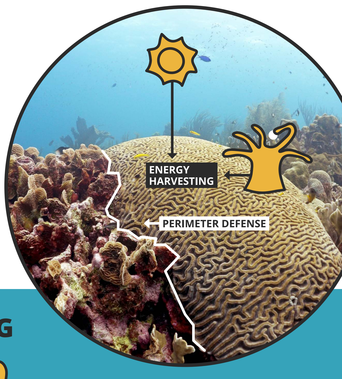
Coral geometry and the competition for space on the reef

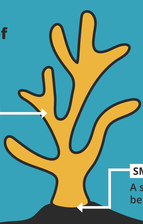
HOW DO CORALS COMPETE?

Reef-building corals are increasingly invaded by algae and other organisms. To compete with these organisms corals must defend their perimeters. They do this by harvesting energy through their surface (e.g., photosynthesis and feeding) then using part of this energy for defense.



WINNING OR LOSING

We predict that corals have a **higher chance of winning** if they have:



LARGER SPACE-FILLING SURFACES
More 'complex' surfaces for feeding and photosynthesis

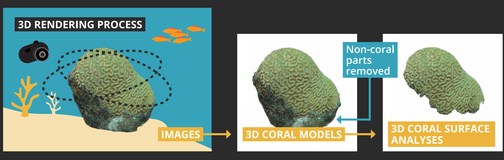
SMALLER PERIMETERS
A smaller area that needs to be defended against invaders

OUR STUDY

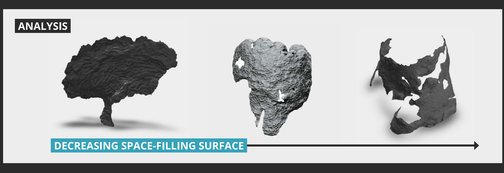
To test the prediction, we:

1. Photographed coral colonies at 15 sites around the Caribbean island of Curaçao.

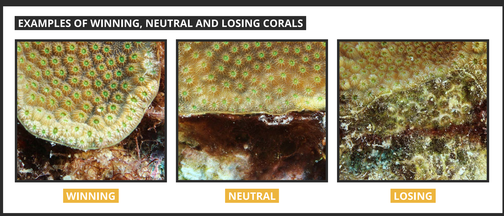
2. Rendered 50 coral colonies using digital 3D and 2D reconstructions.



3. Analyzed the properties (such as coral space-filling and perimeter).

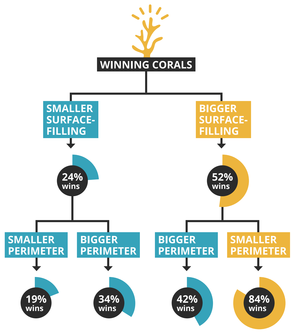


4. Determined **if corals were winning or losing against competitors**, based on either growth or damage of coral tissue.



WHAT WINNING CORALS HAVE IN COMMON

Our study showed that **winning corals had significantly larger space-filling surfaces**. The most successful corals **combined larger space-filling surfaces with smaller perimeter lengths**.



CORAL REEF RESTORATION

Favoring the repopulation of corals with these geometrical properties could facilitate a more rapid recovery of coral reefs.

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