The Majuro Sanitation Crisis and the Death of our Coral Reefs

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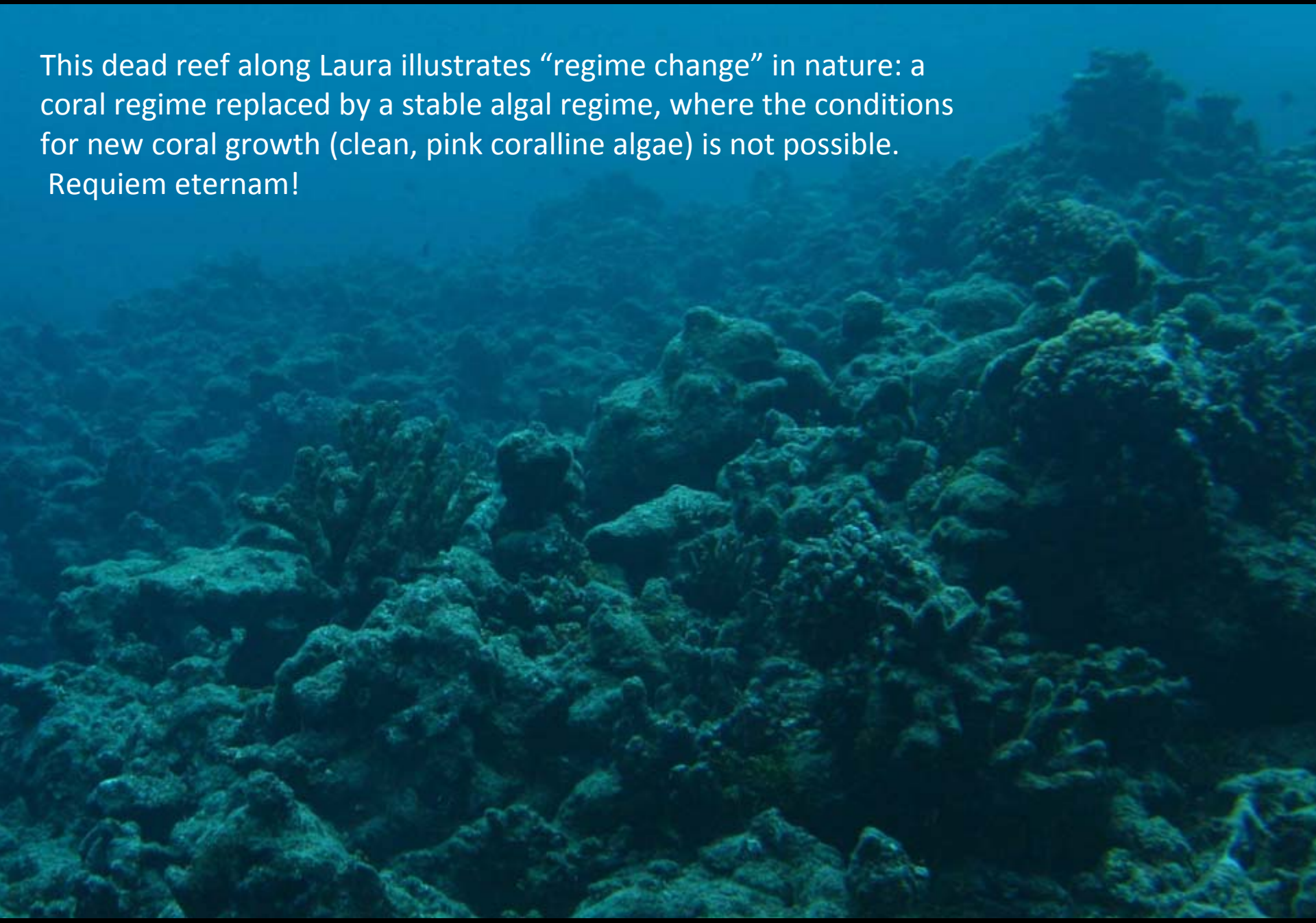
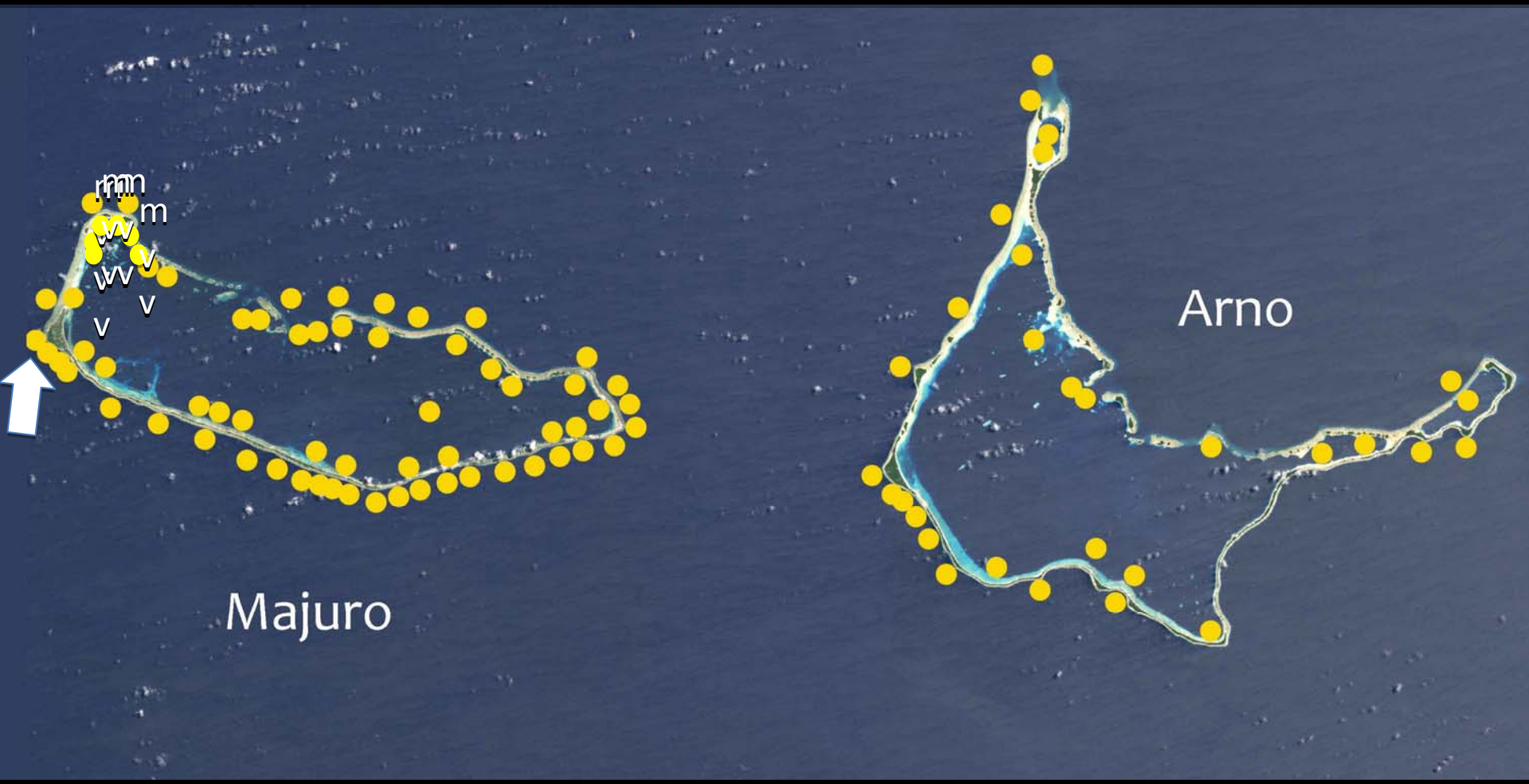
I have set before you life and death, blessing and cursing, therefore choose life, that thou and thy seed may live.

Deuteronomy 30:19



This dead reef along Laura illustrates “regime change” in nature: a coral regime replaced by a stable algal regime, where the conditions for new coral growth (clean, pink coralline algae) is not possible.
Requiem eternam!


Majuro
Arno

Laura

Woja

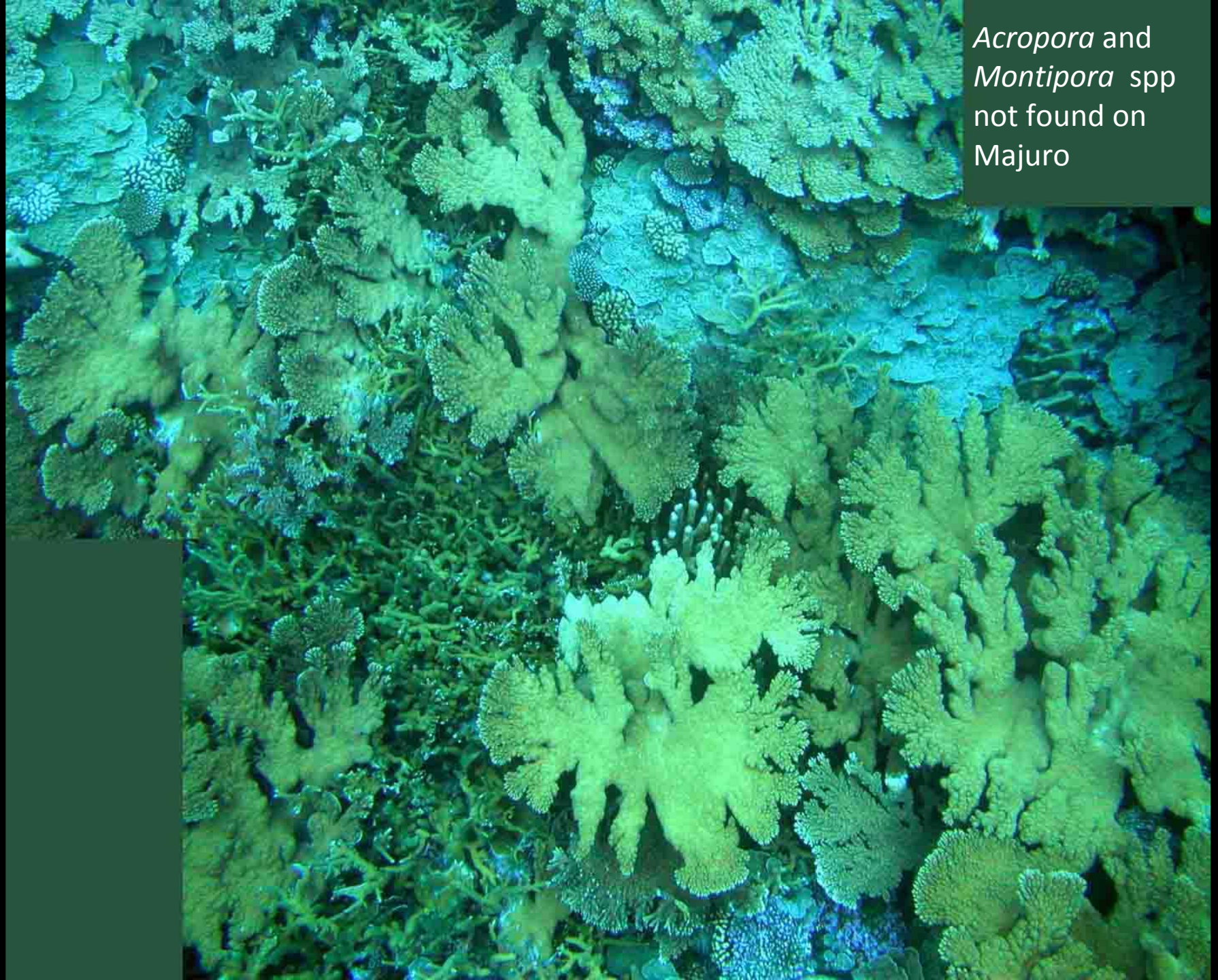
Downtown

airport

Ajeltake

Rairok

At intermediate depths, a high diversity of massive species grow, entirely healthy



Acropora and *Montipora* spp not found on Majuro


Healthy reefs are colorful… blue, yellow, red, especially pink!

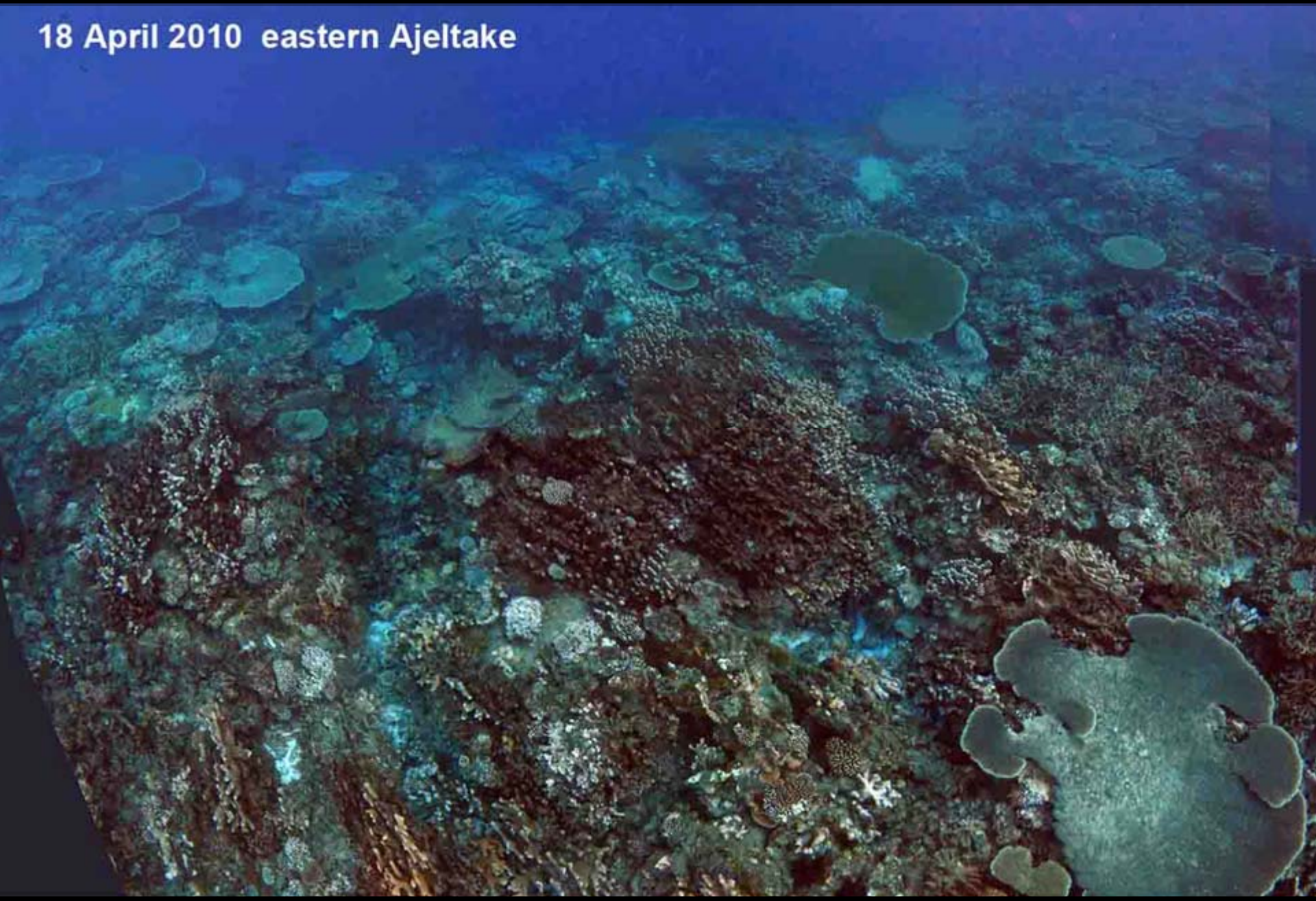

Outer island water is very clean!

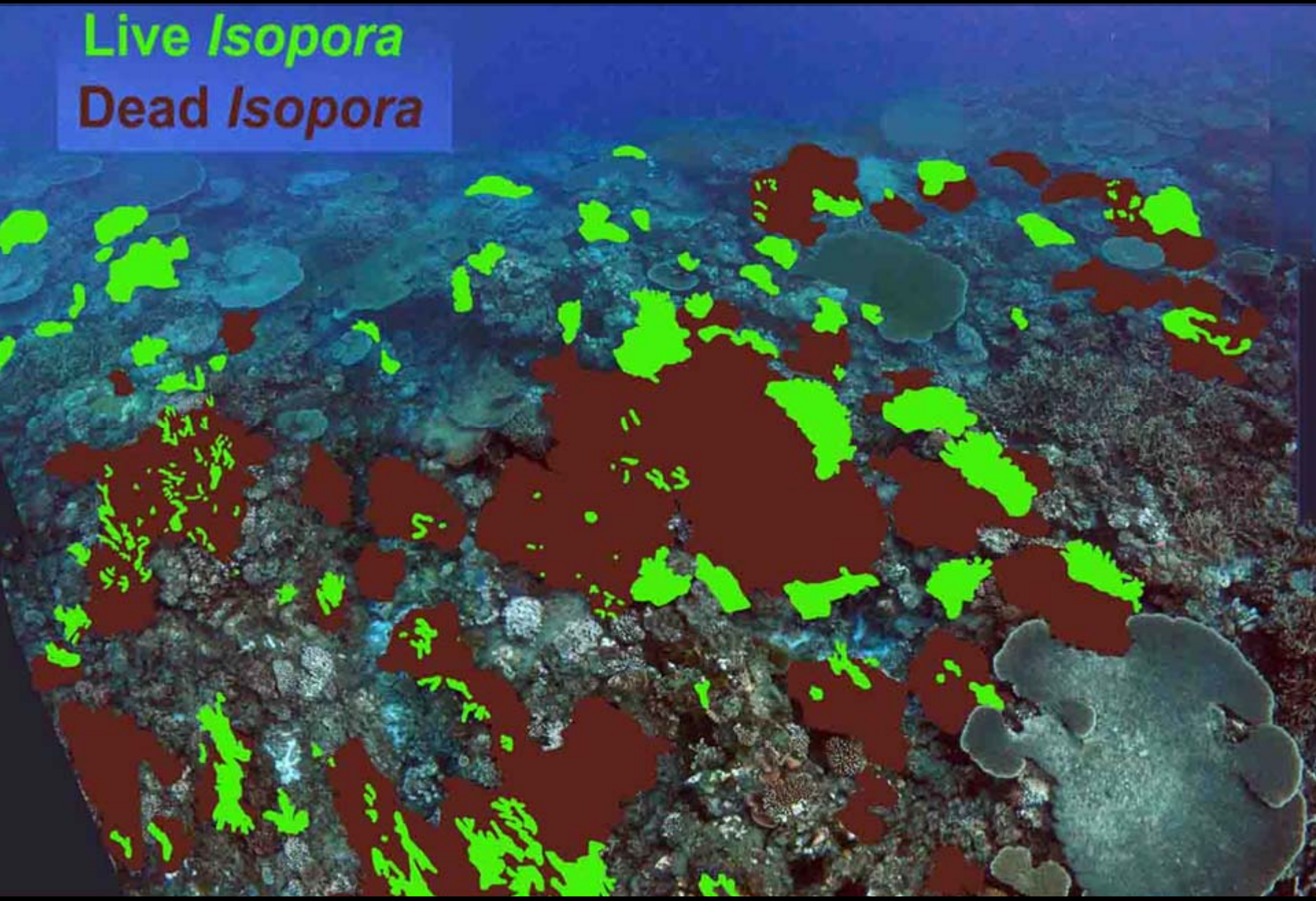

Typical outer island reef…

Isopora is entirely absent in eastern Majuro, where a limited set of *Acropora* dominates

Note the low coral diversity

Isopora: the dominant outer island coral

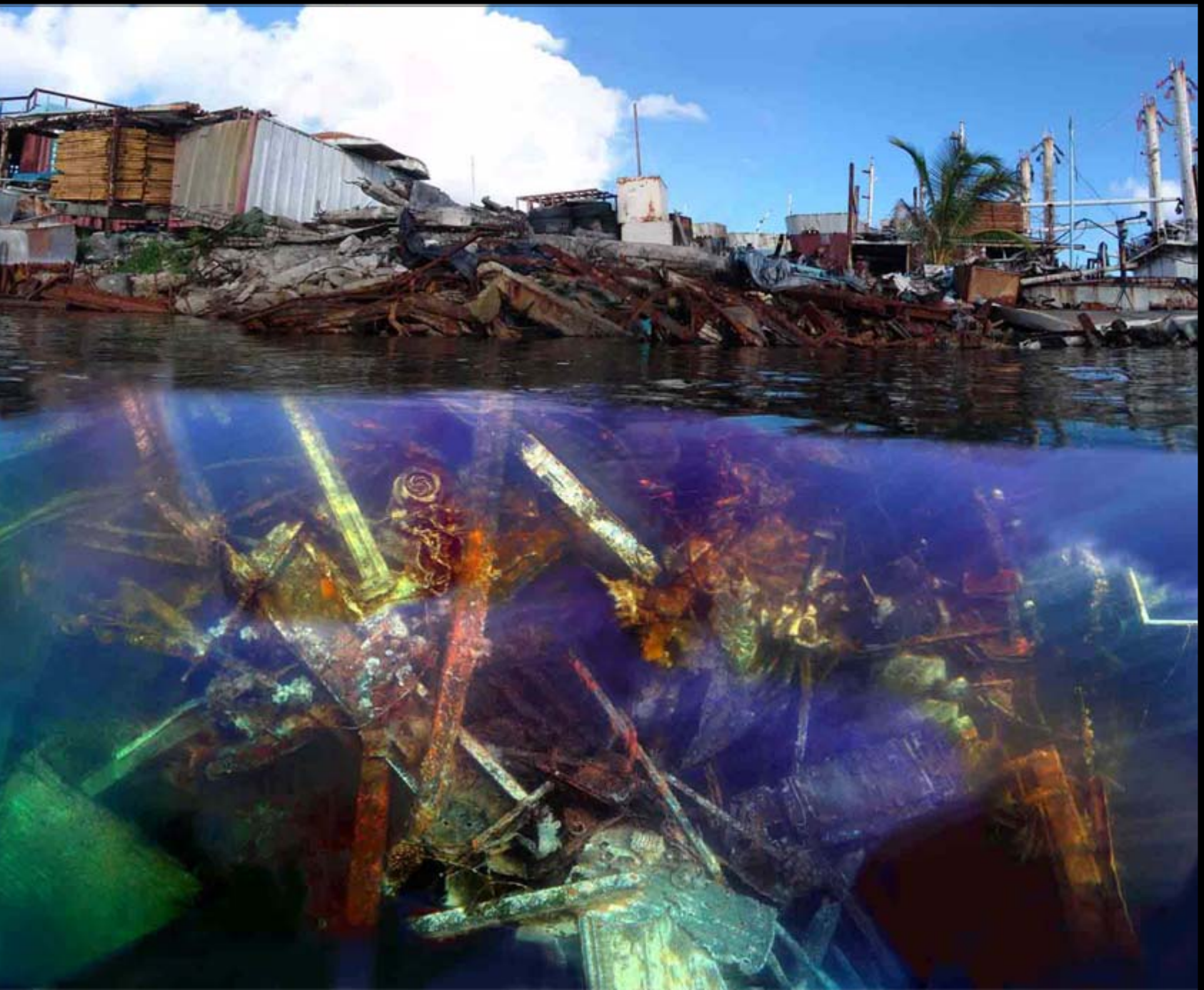

18 April 2010 eastern Ajeltake


Live *Isopora*
Dead *Isopora*

Majuro lacks the resources or the will to manage its solid waste problem: textiles and diapers litter the reef

This callous, thoughtless disregard for the plight of nature is summed up in a single word:

Autistic

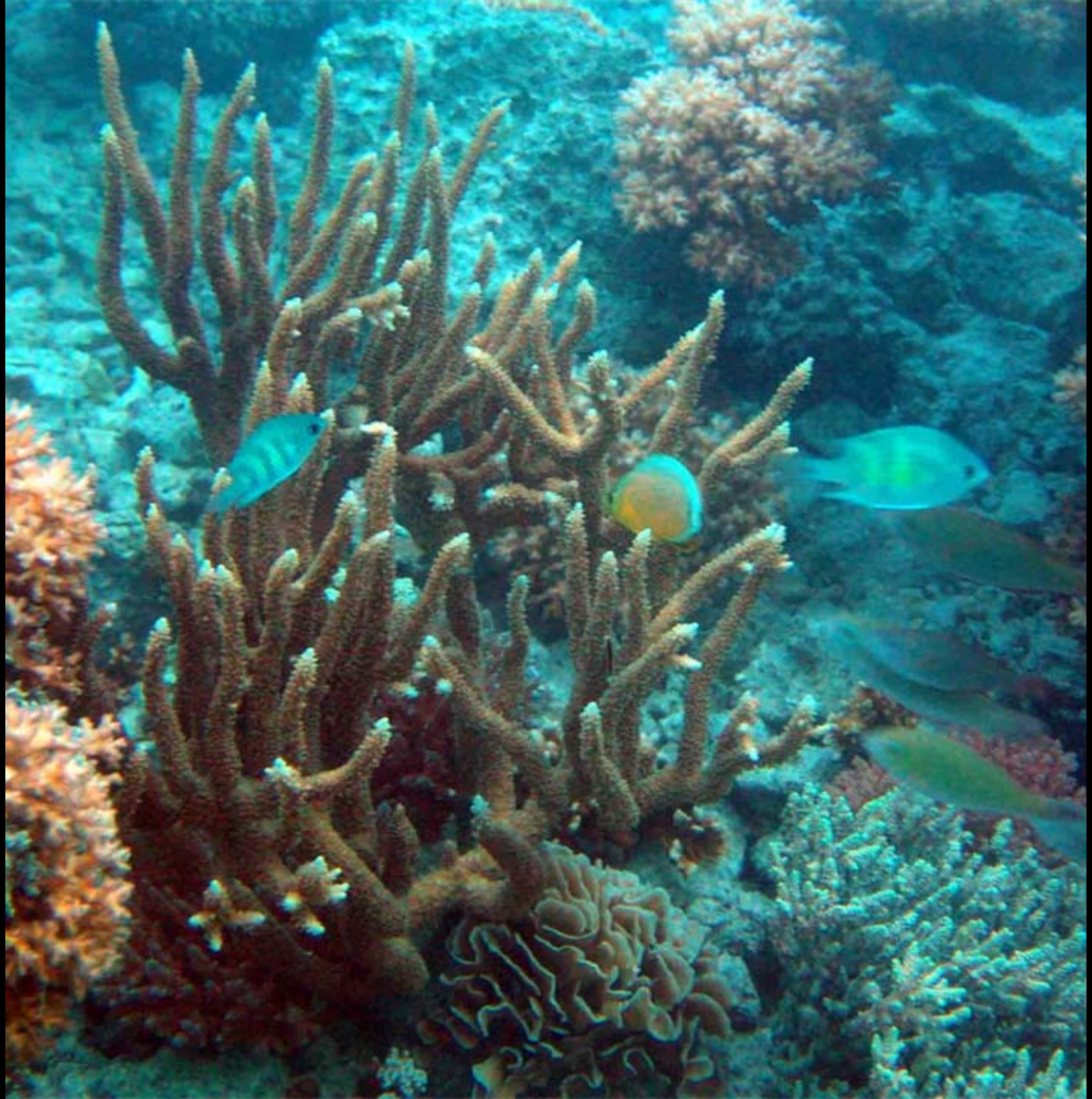


The Lagoon and ocean have long been used as a dump and a sewer

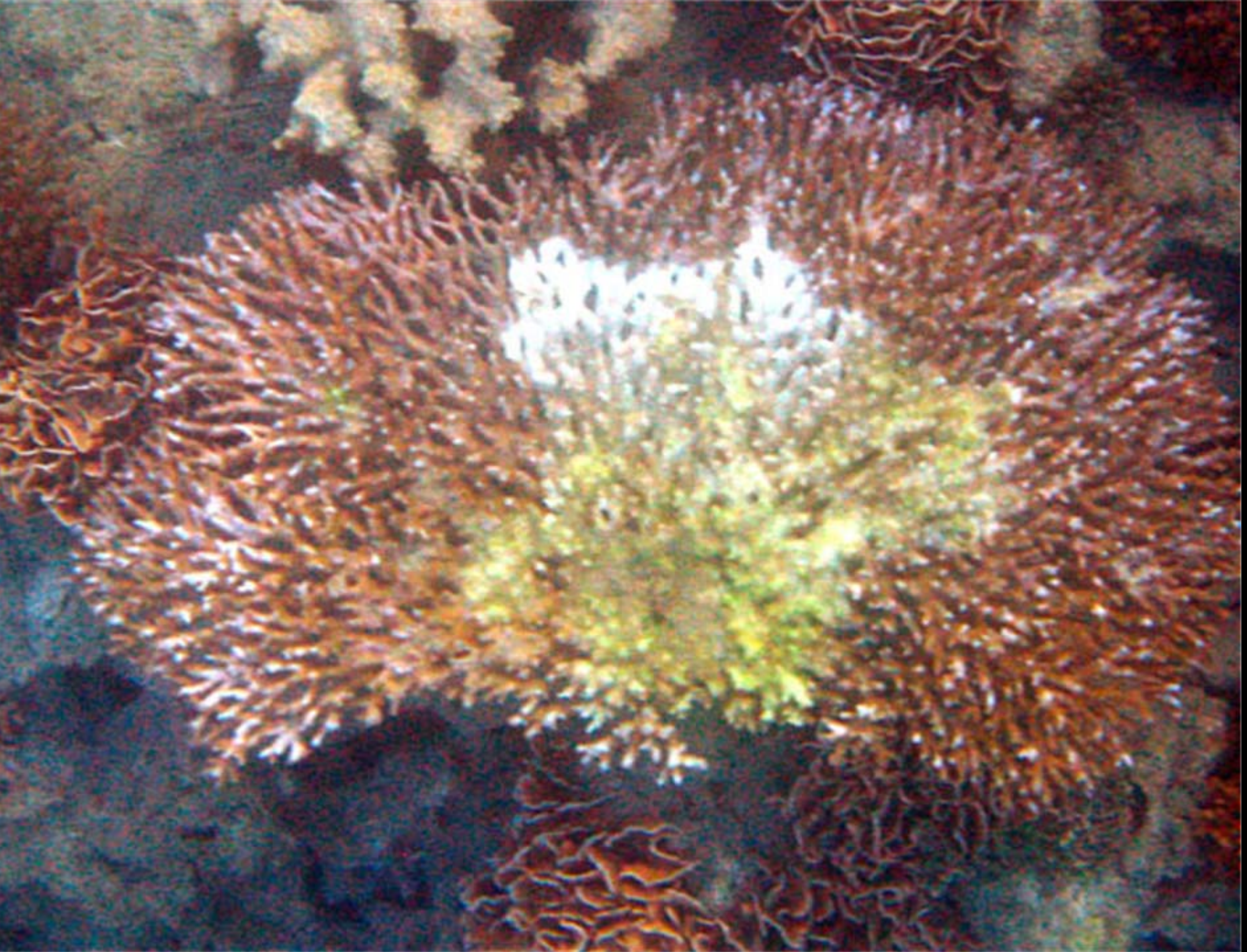
The presence of diapers on coral correlates with coral disease

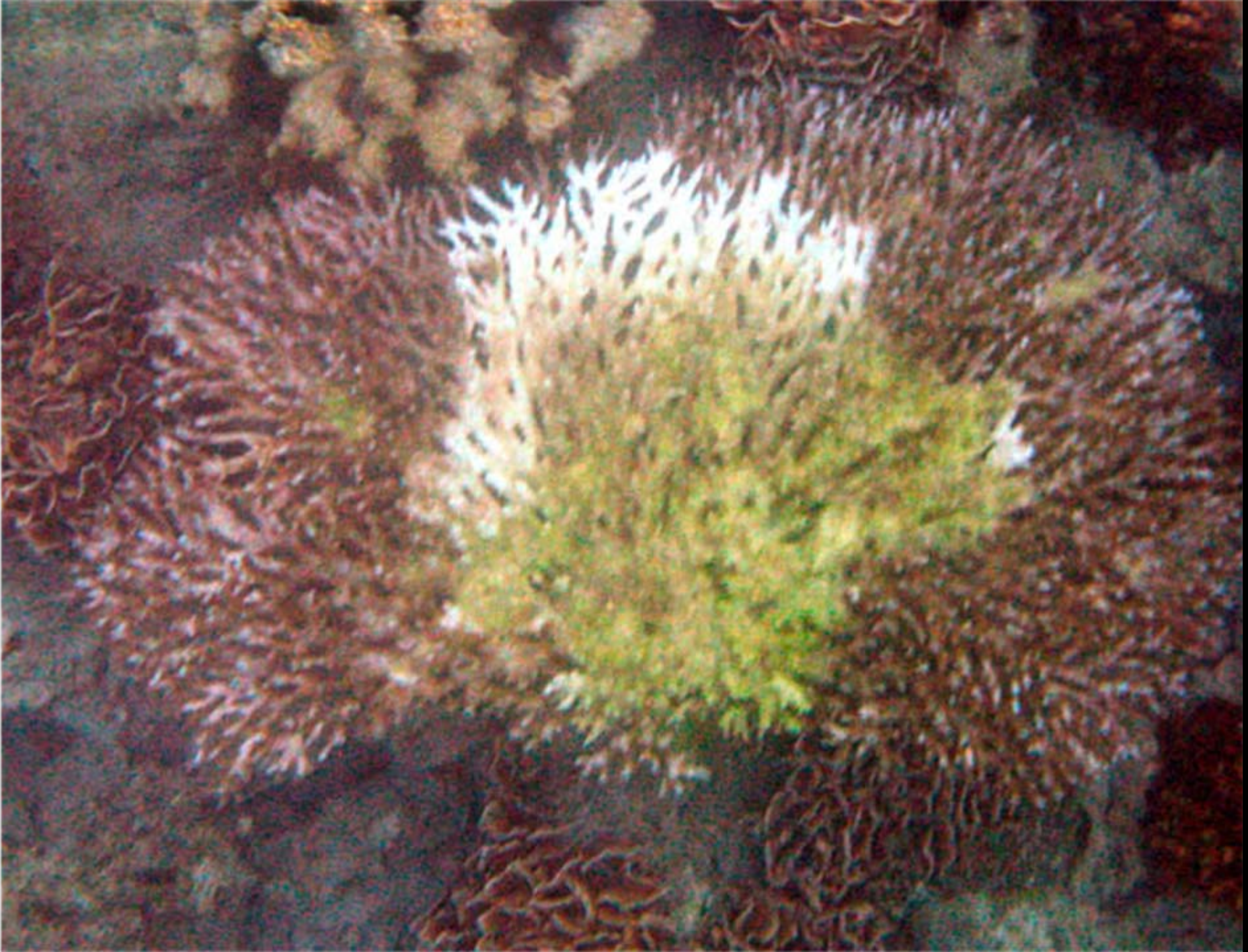
Yet, coral can appear resilient…

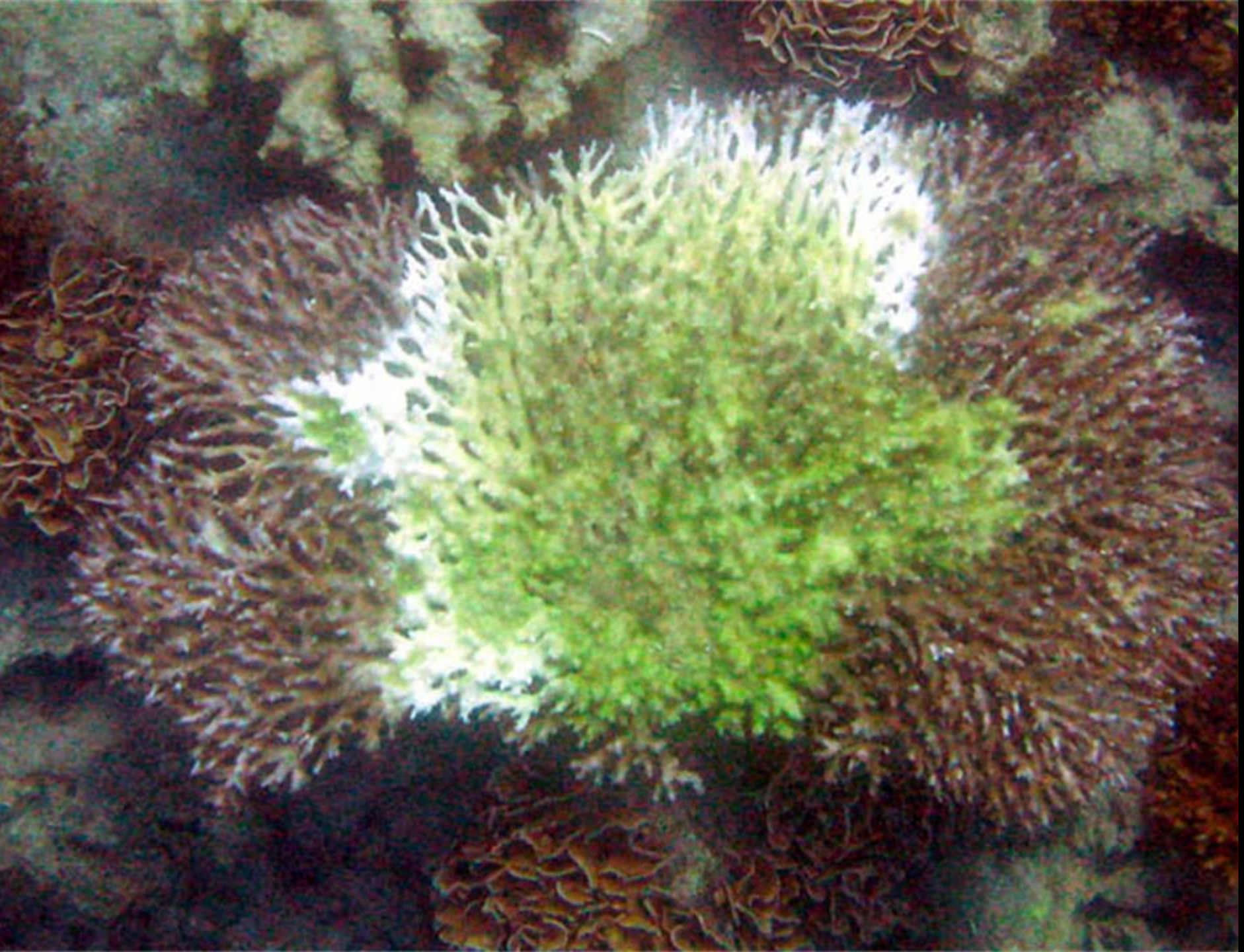
Though heavily polluted and trashed, Uliga Dock developed a small reef of thriving coral, and even attracted juvie Napoleon Wrasse!

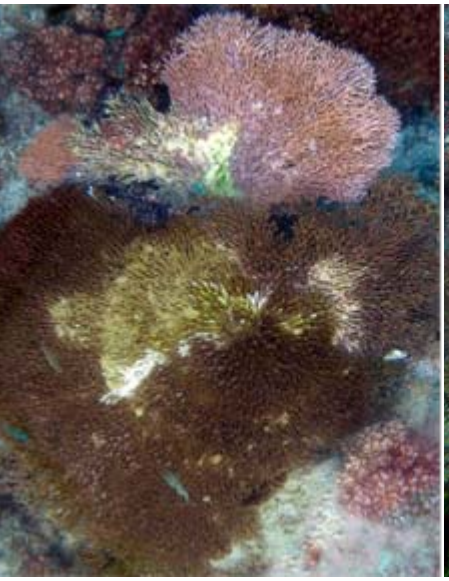


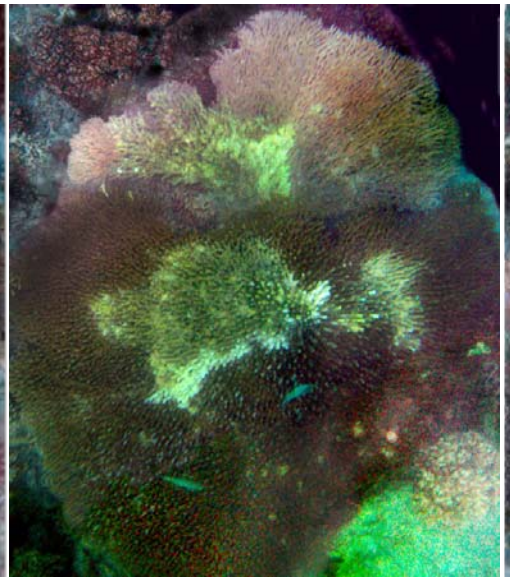

Uliga Dock disease outbreak
of August-Dec 2009

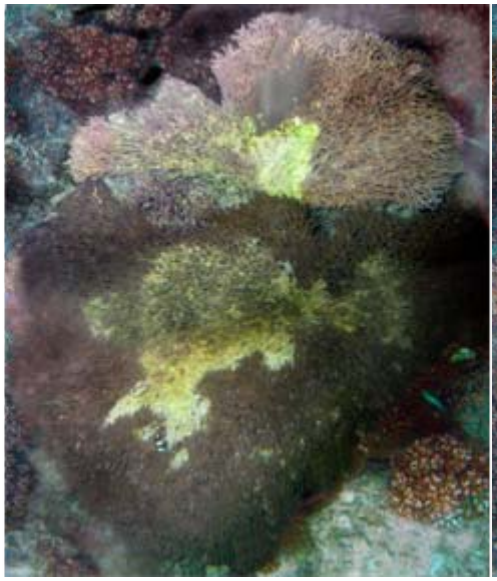




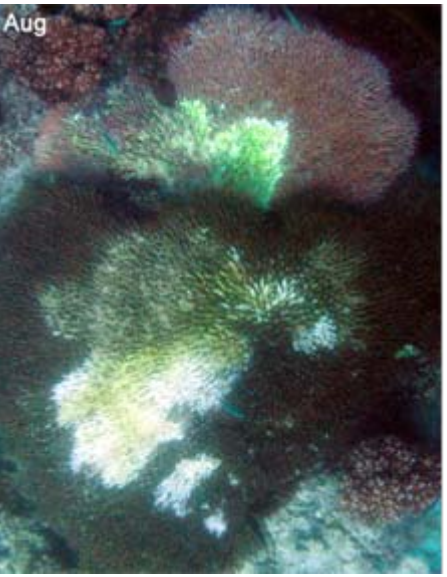


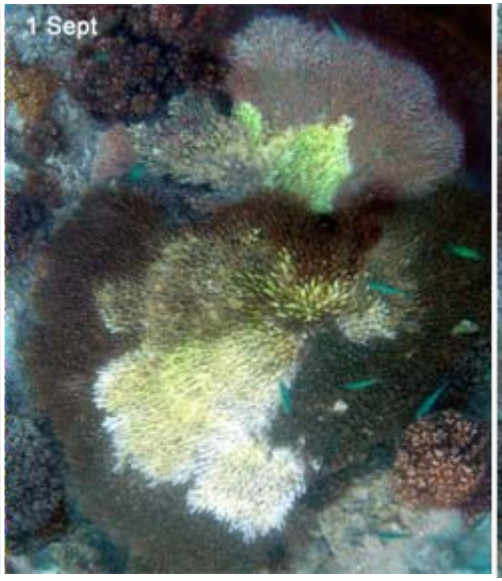




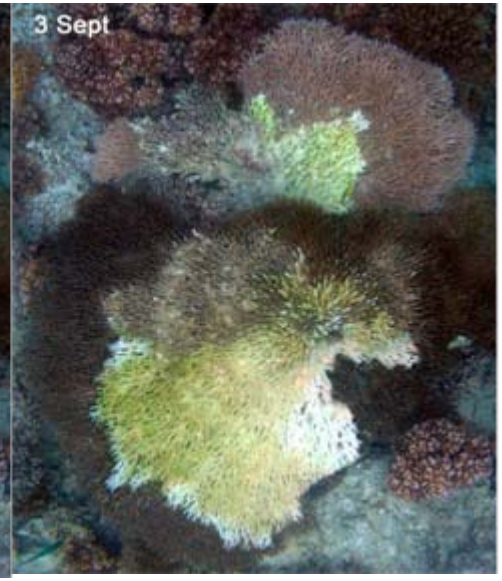


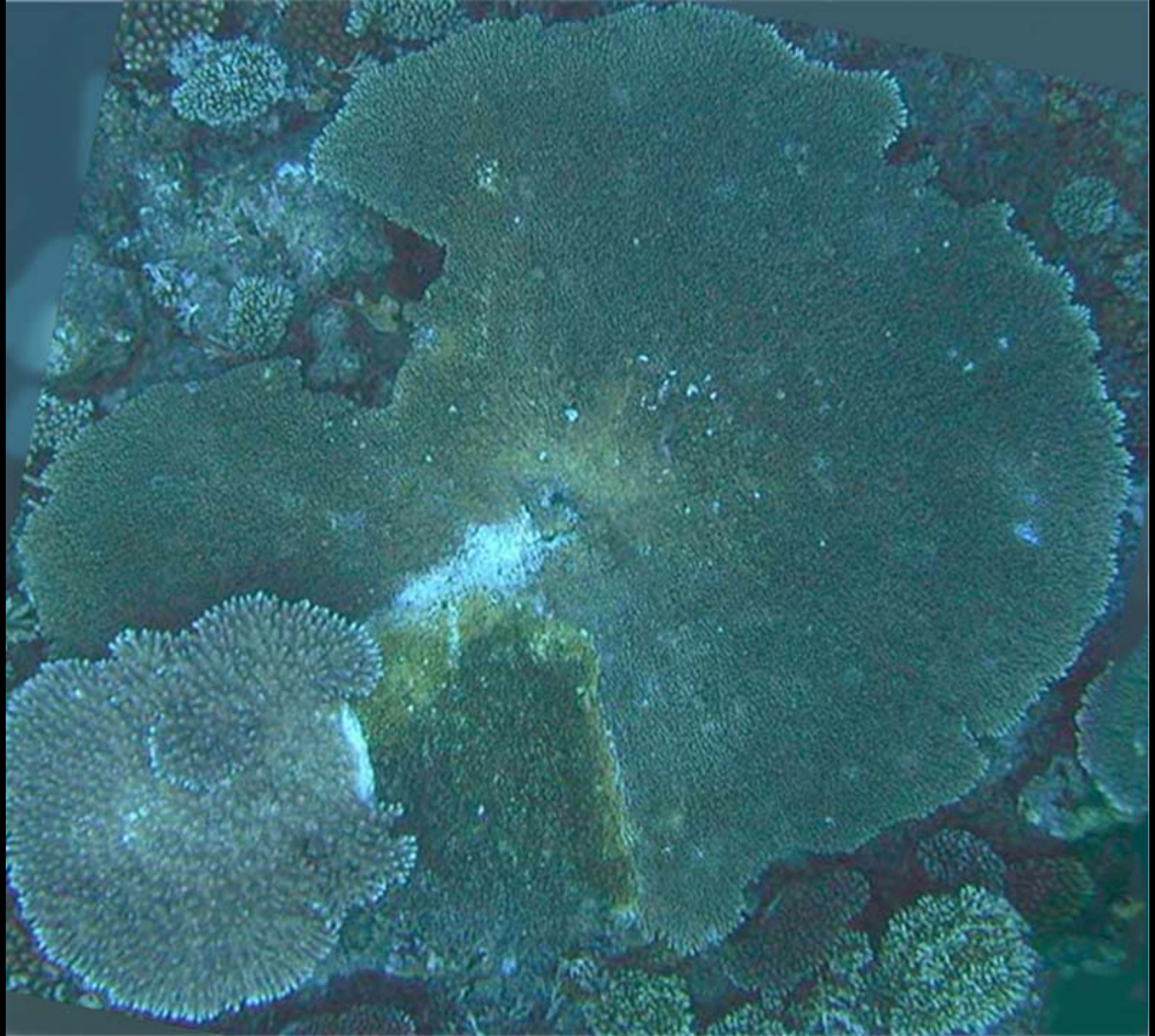

30 Aug

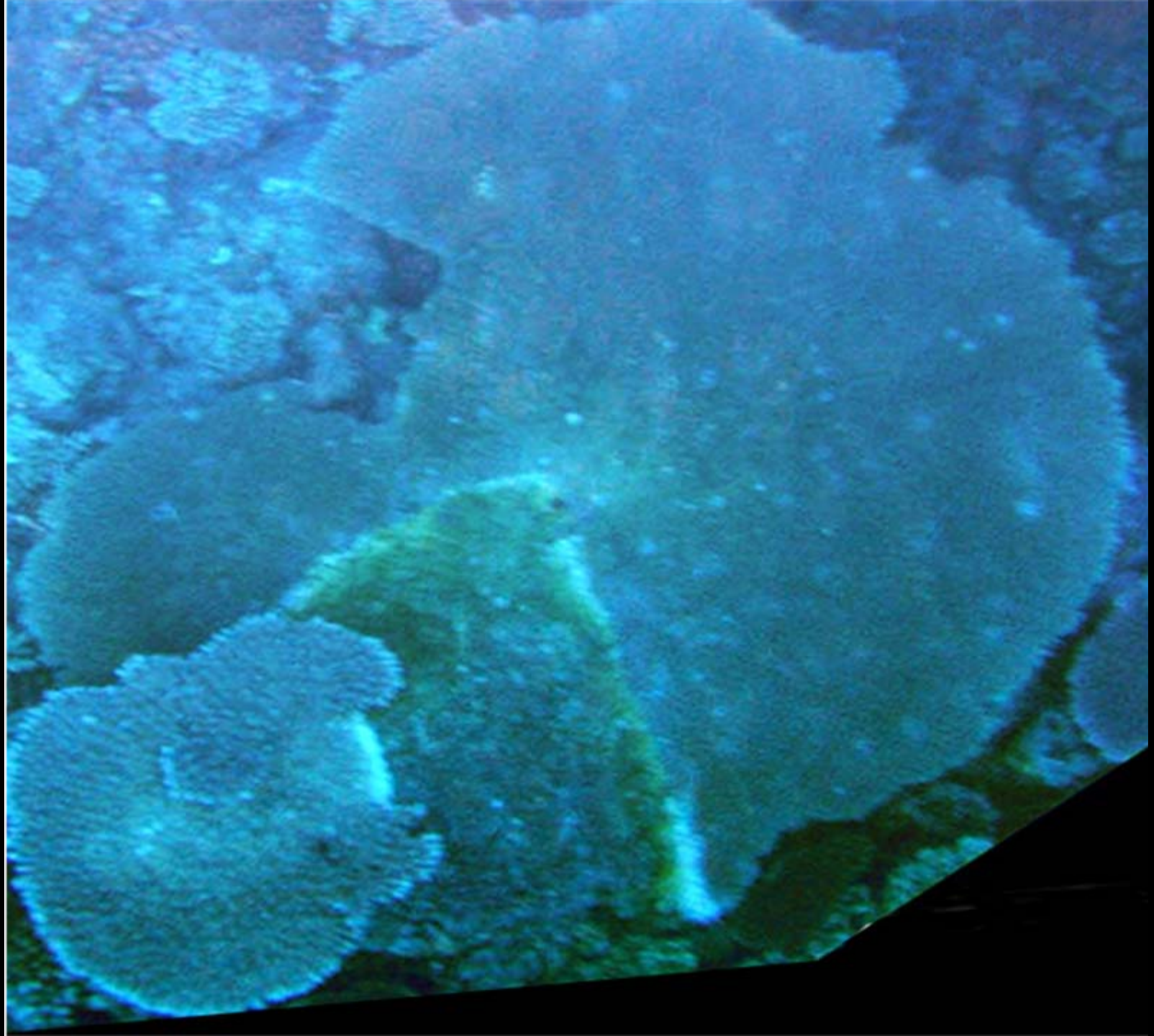

Aug

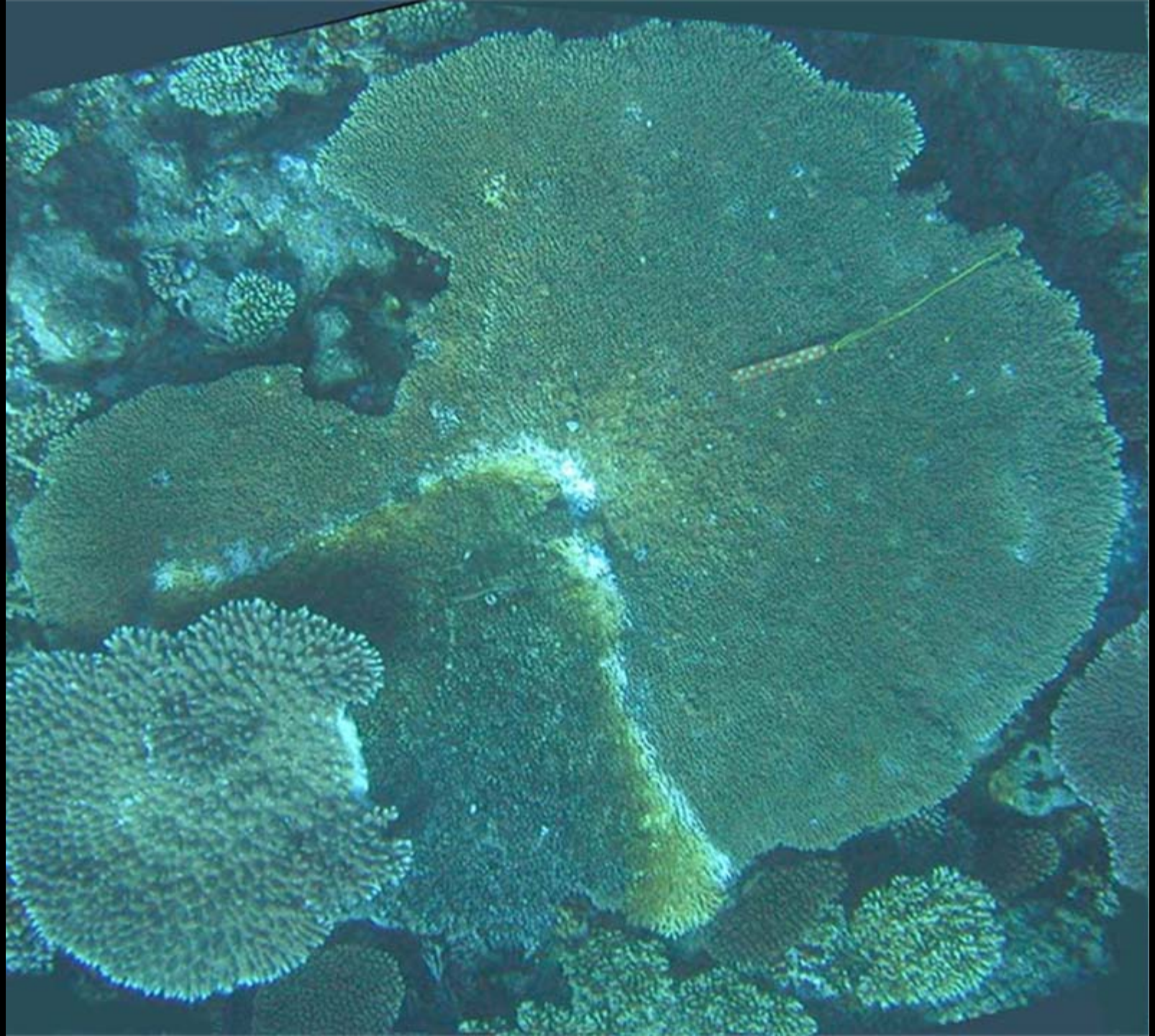

1 Sept

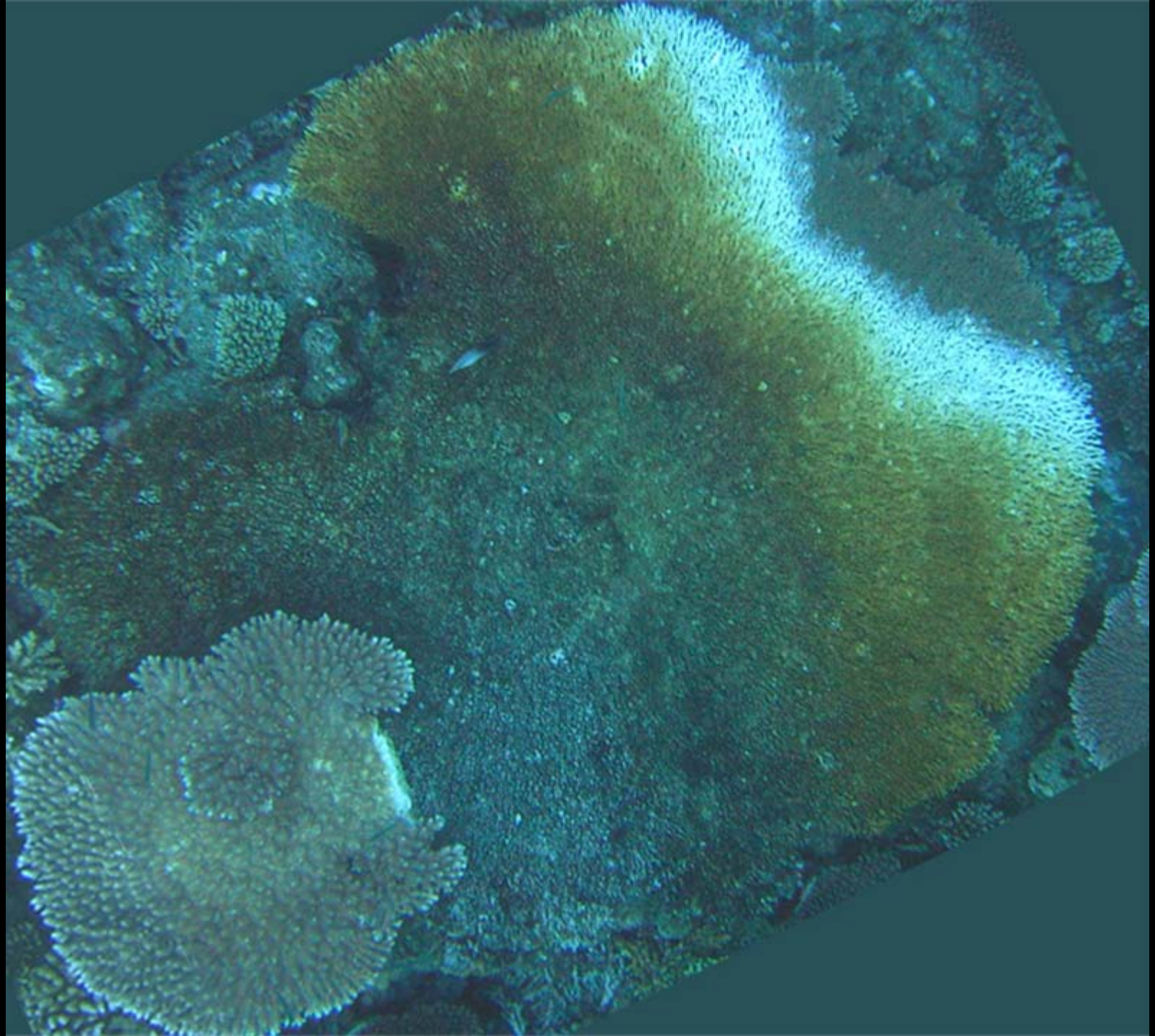

2 Sept

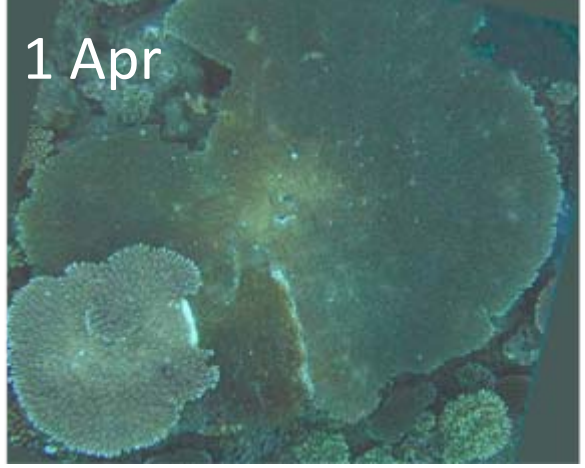

3 Sept

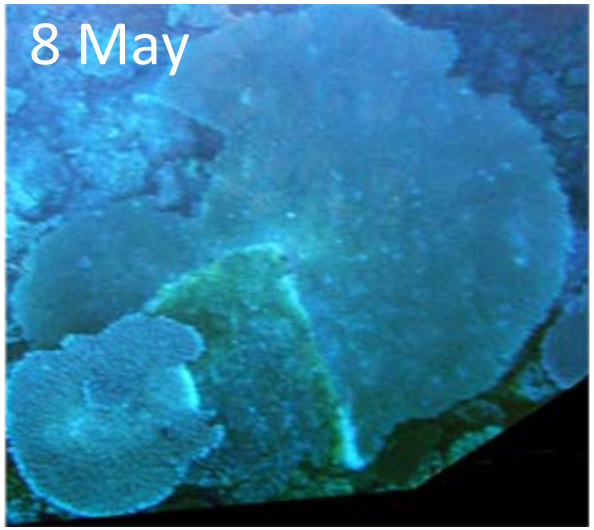


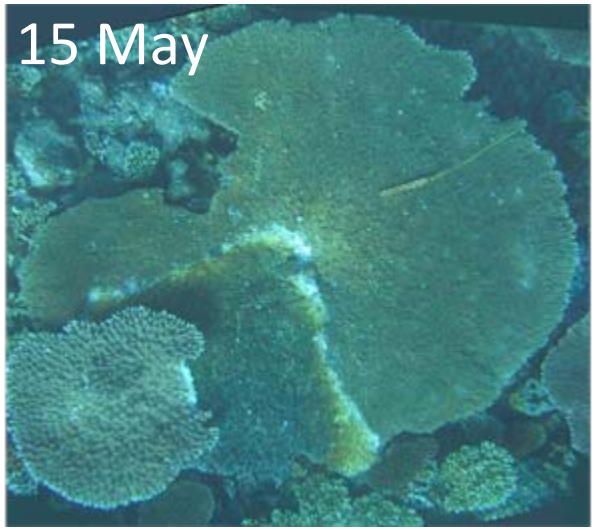


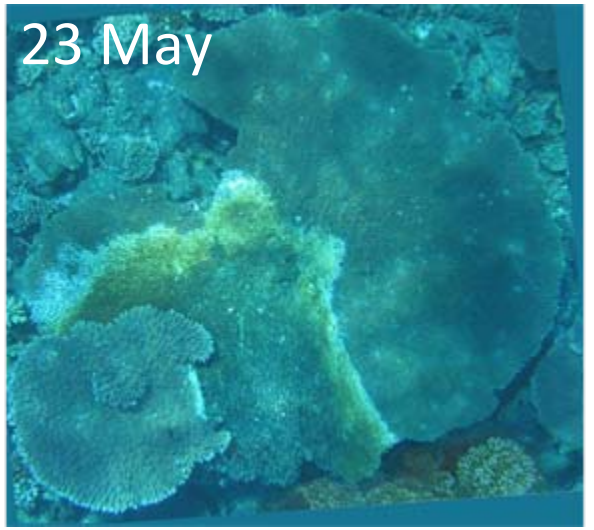




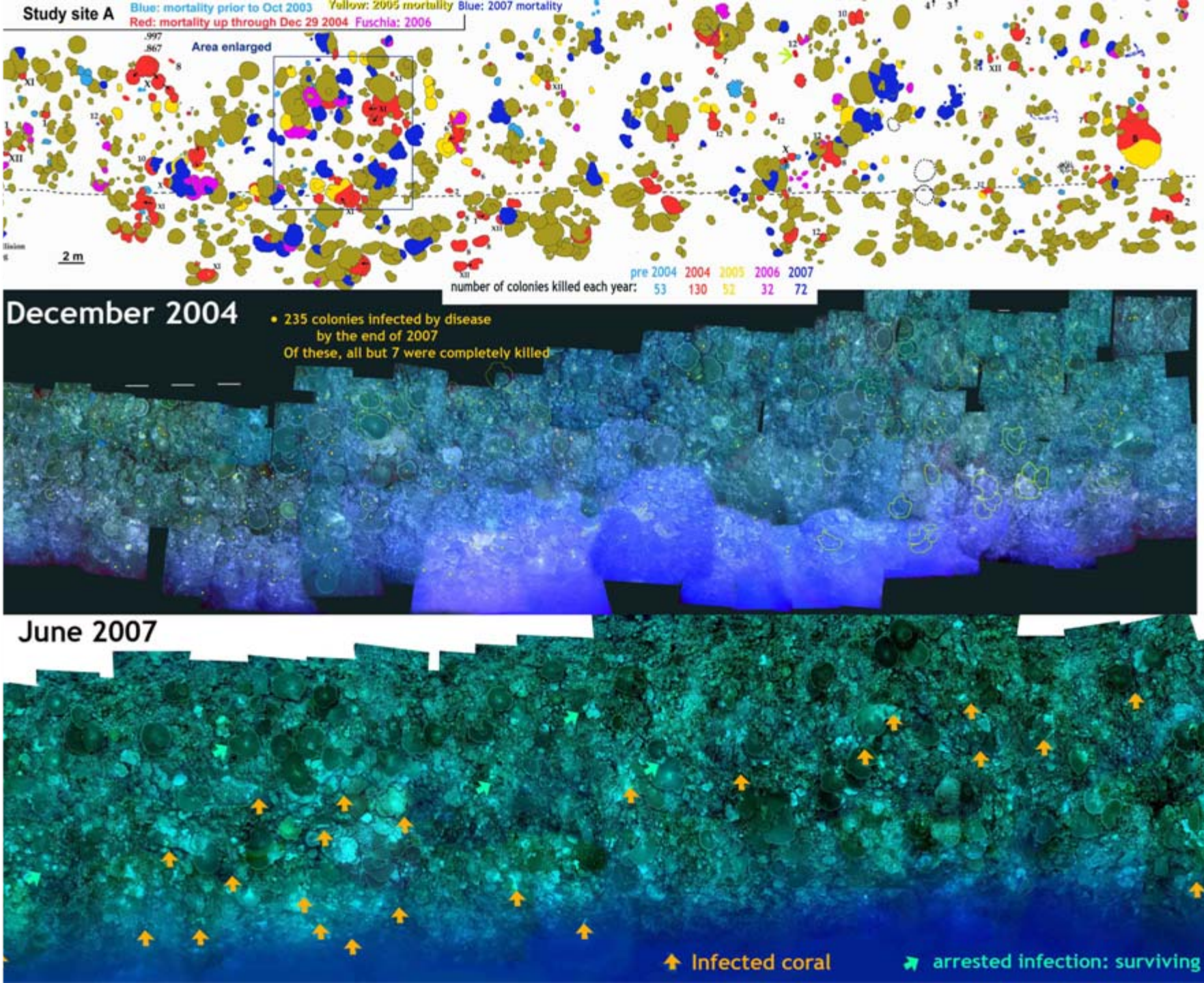


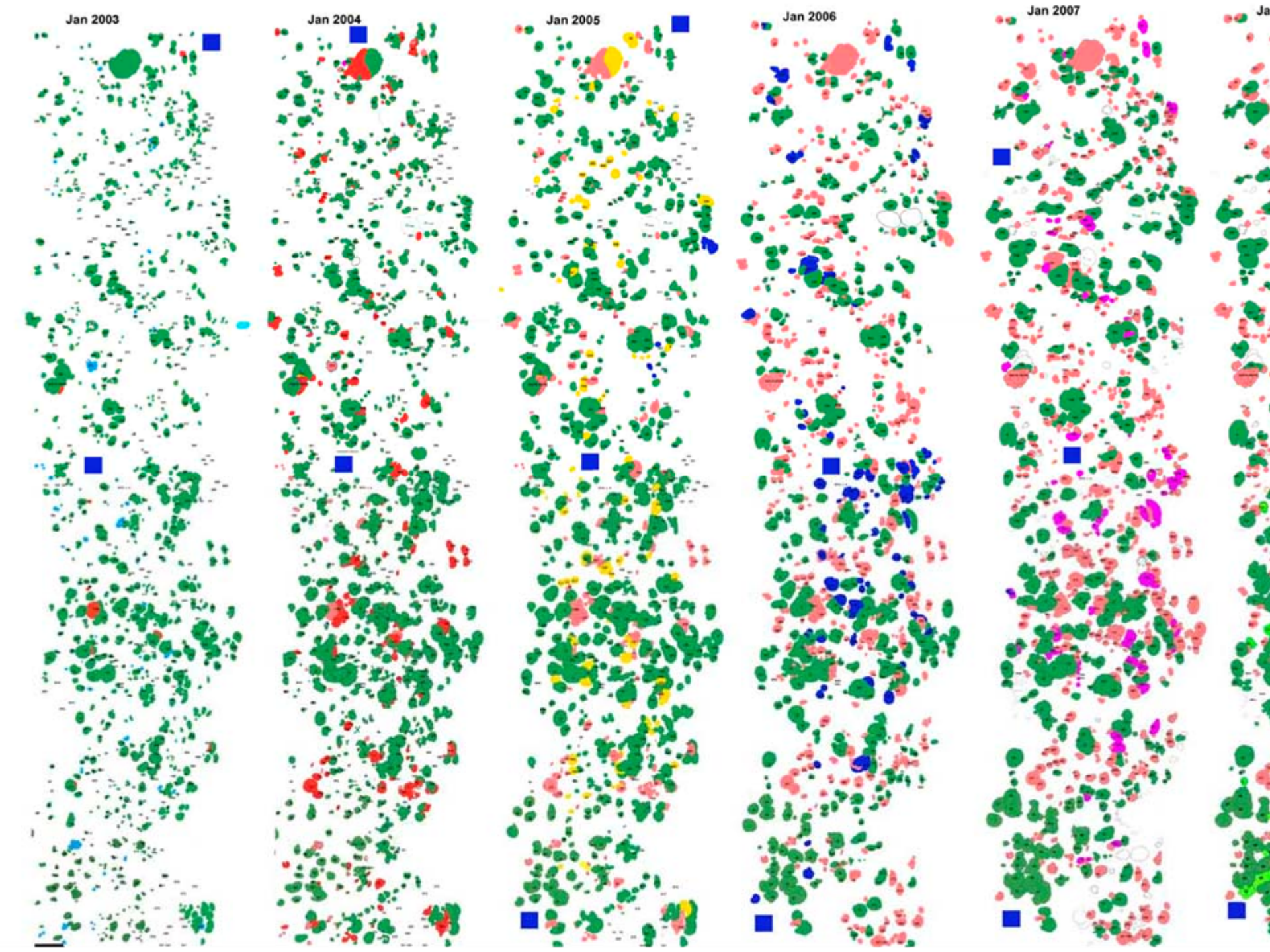


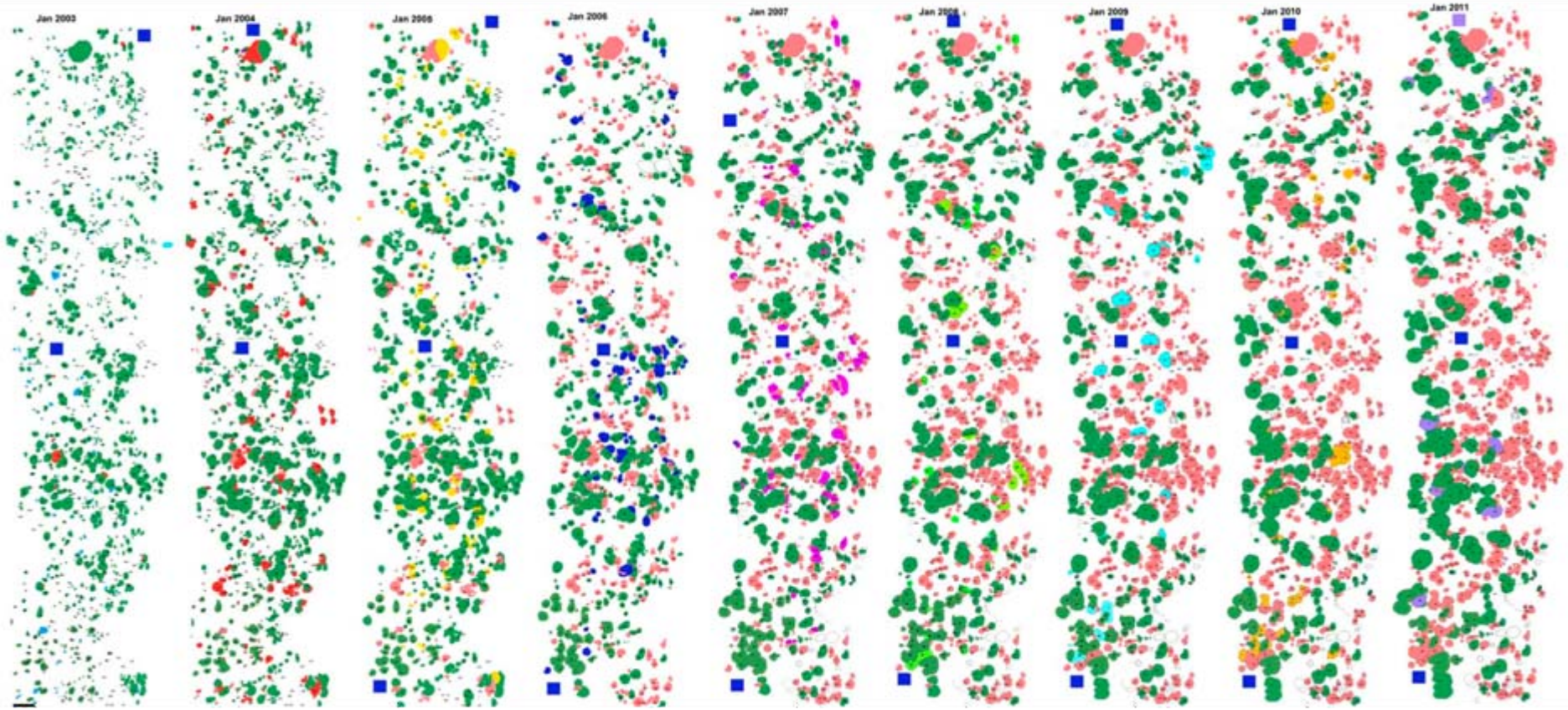


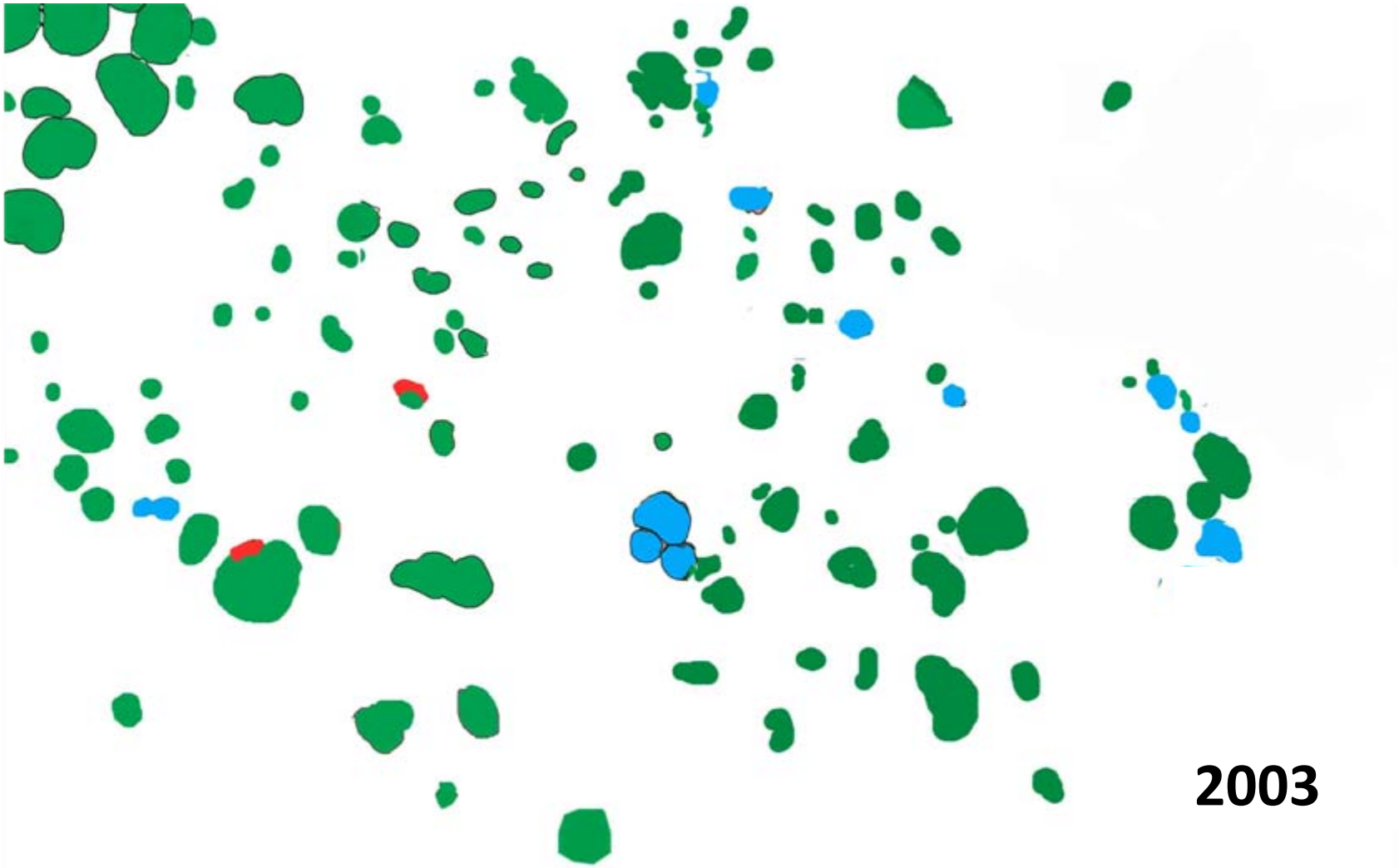


Spreading averages 2 cm/day, killing this 2 meter colony in less than four months


Study site A
Blue: mortality prior to Oct 2003
Yellow: 2005 mortality
Blue: 2007 mortality
Red: mortality up through Dec 29 2004
Fuschia: 2006
Area enlarged
2 m
pre 2004 2004 2005 2006 2007
number of colonies killed each year: 53 130 52 32 72
December 2004
• 235 colonies infected by disease
by the end of 2007
Of these, all but 7 were completely killed
June 2007
Infected coral
arrested infection: surviving co

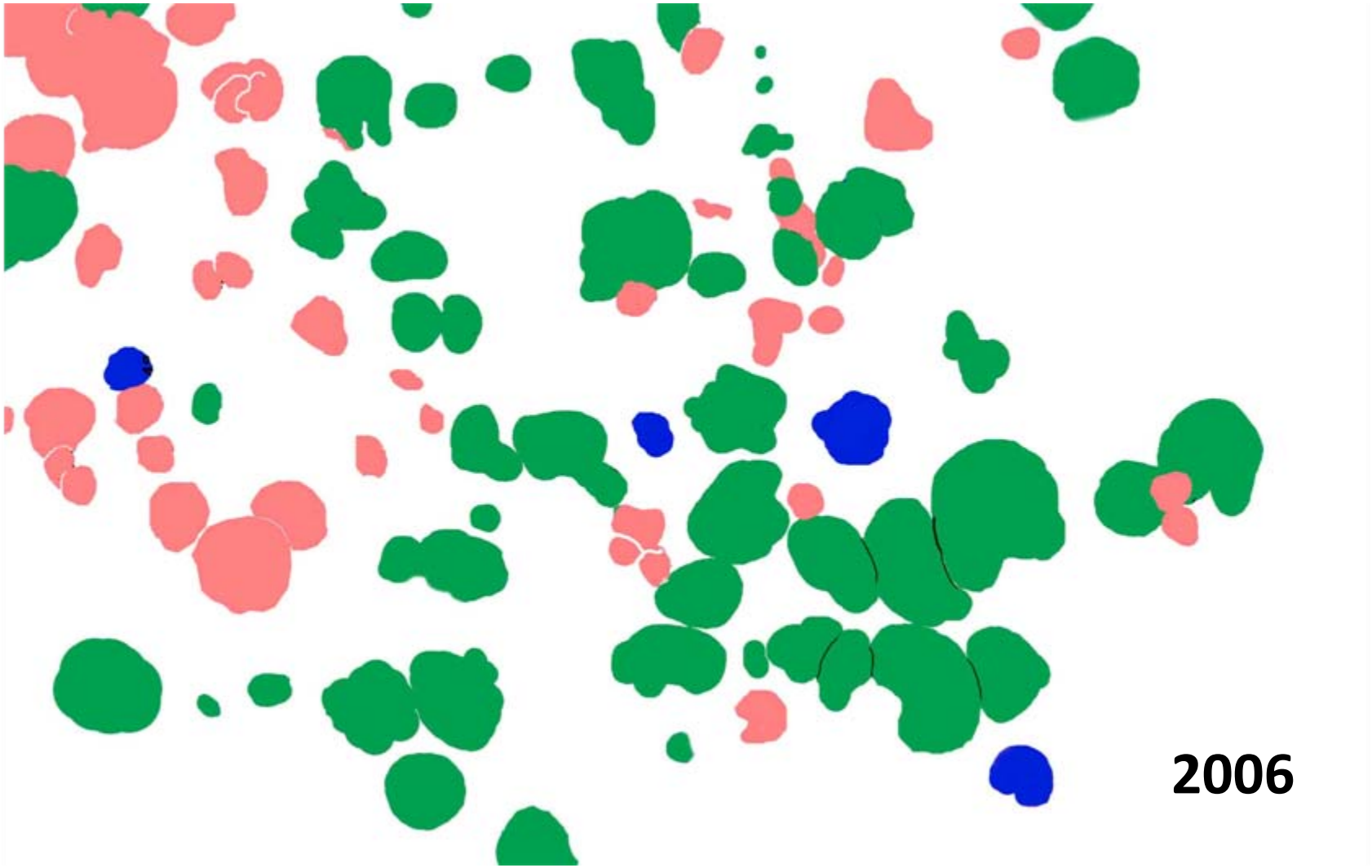

Jan 2003
Jan 2004
Jan 2005
Jan 2006
Jan 2007

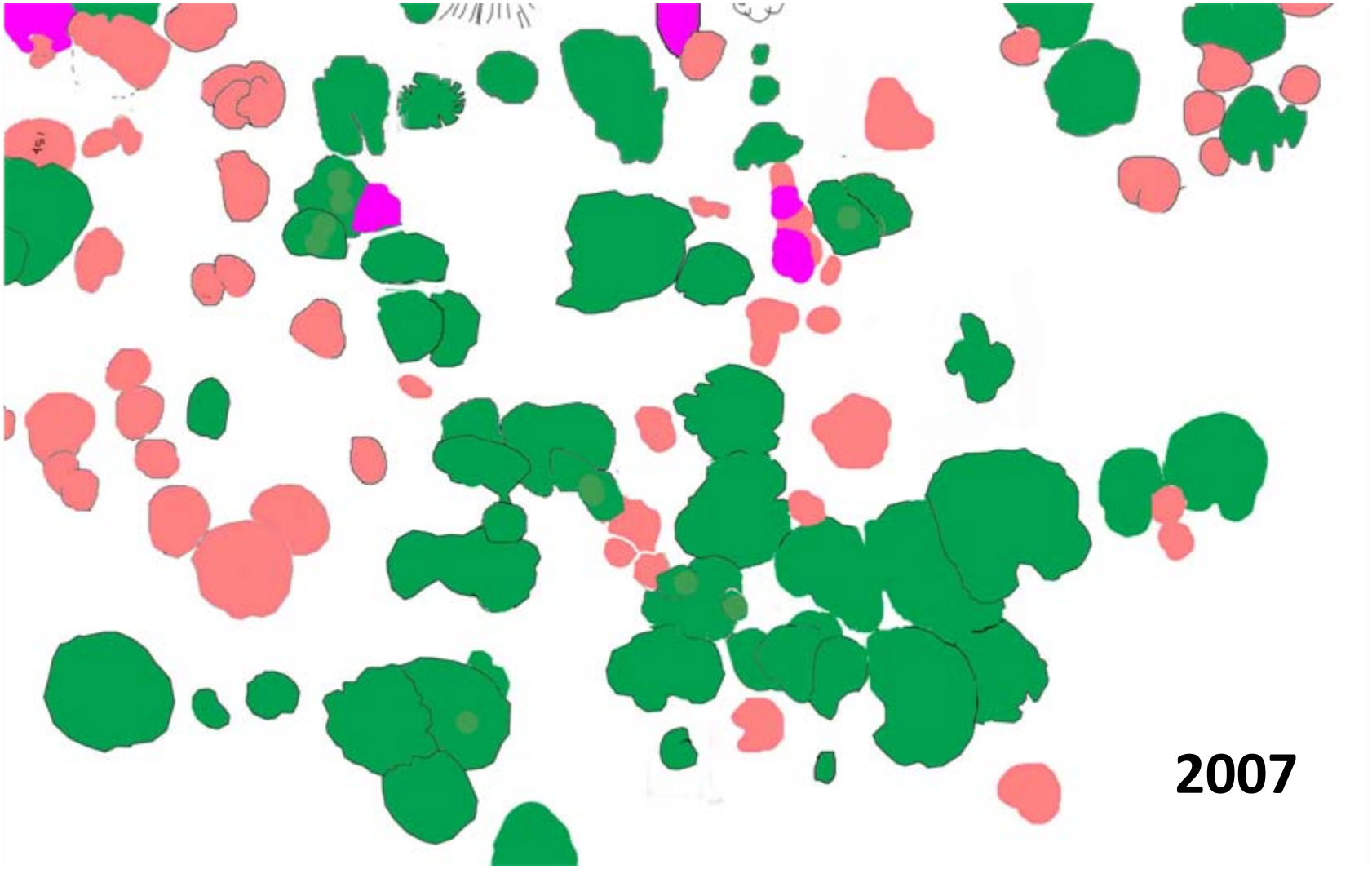

Jan 2003
Jan 2004
Jan 2005
Jan 2006
Jan 2007
Jan 2008
Jan 2009
Jan 2010
Jan 2011

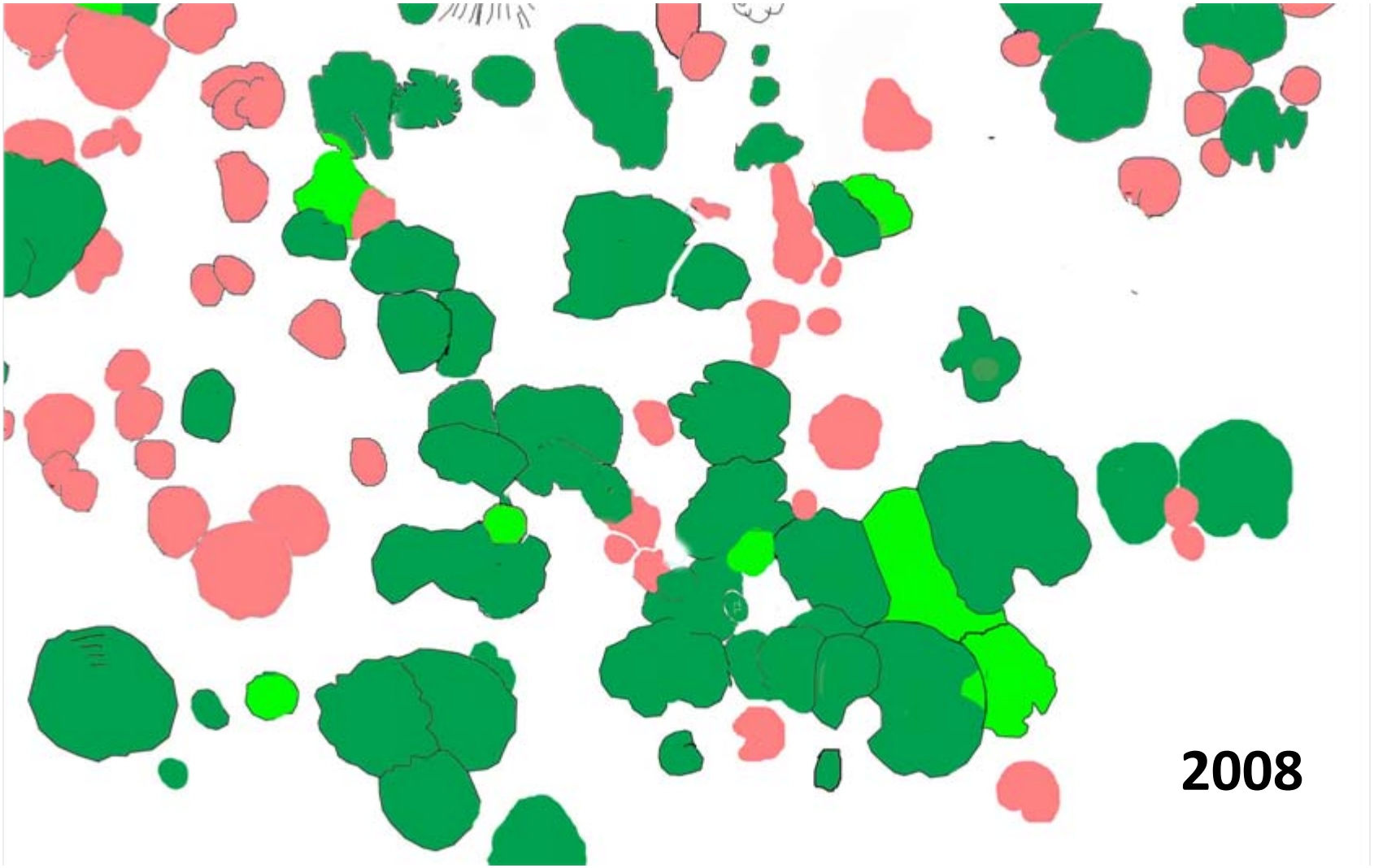

2003

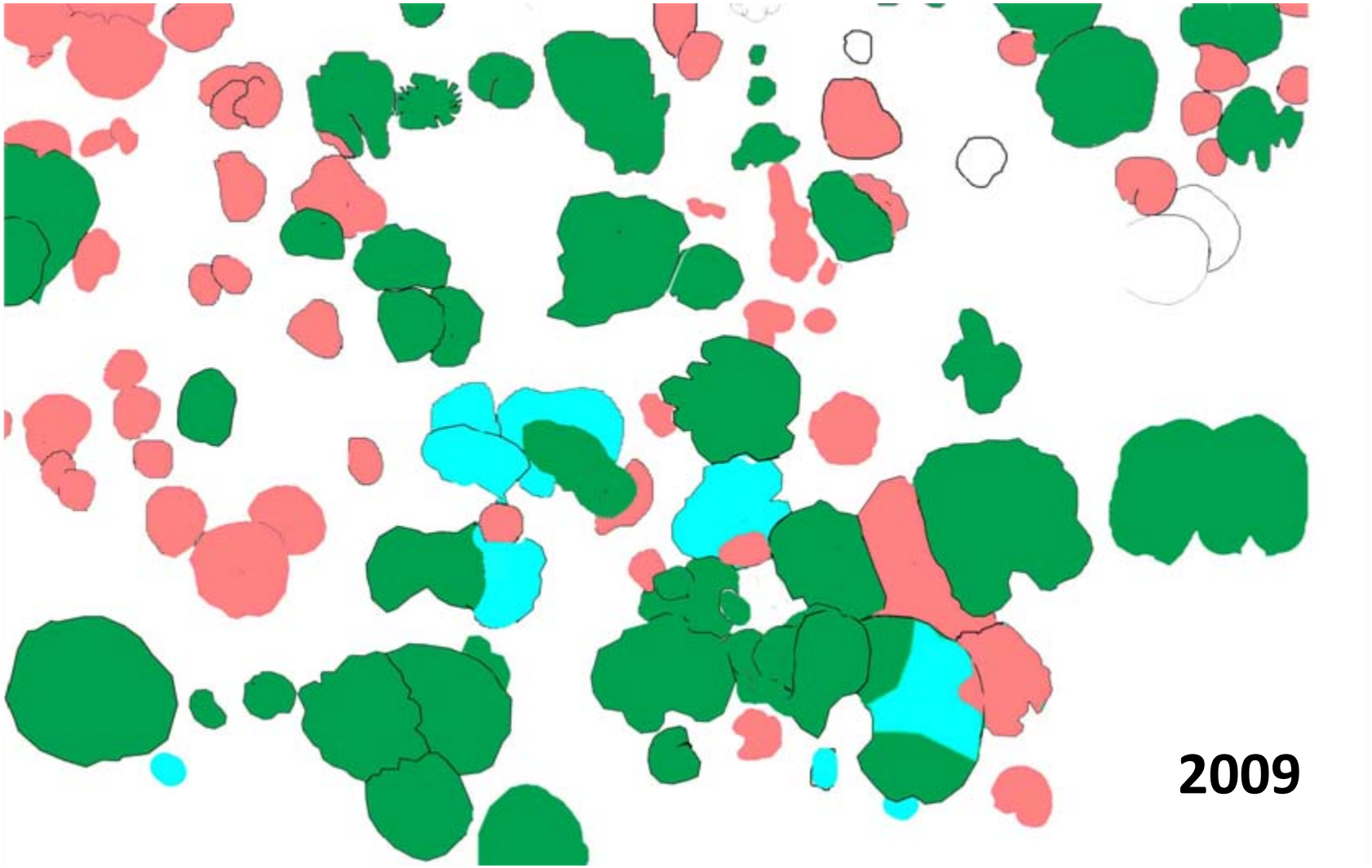

2004

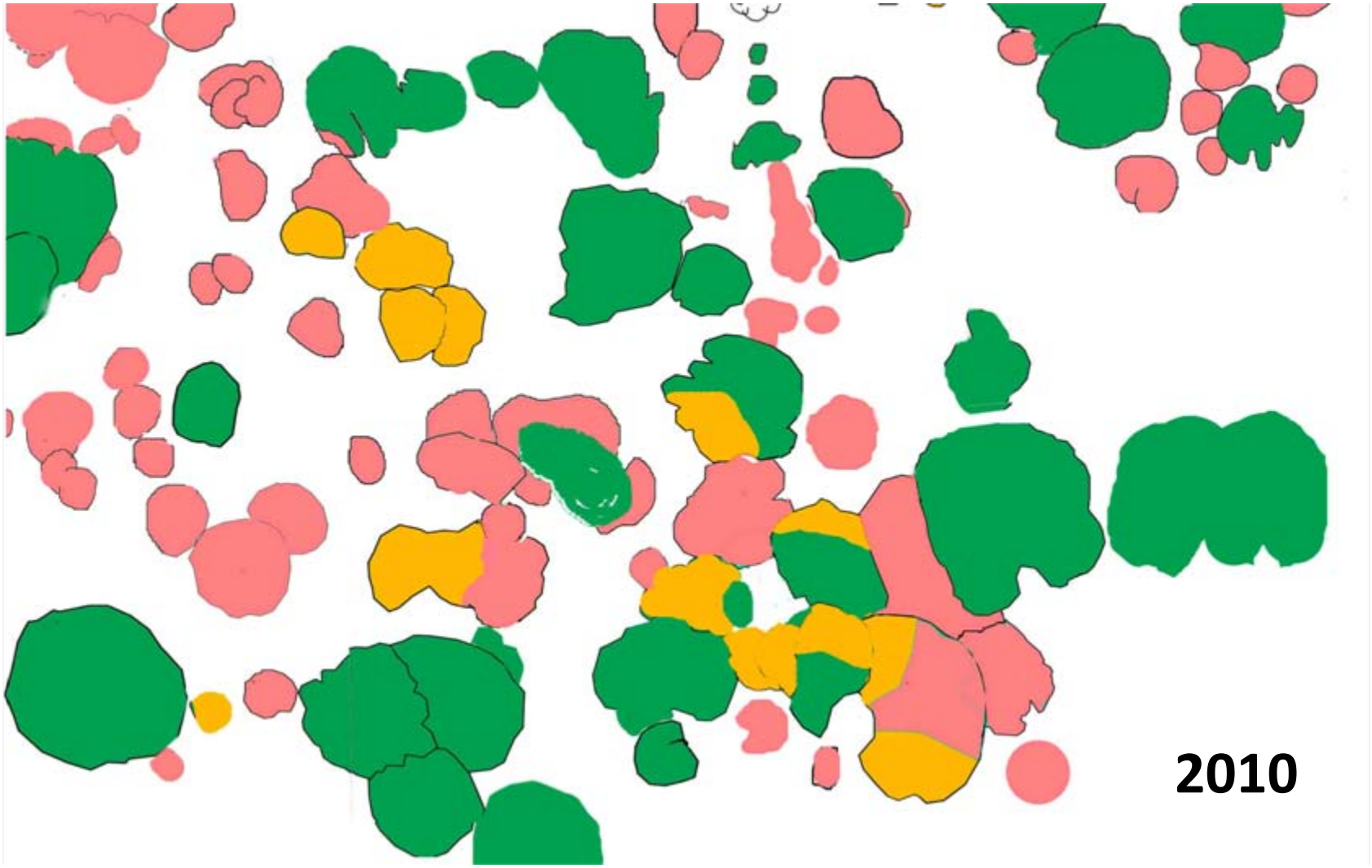

2005

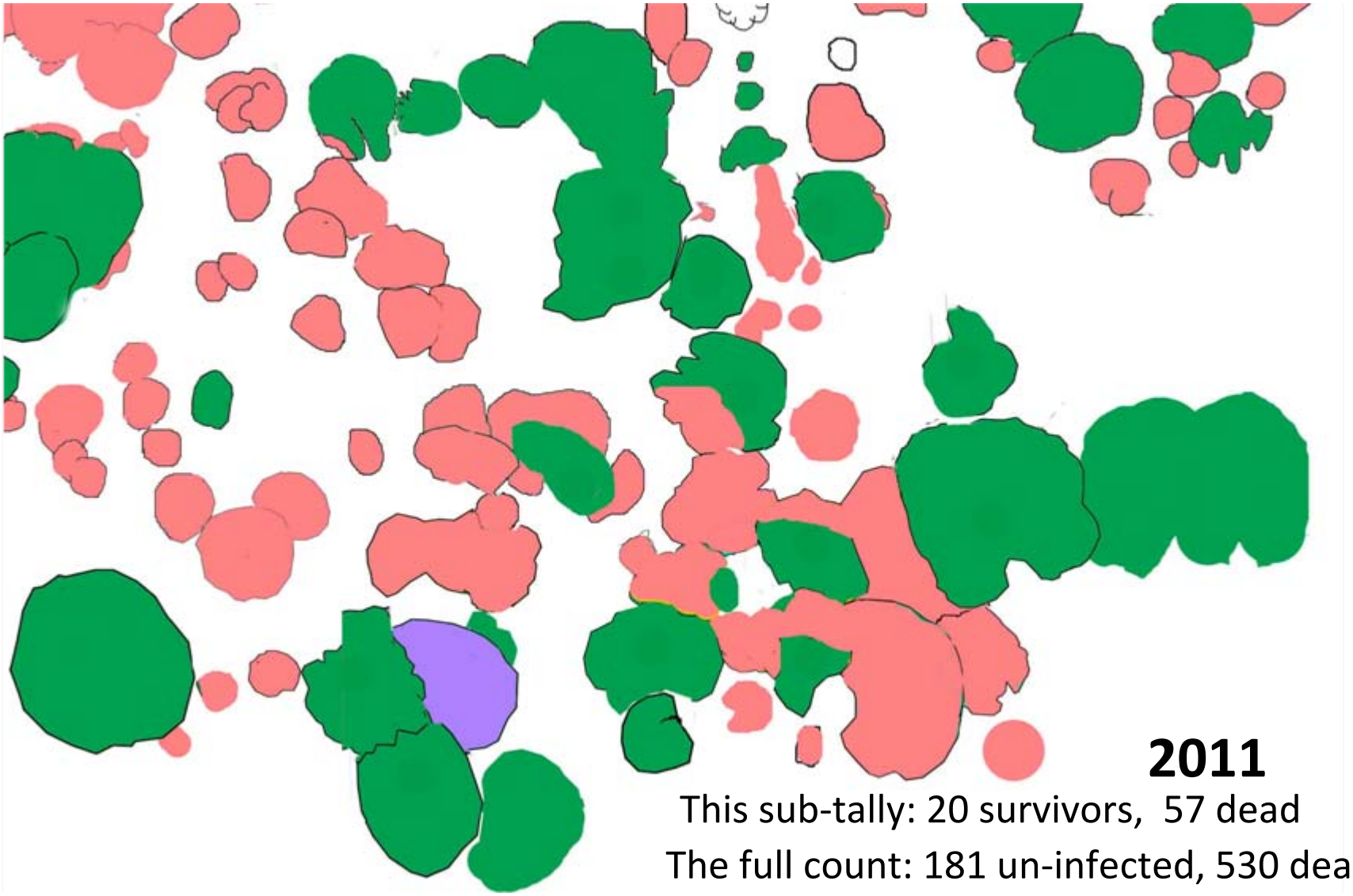

2006


2007


2008


2009

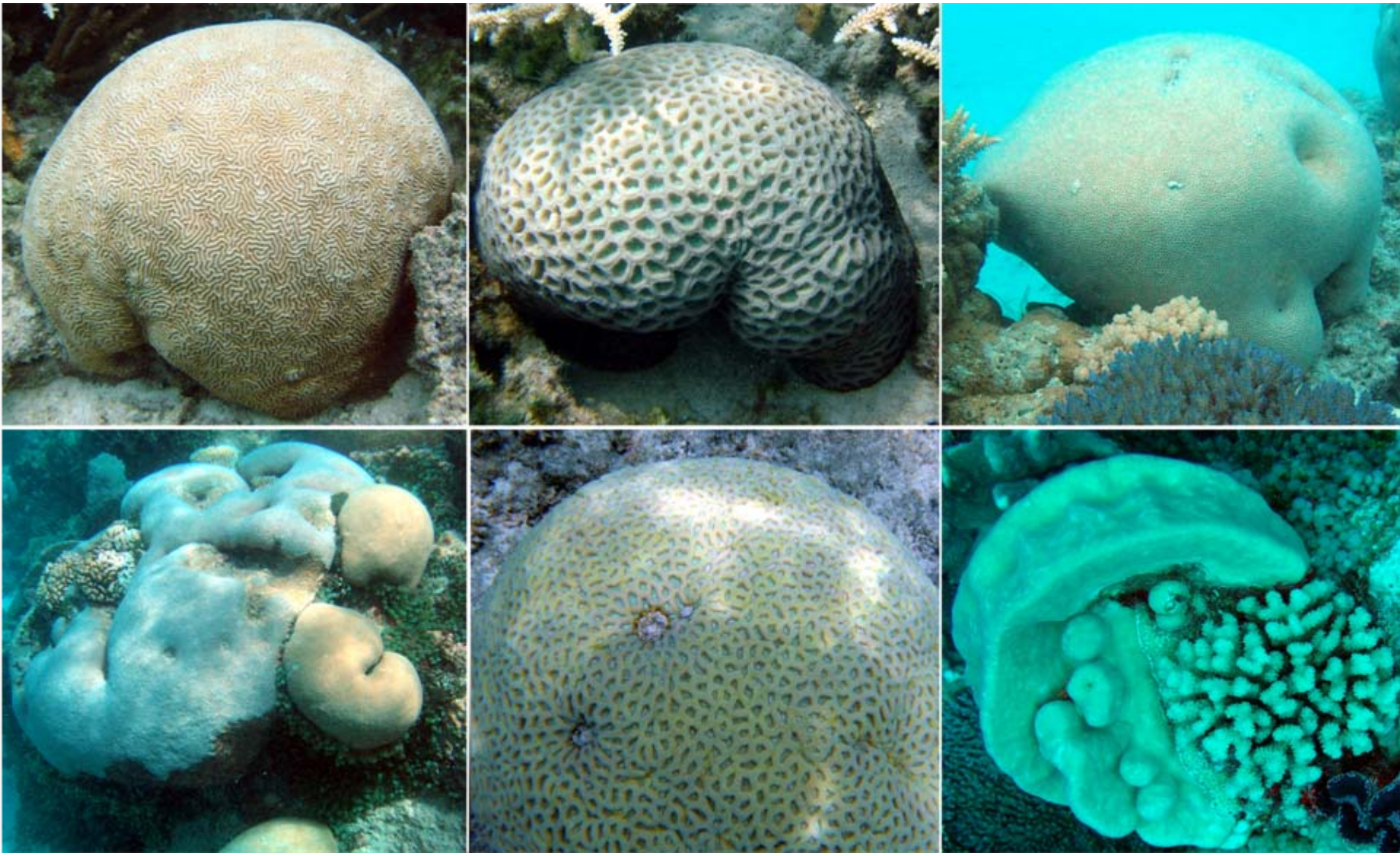

2010



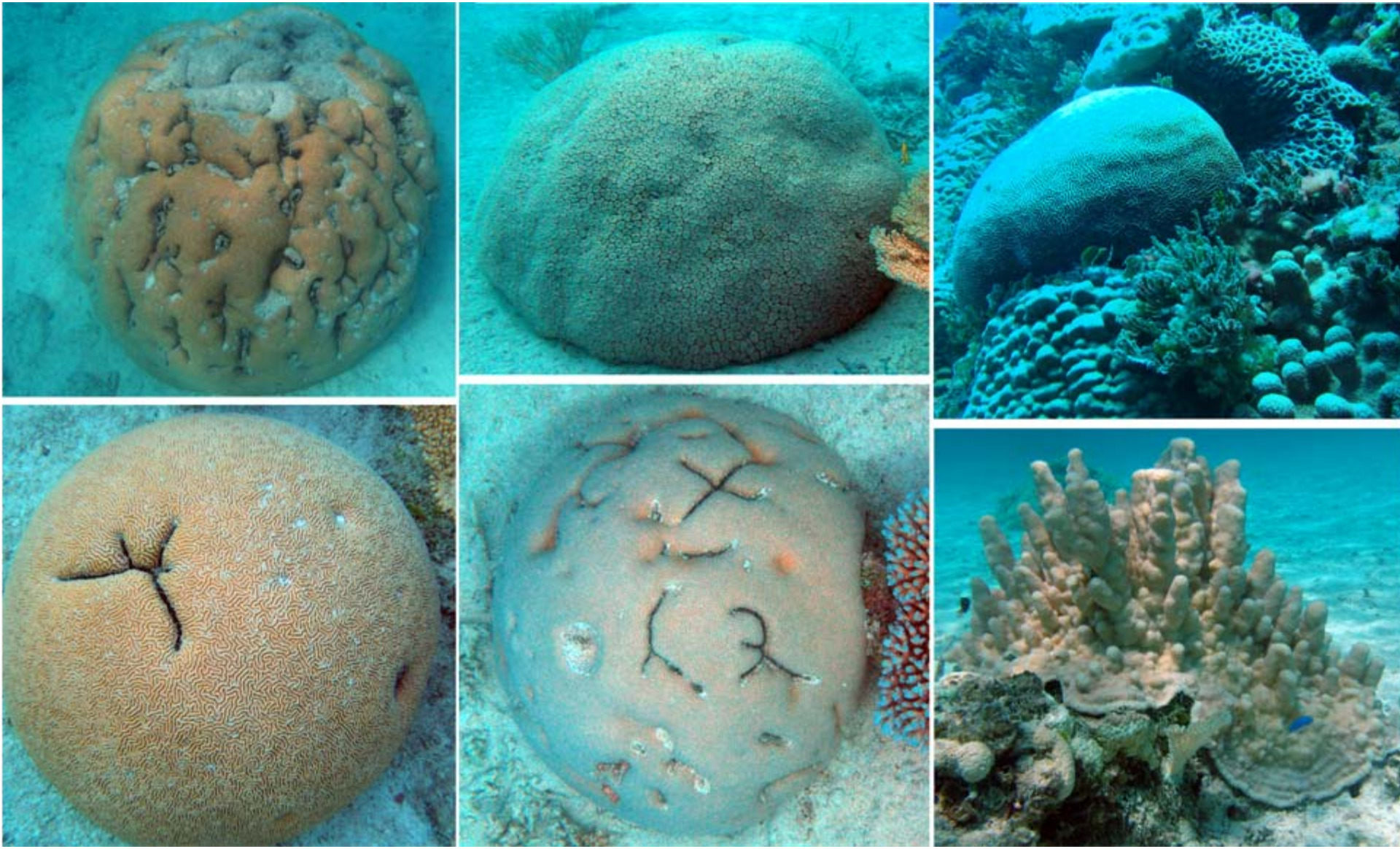
2011

This sub-tally: 20 survivors, 57 dead

The full count: 181 un-infected, 530 dead

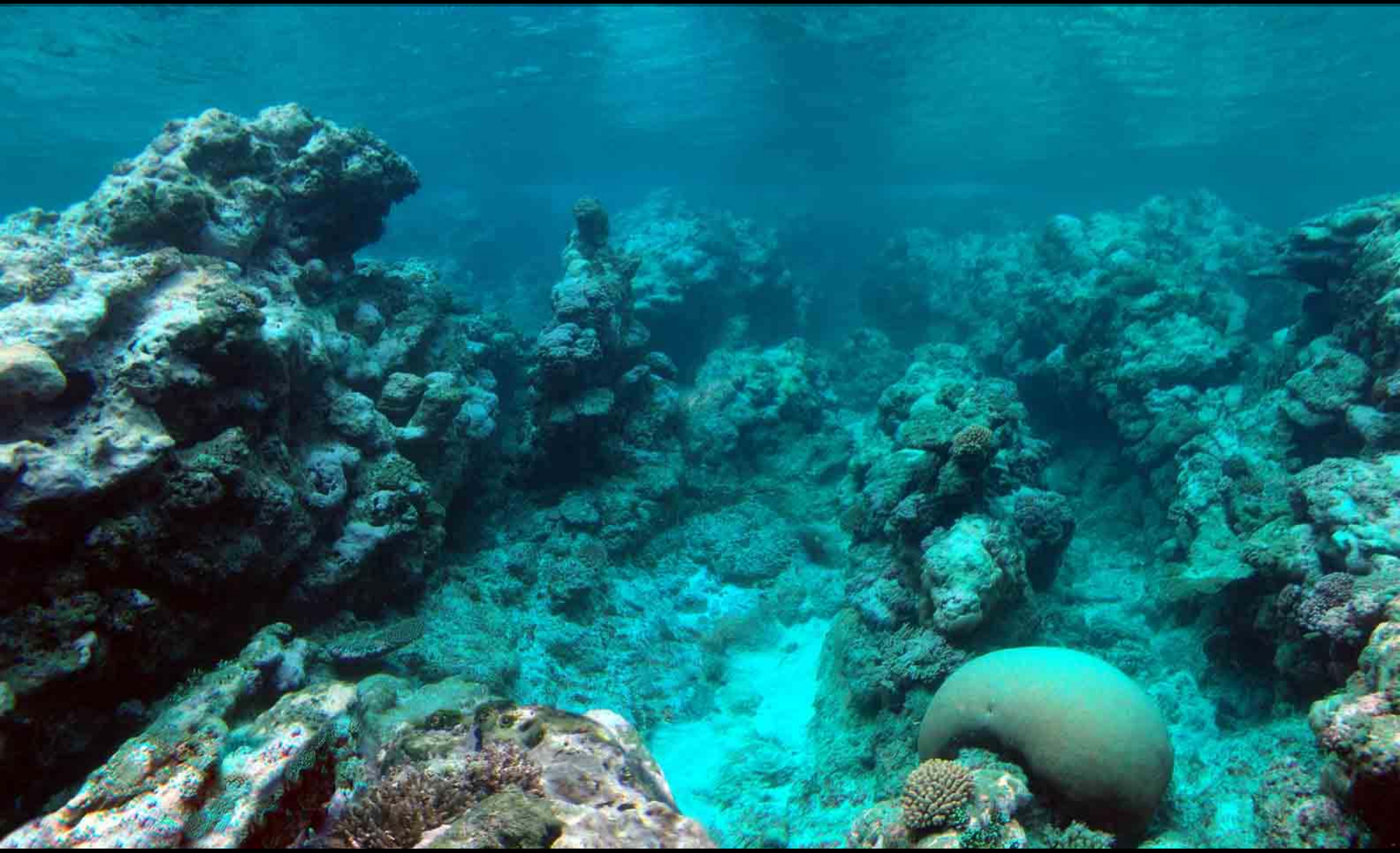


On Rongelap atoll, these “brain” corals are healthy and unblemished



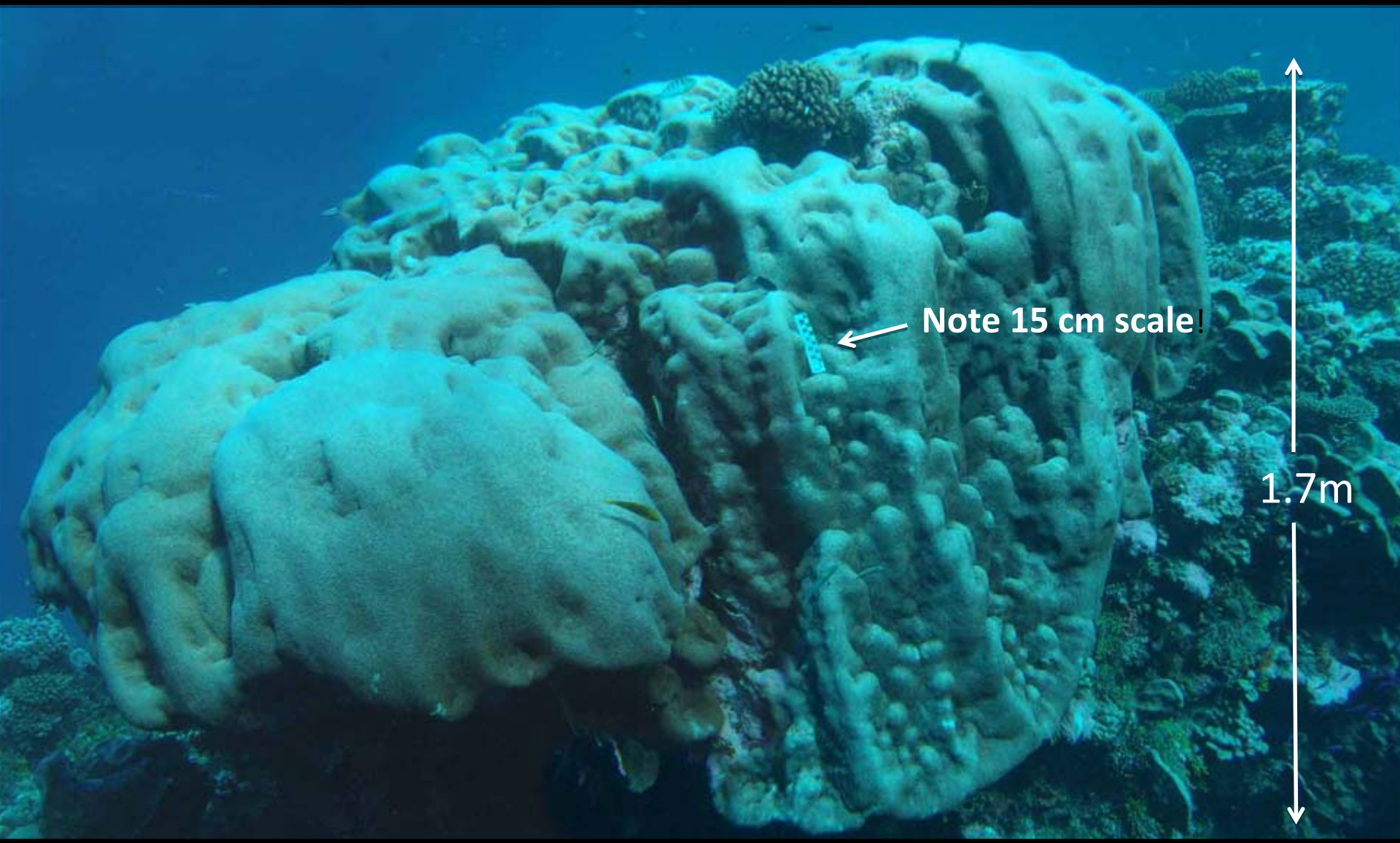
Some of these massive corals are quite large, and old (some have Alpheid shrimp burrows)

Northern Majuro, outside the pass, has healthy brain coral…



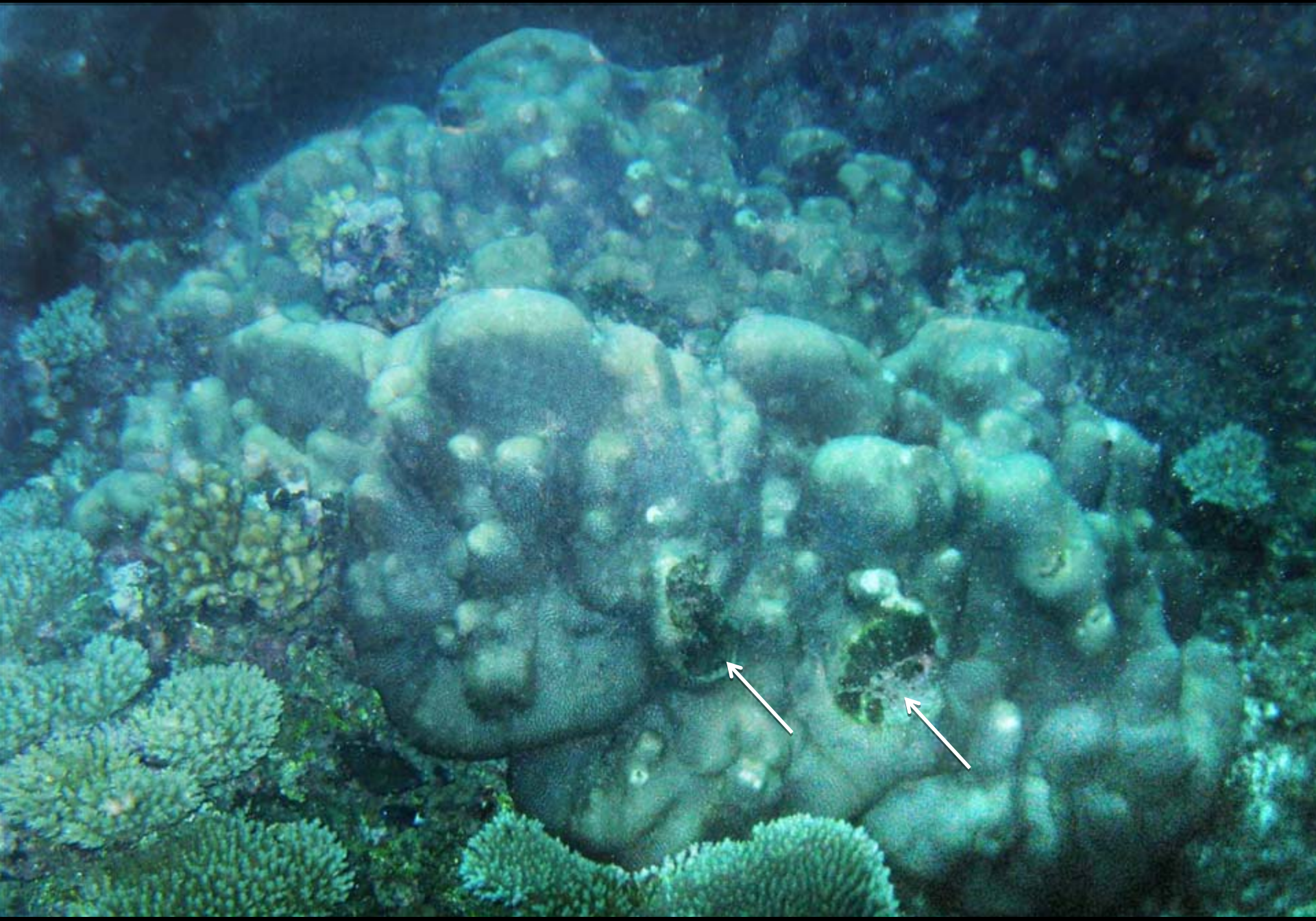
Very large, healthy *Platygyra* and *Hydnophora* are found outside the north shore

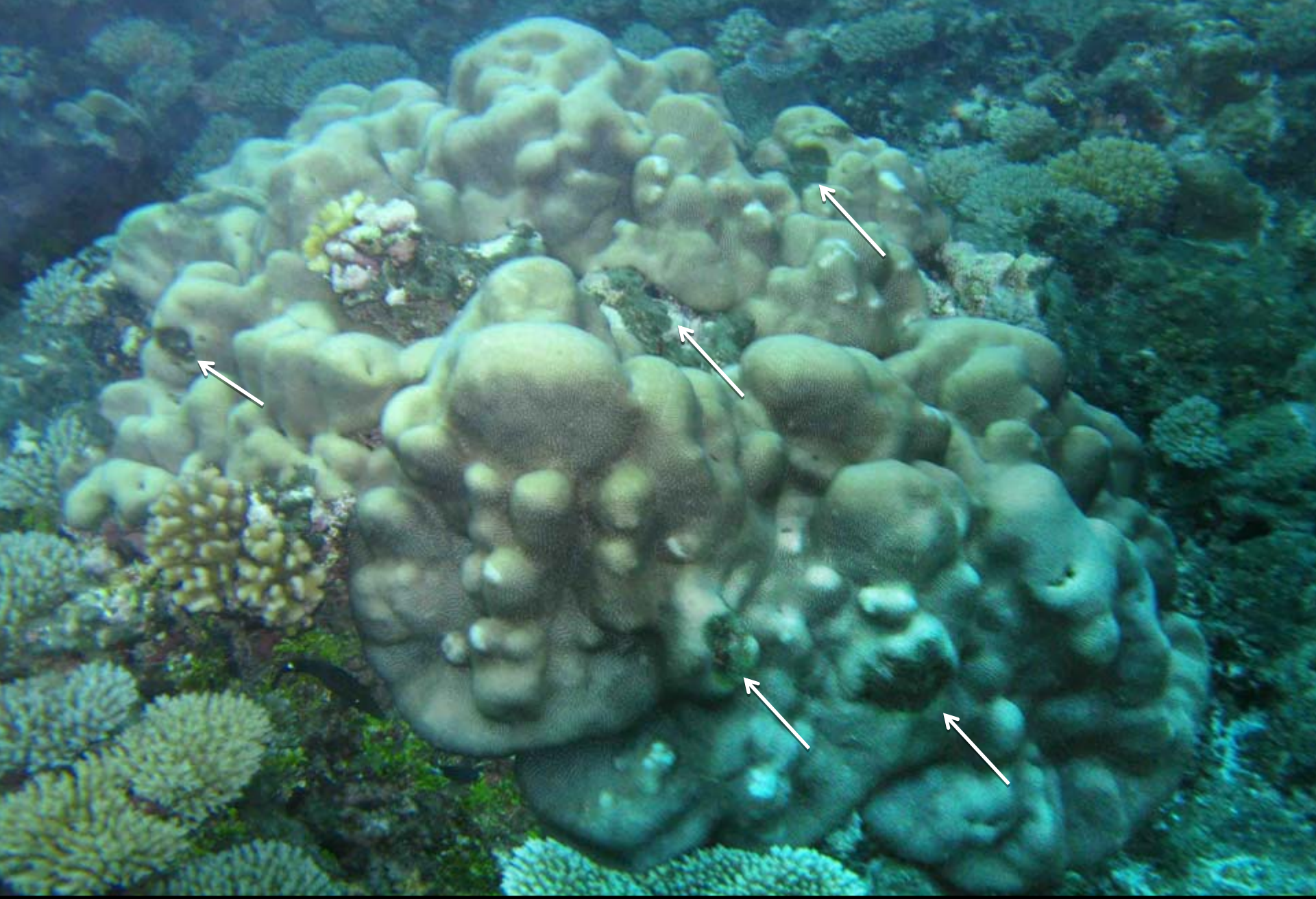
Note how this giant *Isopora* towers over “normal” massive colonies

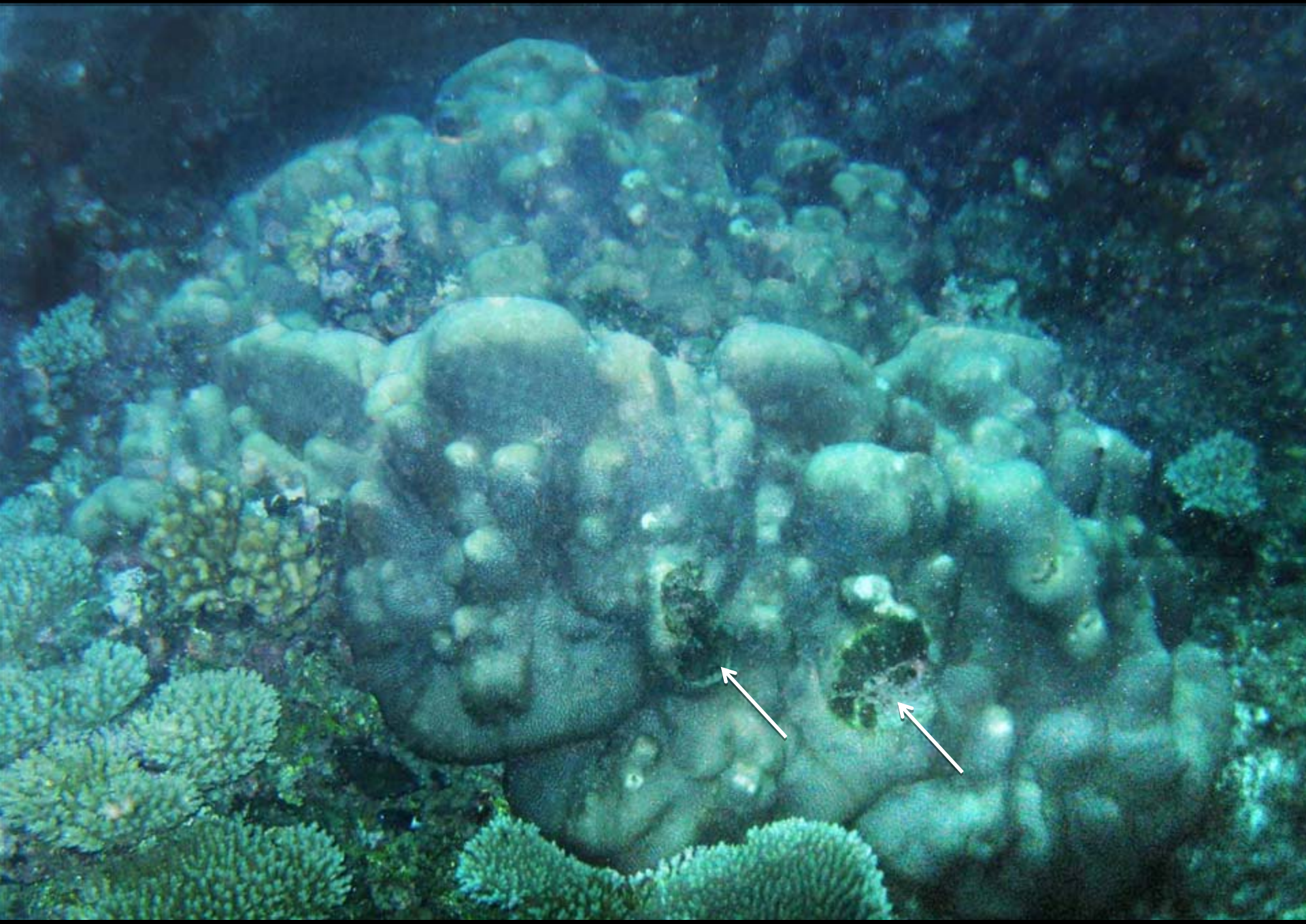


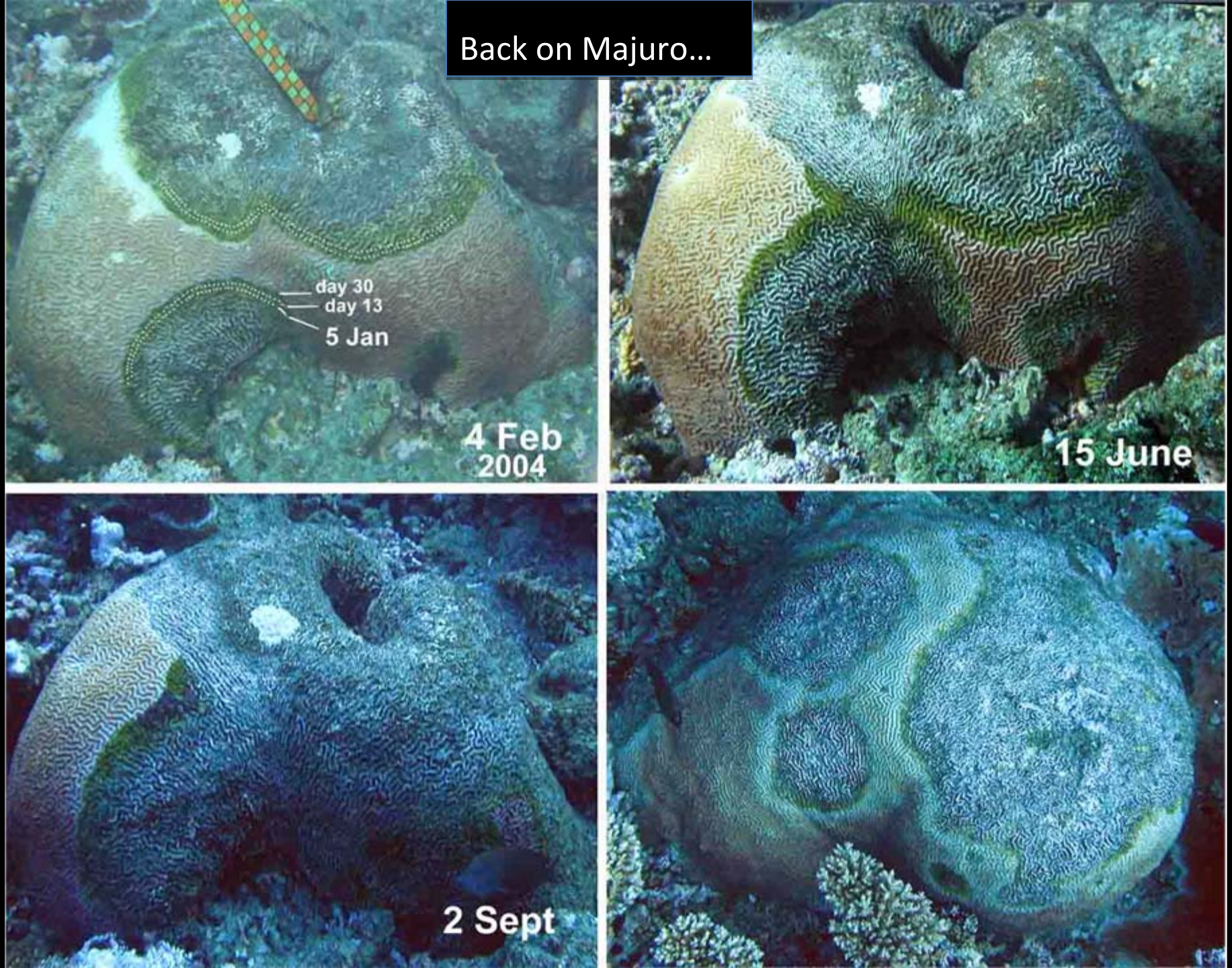
This enormous, ancient *Leptoria* colony (a very uncommon species, with only 2 colonies on Majuro) is found on Arno… it is a testament to prolonged healthy conditions, and it has a twin nearby!

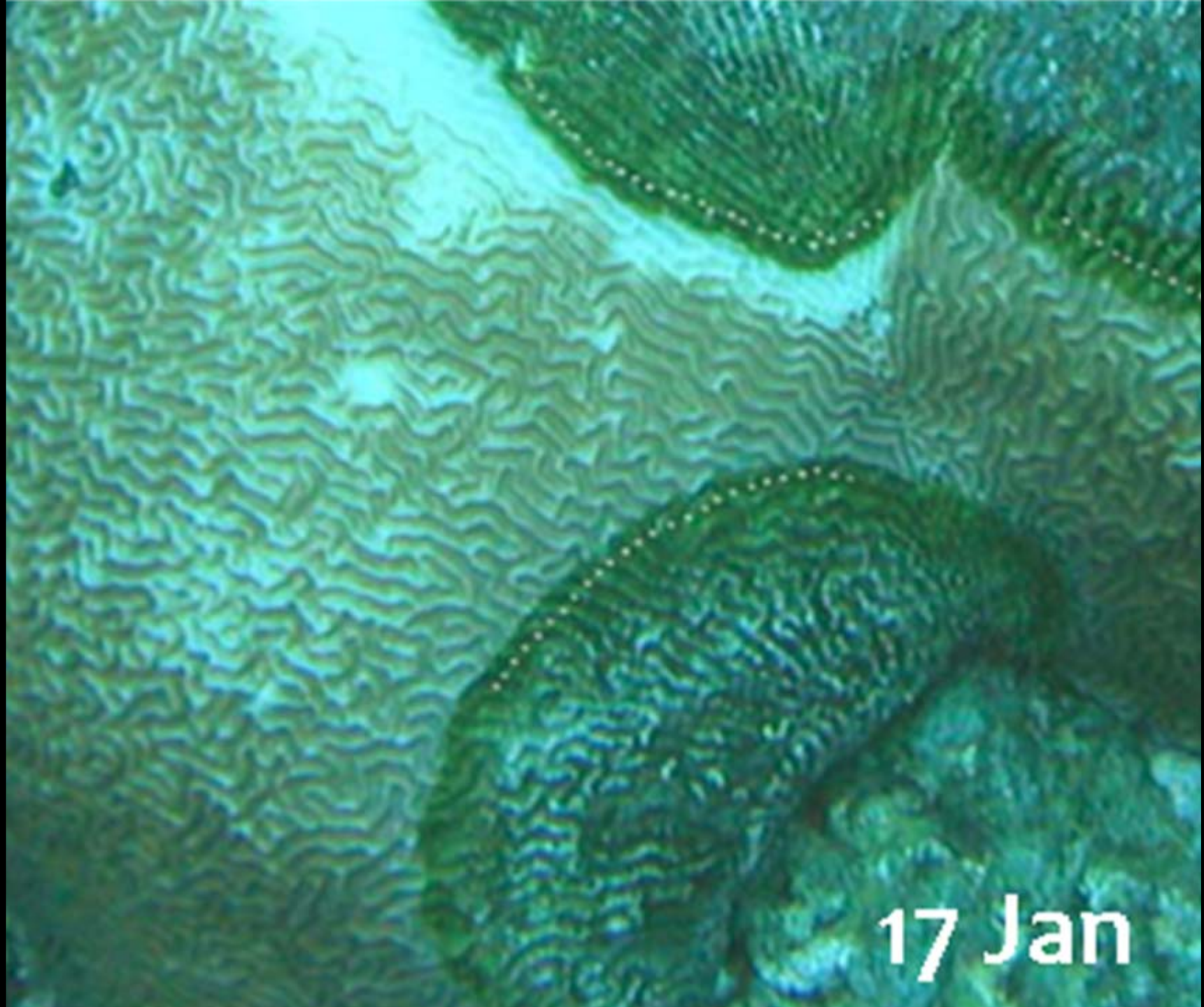
Sadly, one of the two Majuro colonies has multiple, expanding infections

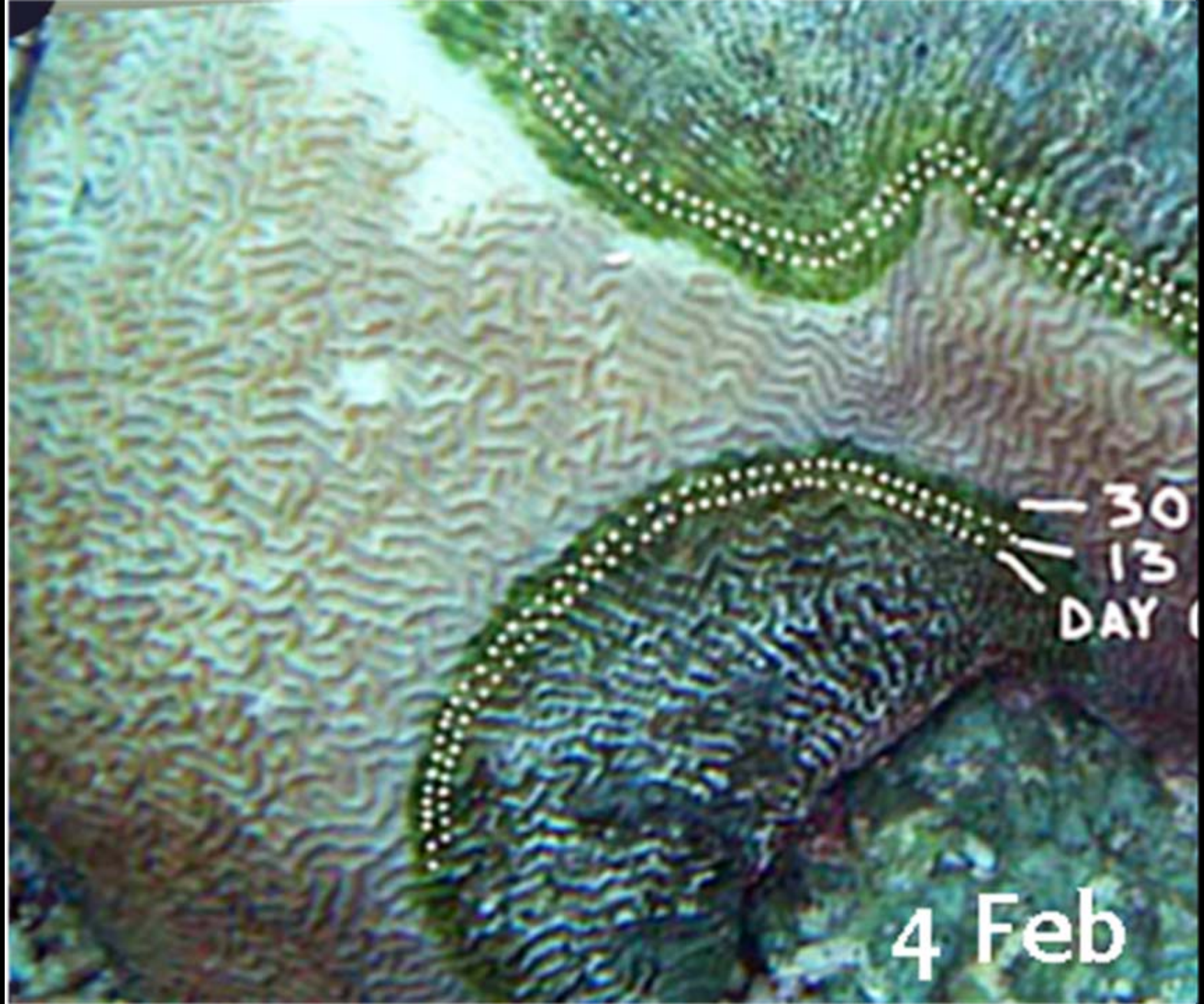




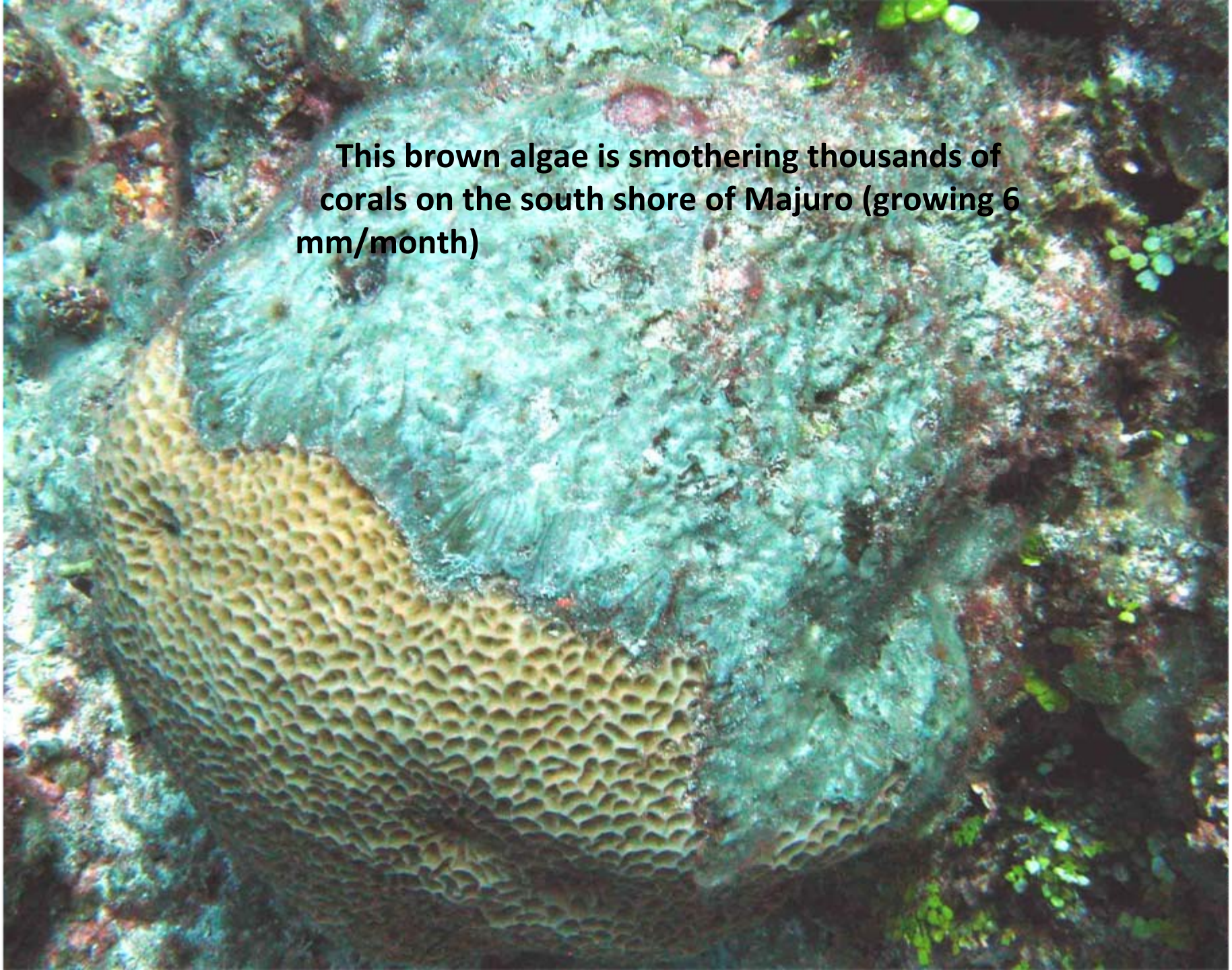


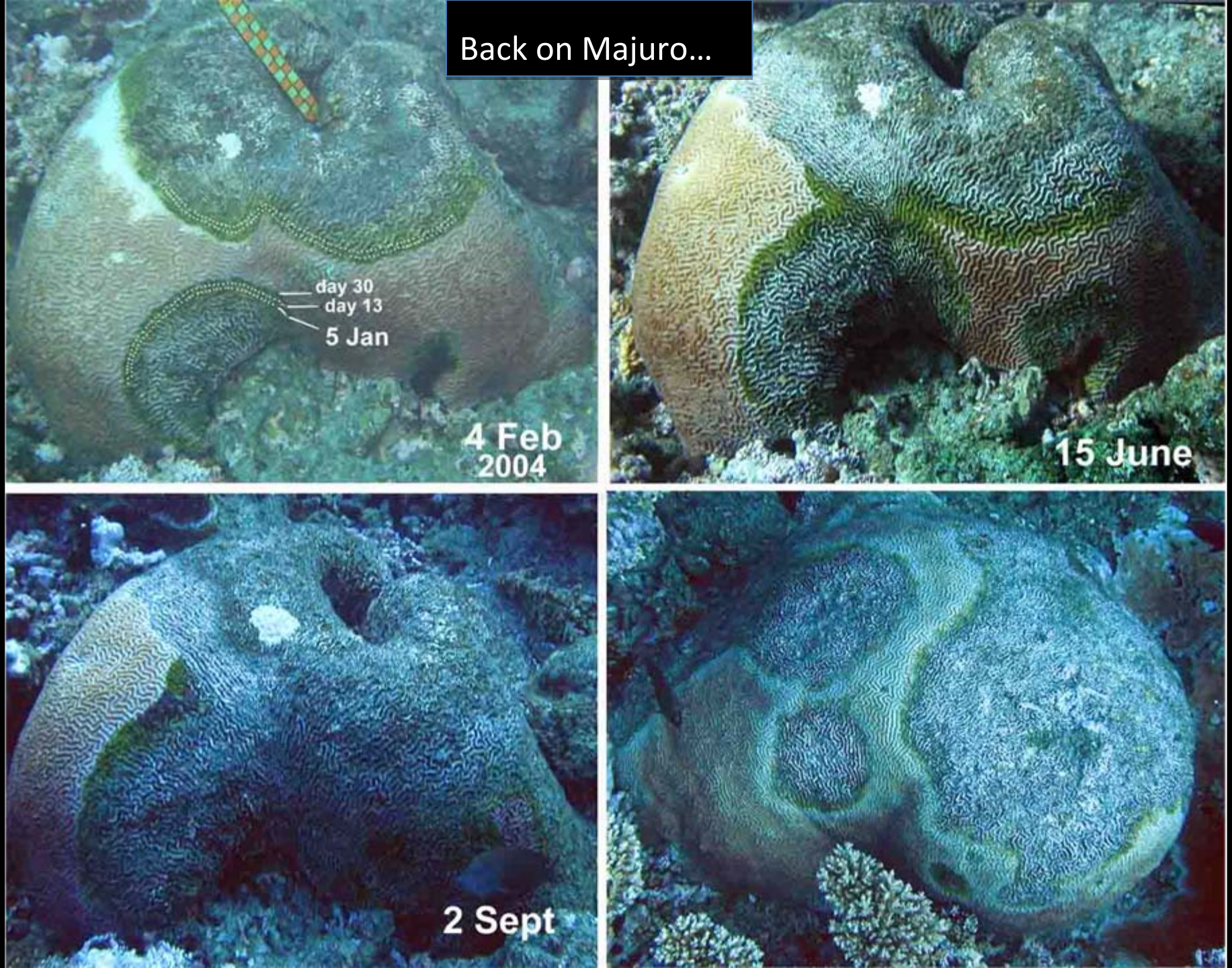

Back on Majuro…
day 30
day 13
5 Jan
4 Feb
2004
15 June
2 Sept


17 Jan


30
13
DAY
4 Feb


22 Mar


This brown algae is smothering thousands of corals on the south shore of Majuro (growing 6 mm/month)


Back on Majuro…
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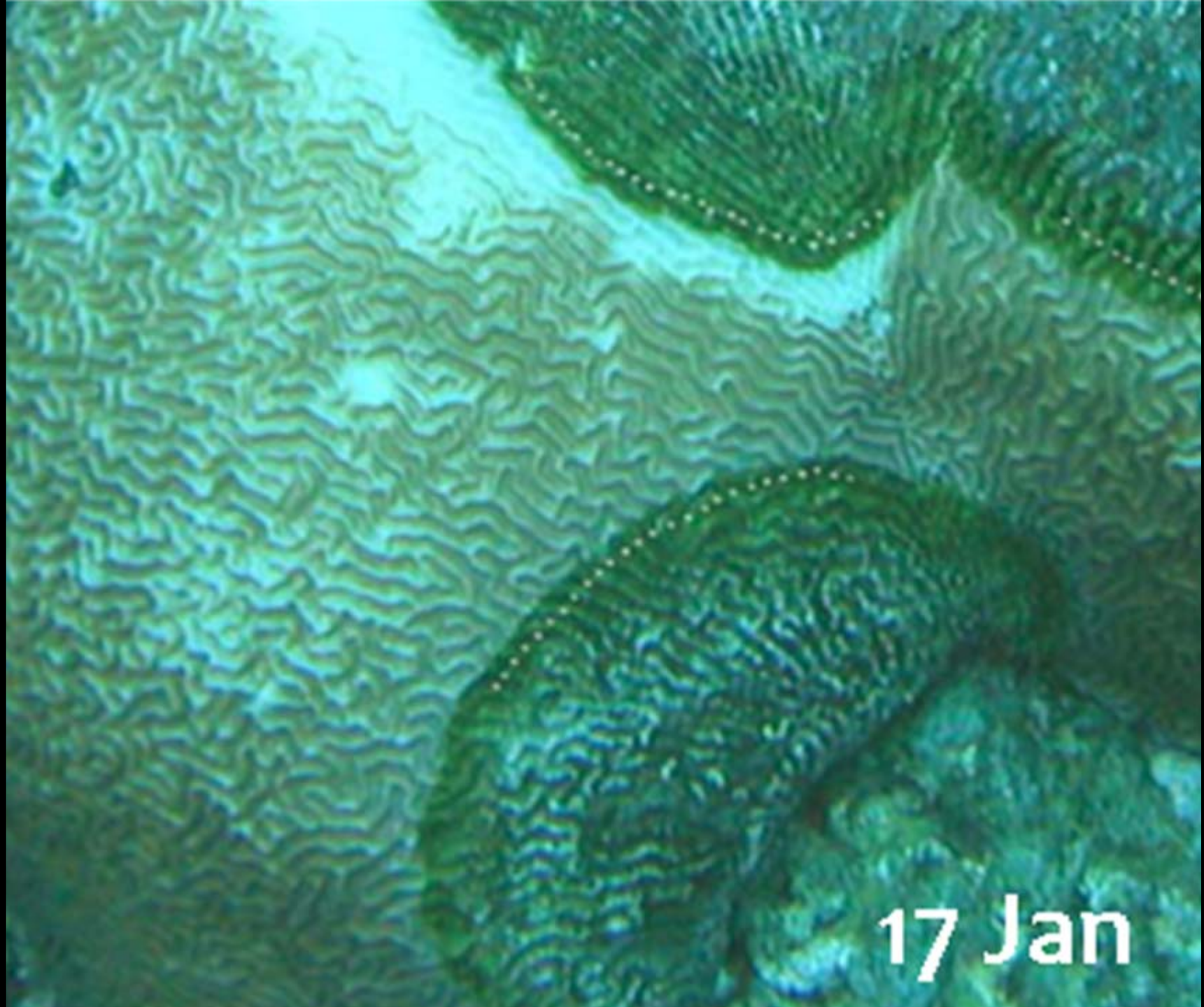
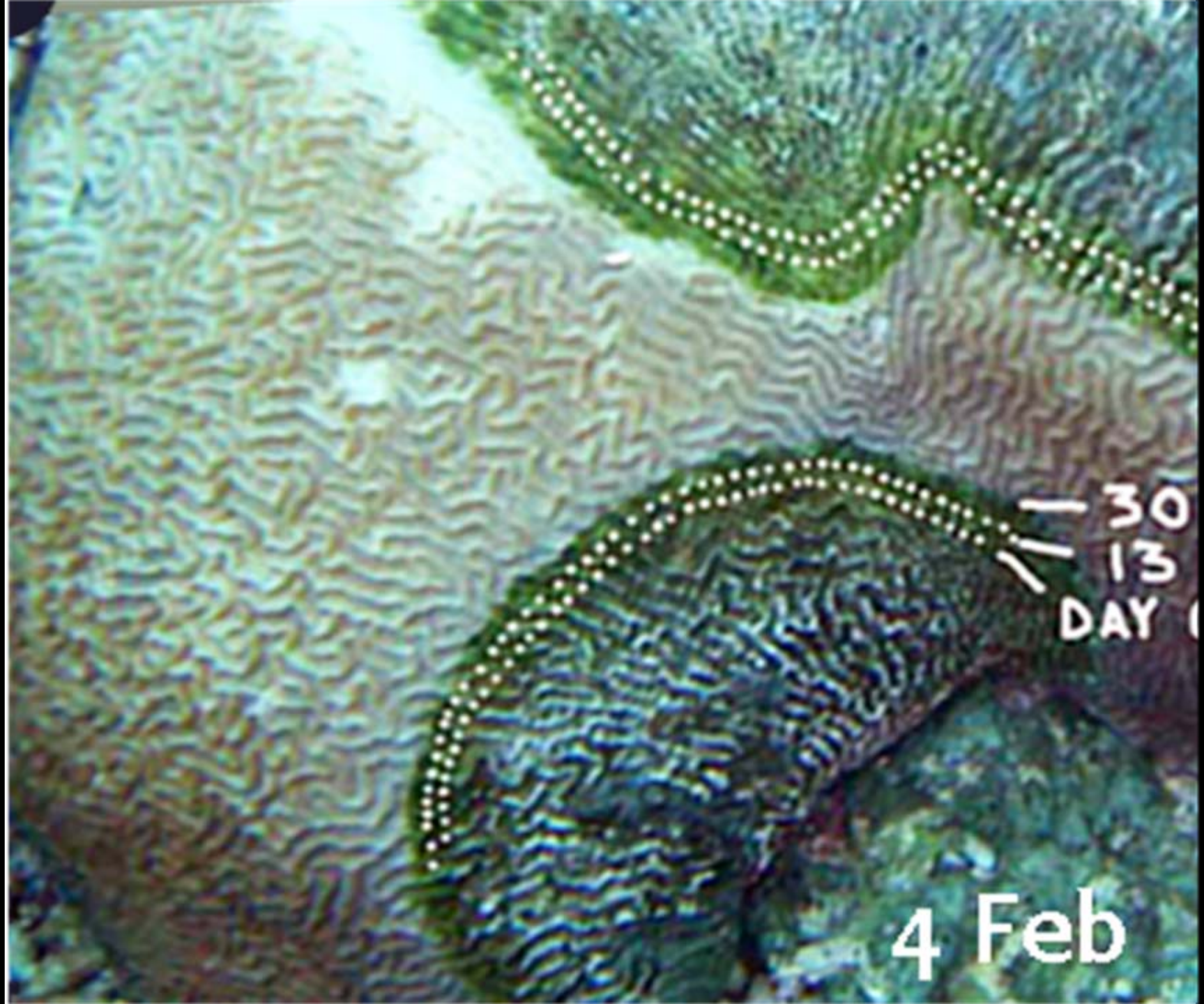
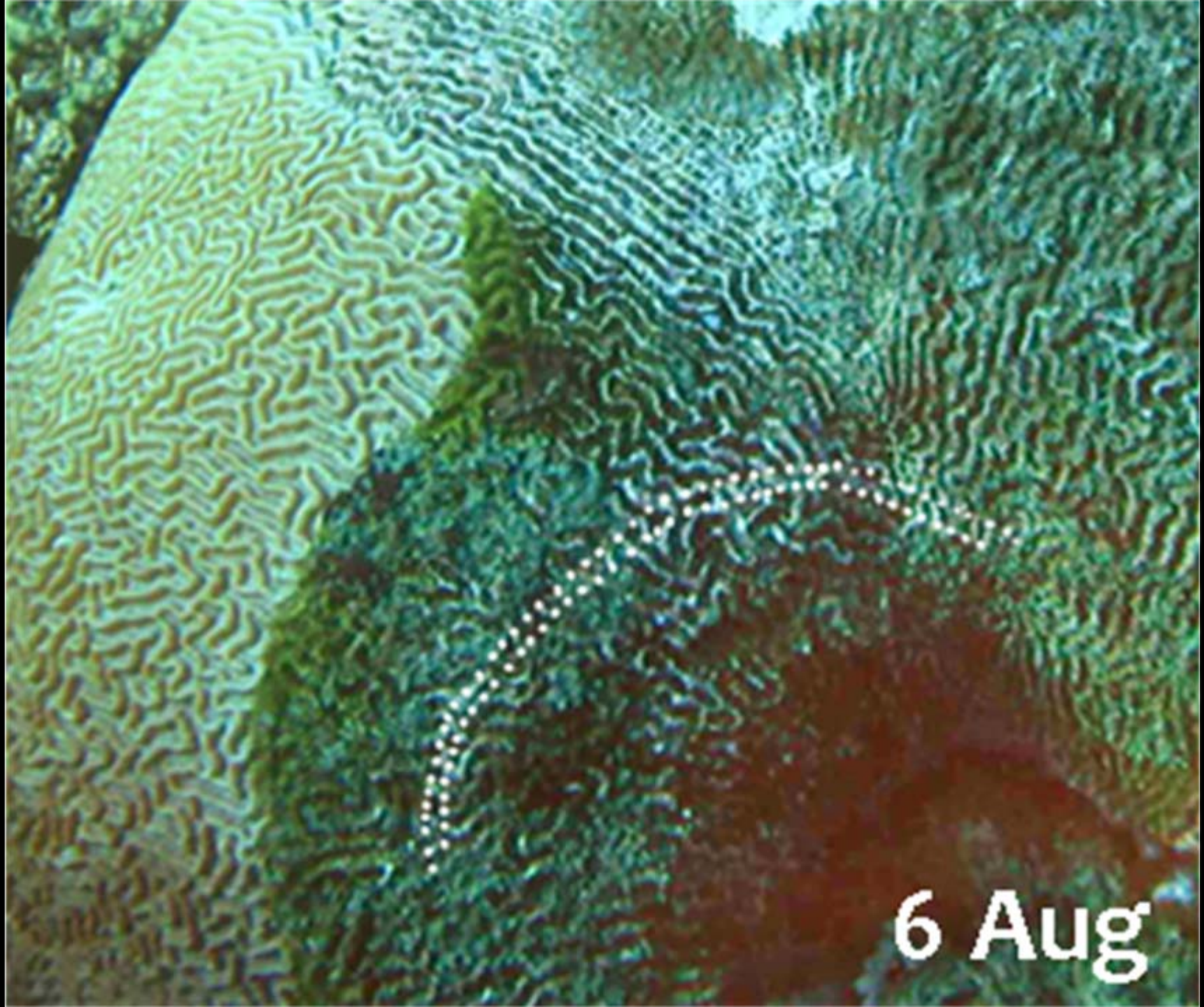

17 Jan


30
13
DAY
4 Feb


22 Mar


6 Aug

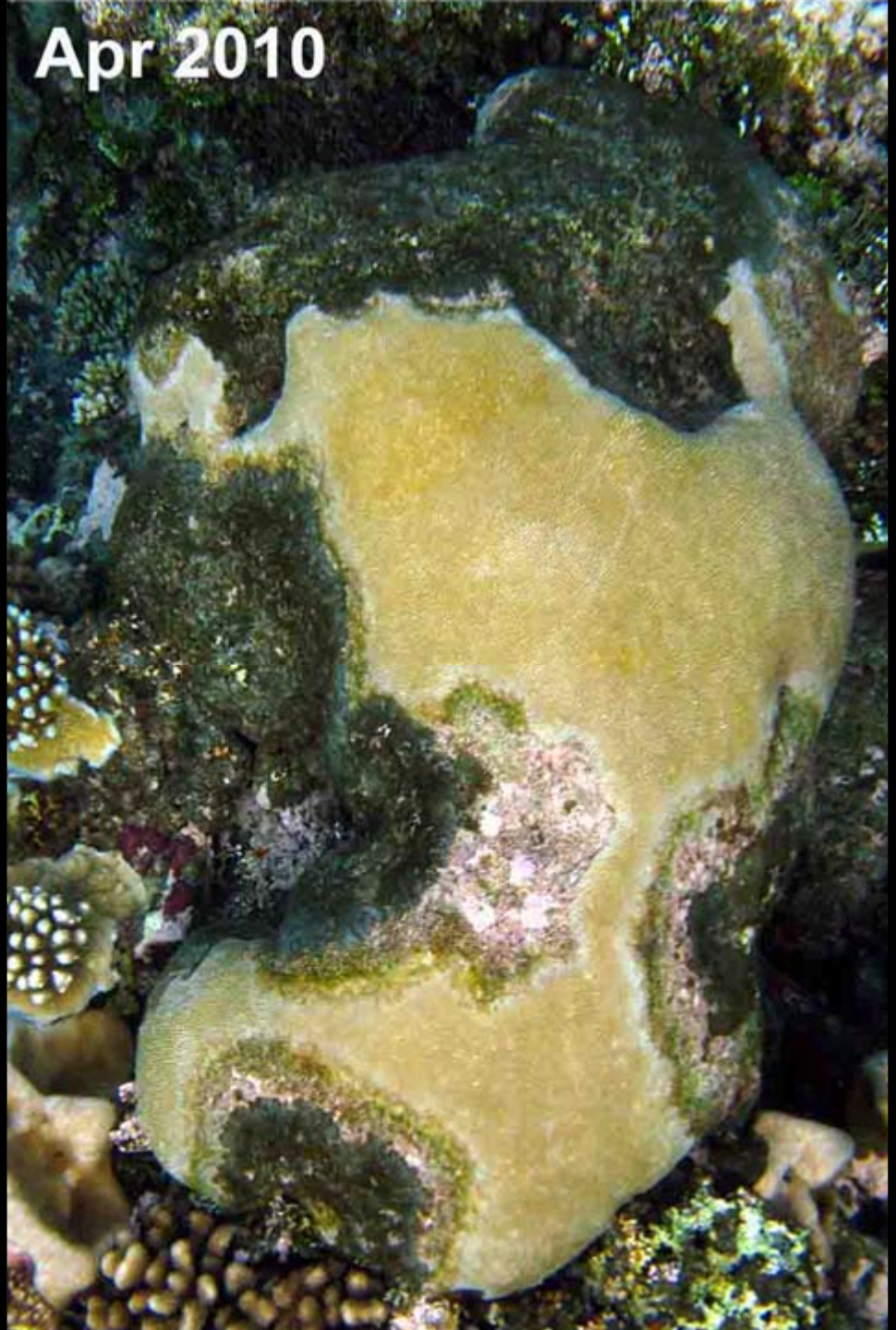
In Ajeltake, where massive corals (especially *Hydnophora* and *Platygyra*) are still common, disease was uncommon before 2006…

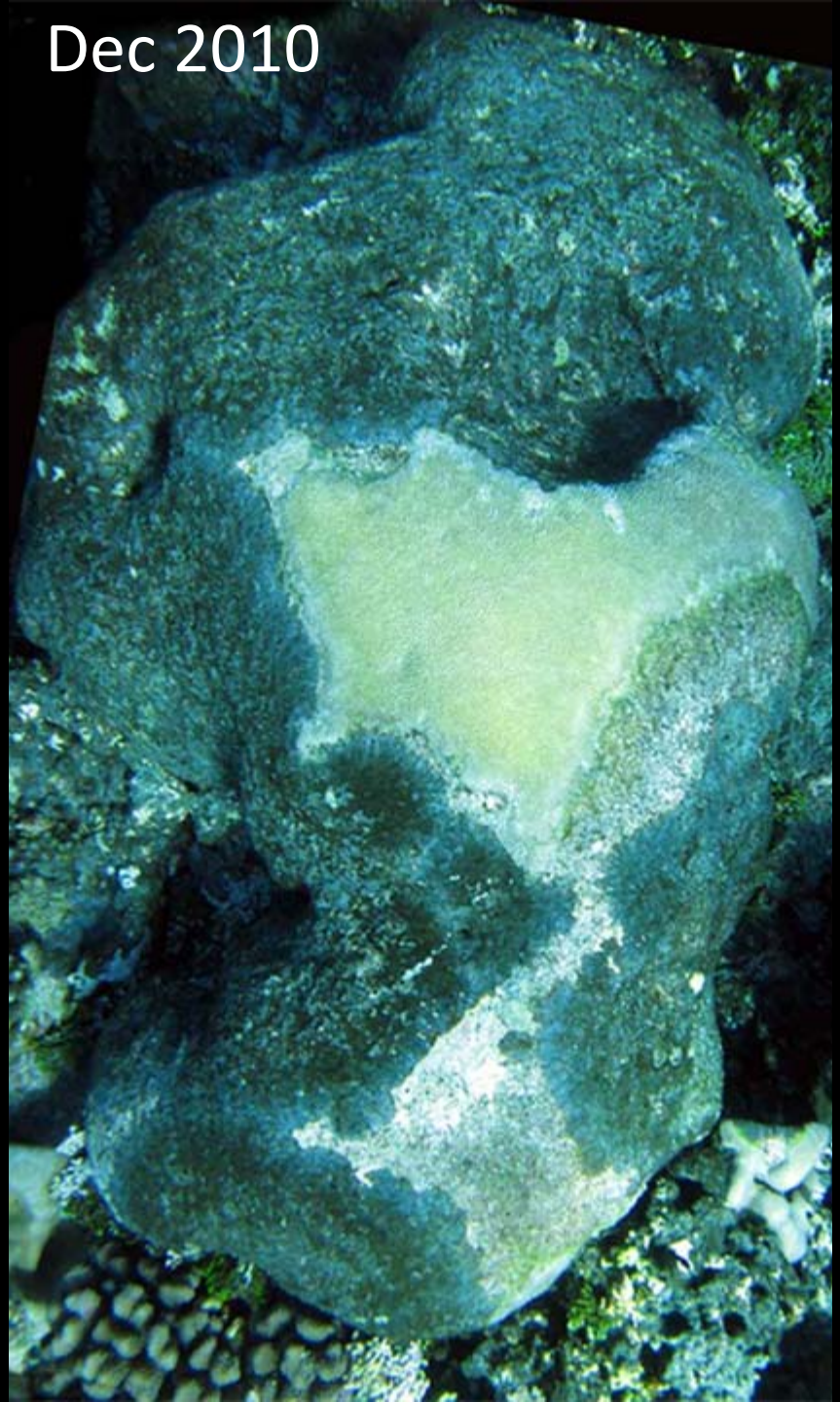
I documented this colony In 2007 not knowing it was infected, but routine follow-up monitoring revealed a disturbing truth:
A slow disease syndrome is now killing most of these brain corals


12 Jan 2008


Nov 2009

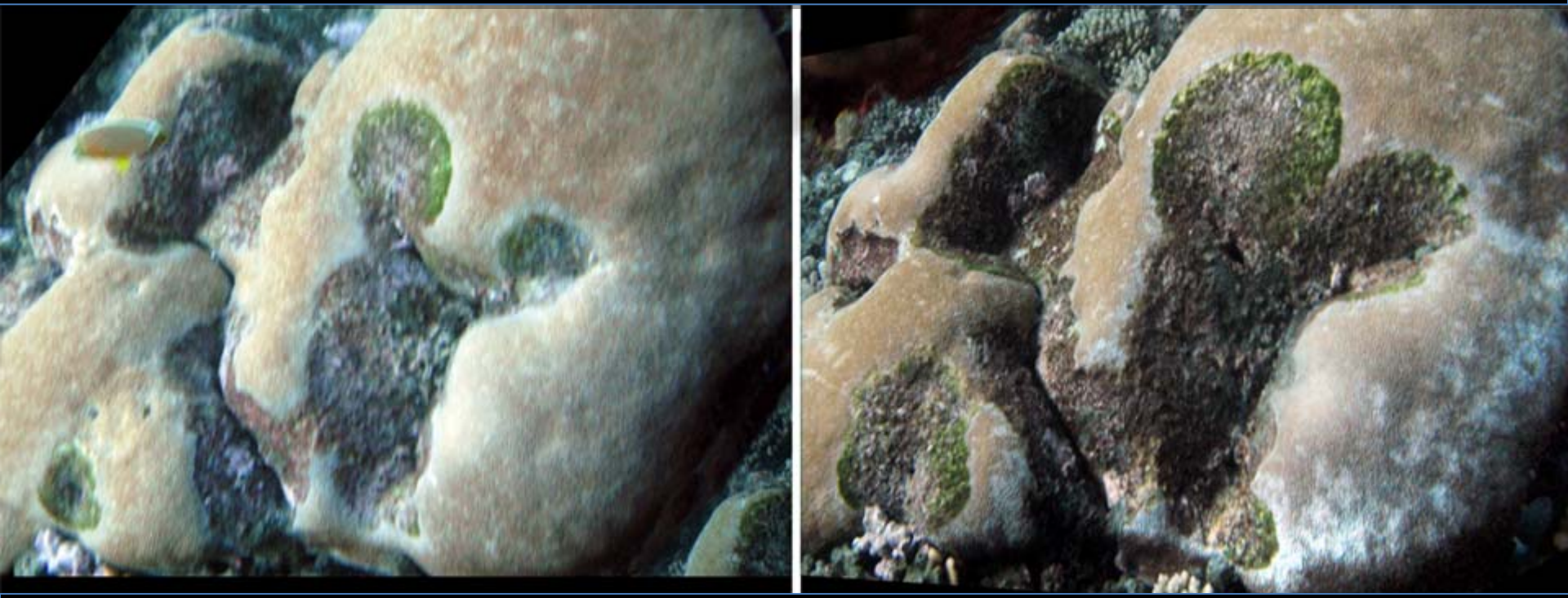

Mar 2010


Apr 2010



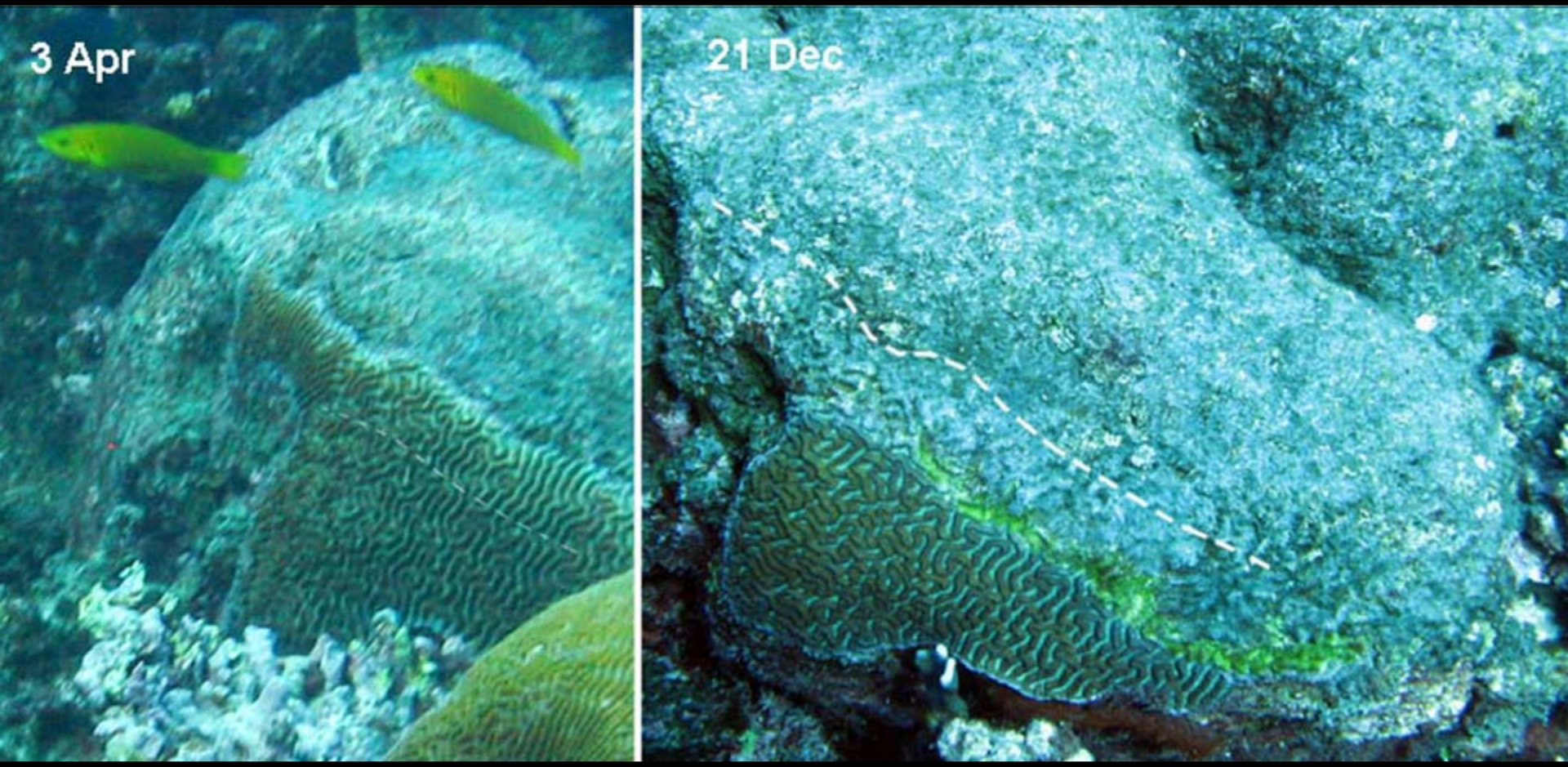
I soon realized that thousands of brain corals were suffering a wave of disastrous destruction, making the “white band” table coral disease look like a picnic!

After all, the brain corals are not growing back!



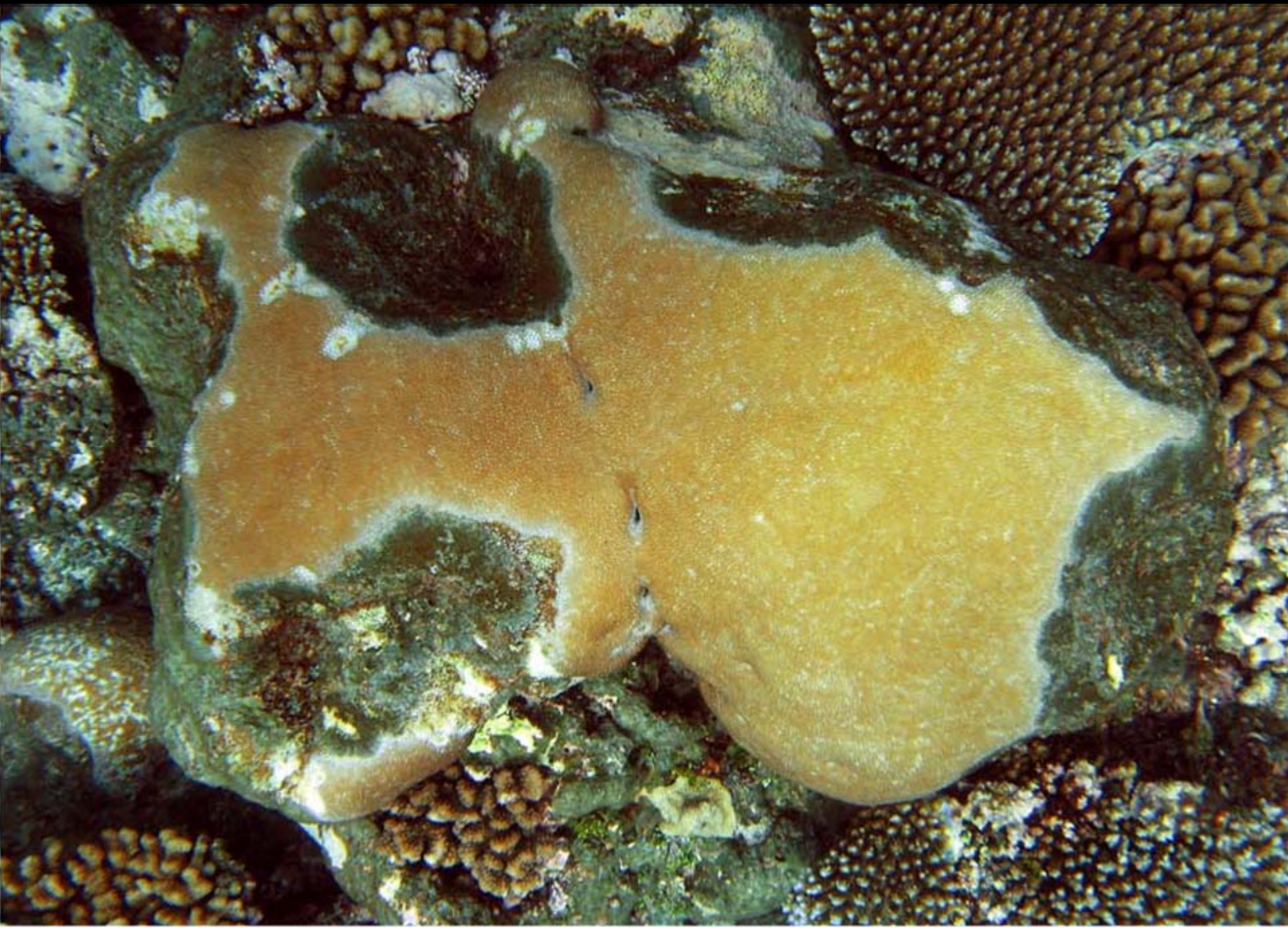

3 Apr
7 Aug
21Dec

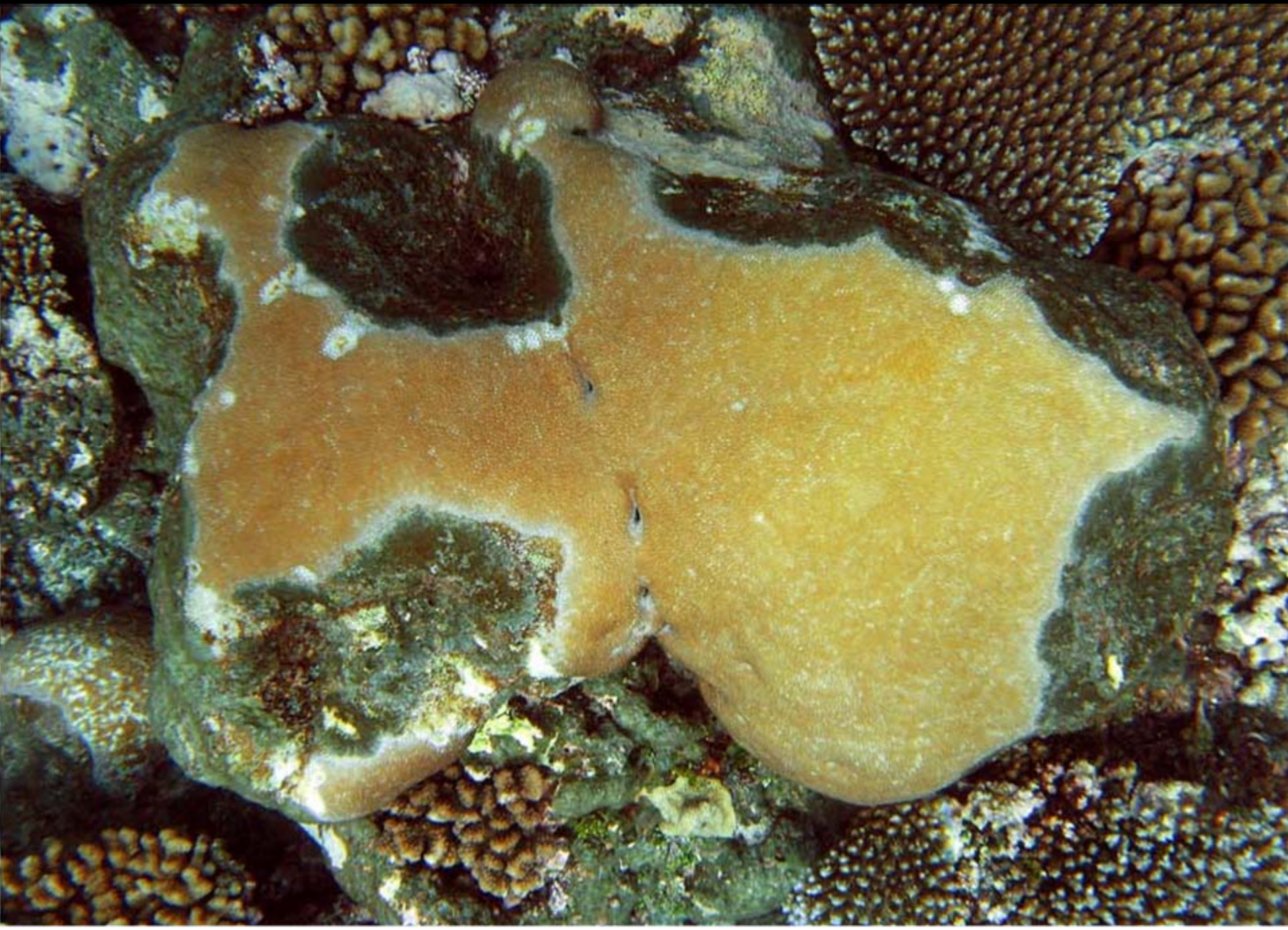

3 Apr
Platygyra
29 Jan


3 Apr
21 Dec

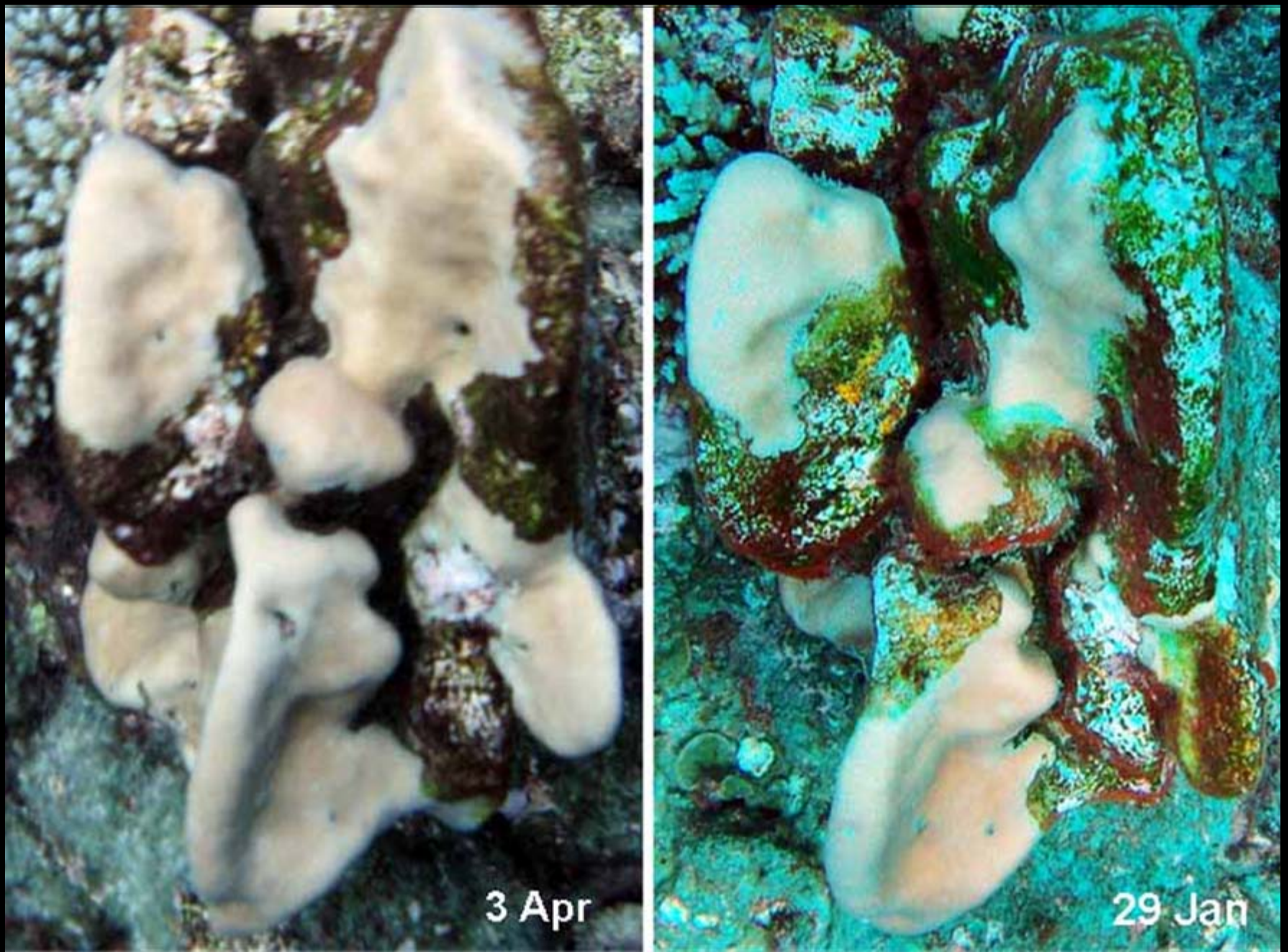
Symphillia (left) and *Favia* spp in Ajeltake


3 Apr
7 Aug





Pavona duerdeni




3 Apr


3 Apr


3 Apr

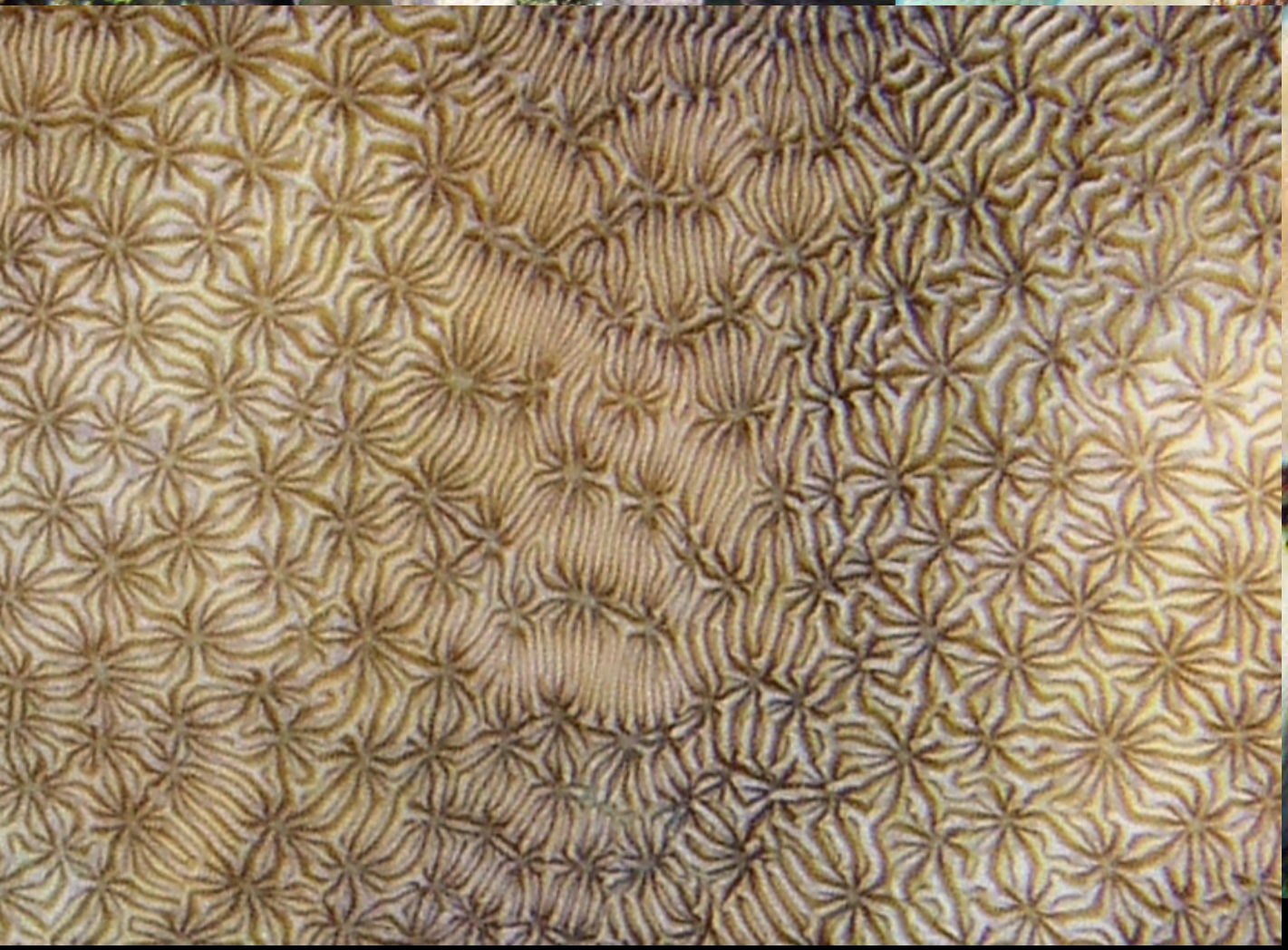

7 Aug

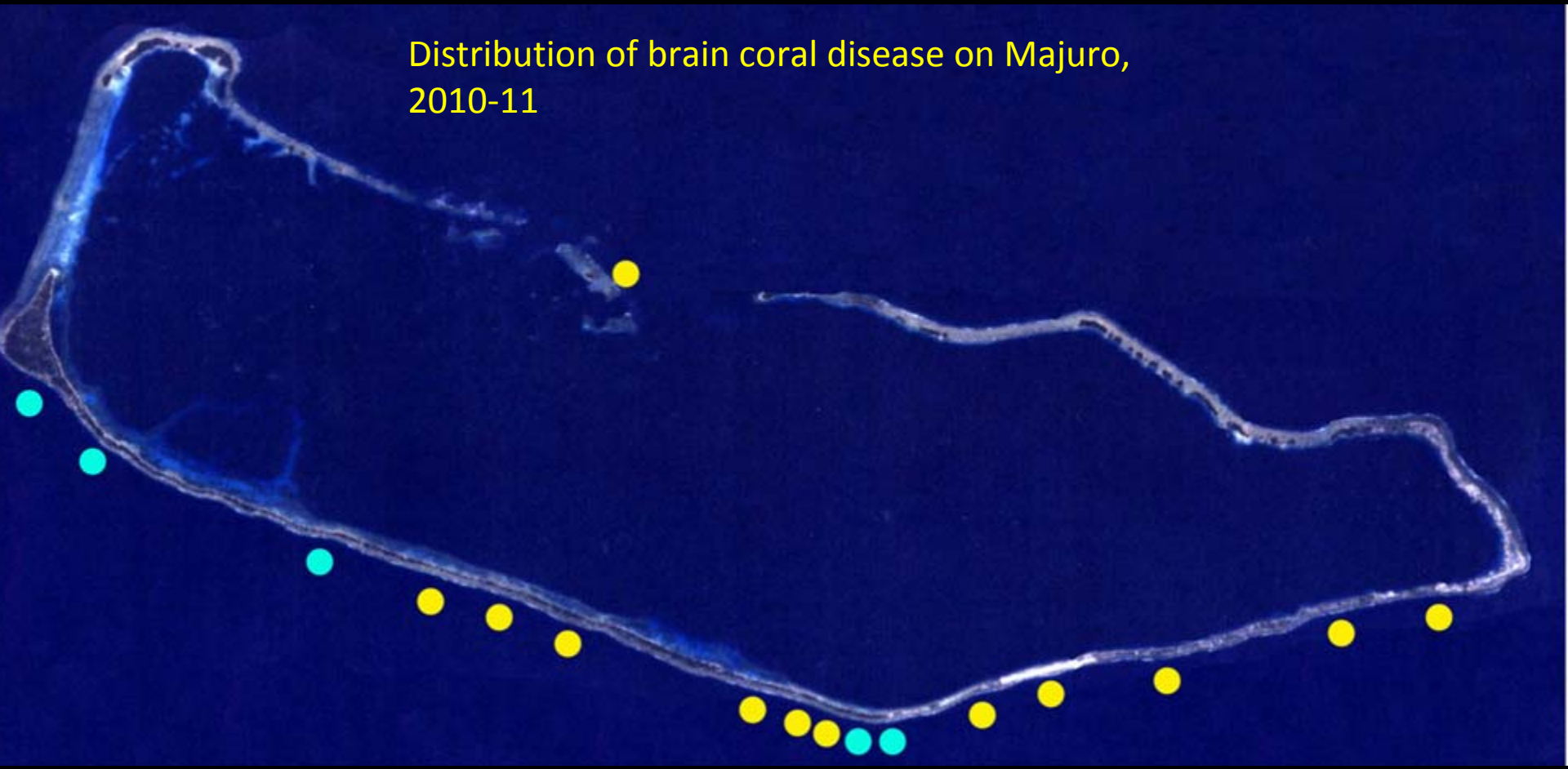

29 Jan


7 Aug


29 Jan

Pavona is particularly beautiful, so its loss is to be mourned




Distribution of brain coral disease on Majuro, 2010-11

The presence of diapers on coral correlates with coral disease

Outer Islands:

Healthy, unblemished coral

Pink substrate

High coral diversity

Lack of “black slime” or other smothering algae

Rarity of COTS

Dominance of *Isopora, Astreopora, Pavona*, *Montipora* etc.

Coral, algal disease rare

Majuro south shore:

Diseased, pock-marked coral

Grey substrate, lots of “whisker” algae

Low coral diversity

Black slime and smothering algae common & increasing

Catastrophic COTS plague

Near complete loss of *Isopora, Astreopora*, with most *Pavona* diseased or overgrown with algae

High incidence of coral and coralline algal disease, high mortality especially among young coral recruits

Eventual ecosystem collapse


Without coral, there is a near absence of fish,
and the shore is less-protected from wave
damage… and a loss of wonder, of beauty