S17 ID: 18255

Field trial of kelp bed introduction to enhance algicidal bacterial supply for biological control of *Karenia mikimotoi* bloom in a fishing port

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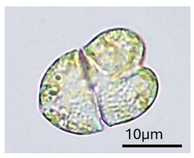
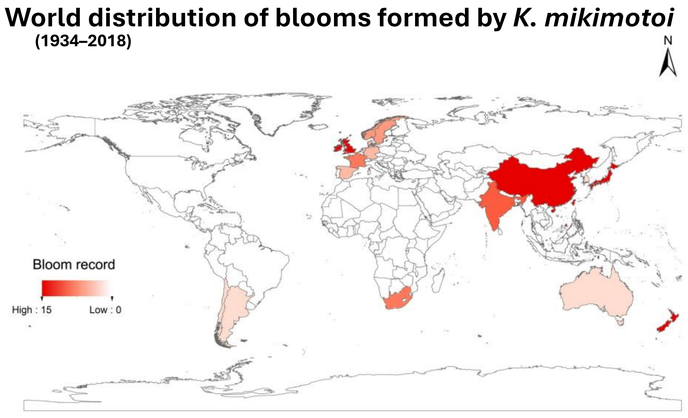
Introduction

- *Karenia mikimotoi* is a globally distributed bloom-forming dinoflagellate (Li et al., 2019)
- Known to produce several lipophilic toxins (Zou et al., 2010), causing anoxic events (Zhang et al., 2023)
- Cause mass die-off of fish, shellfish, crustaceans, and echinoderms (Li et al., 2019)
- Distribution expansion due to climate change (Shimada 2021, Iwataki et al., 2022)

Karenia mikimotoi

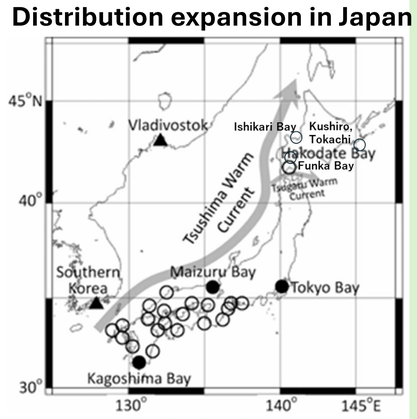


World distribution of blooms formed by *K. mikimotoi* (1934–2018)



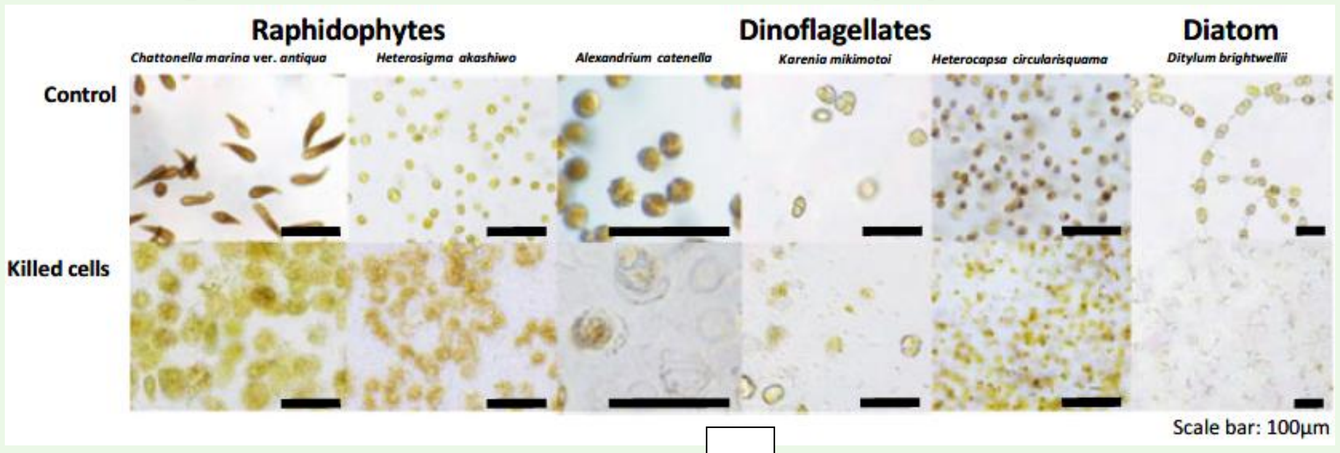
Li et al., 2019

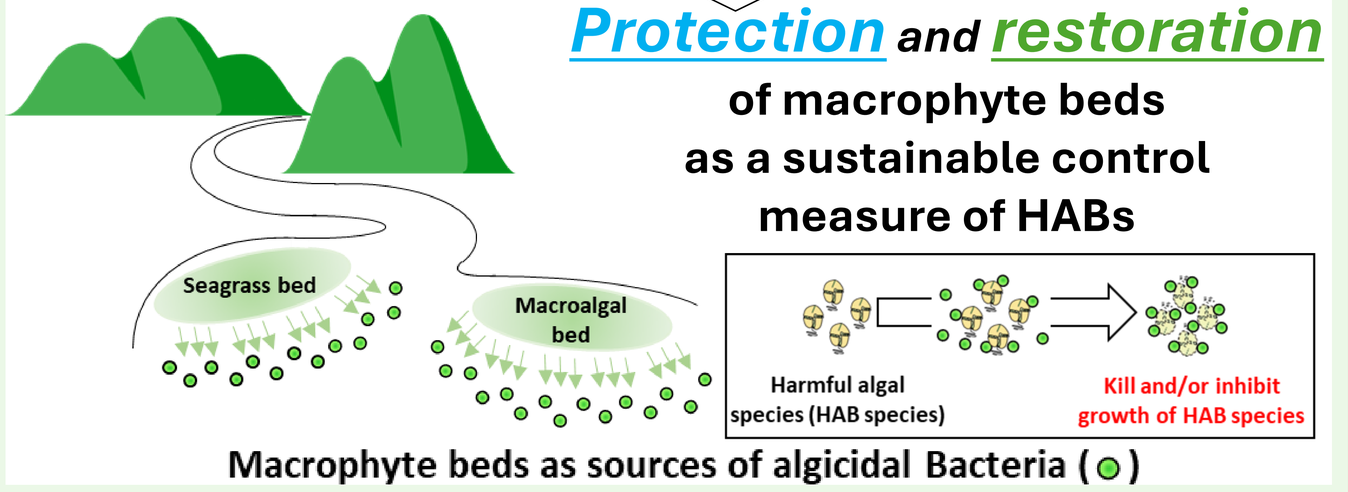
Distribution expansion in Japan



Modified from Shimada et al., 2016

Dense algicidal bacteria detected at macrophyte beds (Imai et al.,2021, Inaba 2024)





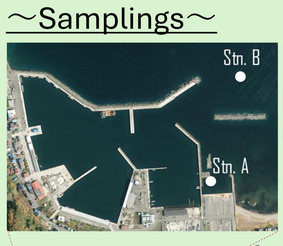
Partly modified from Inaba 2024

Research Questions

Does introducing a kelp bed boost the supply of algicidal bacteria to adjacent waters, and what is the magnitude of that effect?

Materials and methods

〜Samplings〜



Stn. A Culturing kelps using ropes

Stn. B Port entrance

〜Collected samples〜

Stn. A: Kelp (or Ulva), seawater (surface), and sediment

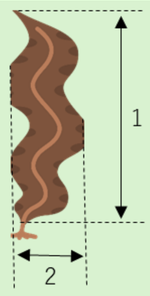
Stn. B: Seawater (surface) and sediment

Sampling period: Dec. 2022 to Dec. 2023 (every 3 months)

〜Kelp counts〜

- Counting kelp density per 1 m of rope
- Collecting five kelp individuals and proceed to the "**Measurements**".

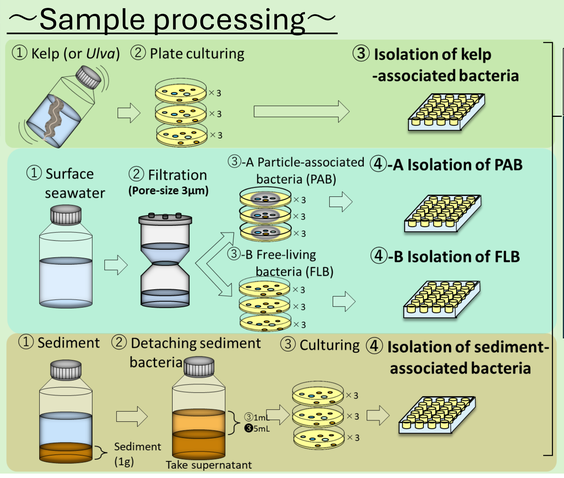
〜Measurement of kelp〜



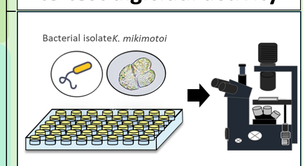
1. Blade length
2. Maximum blade width
3. Wet weight (g)
4. Photos

※Accuracy
Distance: to the nearest 1 mm
Weight: to the nearest 1 mg

〜Sample processing〜



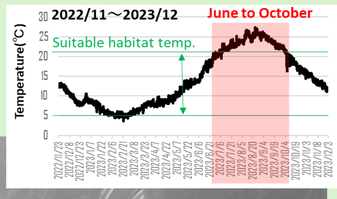
Co-culturing experiments to test algicidal activity

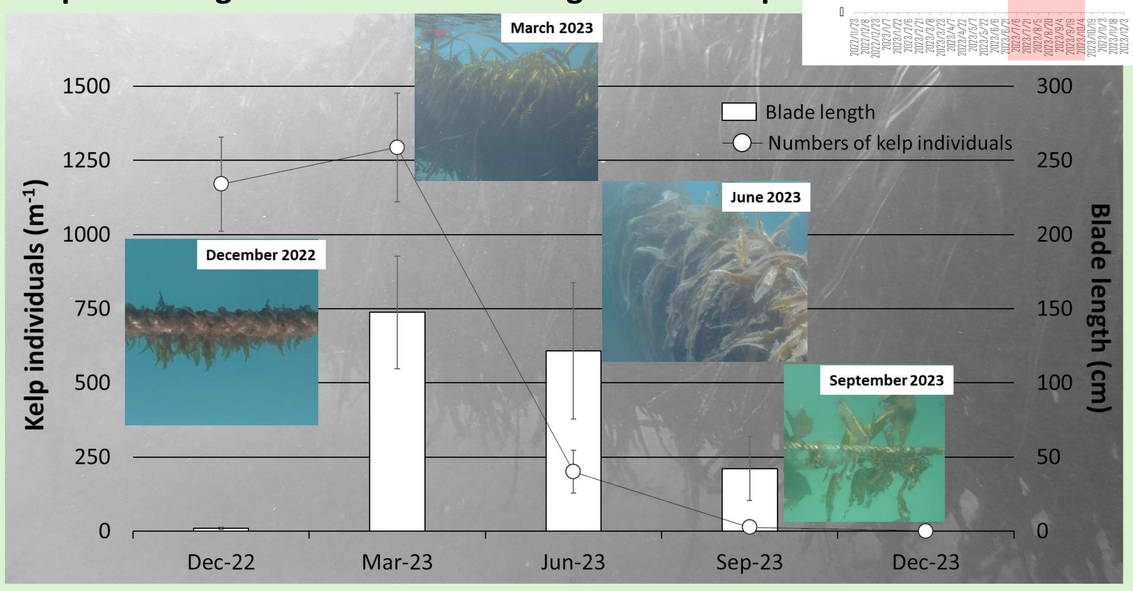


*Algicidal: more than >90% killed compared to control

Results and discussion

Temporal changes in the densities and growth of kelps

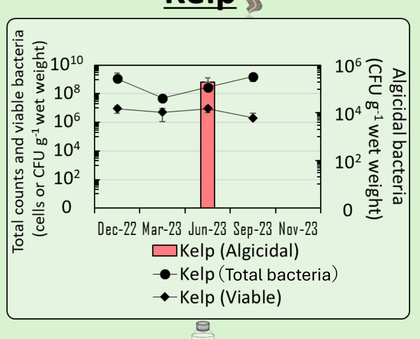




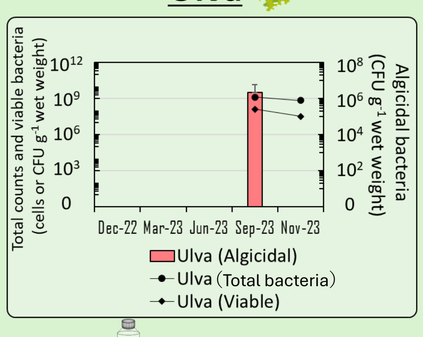
The temporal changes in the densities of algicidal bacteria

Stn. A

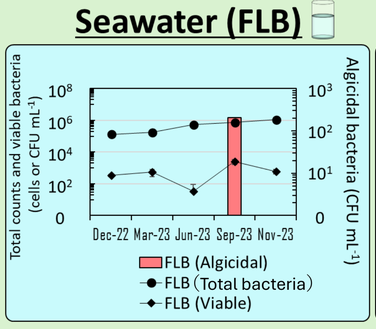
Kelp



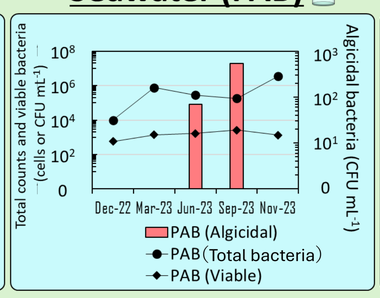
Ulva



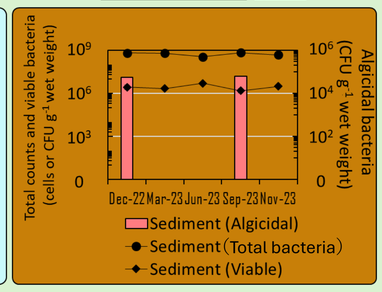
Seawater (FLB)



Seawater (PAB)



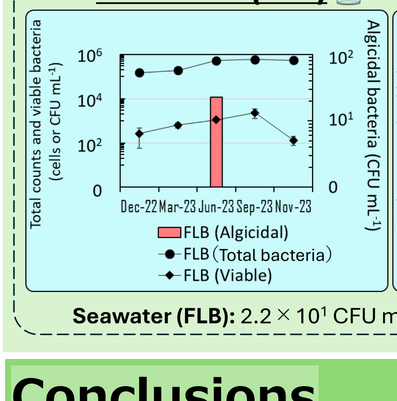
Sediment



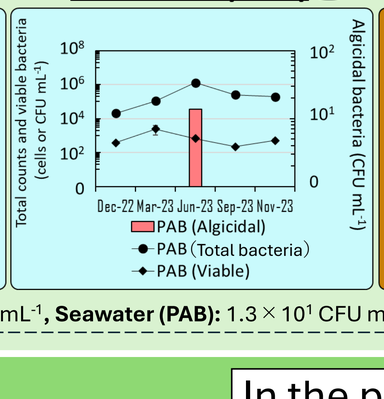
Kelp: 1.9×10^5 CFU g^{-1}, **Ulva:** 1.3×10^8 CFU g^{-1}
Seawater (FLB): 2×10^2 CFU mL^{-1}, **Seawater (PAB):** 0.7〜5.3×10^2 CFU mL^{-1}, **Sediment:** 5.7〜6.3×10^4 CFU g^{-1}

Stn. B

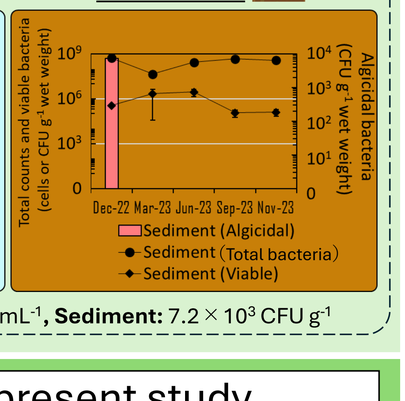
Seawater (FLB)



Seawater (PAB)



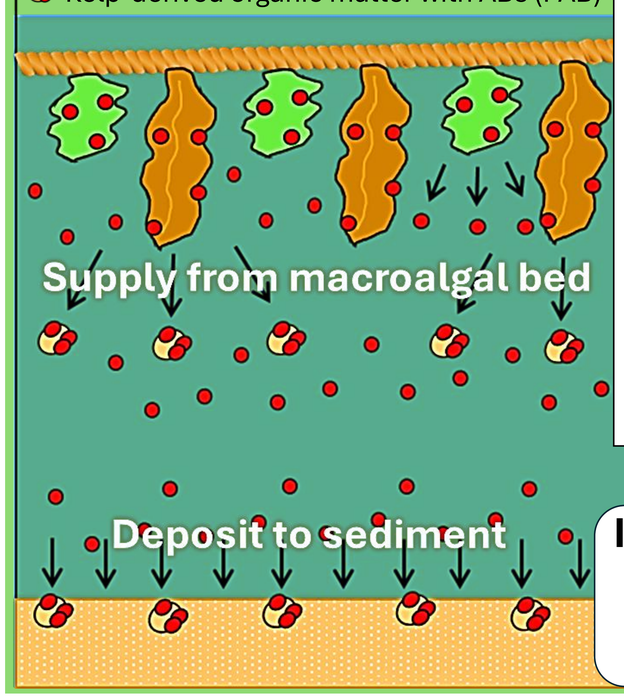
Sediment



Seawater (FLB): 2.2×10^1 CFU mL^{-1}, **Seawater (PAB):** 1.3×10^1 CFU mL^{-1}, **Sediment:** 7.2×10^3 CFU g^{-1}

Conclusions

- Algicidal bacteria (AB)
- Kelp-derived organic matter
- Kelp-derived organic matter with ABs (PAB)



In the present study,

- Algicidal bacteria (AB) against *K. mikimotoi* were **rich in June and September**
- AB densities in the seawater (both FLB and PAB) and sediment at **Stn. A** were about **twice as high** as at Stn. B
- The introduced kelp ked harbored **1.0×10^{11} CFU of AB** on June as a whole culturing area

Introducing a kelp bed could boost the AB supply as biocontrol of HABs