
Bridge Technology applied to Coral Restoration
(橋梁技術をサンゴ再生に活用)
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2. Summary(発表の要旨)
Applying anti-corrosion engineering for steel bridges and coastal structures, we developed new coral restoration technology.
This can help natural settlement of coral larvae on substrates and promote vital growth of coral juveniles.
自然のゆりかごであるサンゴ礁の再生に長年取り組み,サンゴの成長や幼生の活着(根付いて成長)を促進する技術を開発した.
Acknowledge
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3. An Engineer noticed at TAKETOMIHIGASHI pontoon （竹富東港をヒントに）

① Corals growing on the pontoon surface.（浮桟橋の側壁でサンゴが成長）

② No corals could not be found on the concrete seawalls nearby.

（近傍のコンクリート構造物にはサンゴが見あたらない） → Why?

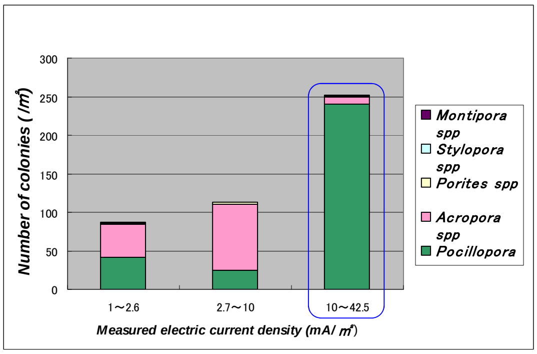
Five years have passed since pontoon set

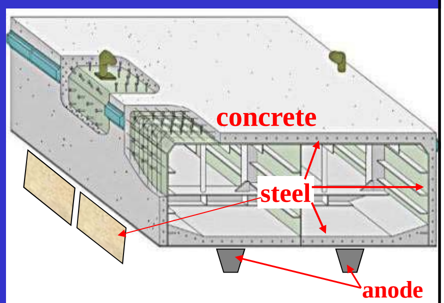
（5年経過後の状況）

4. Electric field supports coral colonies.（電場があるとサンゴが育つ）

Relation between electric current density and number of coral colonies

（電流密度別単位面積毎のサンゴ着生状況）





Cross section of the pontoon

Galvanic Anode System for anti-corrosion

（防食のための流電陽極システム）

5. *Corrosion technology should be modified in a coral friendly manner.*
（電気防食は，そのままでは使えない）

R/D issues (problems to be solved)

- ✓ *Damaged community of corals often found in the offshore sea. How can we provide electricity cheaply to the offshore far from coast?* *（遠隔海域での適用）*
- ✓ *Too strong electric current was anticipated reverse effect for coral growth. How much ampere is the most suitable?* *（適正な条件の模索）*
- ✓ *How can we provide good attaching surface for promoting formation of new coral communities? Is the electrically formed substrate good for coral settling and growth?* *（電着を応用した着床基盤の作成）*

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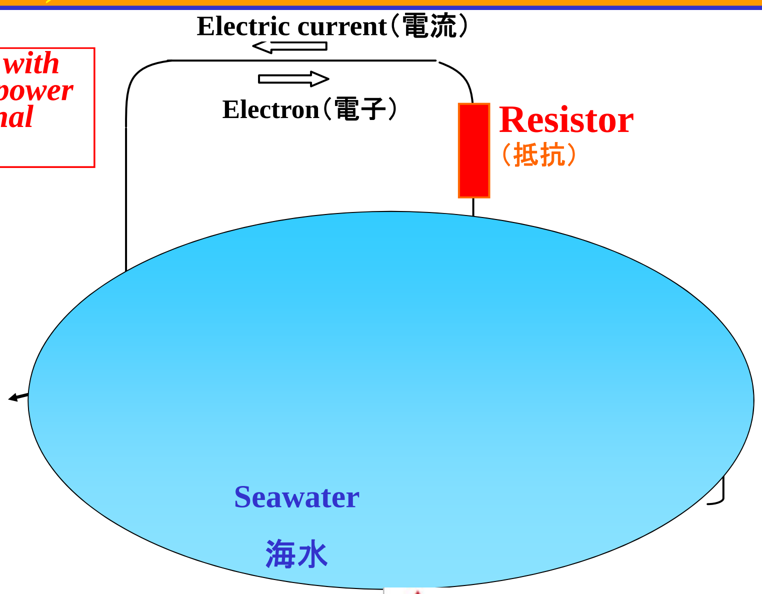
6. *Galvanic anode method (No power cable method)*
（流電陽極法の概要）

Galvanic system with anode needs no power cables nor external electric sources.

Aluminum or Magnesium
（アルミニウム又はマグネシウム）



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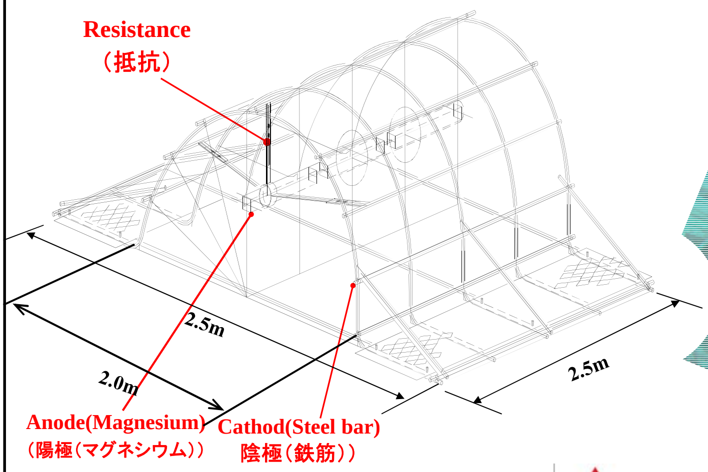
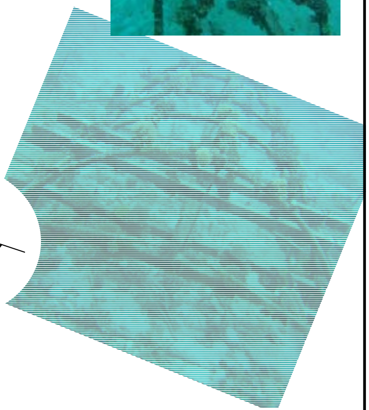
7. A field experimental device (cage)
(実海域実験用棚(サンゴ増殖棚))

Field experiment cages for checking suitable electric current density（現地実験で適正電流を把握.）





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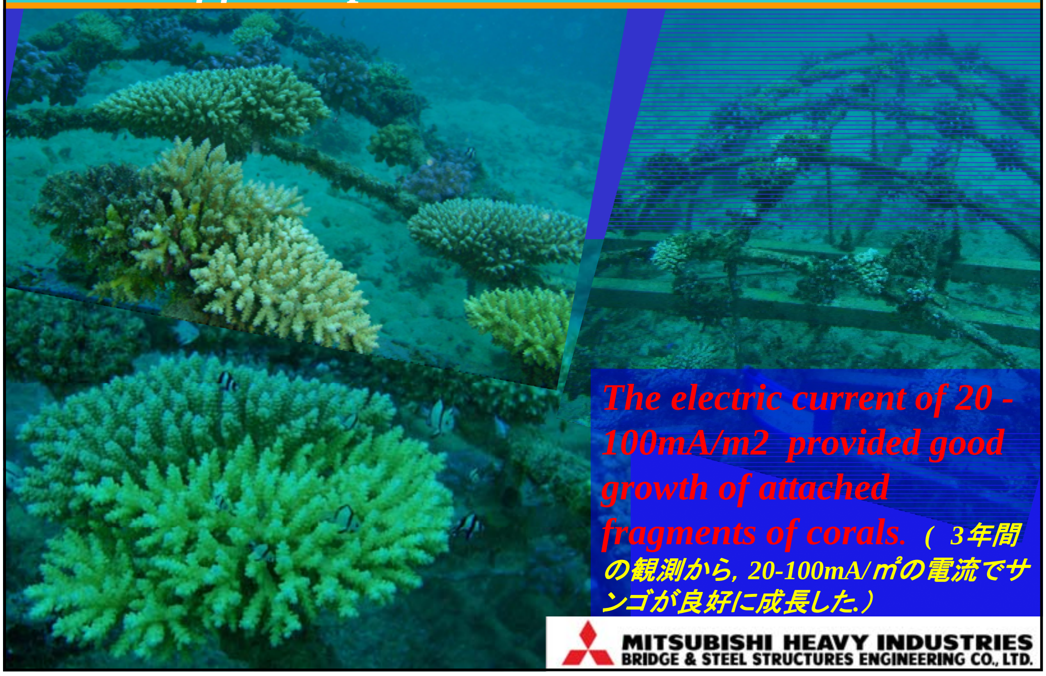
8. Result of field experiment（現地実験結果）



The electric current of 20 - 100mA/m2 provided good growth of attached fragments of corals. *（ 3年間の観測から, 20-100mA/㎡の電流でサンゴが良好に成長した.）*

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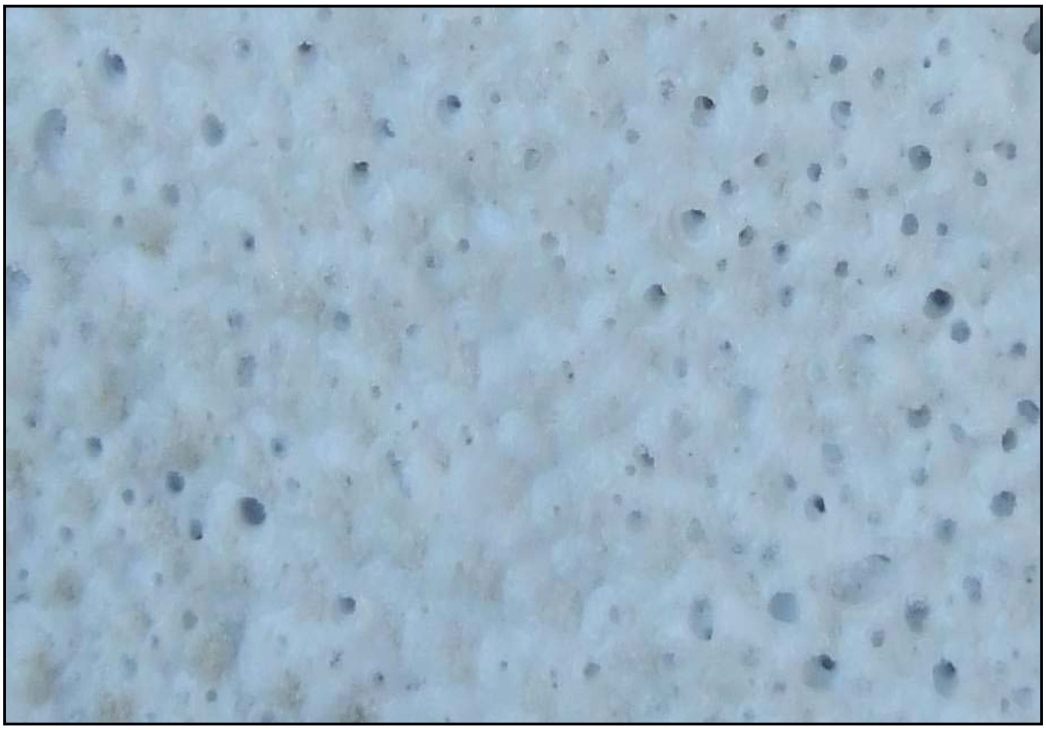

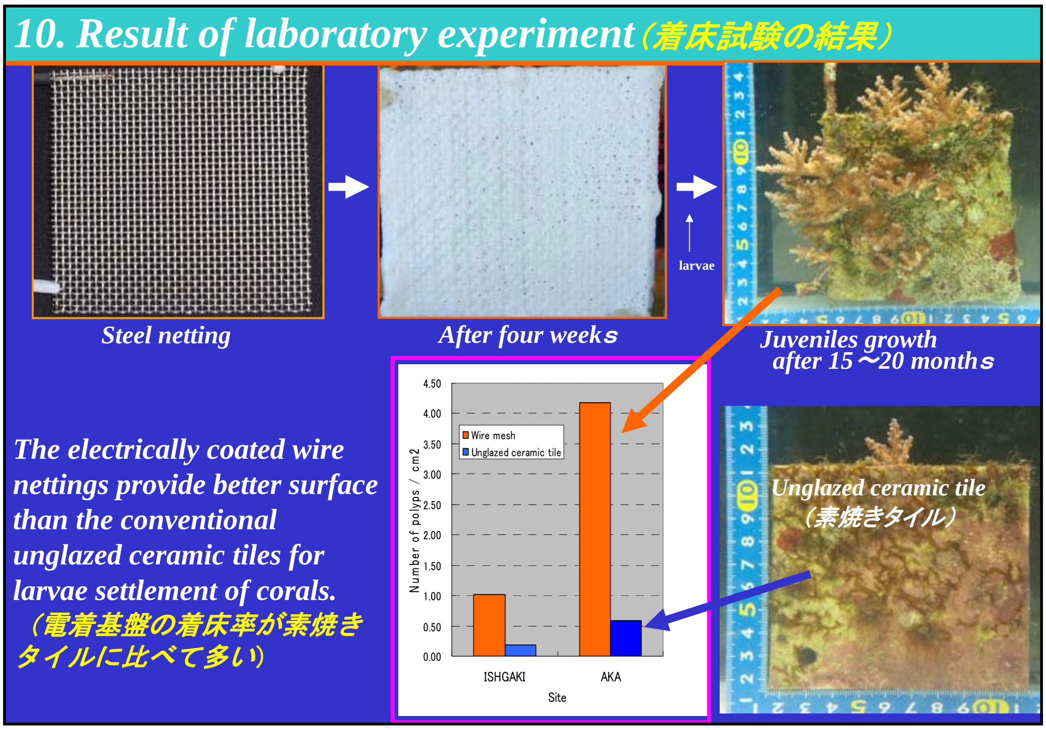

10. Result of laboratory experiment（着床試験の結果）
Steel netting
After four weeks
larvae
Juveniles growth
after 15～20 months
The electrically coated wire nettings provide better surface than the conventional unglazed ceramic tiles for larvae settlement of corals.
（電着基盤の着床率が素焼きタイルに比べて多い）
Wire mesh
Unglazed ceramic tile
Number of polyps / cm2
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
ISHGAKI
AKA
Site
Unglazed ceramic tile
（素焼きタイル）

11. Conclusions （結論）

① In the field observation about the pontoon, reef-building corals grew faster on the steel surface at actual current density of 10-50mA/㎡ than lower electric current.

② Response to electric current may varies with species.

③Galvanic system for substrate is proposed .

④ Weak electric current (20-100mA/㎡) seems favorable to coral growth on the cages under the sea. The electrochemically coated substrates were better than the unglazed ceramic tiles as substrate.

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12. Our Dream （私たちは夢を持っています）