HOLLY ADAMS

FABRICADEMY 2025

TerrAqua

RESTORING MARINE BIODIVERSITY USING 3D PRINTED CLAY REEFS

Key Words: Bioremediation | 3D BioPrinting | Regenerative BioDesign | Conservation | Parametric Architecture | Organic Design

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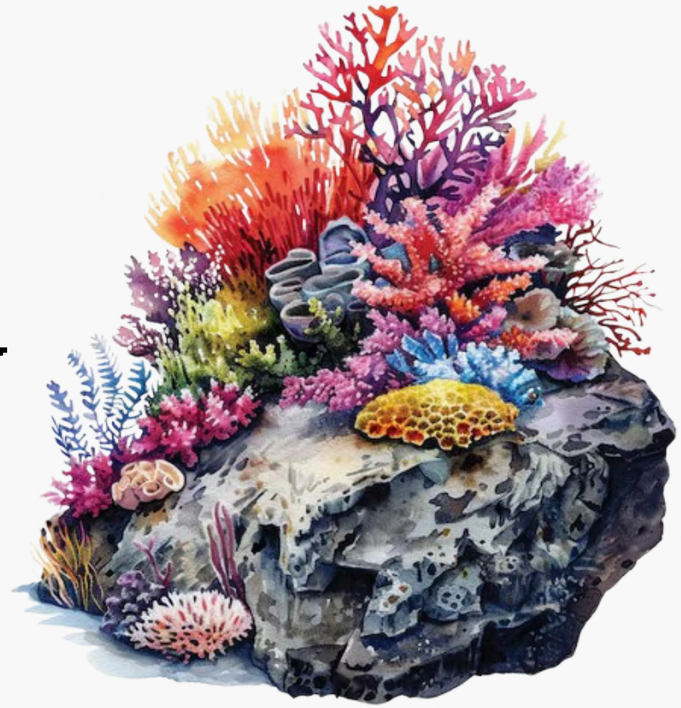
THE PROBLEM

Deforestation

Agriculture & Fertilizing Crops

Industrial Sector

Burning Fossil Fuels



Bleaching

Algae Blooms

Weather Changes

Ocean Acidification

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[1]Global Bleaching Events

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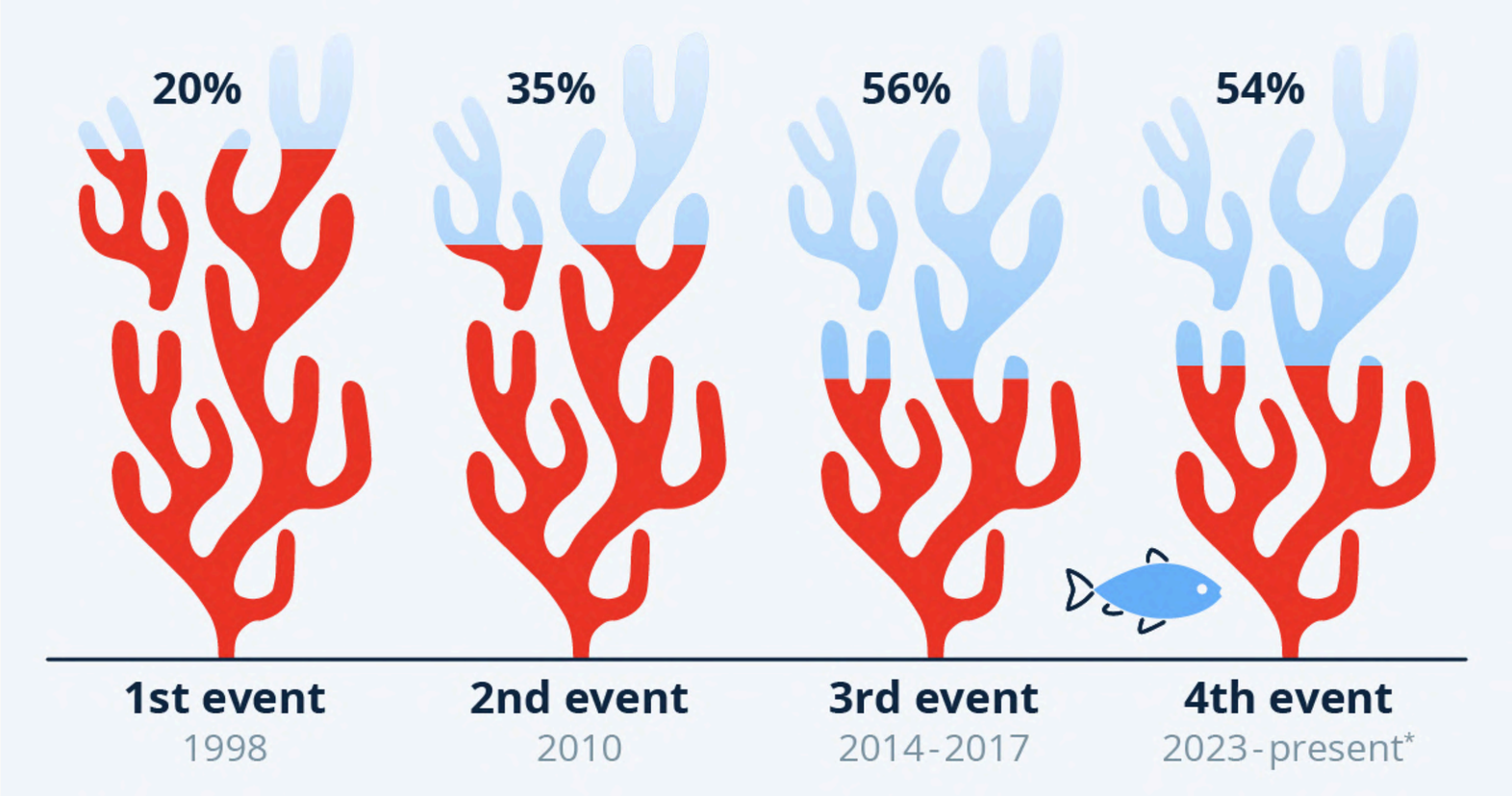
SHARE OF CORAL REEFS WORLDWIDE THAT EXPERIENCED HEAT STRESS CAUSING BLEACHING



0.5°C-1.5°C rise in average sea surface temperature [1]

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RESEARCH

- fish are more abundant in corals with the **highest levels of complexity**.
- reefs need to be designed for the **particular location**, **environment** and **organisms**

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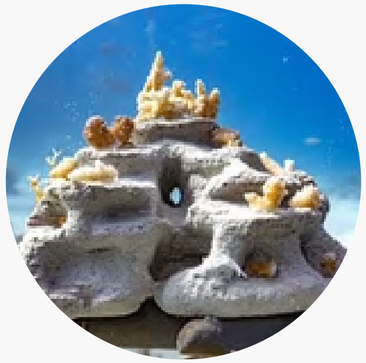
3d printing **customisable clay** reef structures, and empowering communities through science, art and education.

REEF DESIGN LAB

3D printed reef structures made from **eco-concrete**, **oyster shells** or other **recyled** materials.



COASTRUCTION

3d printing using natural materials aiming for the lowest CO2 footprint possible. Ideally, **local materials** such as **beach sand** or **recycled** concrete.

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THE SOLUTION

3D PRINTED CLAY CORAL REEF ECOSYSTEM

Aim: Using **advanced manufacturing** technology and **digital fabrication** techniques to design a **modular** structure which aims to **promote marine biodiversity** through the use of a **triply periodic minimal surface**

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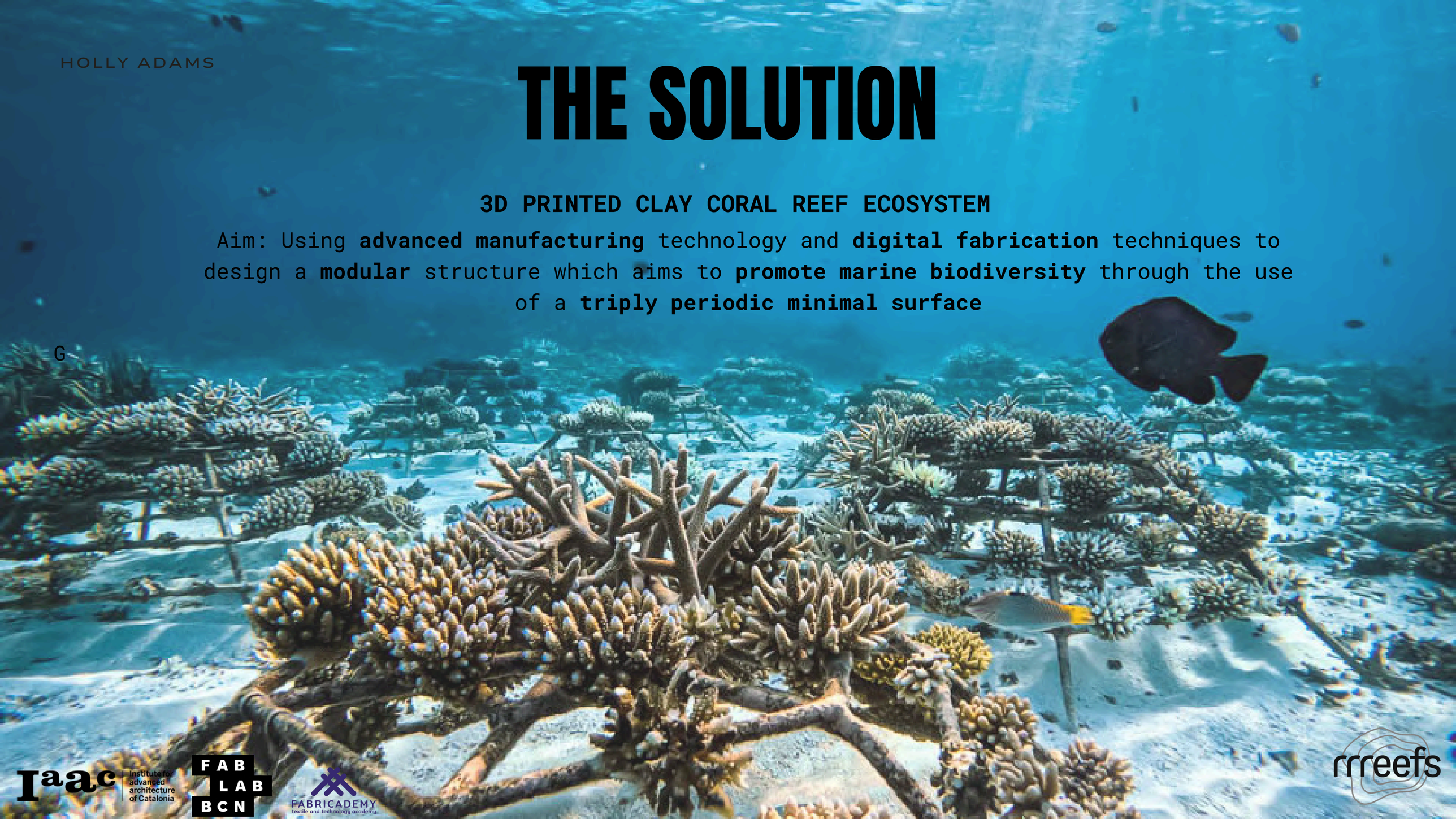

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COLLABORATION & LOCATION

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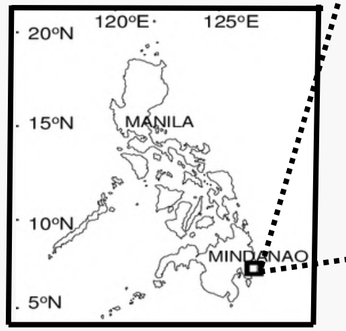
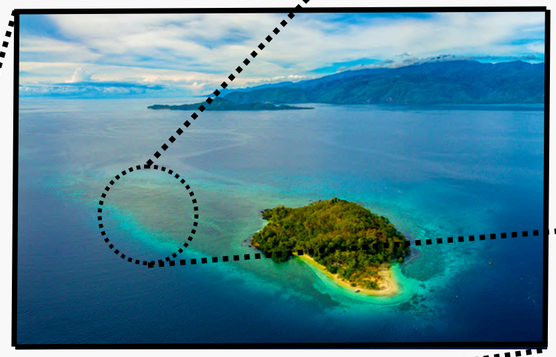
- ‘**rethink, rebuild and regenerate**’ our approach to helping coral reefs survive the climate and biodiversity crisis

PUJADA BAY, PHILIPPINES

10% of the Worlds coral reefs
98% are classified ‘threatened’

- deployed **820** 3D-printed terracotta modules





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[1] RRReefs
[2]3D Printed Reef
[3] IAACs]
[4] 3D Printed Oyster Shell

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MATERIAL FABRICATION

RRReefs[1]

3D Printed Reef [2]

IAAC - TerraPerforma[3]

3D Printed Oyster Shell [4]

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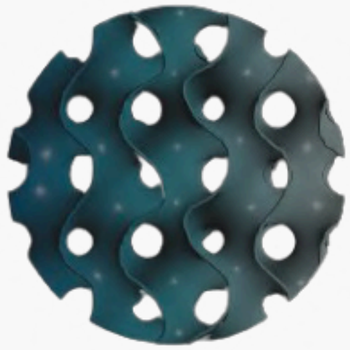
GEOMETRY & 3D MODELLING

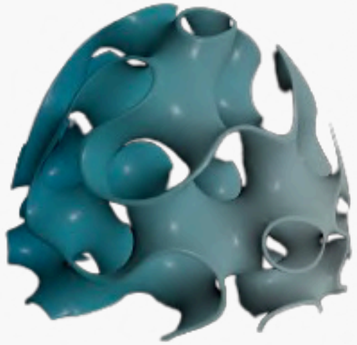
3D AI GENERATION - Tripo3D

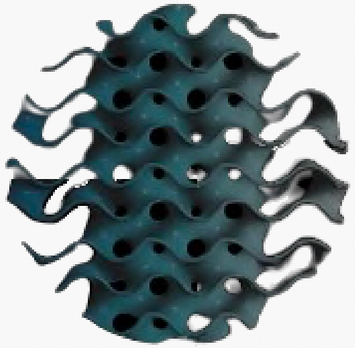
Gyroid (TPMS)

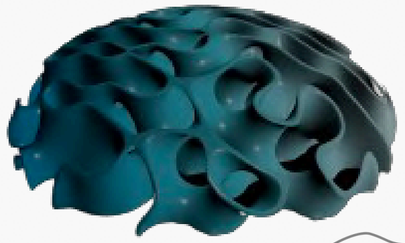
- great strength:weight and surface:volume
- **durable** and **resilient**
- efficient material usage
- varying **heights**, **channels** and **high surface area**

DEFORMED GYROID EXPLORATION - Houdini









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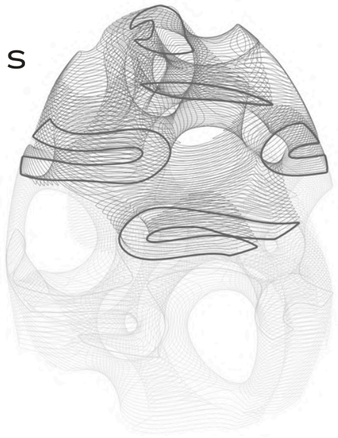
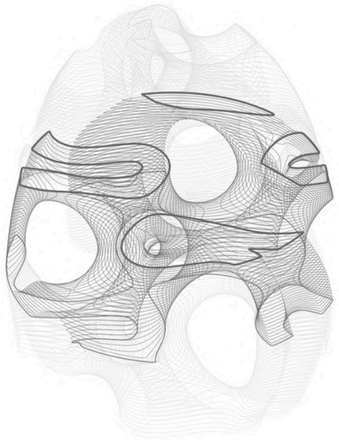
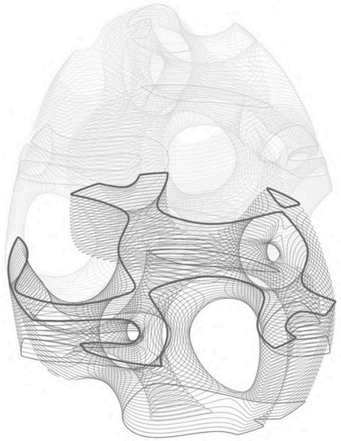
MODULAR



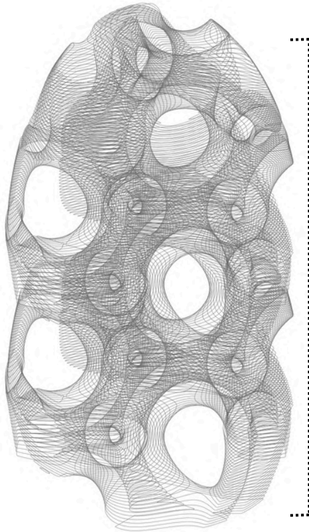
Top Module



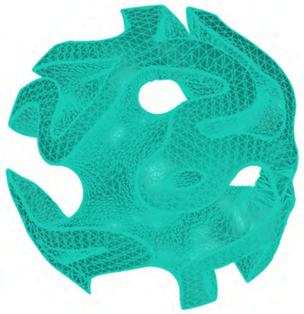
Central Module

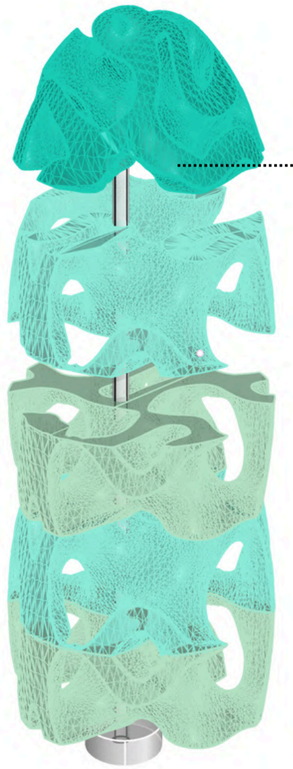


Mirrored and Flipped Central Module



Top + 4 Central Modules





Central Supporting Pole [diameter varies with scale]

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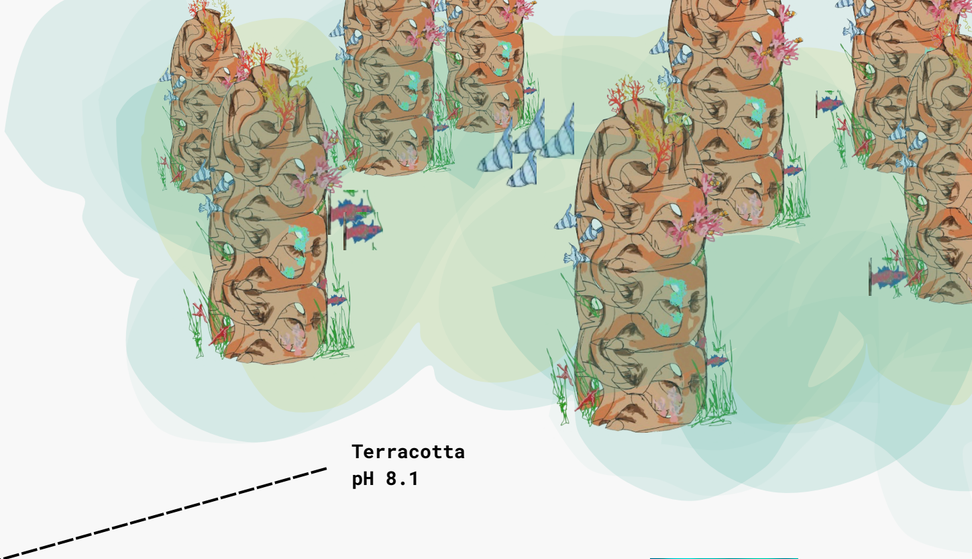
THE FUTURE ECOSYSTEM

SCALE: ≥1m x 1m x varied



Fire Coral
Found in shallow reefs, with optimum level of sunlight and a variance in the flow of water

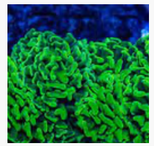
Terracotta
pH 8.1

Blue Angel Fish
Prefer dimly lit areas or under overhanging vegetation

Clown Fish and Anemones
Found in warm sheltered waters. Clownfish live symbiotically with the anemone

Seagrass
Critical marine ecosystem providing habitat and diverse communities

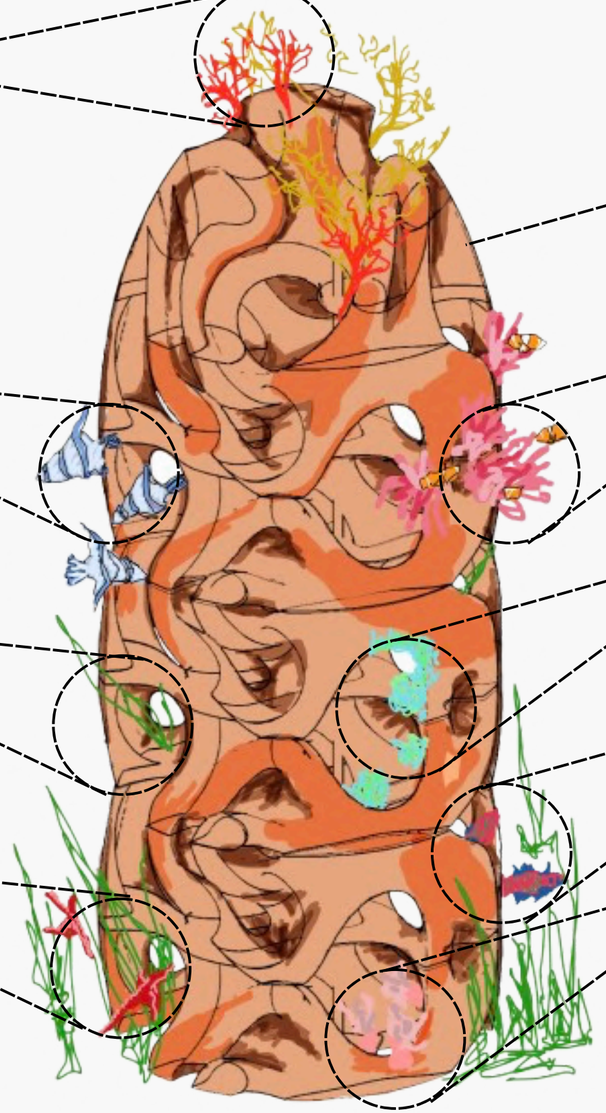
Hammer Coral
Typically found in shallow waters on rocky substrates. They Don't require much light



Mandarin Fish
Found in shallow protected reefs with rocky rubble

Ghost Pipefish
Found in shallow reefs and seagrass meadows where they can hide

Capnella
Found in shadier places and on coral rubble in shallow water



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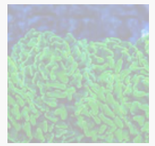

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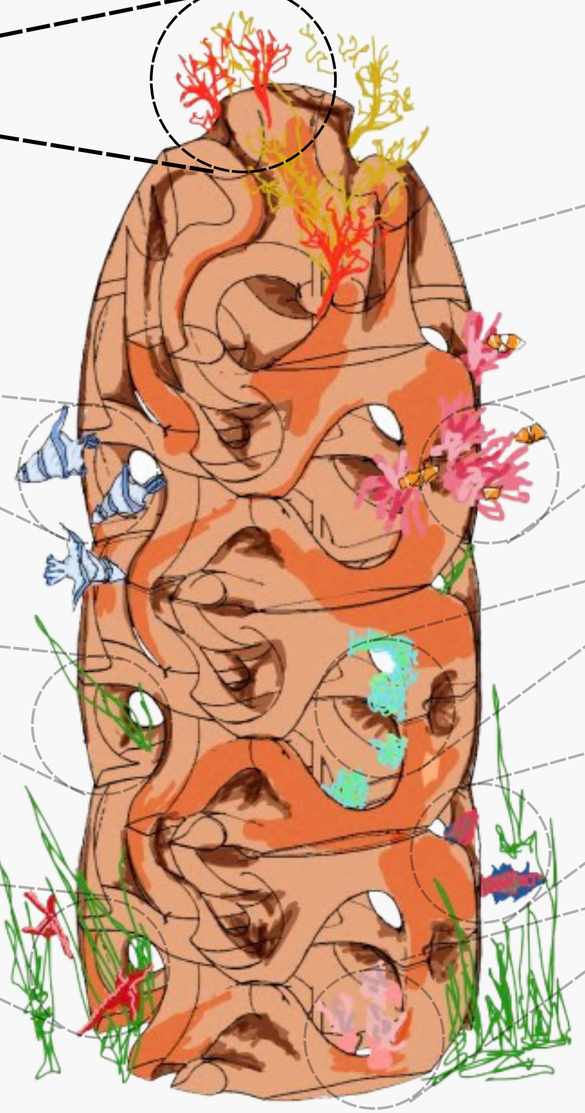

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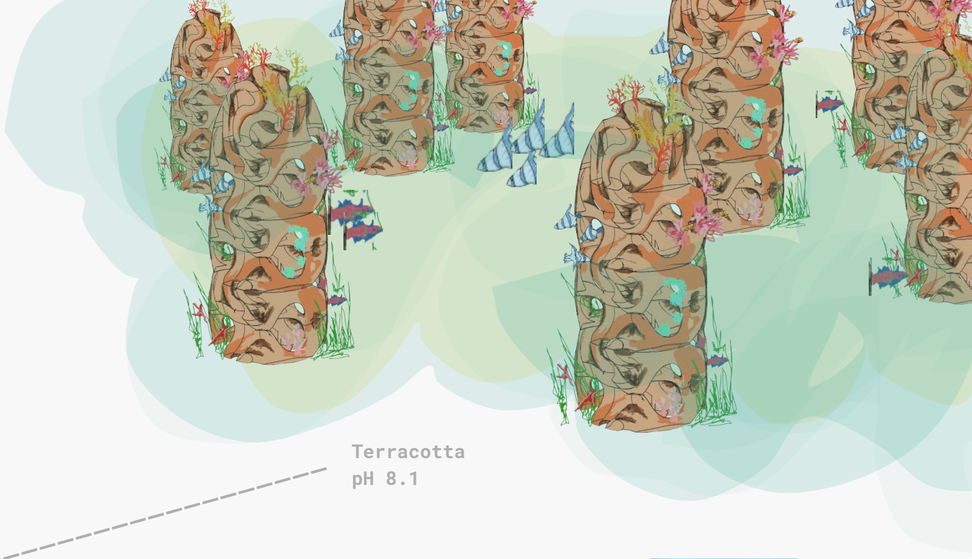

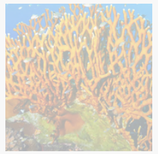

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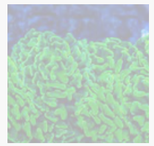

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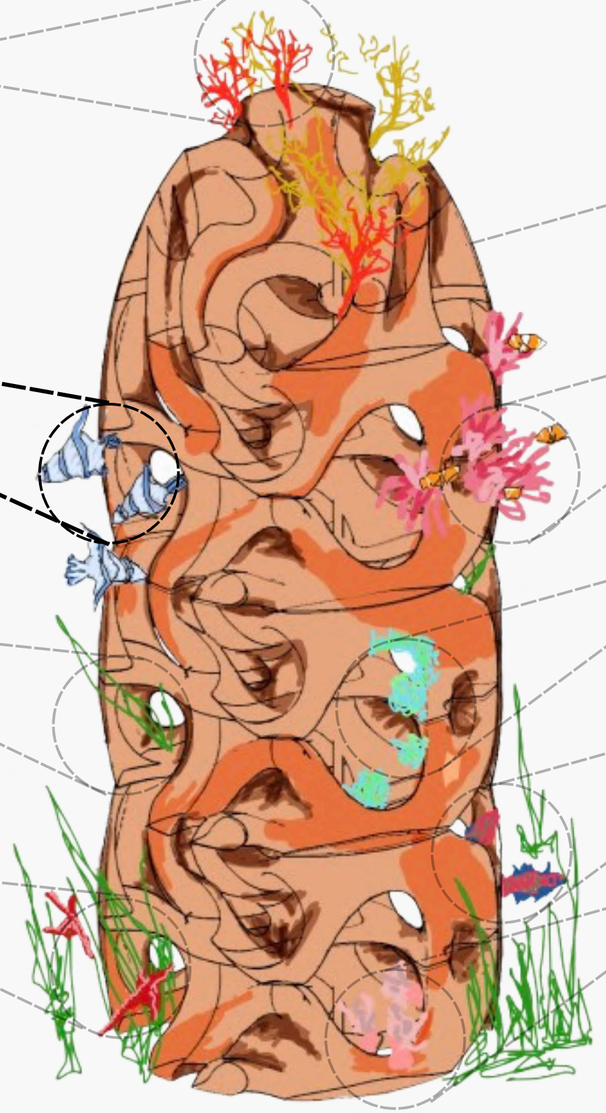

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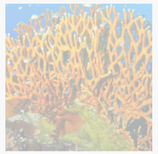

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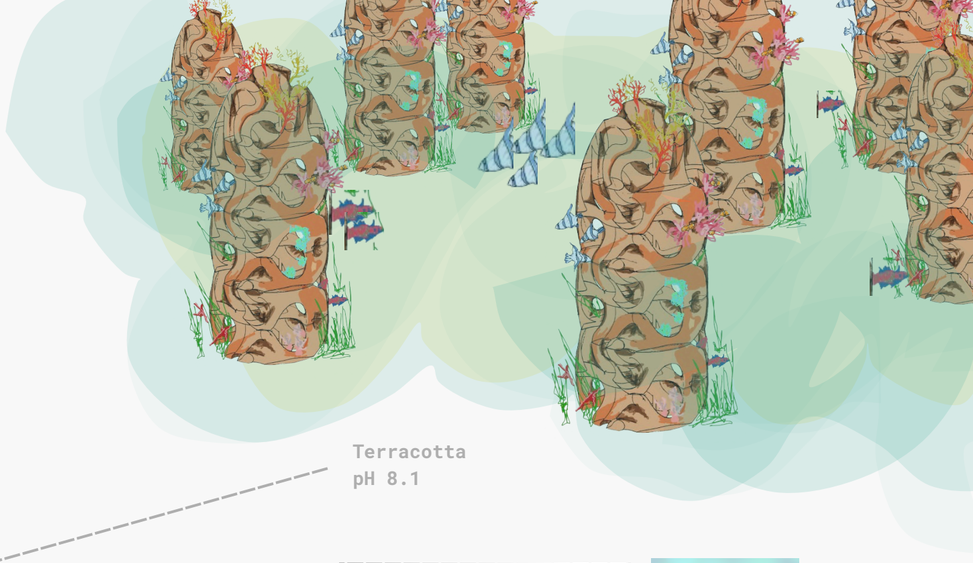

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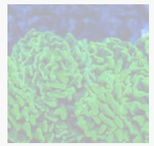

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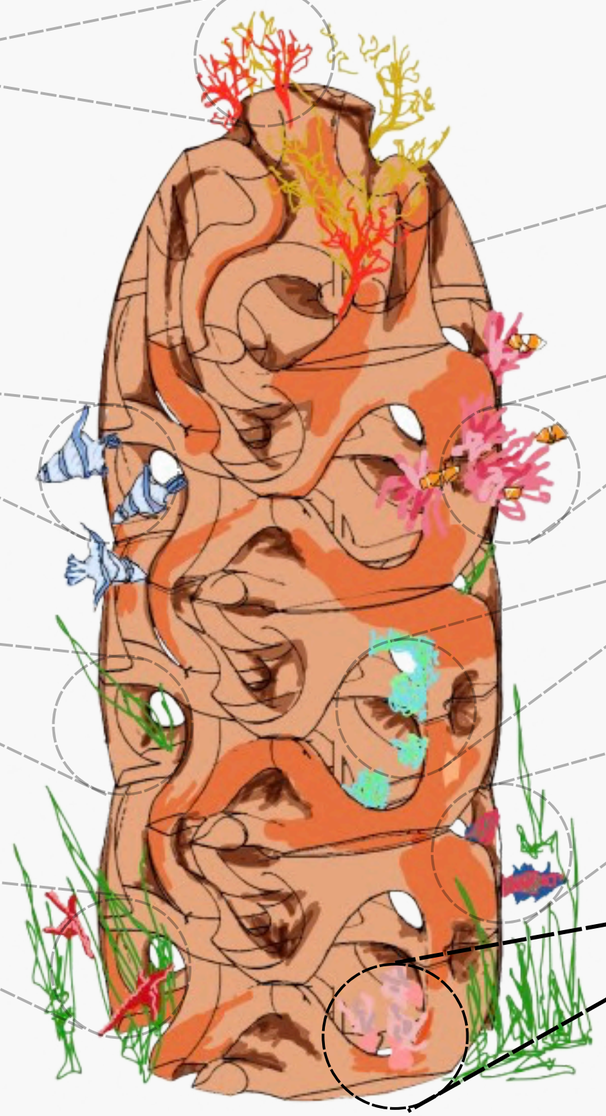

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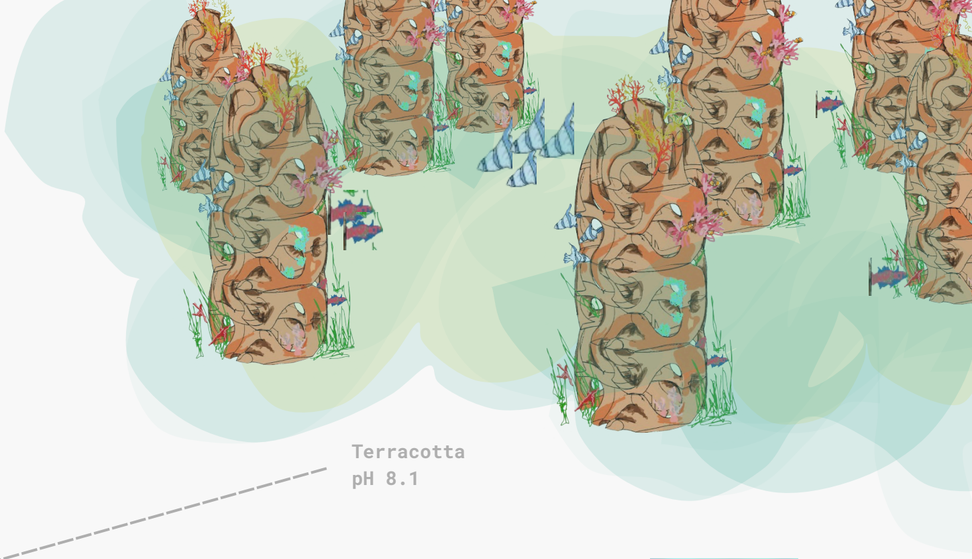

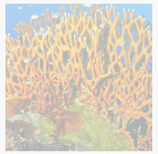

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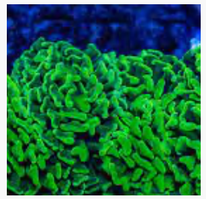

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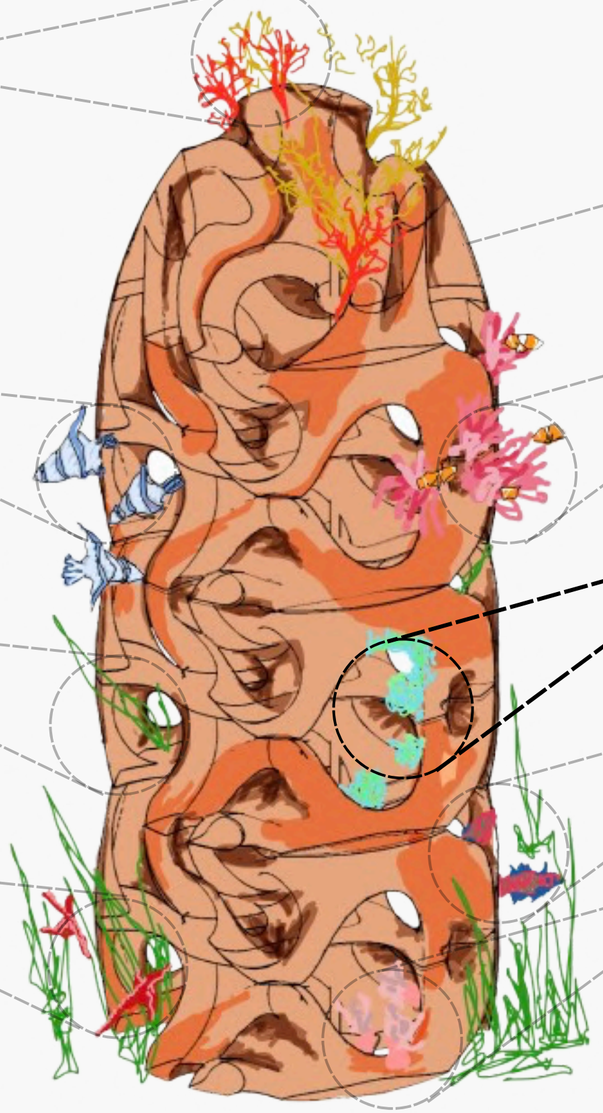

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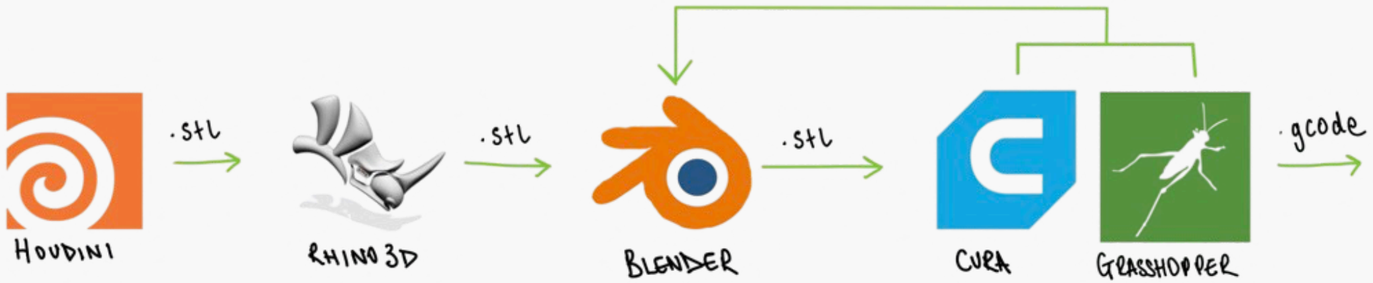
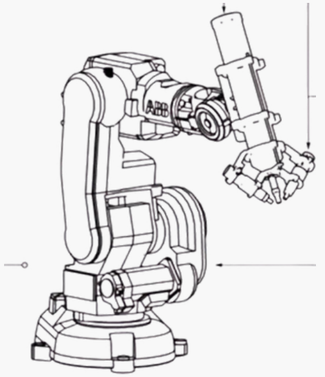
3D PROTOTYPING





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TERRAQUA

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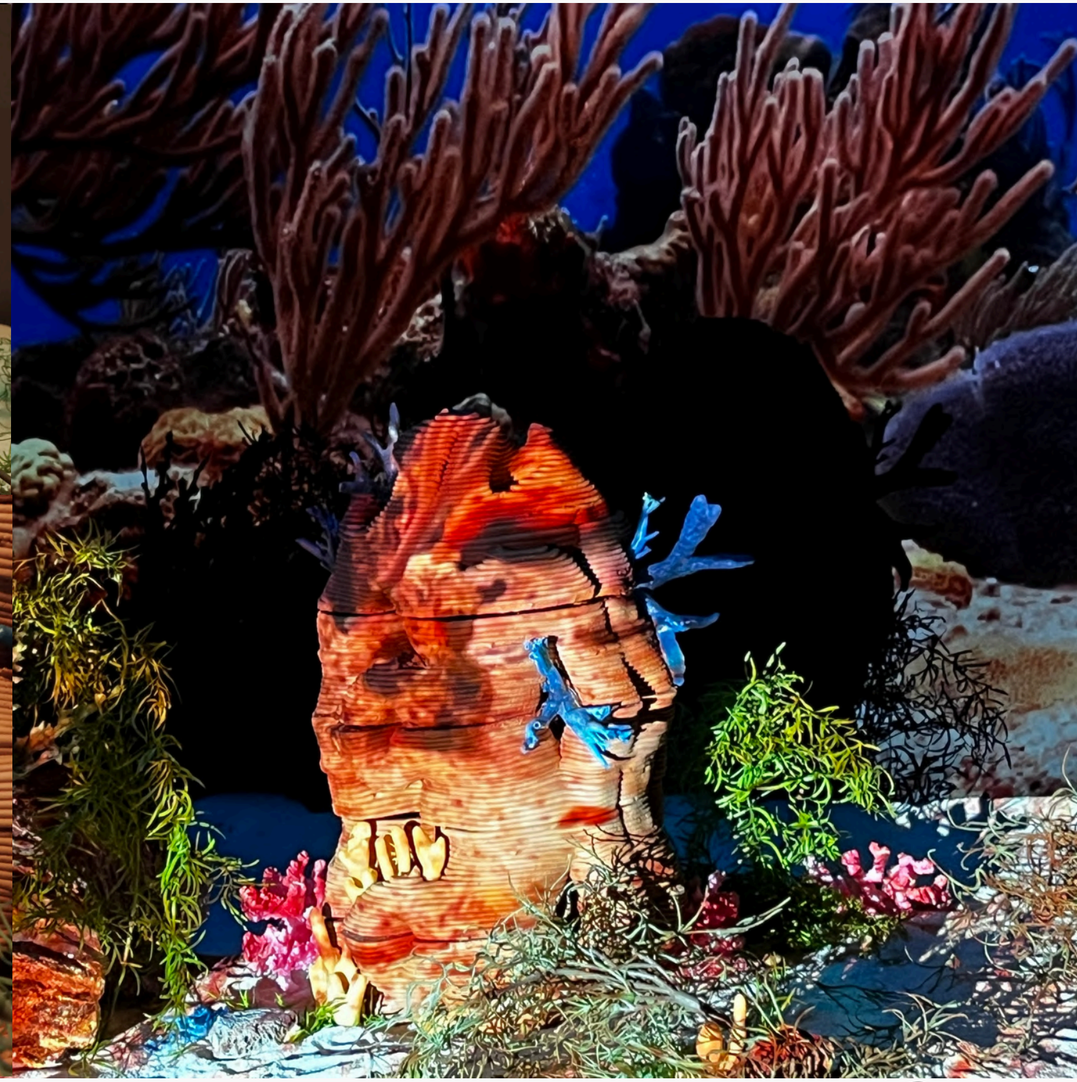

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FUTURE OF TERRAQUA

BioDesign for All Initiative

Coral Catch, Indonesia

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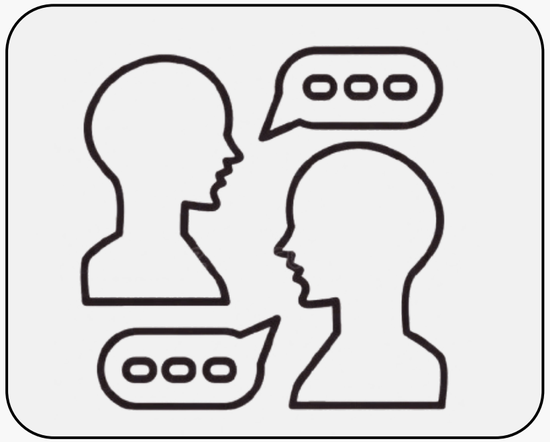
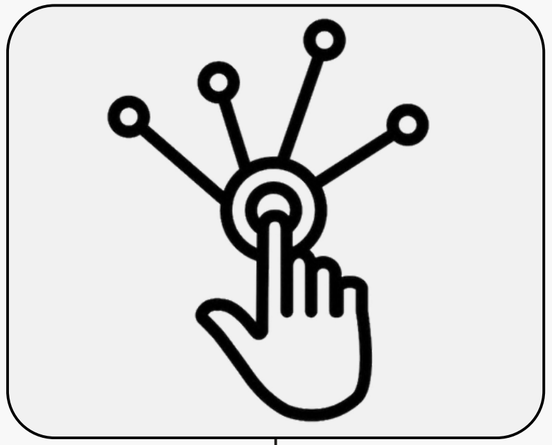
EDUCATE



TAKE ACTION

INTERACT



REDUCE

ACTIONS

Ecosystem revival and climate protection is not solved by one design and person, but by collaborative action and education.

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THANK YOU

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www.linkedin.com/in/hollymayadams

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