater pH decrease.
- With OA, the cost of calcification increase and could impair coral growth

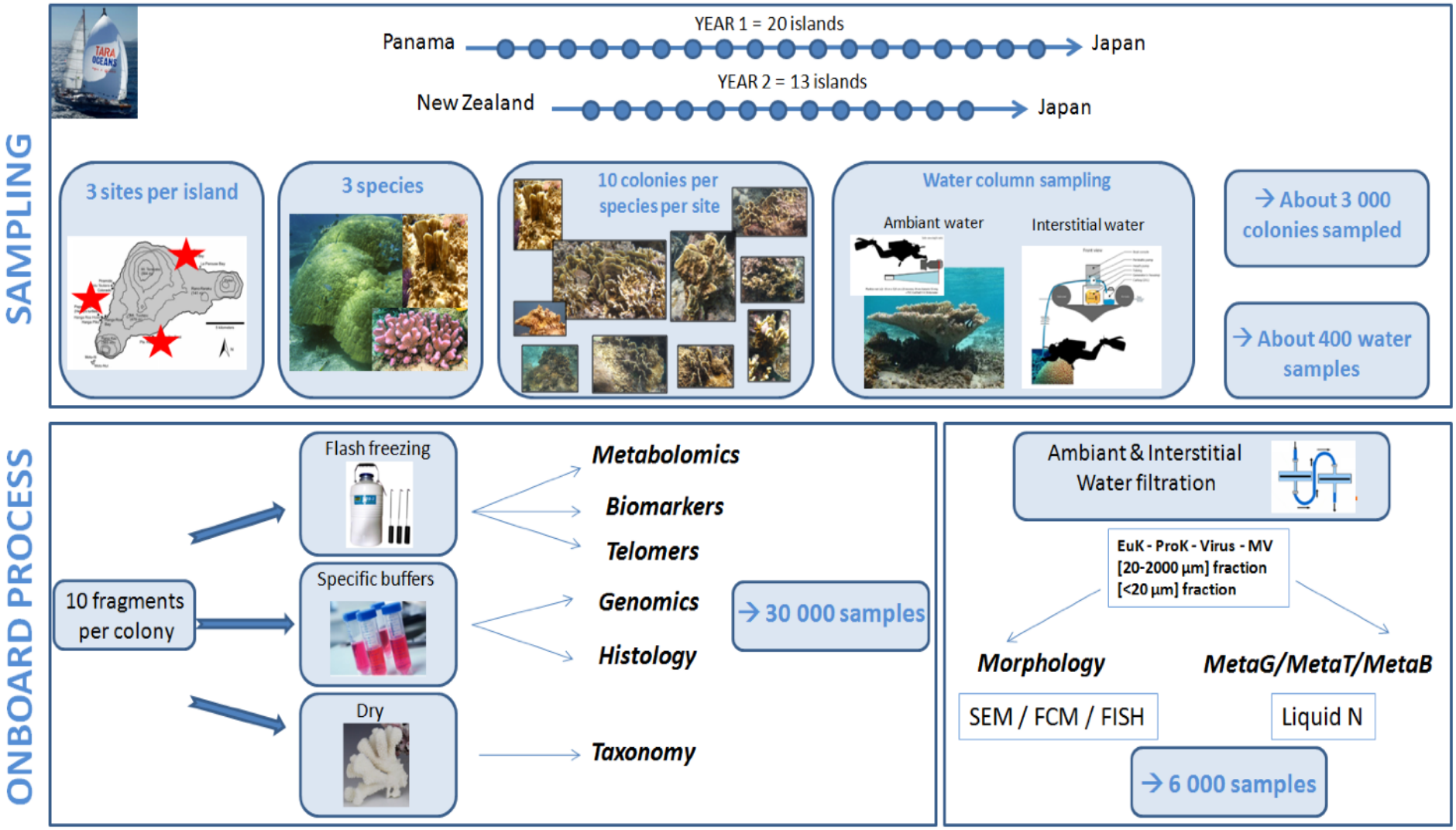


Questions?

- Tara Pacific: Evolution of coral reefs under increasing anthropogenic pressure
  - holobiont microbial diversity
  - patterns of microbial diversity
  - Compare transcriptomes and metabolomes
  - Investigate new markers of coral health status
  - contrasting physicochemical characteristics
- Tara Pacific Japan Leg:
  - What are the mechanisms of tropicalization ?
  - What are the OA effects on tropicalization?
  - What are the habitat change effects on tropicalisation?

Tara Pacific

Protocol of the Tara Pacific




tara

Japan Leg:
Coral, Algae and Fishes under Warming and Ocean Acidification

Survey Plan:

Temperature Effect: Latitudinal Gradient

- Shift from Algae to Coral
- Different Fish communities

OA Effect: CO_2 seeps

- Both temperate and tropical

Loss of Habitat Effect

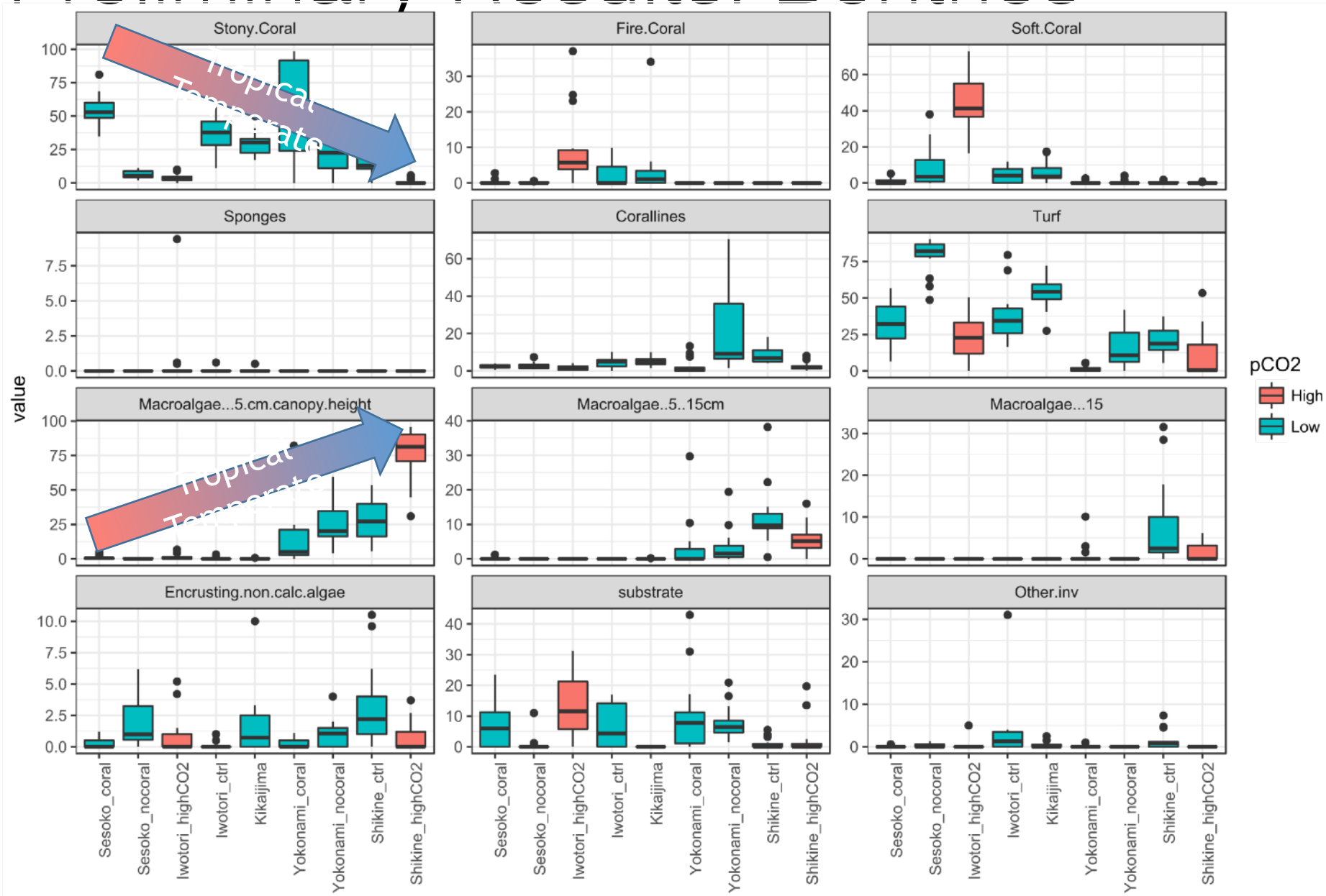
- Loss of Kelp
- Shift from Algae to Coral
- Loss of corals

Coral · Algae abundance and diversity

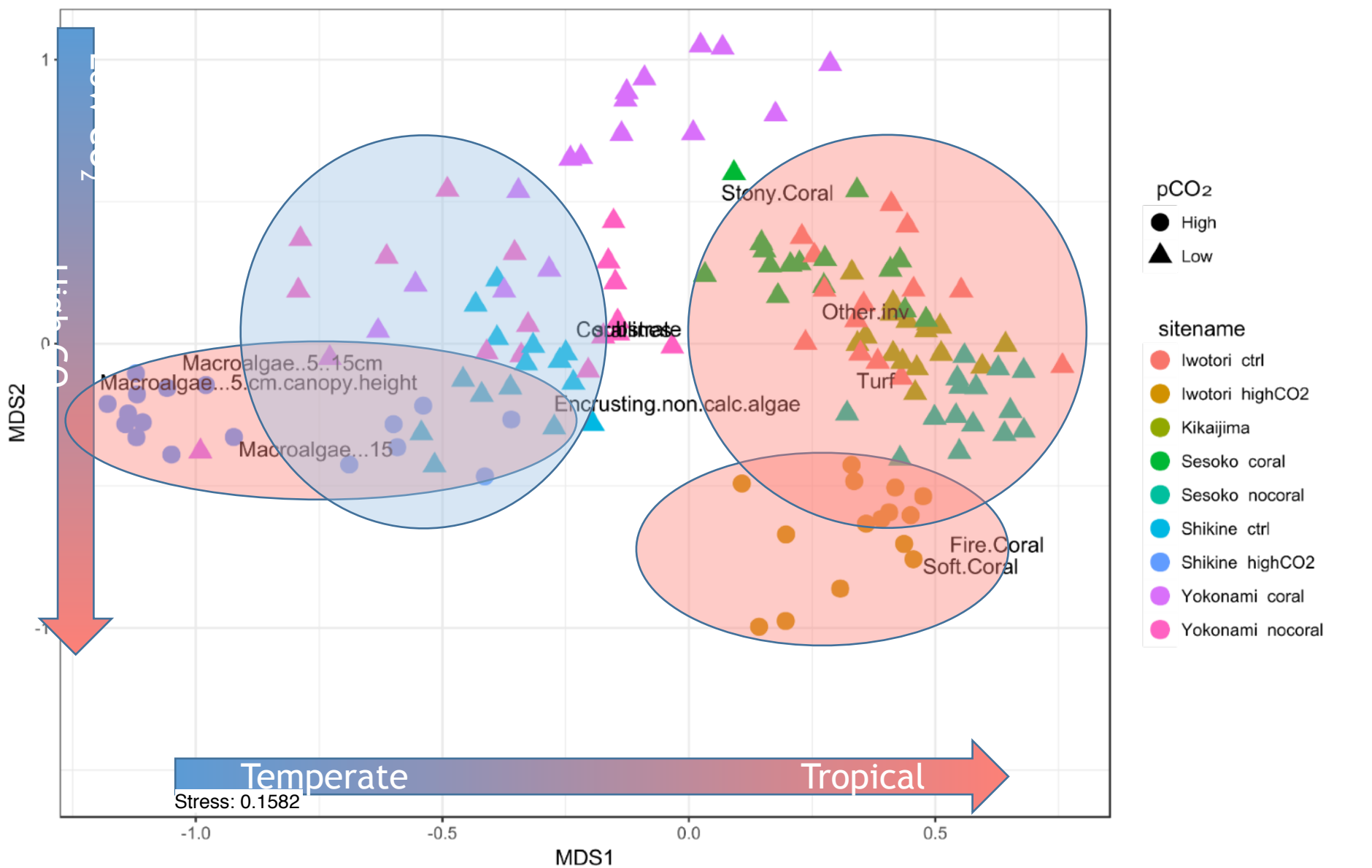
Coral · Algae abundance and diversity

Fish abundance and diversity

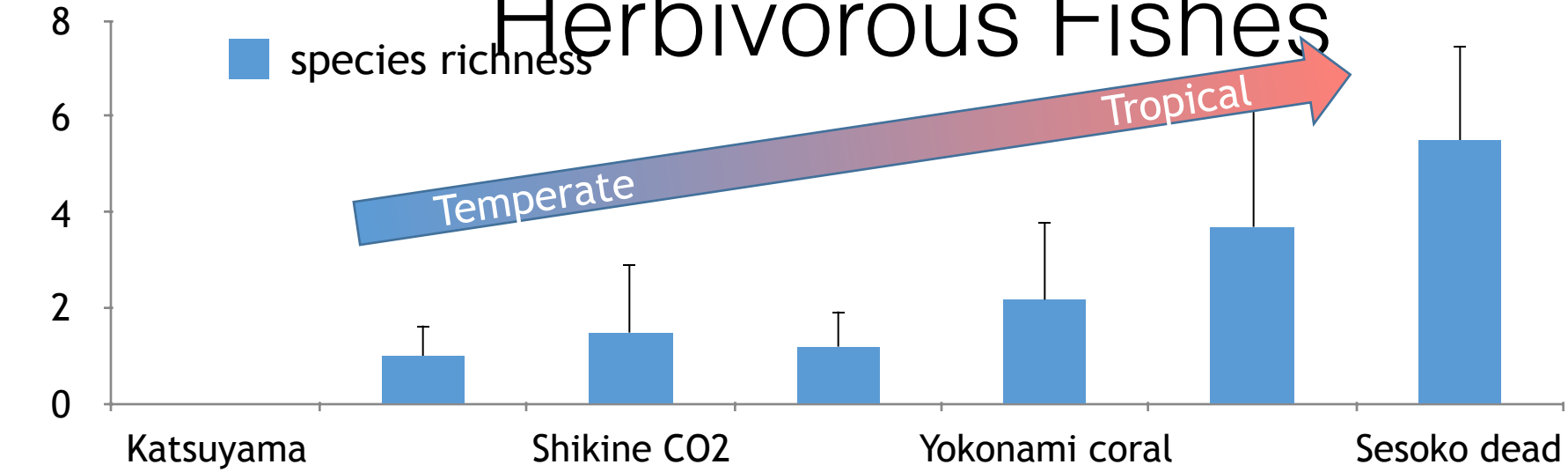
Preliminary Results: Benthos

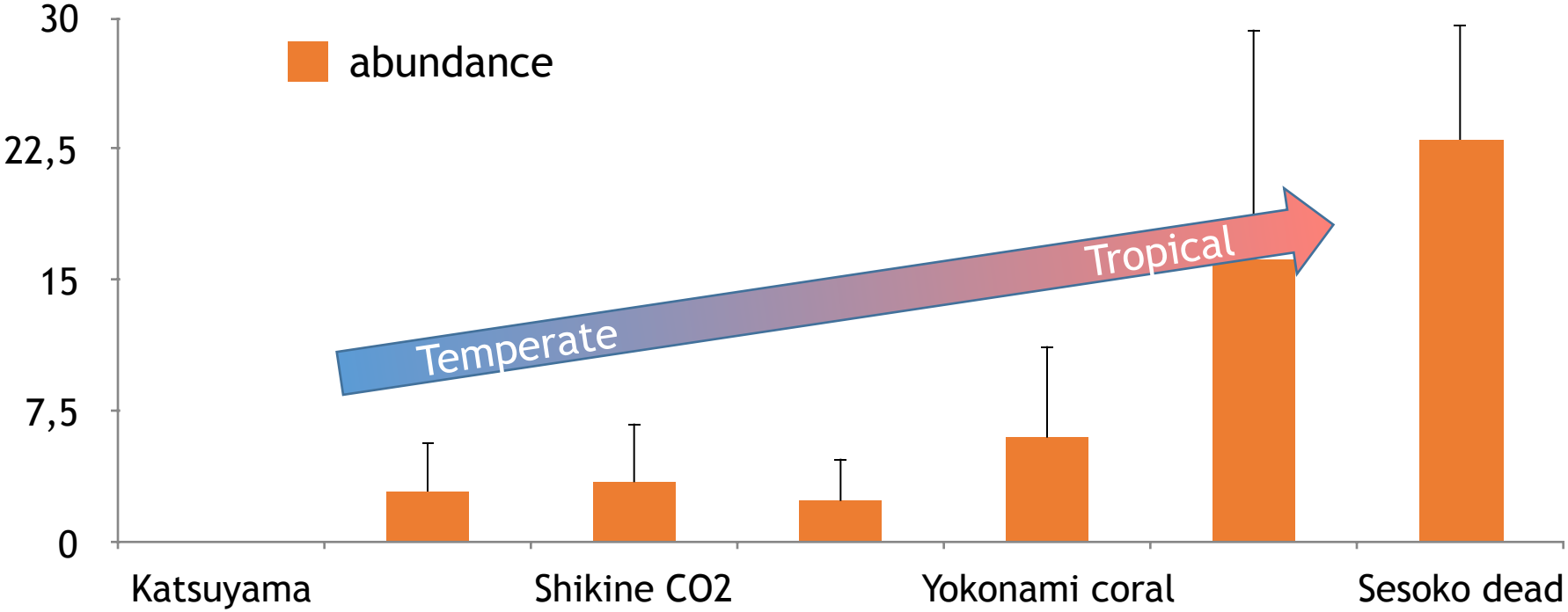


Preliminary Results: Benthos



Preliminary Results: Herbivorous Fishes

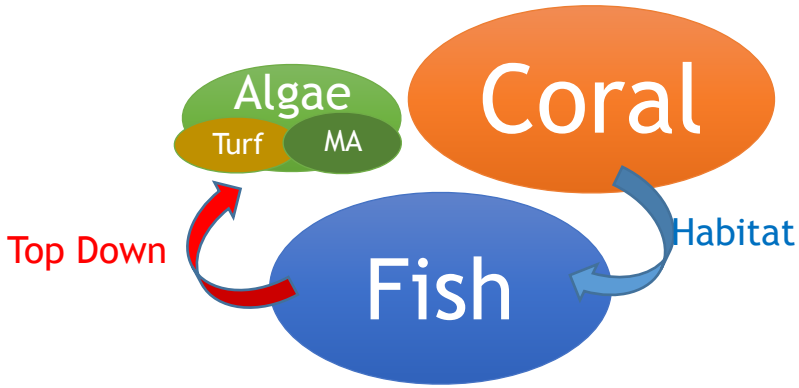




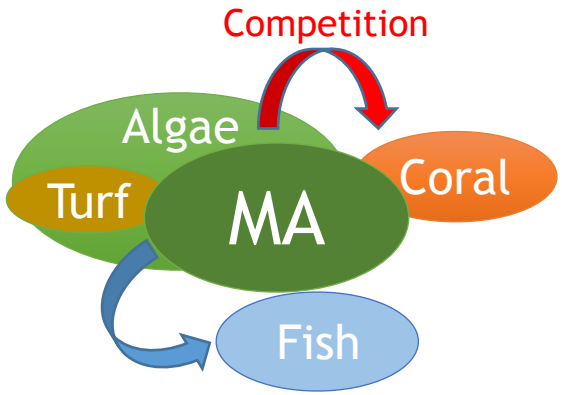
Hypothesis for Japan ecosystems

Present

Tropical Coral Reefs

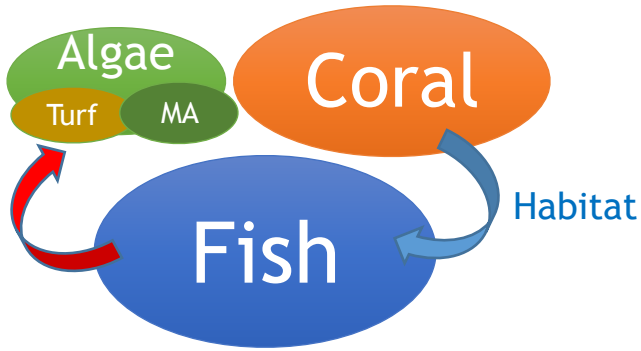


Warm temperate ecosystems



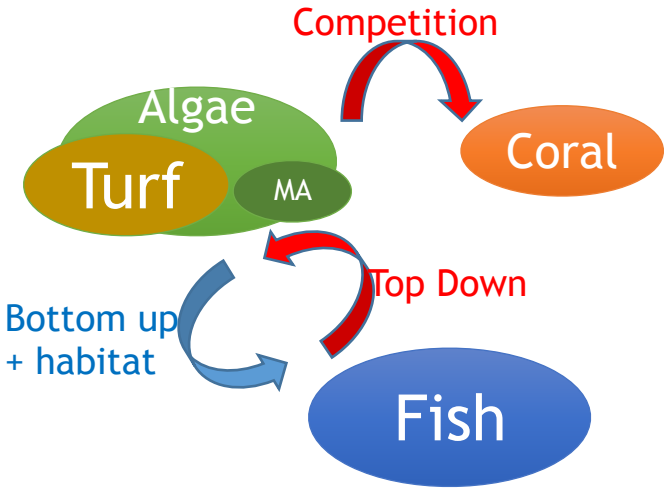
Future of warm temperate ecosystems

Increased Temperature



Tropicalization

Increased Temperature
Ocean acidification



Shimoda Marine Research Center technicians and staffs

Tara Team:
The Crew
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Fukami Hironobu (Miyazaki University)
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Yamamoto Shoji (University of Tokyo)
Kitano Yuko (Miyazaki University)
Nicolas Floc'h (EESAB)

Shikine Team:
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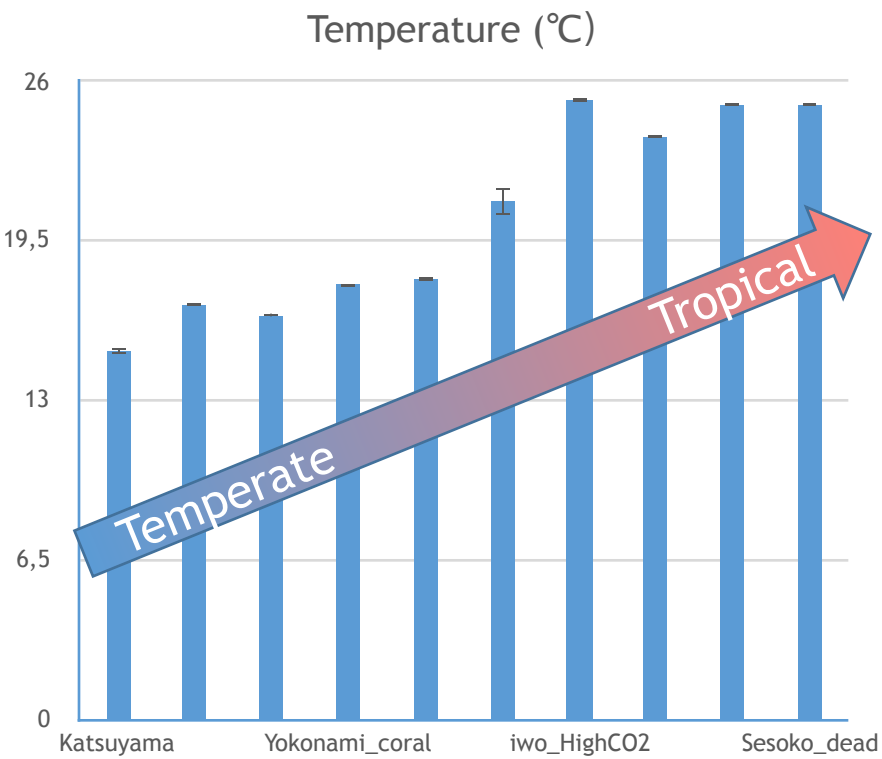
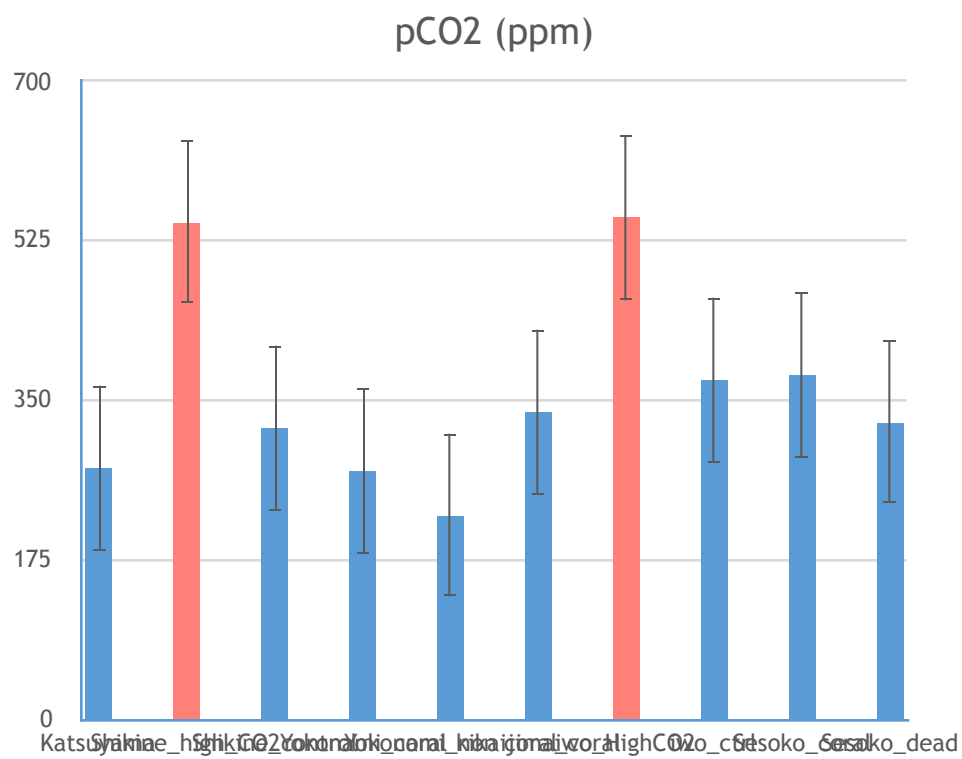
Ben Harvey (SMRC)
Koetsu Kon (SMRC)
Jason Hall-Spencer (SMRC+ University of Plymouth)
Marco Milazzo (Universiti di Palermo)
And many others

Merci!

Photos: Nicolas Floc'h

Chemistry of the sites





Temperature gradient and two pCO_2 conditions

Herbivory: Kelp bioassay

Spring nothing was eaten across latitudes.

- Temperate zone: low temperature and low fish abundance reduce herbivory
- Tropical zone: few "browsers" type fishes, mostly "scrappers"

Autumn: (Only Shikine tested atm)

- Eaten in both sites: Low and High pCO_2
- Higher rate in low pCO_2 because more *Calatomus*