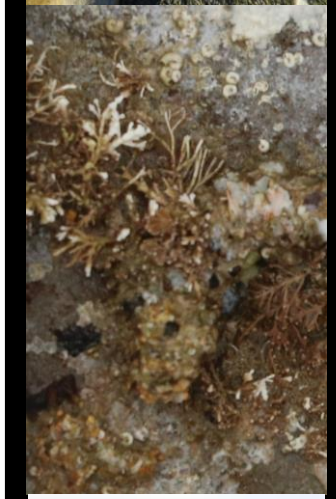
13TH INTERNATIONAL TEMPERATE REEFS SYMPOSIUM
HOBART, UNIVERSITY OF TASMANIA

sims
sydney institute of marine science

THE UNIVERSITY OF SYDNEY



Shifts in understory microbial communities mediated by canopy disturbance on rocky shores

Sebastian Vadillo Gonzalez and Georgina V. Wood

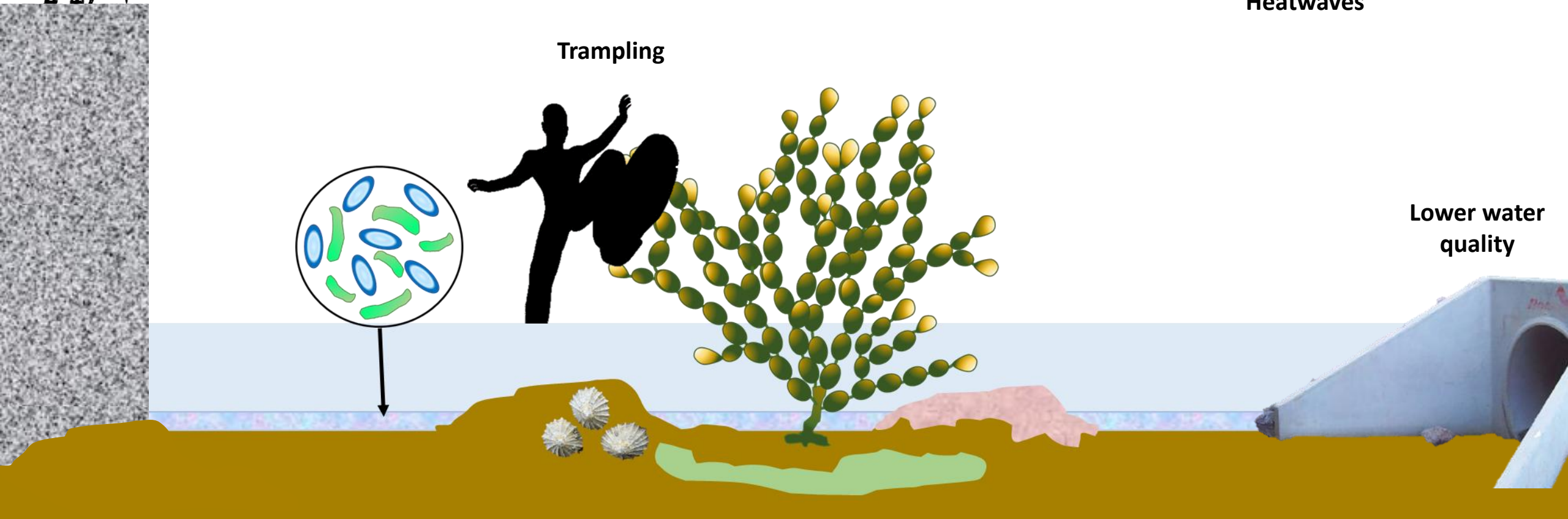
Disturbances to an already tough rocky habitat

Habitat modification

Cascading ecological changes in the system

Heatwaves

Trampling

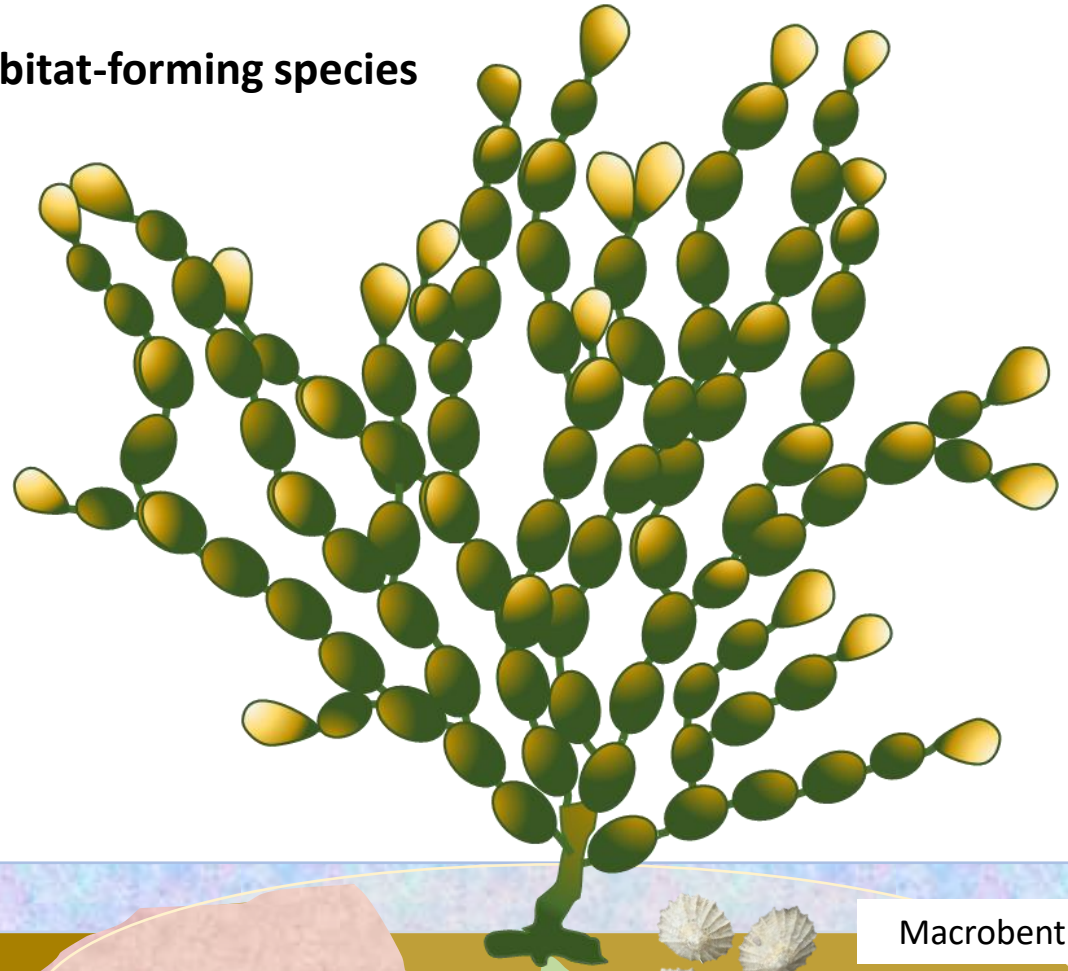


Lower water quality

A tough environment: Nursery/shelter effects of habitat forming species

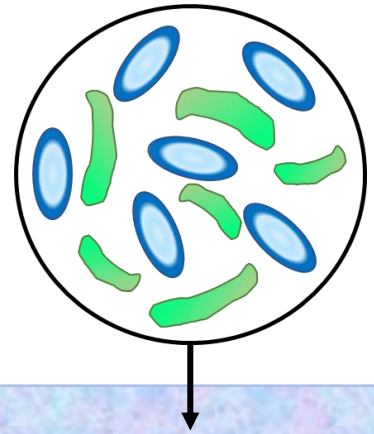
But what about microbial communities?

Habitat-forming species



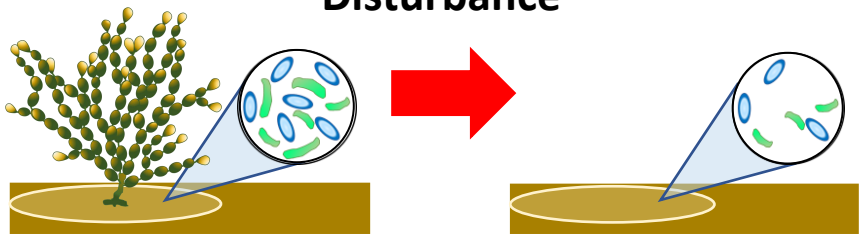
Substrate microbial biofilms

1. Nutrient exchange
2. Protection
3. Carbon sequestration
4. Org. matter degradation
5. Contaminant remediation
6. Recruitment macroorganisms



Manipulative experiments and the recovery of *Hormosira banksii*

1 **Substrate microbial biofilms**



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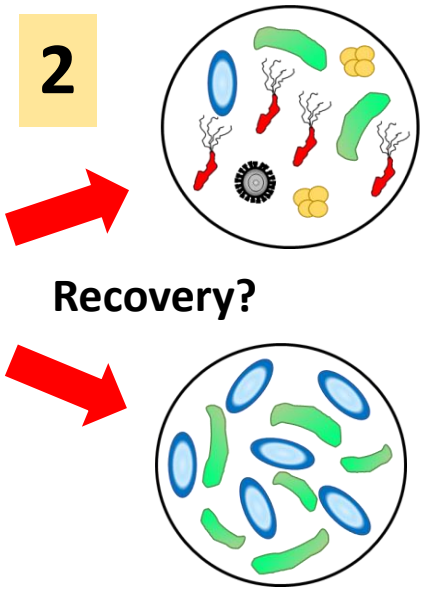
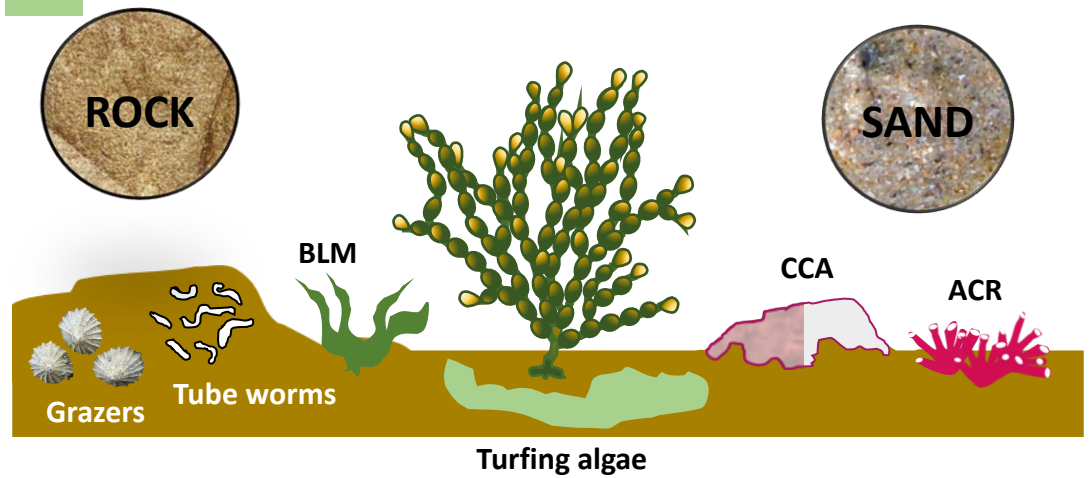


3 **Influence of other benthic abiotic and biotic components**



- *BLM = Brown Laminate Macroalgae*
- *CCA = Crustose Coralline Algae*
- *ACR= Articulated Coralline Algae*

H. banksii density manipulative experiment and its recovery through time

Site location: Coalcliff rocky shore, ~59km south from Sydney

Control
(100% density, n=5)

Procedure control
(100% density, n=5)

50% density
(n=5)

0% density
(n=5)

Bare rock
(n=5)

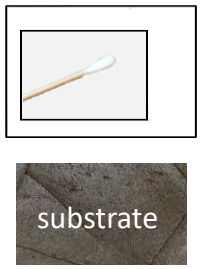
Manipulative experiments and the recovery of *H. banksii* + Microbes

Setup

Sampling times

T0: OCT 2018 → **T1:** Nov 6, 2018 → **T2:** Nov 26, 2018 → **T3:** May 2019 → **T4:** Jan 2020

Bacterial analysis



Microbial swabs
Mini-quadrats (25cm²)

DNA extraction

PCR
(V3-V4, 341F + 805R)

Amplicon sequencing
(Miseq 2000, Ramaccioti centre)

DADA2
GTDB

Bioinformatics

Canopy cover photos

CORALNET

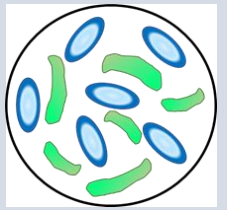
Benthic images analysis

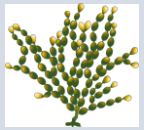
Neural networks that allows fully and semi automated annotation of images

α Richness and diversity metrics

β Composition (multivariate)

Mvabund
Differential abundance analysis





Canopy cover (%)
Different from *H. banksii* density

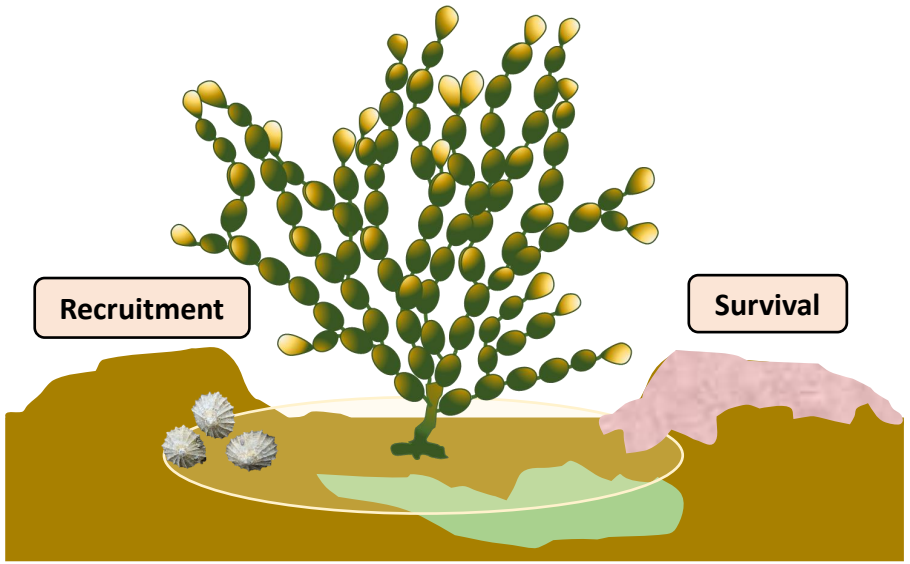
Macrobenthos cover (%)
Abiotic and biotic components

Main factors

Removal treatments
(5 treatments)

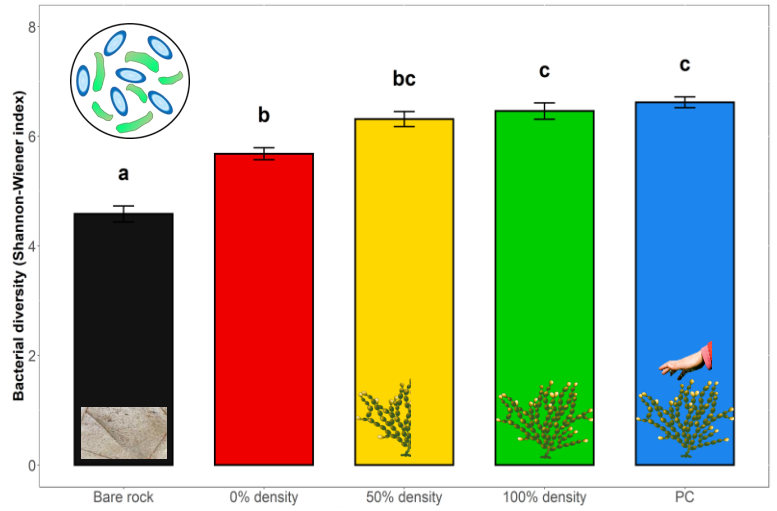
Time (4 times)

1 The effects of *H. banksii* removal

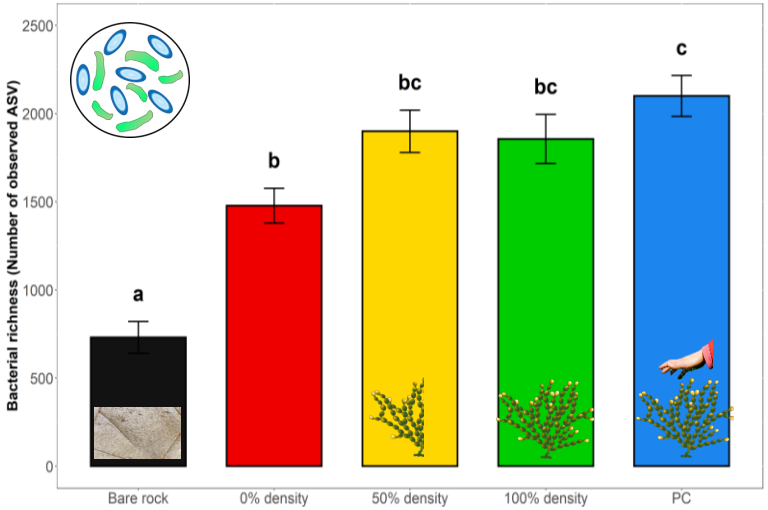


Canopy cover = Shelter/nursery from the tough habitat

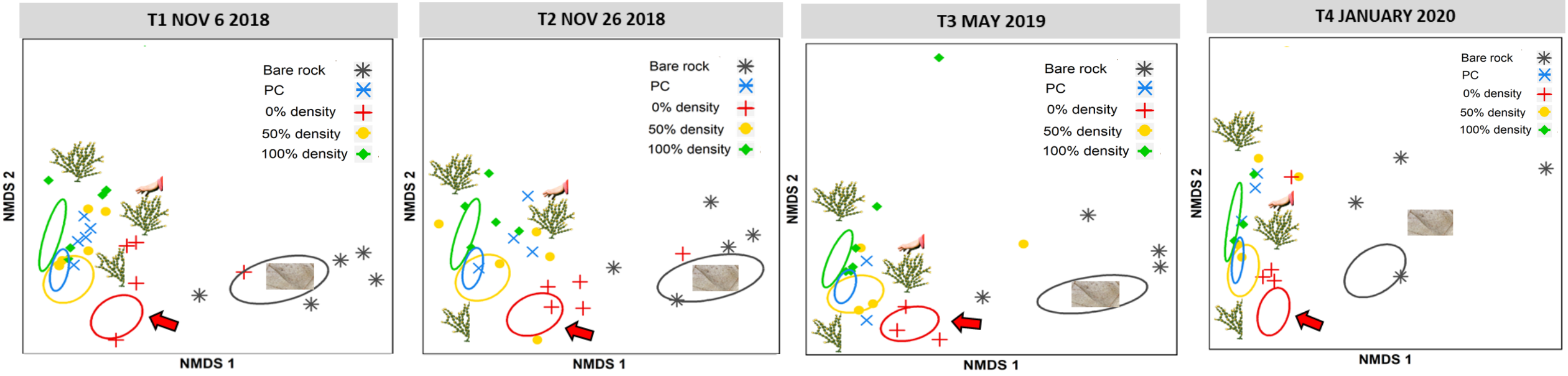
Bacterial richness (# of bacterial ASV)

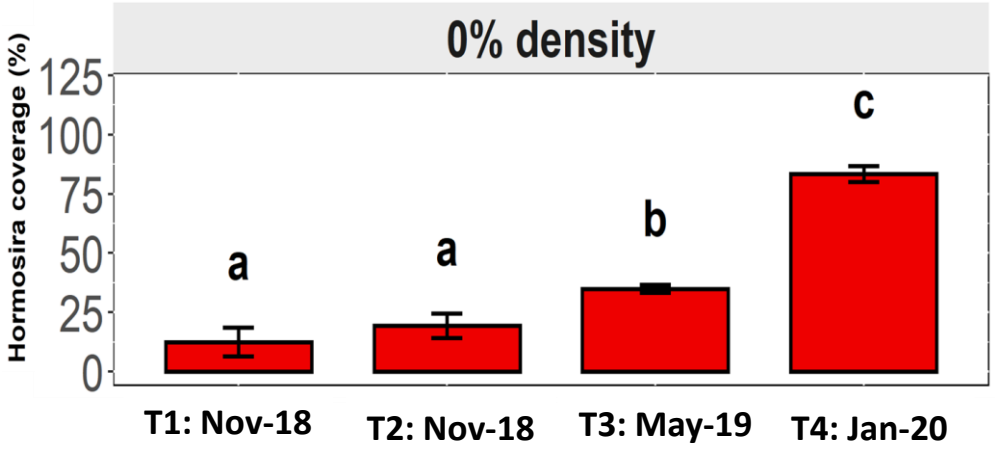


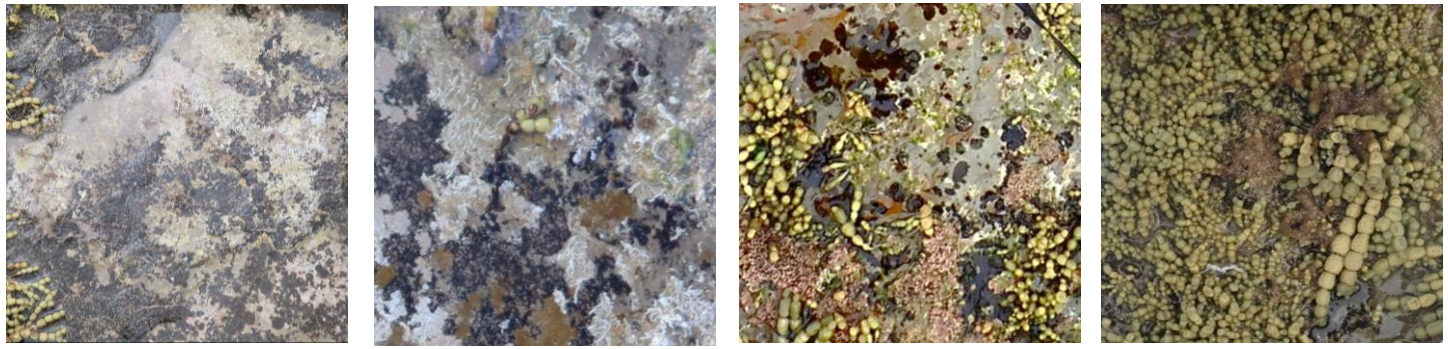
Bacterial diversity (Shannon-Wiener index)



2 Recovery after ~18 months from the disturbance





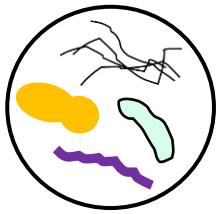
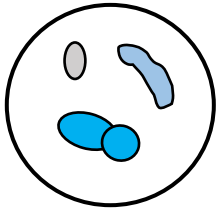
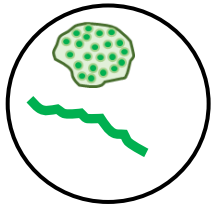


T1: Nov-18 T2: Nov-18 T3: May-19 T4: Jan-20

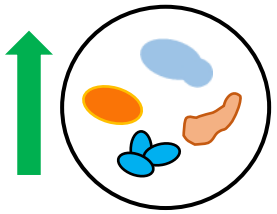
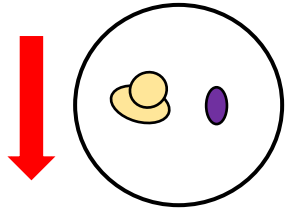
1 **The effects of *H. banksii* removal**

Recovery after ~18 months from the disturbance **2**

T1: 6th NOV 2018

	Understory biofilms	Symbionts
PC 100% 50%	 *Haliscomenobacter* *Lacinutrix* *Saprospira* *Rubritalea*	 *Colwellia* *Halioglobulus* *Thiodiazotropha*
0%	Lost taxa = lost functions?	Loss of other benthic organisms?
BR	 **Cyanobacteria** *Chondrocystis* *Phormidesmis*	

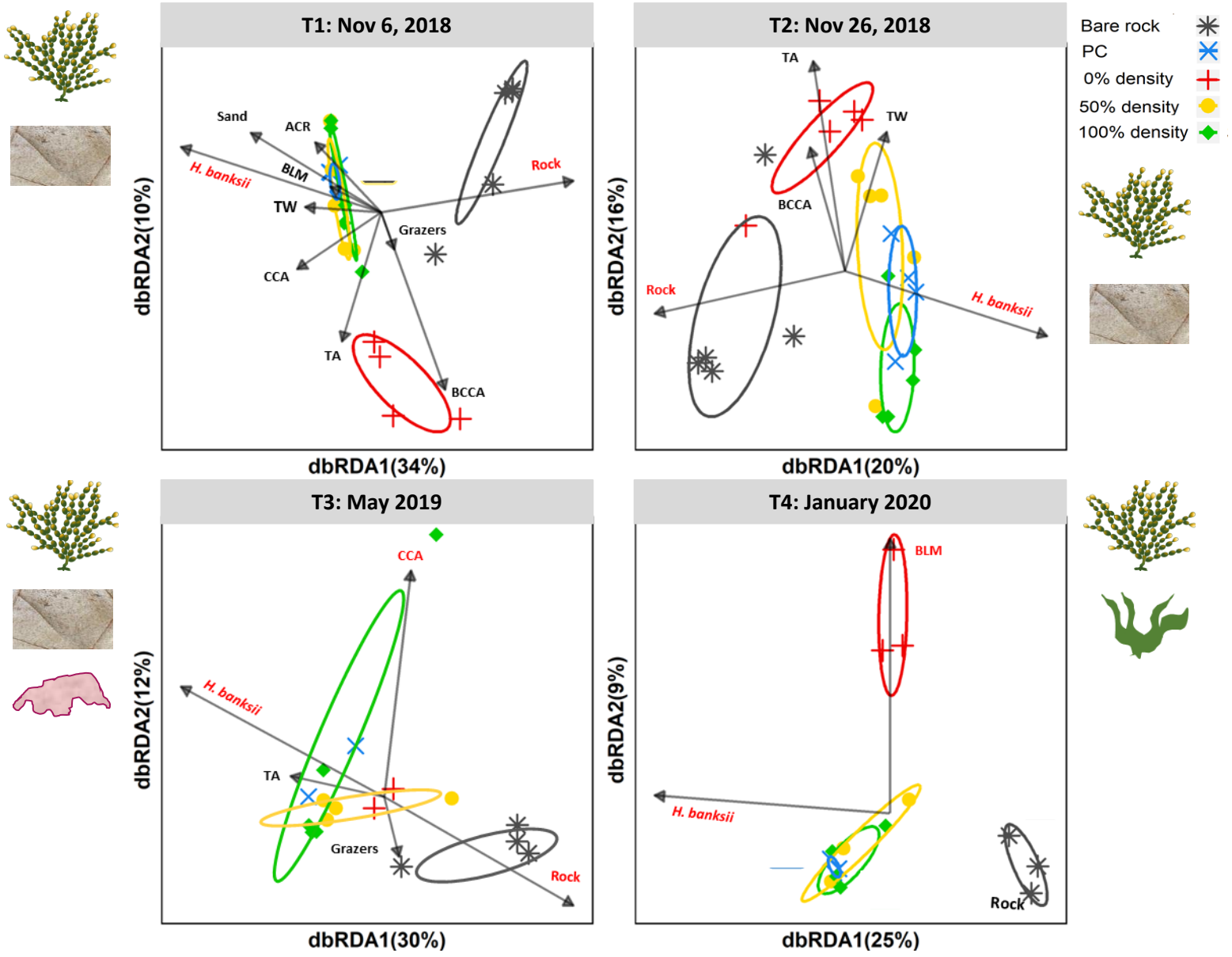
Substrate bacterial community recovery?

	Bacterial groups that recovered	Bacterial groups that disappear
0%	 *Tateyamaria* *UnID Rhizobiaceae* *UnID Pirellulaceae* *Fuerstia*	 *Dokdonia* *Roseibacillus*
	Groups present in early stages of recovery of other macroalgae	

- Loss of *H. banksii* changes biofilm bacterial communities
- Not quite like bare rock ➔ Remnant biofilm?
- Support for future recolonization?

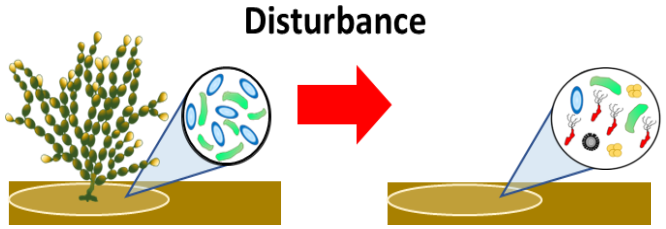
- First indications of a biofilm recovering but dependent on slowly developing nursery effects of *H. banksii*
- A long-lasting process…

3 Influence of benthic abiotic and biotic components



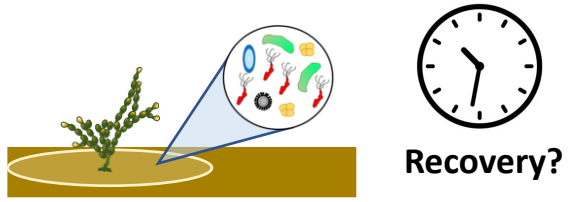
Summary

1 Substrate microbial biofilms



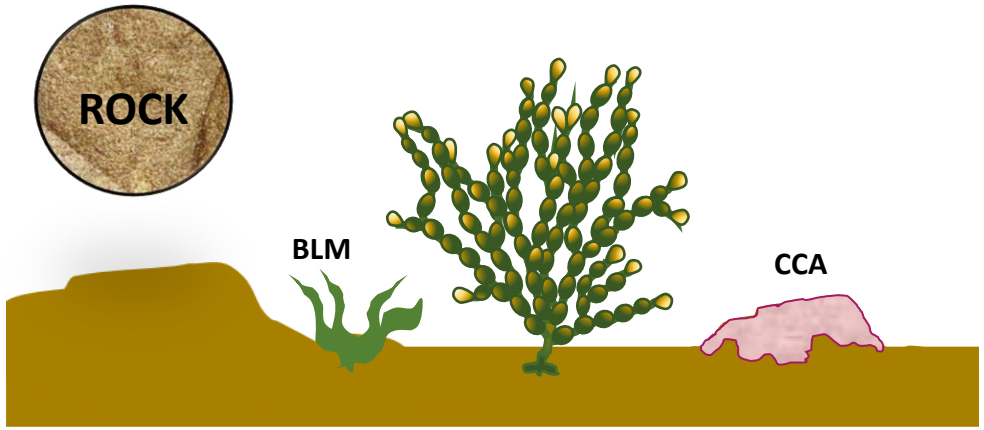
- Clear effects of substrate bacterial communities.
- Cryptic changes that could cascade to larger ecological effects
- Further functional analysis needed

2 Substrate microbial biofilms



- Unique biofilm that may lead to recruitment and development
- Slow recovery that could be affected if disruptions are more common

3 Influence of benthic abiotic and biotic components



- Larger effect mediated by *H. banksii* canopy cover
- Small effects of other benthic organisms

Acknowledgments to co-authors

- Ph.D cand. Regine Tiong Hui
- Dr. Kimberly Lema
- Sr. Lect. Mariana Mayer-Pinto
- Assoc. Prof. Federico Lauro
- Prof. Staffan Kjelleberg
- Assoc. Prof. Fabio Bulleri
- Em. Prof. Peter Steinberg
- Assoc. Prof. Ezequiel Marzinelli

Other acknowledgments

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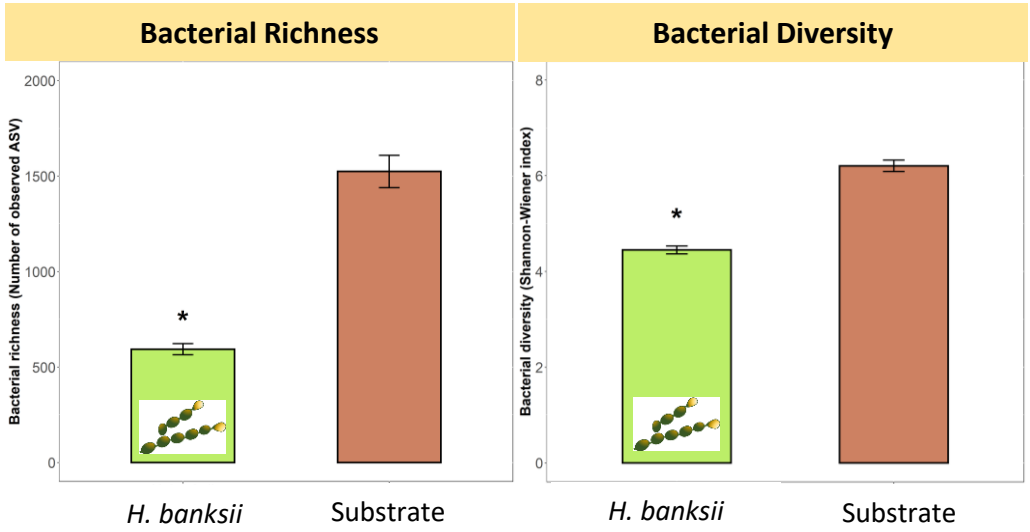
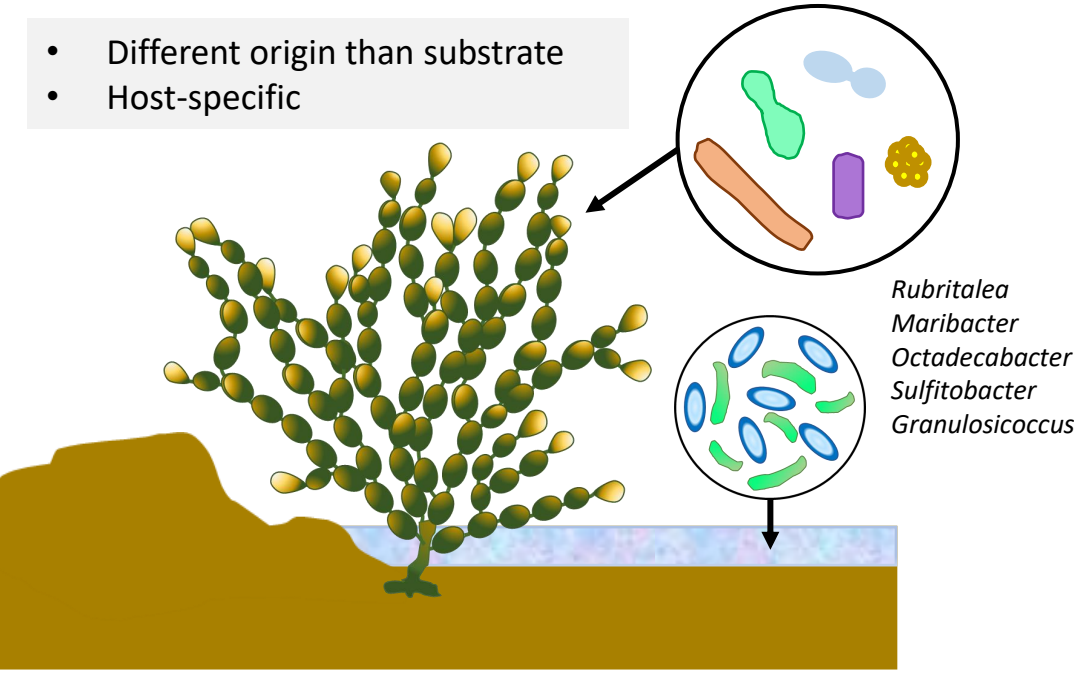
- Ramaccioti center for genomics

3 Substrate vs epiphytic bacterial communities



- Different origin than substrate
- Host-specific



Rubritalea
Maribacter
Octadecabacter
Sulfitobacter
Granulosicoccus