An underwater photograph of a coral reef. The image shows a clear gradient of coral health and structure from left to right. On the left, the coral is mostly white and blue, indicating bleaching or death. In the center, there are some brown and orange corals, showing signs of stress. On the right, the coral is vibrant and diverse in color, including greens, yellows, and oranges, representing a healthy and diverse assemblage. The water is clear and blue, and the overall scene illustrates the impact of water quality on coral reef health.

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

Y. Golbuu, K. Fabricius, R.H. Richmond R. van Woesik

An underwater photograph of a coral reef. The water is murky and greenish, indicating sedimentation. The coral structures are heavily covered in a thick layer of brown and grey sediment, obscuring their natural colors and textures. Some white coral structures are visible in the lower right, but they are also partially covered in sediment. The overall scene depicts a degraded reef environment.

Sedimentation is one of the major issues facing coral reefs

Palau and many Pacific Islands

steep topography

highly erodable soil

high rainfall

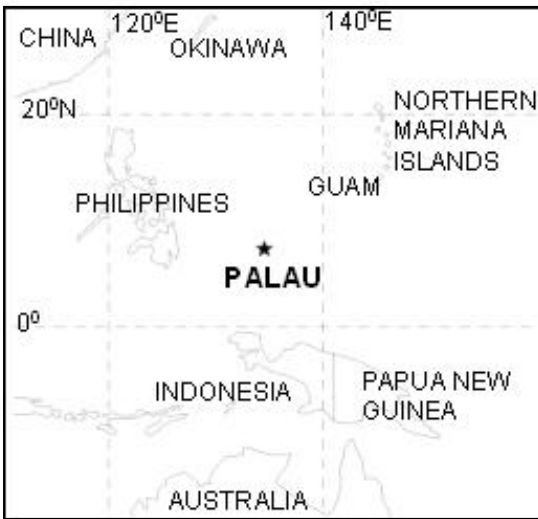
increasing land-use change

Rationale

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

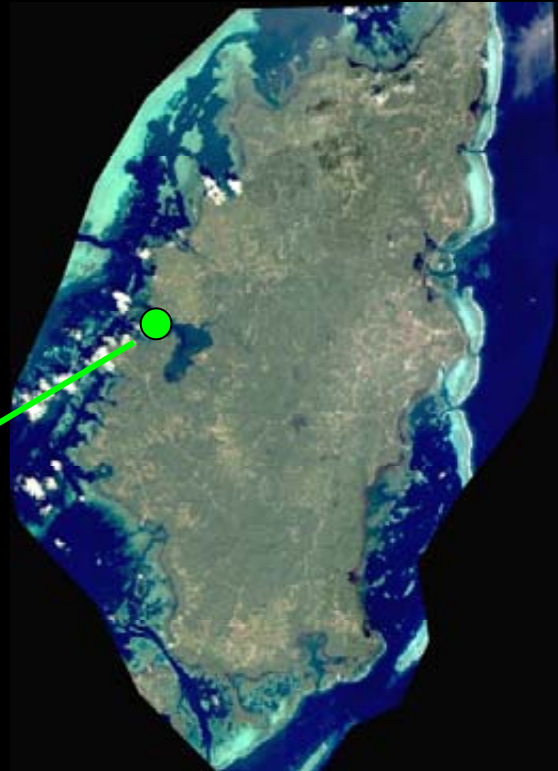
Objectives

- (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



Study Site







Benthic: Video transects

Coral Recruits: Belt transects .30 X10 m



YSI deployable loggers
SSC, salinity, temperature

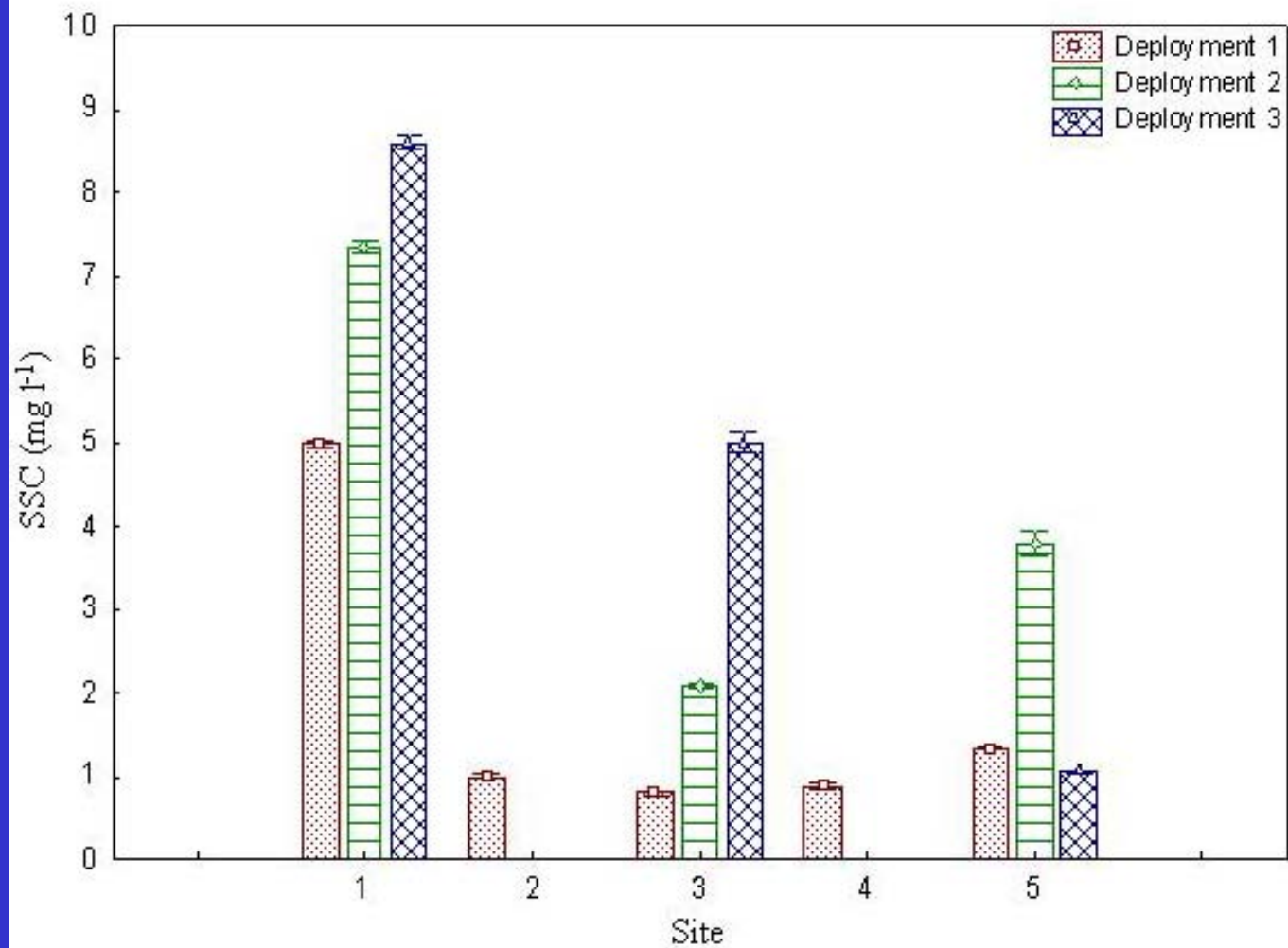


Sediment trap

Transplant



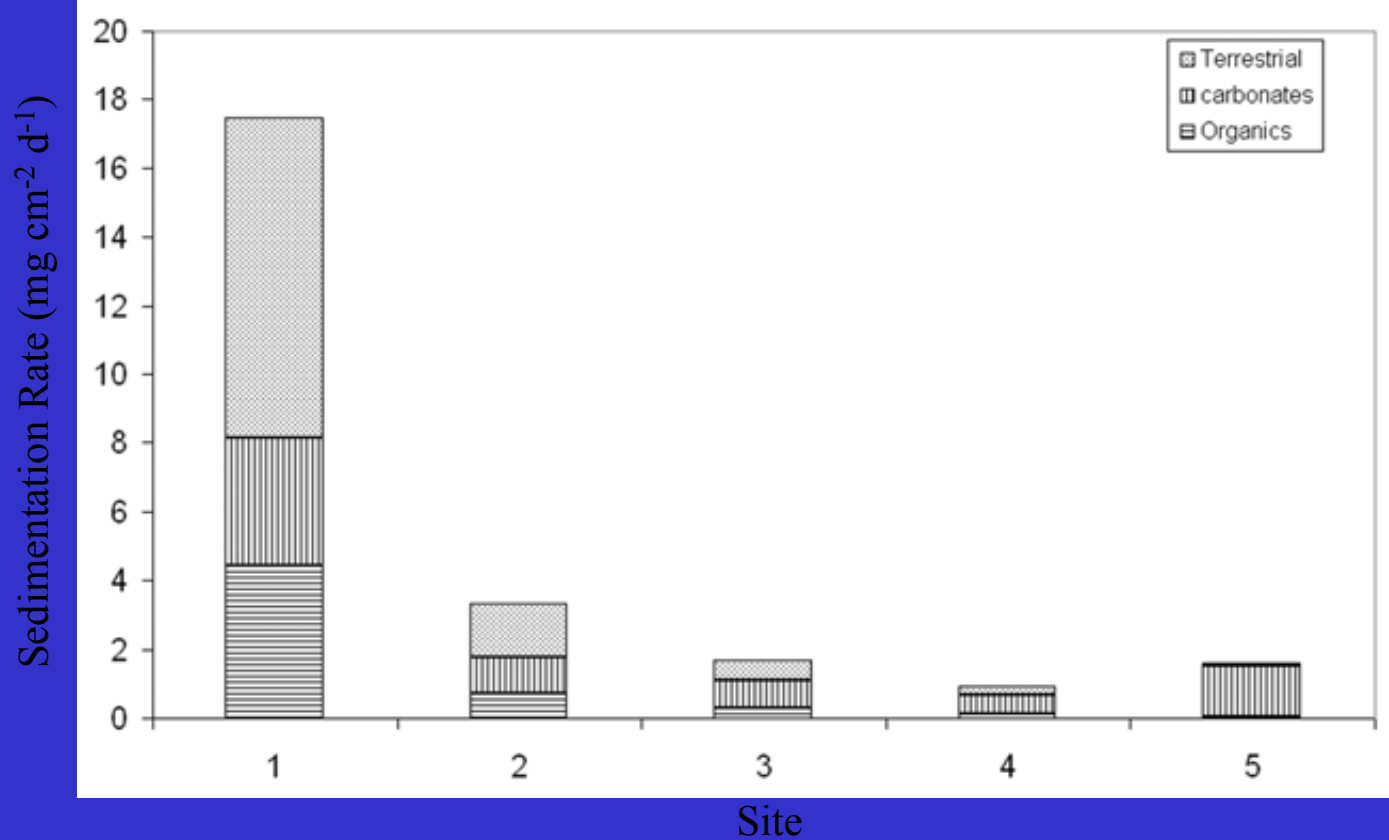
Fabricius (2006) *Limnol. Oceanogr.* 51: 30-37



SSC decreased from S1-S5 in all deployments

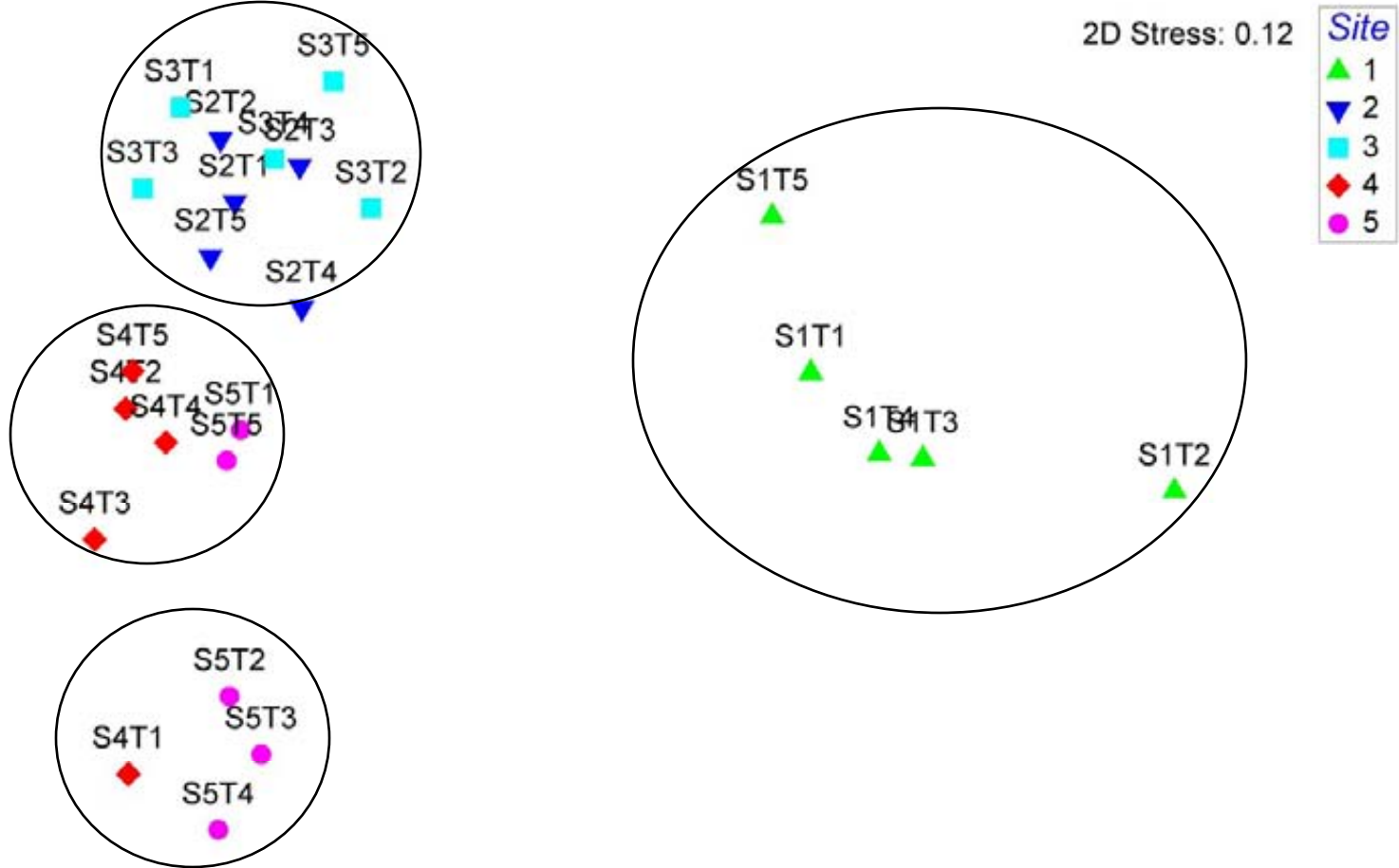
D1 mean SSC decreased by 74% from S1 to S5

D1 max SSC decreased by 87% from S1 to S5



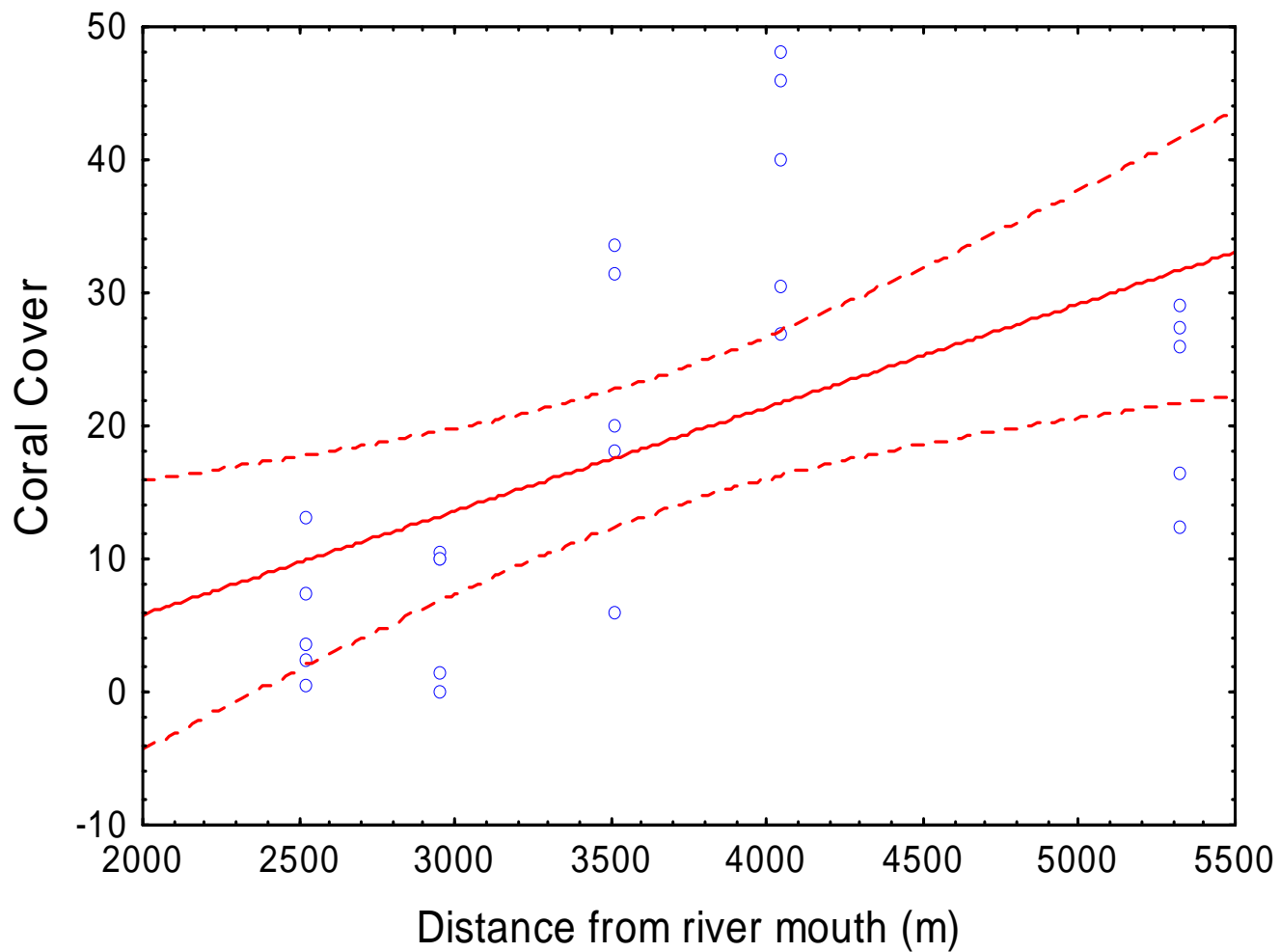
S1-S2 83% decreased

S3-S4 47% decreased



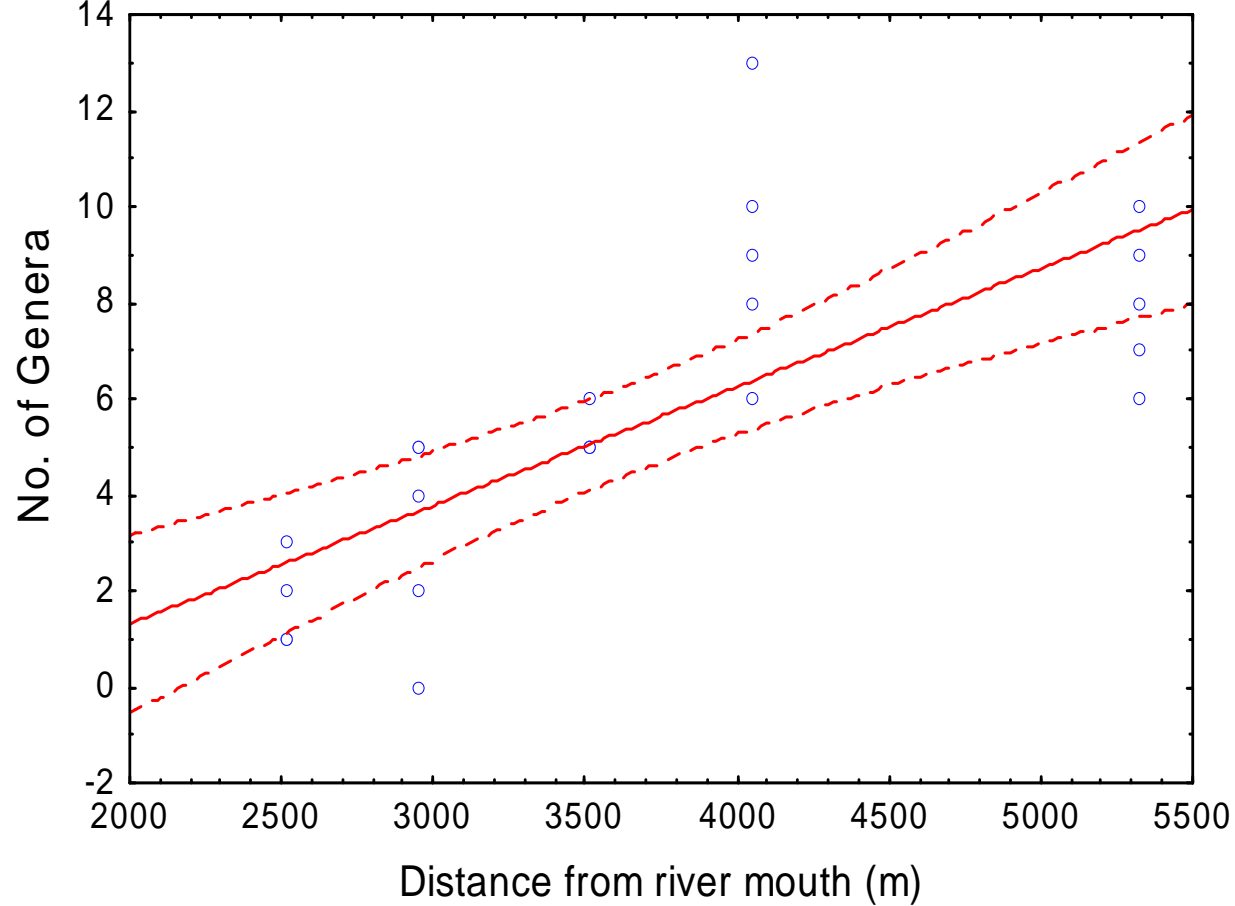
Site 1 dominated by mud-covered substrate

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 $1 \text{ mg cm}^{-2} \text{ d}^{-1}$
($r^2=0.54$, $p<0.001$)



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

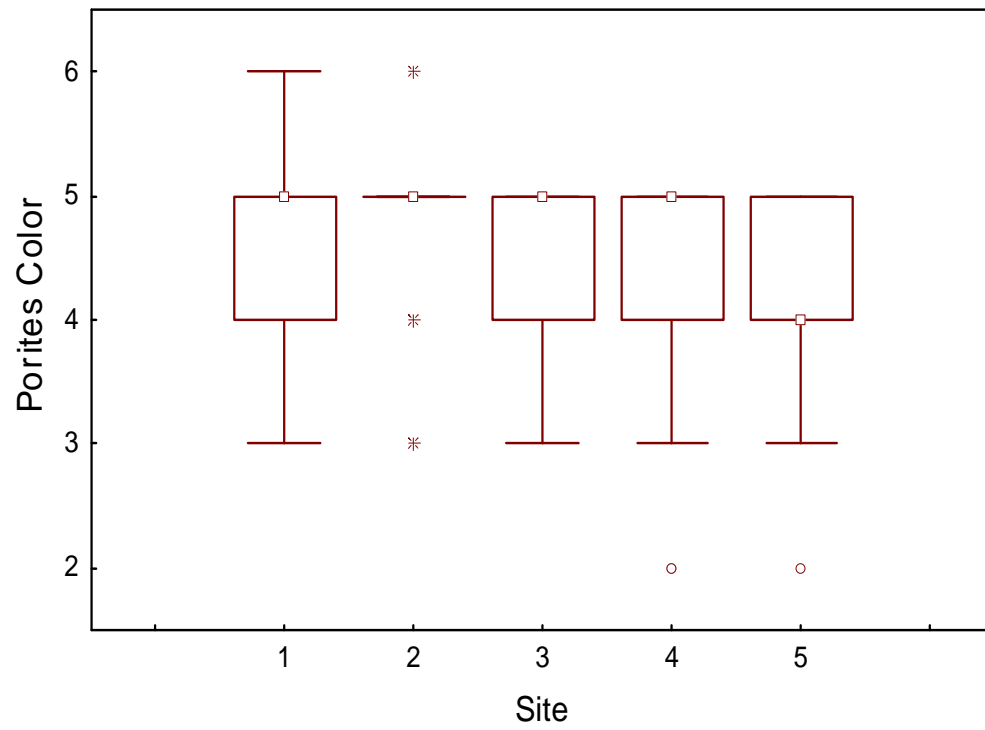
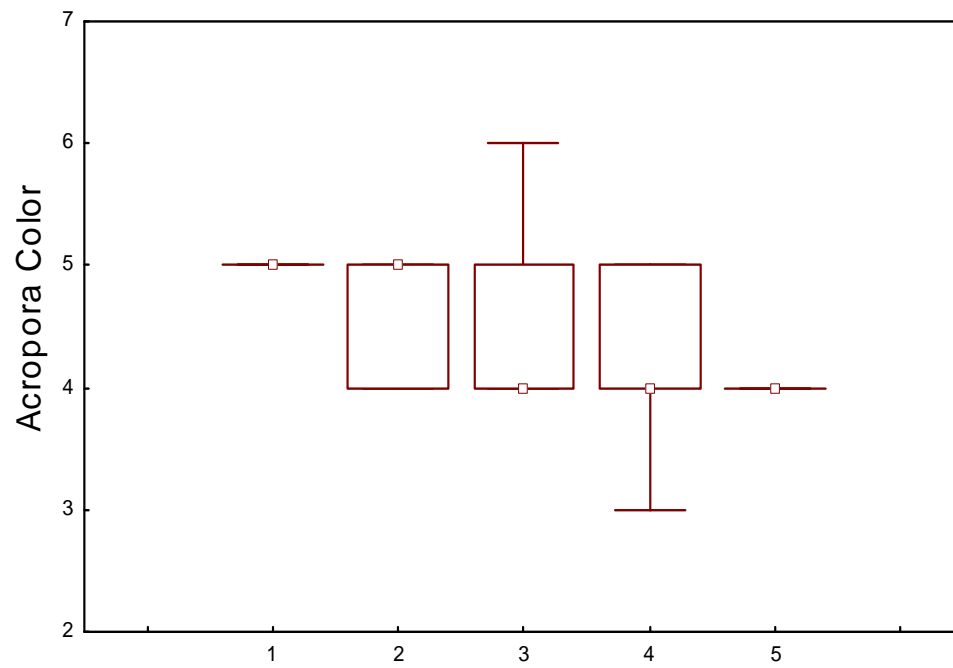
0.49 recruits m^{-2} decrease with every 1 $mg\ cm^{-2}\ d^{-1}$ increase in SR
($r^2=0.33$, $p<0.001$)

An underwater photograph showing a seabed covered in dark, greenish-brown sediment. Several small, cylindrical coral transplants are visible, some with bright green centers. A white tag with blue markings is attached to one of the transplants on the right side. The text is overlaid on the image in white.

Acropora mortality higher than *Porites* at all sites

No significant difference in mortality of transplants among the five sites

No significant difference in growth of transplants among the five sites





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

NOAA Coastal Oceans Program (CRES
Grant A160P2920)

Packard EBM

Palau International Coral Reef Center