Monitoring growth and mortality of coral transplants and coral-assemblage structure along a water quality gradient

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Sedimentation is one of the major issues facing coral reefs

Palau and many Pacific Islands

- **steep topography**
- **highly erodable soil**
- **high rainfall**
- **increasing land-use change**

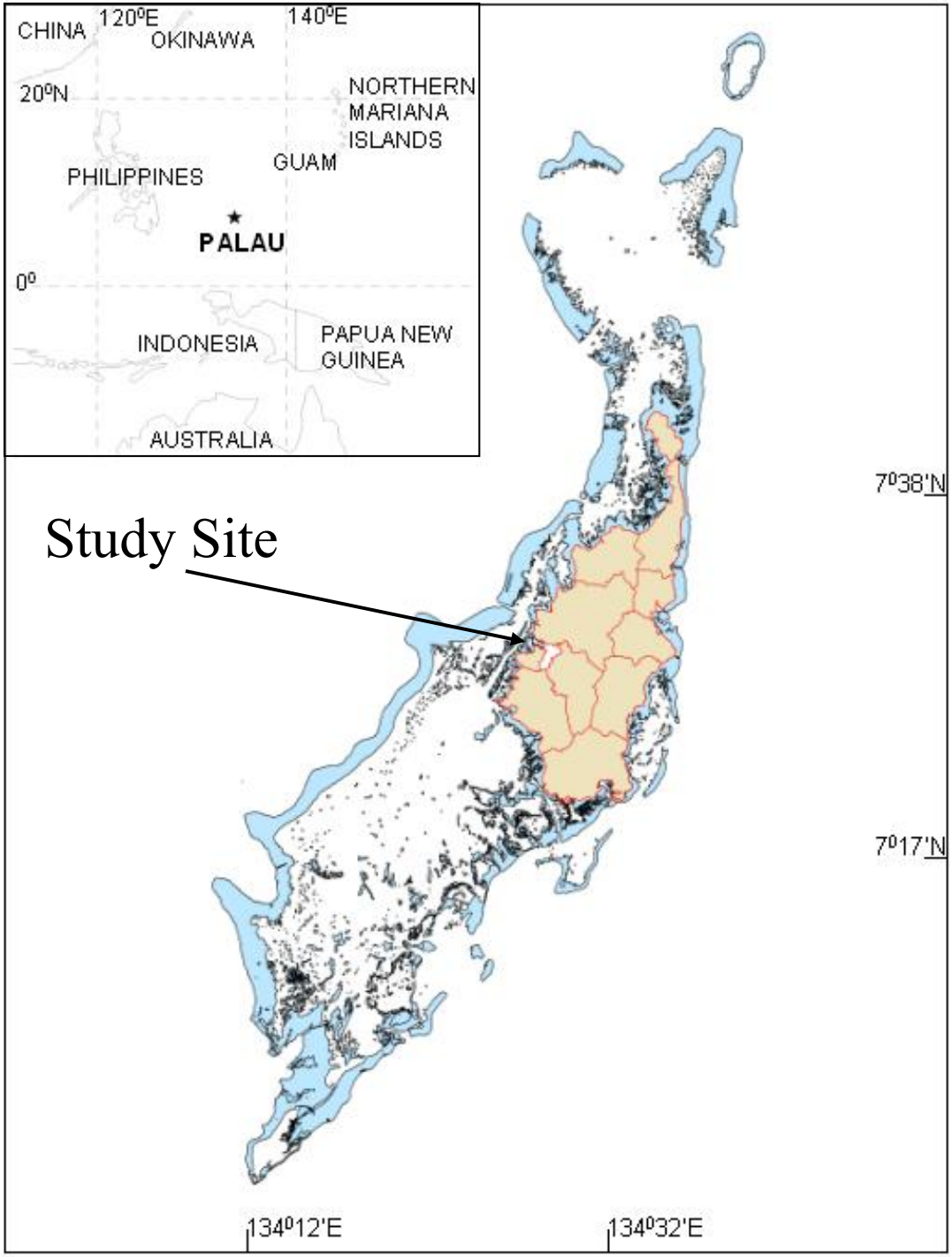
Rationale

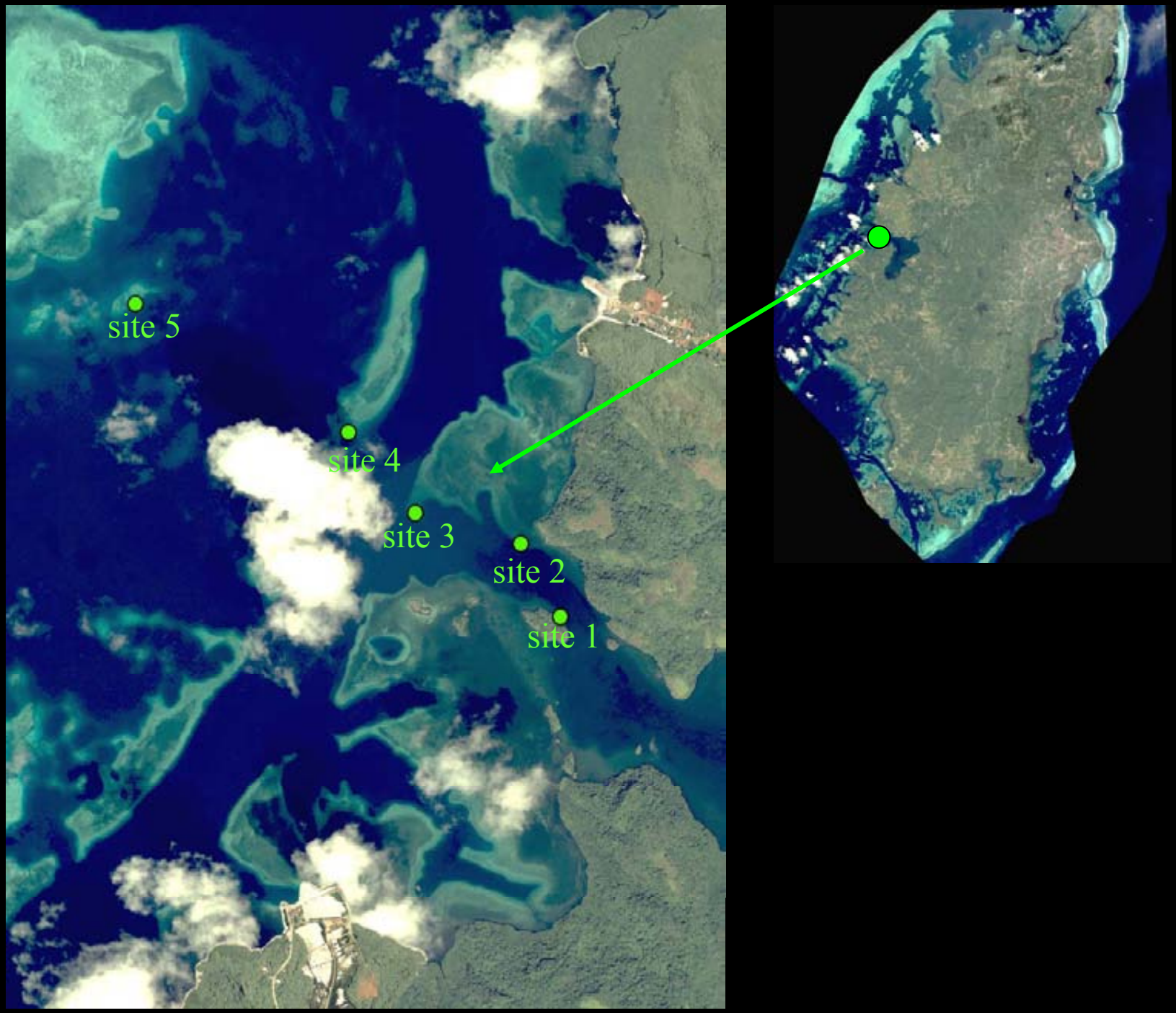
To better understand key processes that influence coral reef community structure under sedimentation stress.

Objectives

(1) Determine changes in coral reef communities along a terrestrial discharge gradients

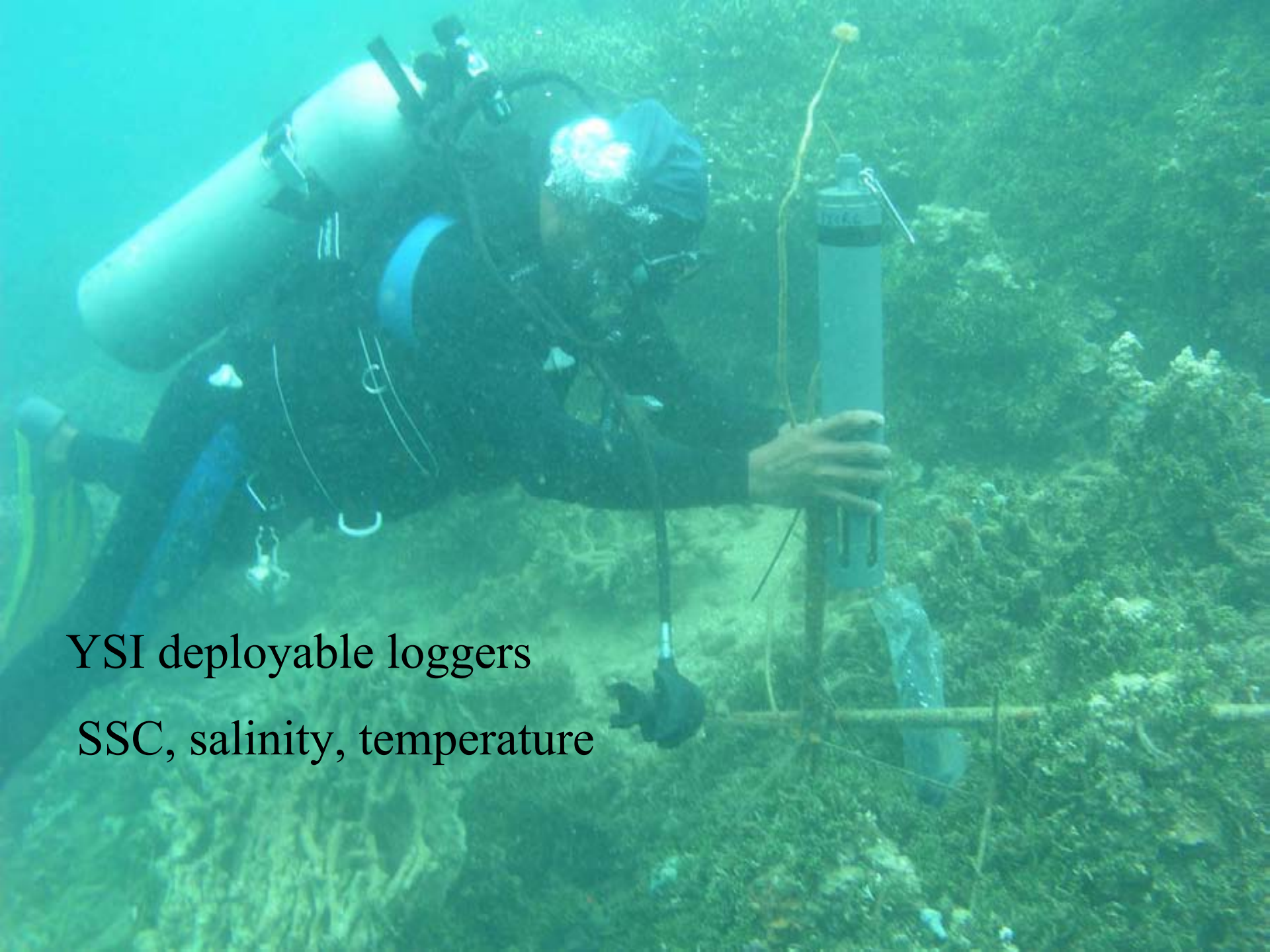
(2) Assess the effects of sedimentation, SSC, and salinity on reef coral growth, survival, and community structure


CHINA
120°E
OKINAWA
140°E
20°N
NORTHERN
MARIANA
ISLANDS
GUAM
PHILIPPINES
PALAU
0°
INDONESIA
PAPUA NEW
GUINEA
AUSTRALIA
Study Site
7°38'N
7°17'N
134°12'E
134°32'E


site 5
site 4
site 3
site 2
site 1

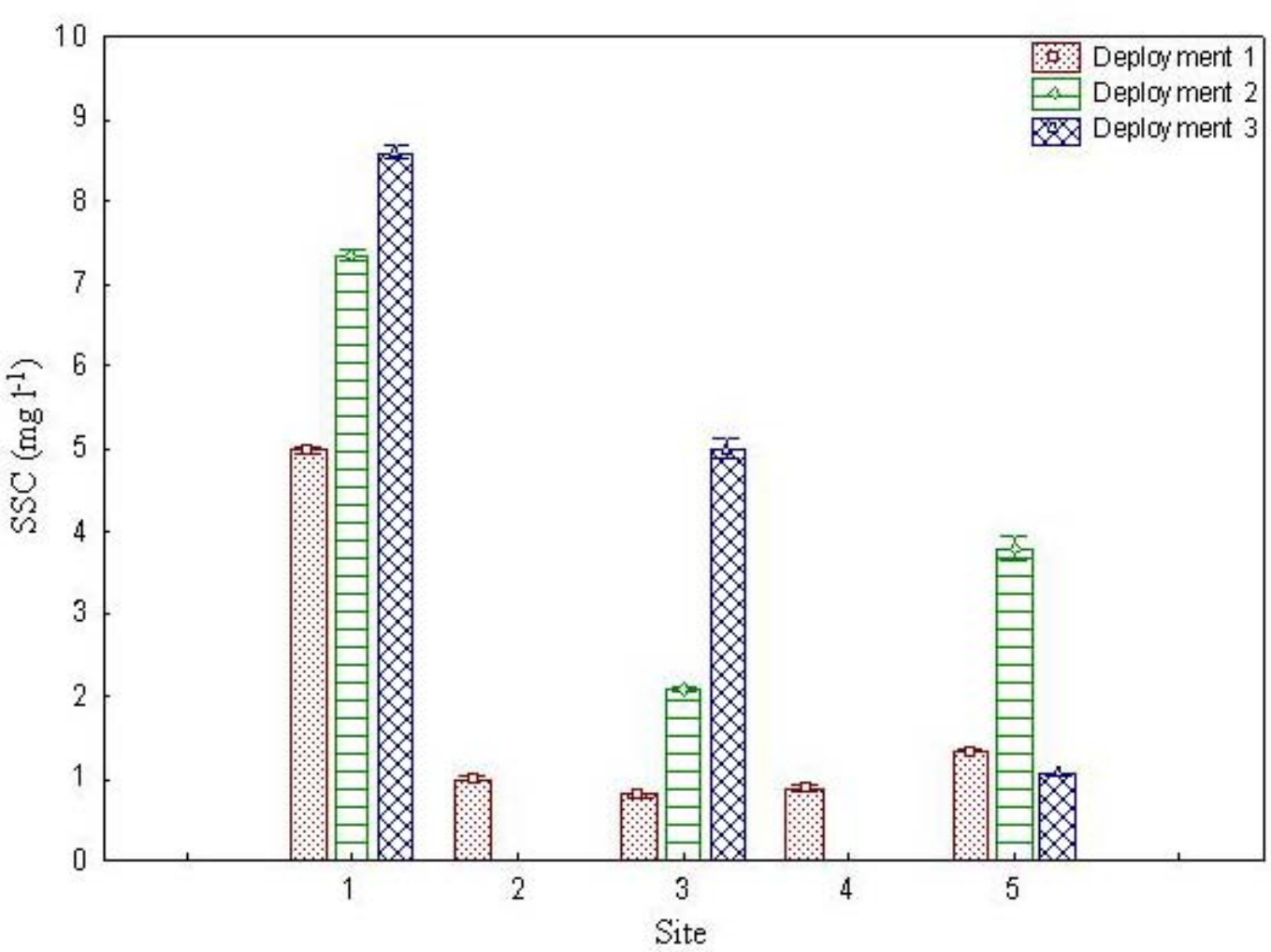
Benthic: Video transects

Coral Recruits: Belt transects .30 X10 m


YSI deployable loggers
SSC, salinity, temperature

Sediment trap
Transplant

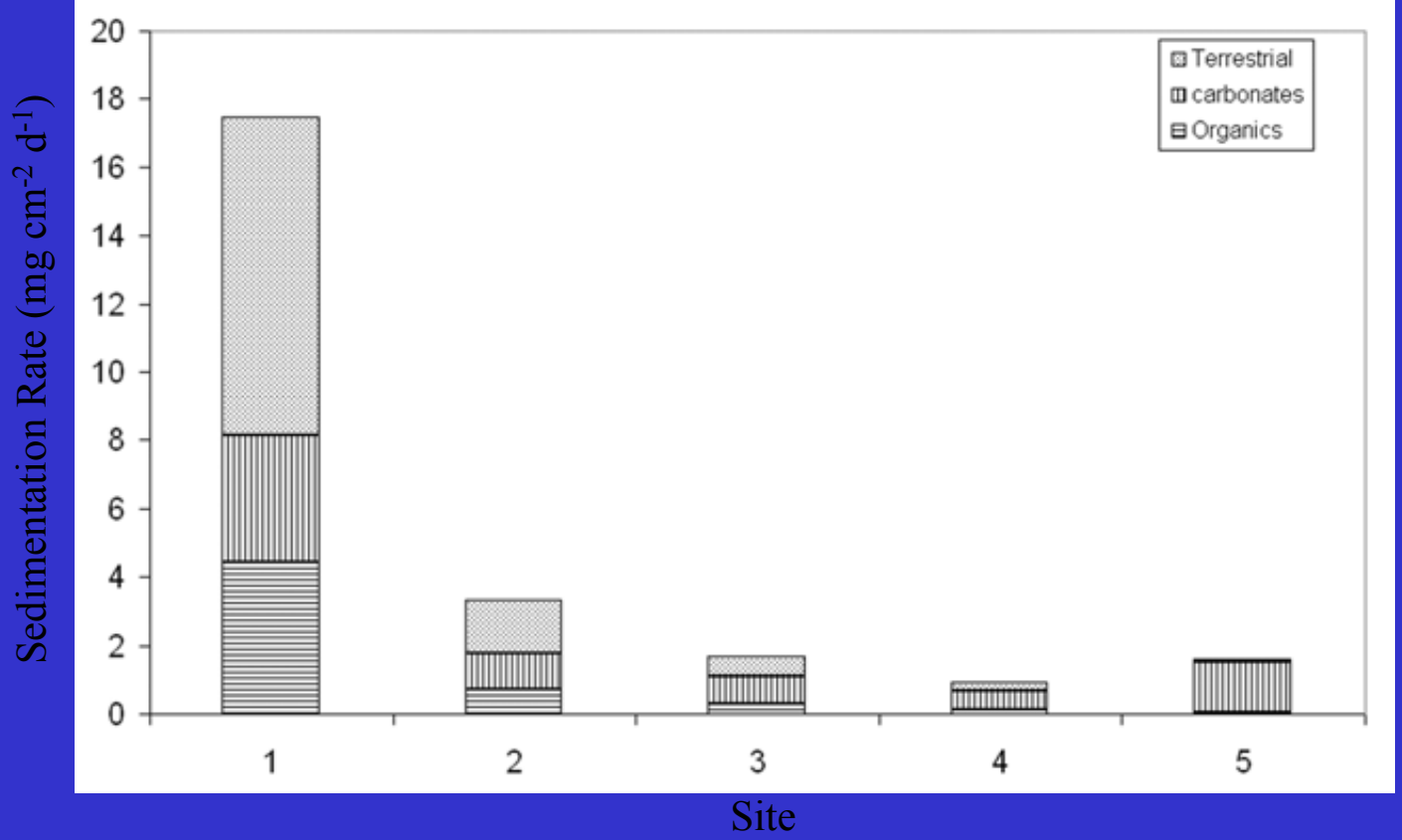
Fabricius (2006) Limnol. Oceanogr. 51: 30-37



SSC decreased from S1-S5 in all deployments

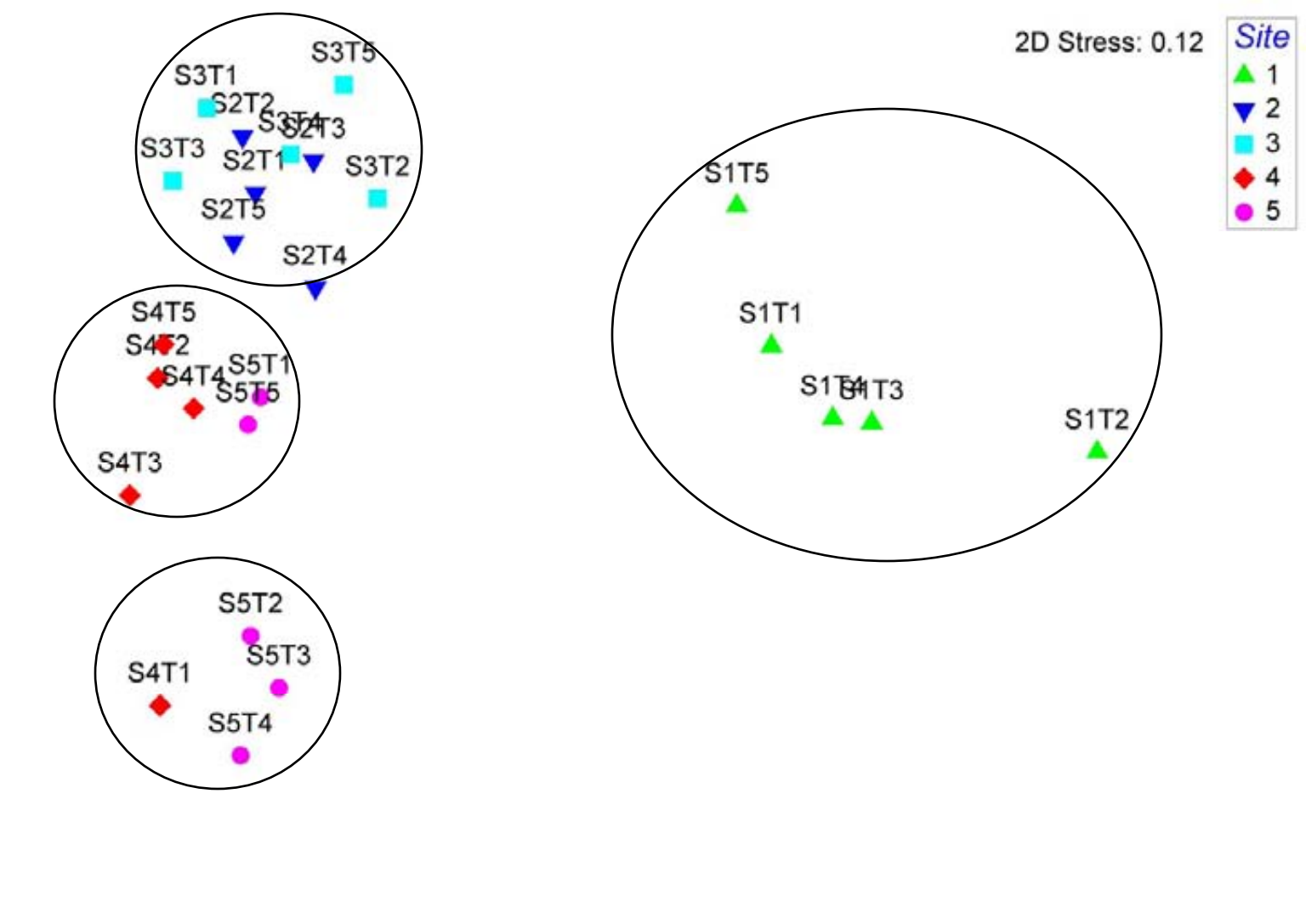
D1 mean SSC decreased by 74% from S1 to S5

D1 max SSC decreased by 87% from S1 to S5



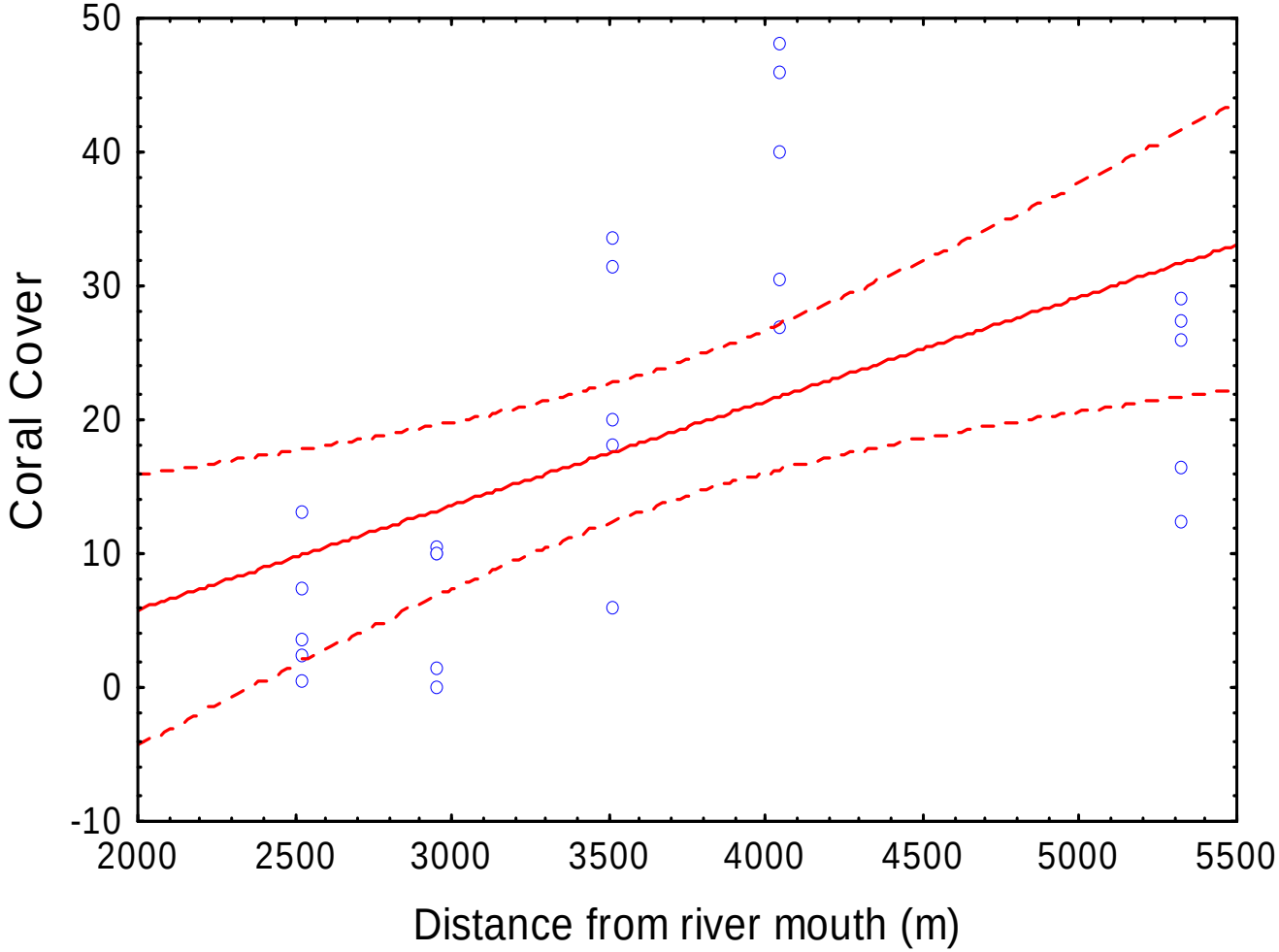
S1-S2 83% decreased

S3-S4 47% decreased



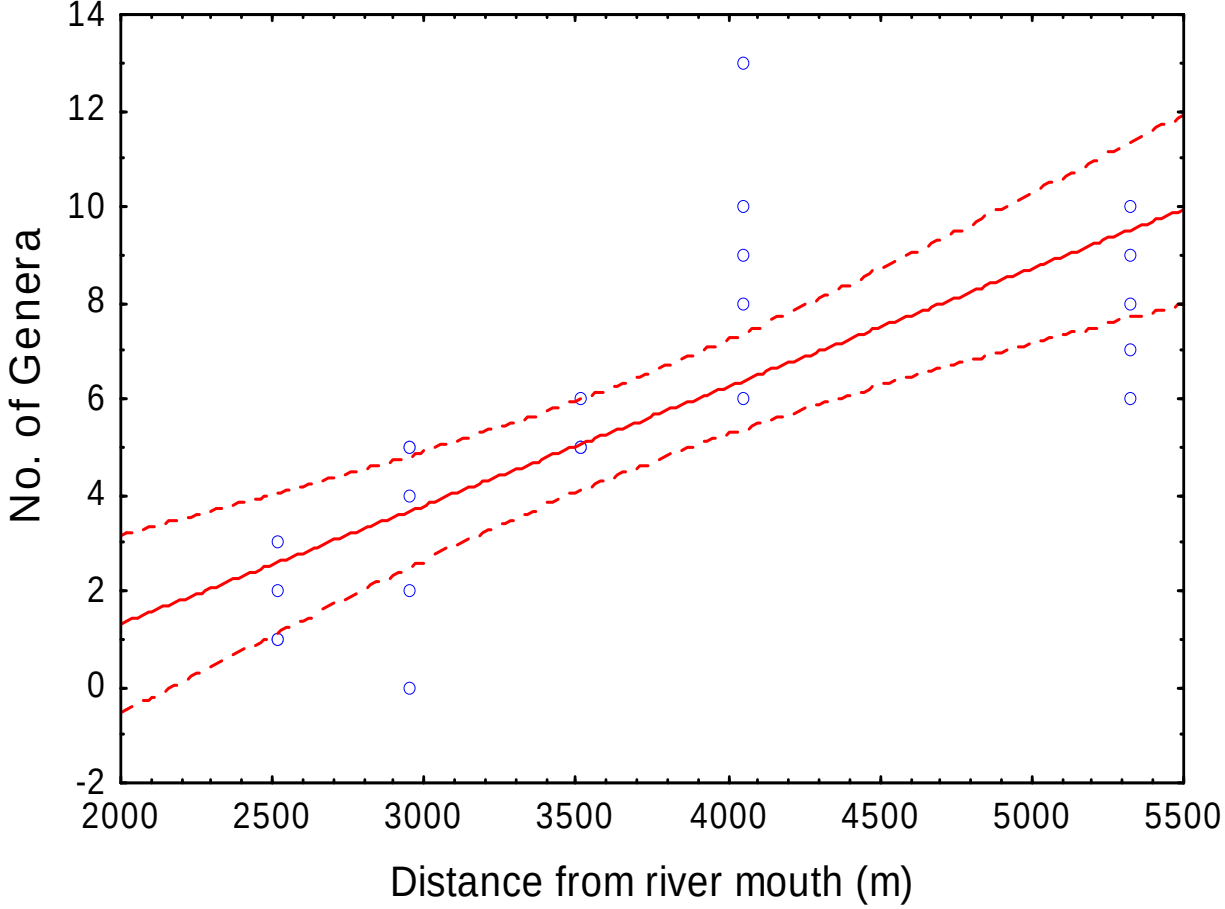
Site 1 dominated by mud-covered substrate

Site 5 dominated by consolidated substrate and coral communities



7% increase every km moving away from river mouth (r^2=0.29, $p<0.05$)

2.6% decrease with every increase of 1 mg l^{-1}SSC (r^2=0.34, $p<0.001$)



2.5 genera/transect with every km moving away from river mouth (r^2=0.55, $p<0.001$)

Reduction of 0.53 genera for every addition of 1 mg cm^{-2} d^{-1} (r^2=0.54, $p<0.001$)

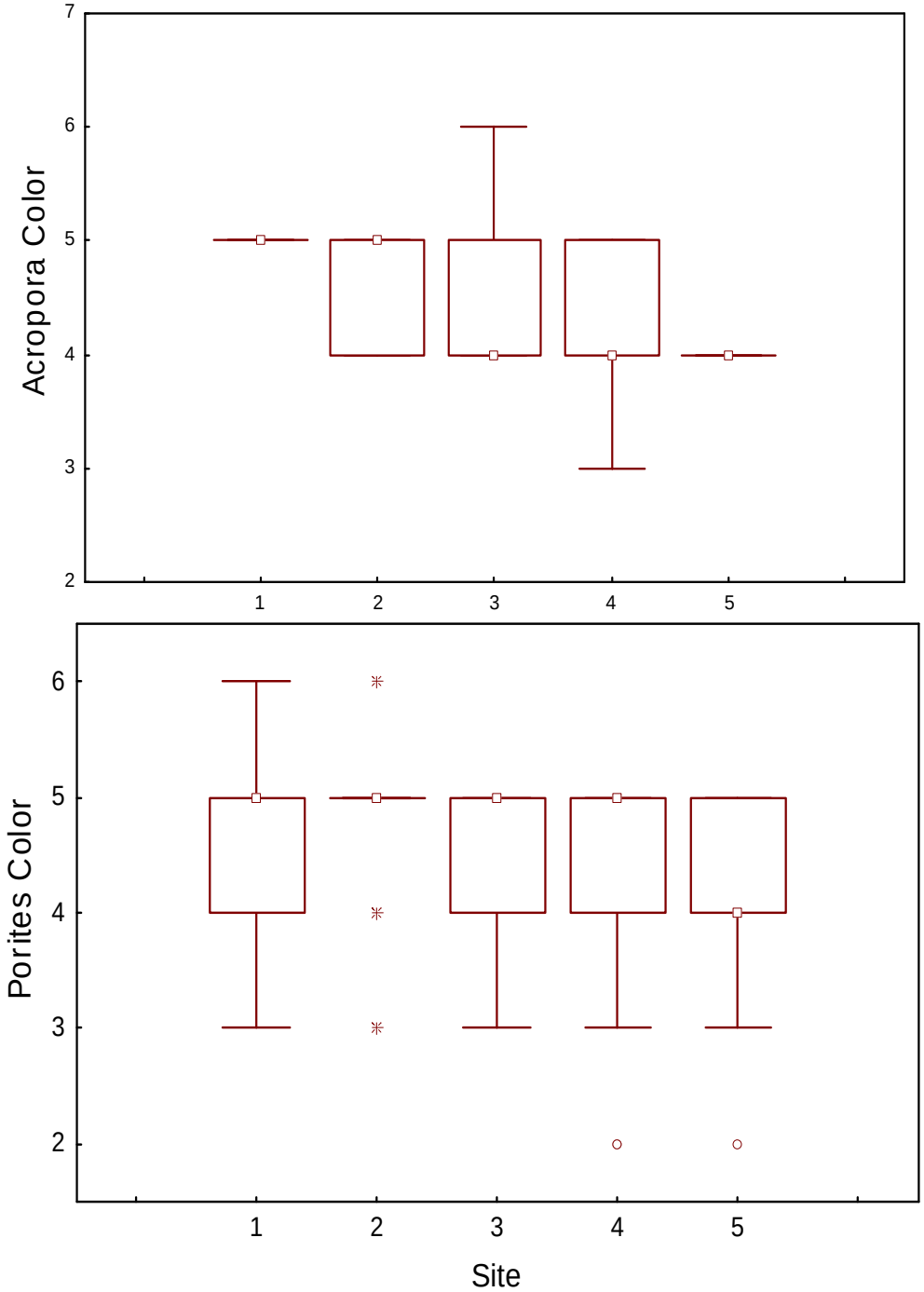
An increase of 3.2 recruits m^{-2} for every km (away from river mouth) (r^2=0.66, $p<0.001$)

0.49 recruits m^{-2} decrease with every 1 mg cm^{-2} d^{-1} increase in SR (r^2=0.33, $p<0.001$)

Acropora mortality higher than *Porites* at all sites

No significant difference in morality of transplants among the five sites

No significant difference in growth of transplants among the five sites


Acropora Color
7
6
5
4
3
2
1
2
3
4
5
Porites Color
6
5
4
3
2
1
2
3
4
5
Site

Summary

Clear gradients: coral reef communities, recruit density and diversity, *Acropora* color

No difference: survival and growth of transplants

Transplants may have 'escaped' post-settlement mortality through sedimentation stress because of their large initial size

Significant relationships between coral reef community parameters and sedimentation and SSC

No significant relationship between coral reef community parameters and salinity

Conclusions

Transplant growth and survival may not be good indicators of reef health at the time scale of the study

Community composition, coral diversity, recruit density and diversity and transplants color were the most sensitive indicators of exposures to terrestrial influences

Recruitment processes are important in shaping the the coral community structure

Acknowledgements

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