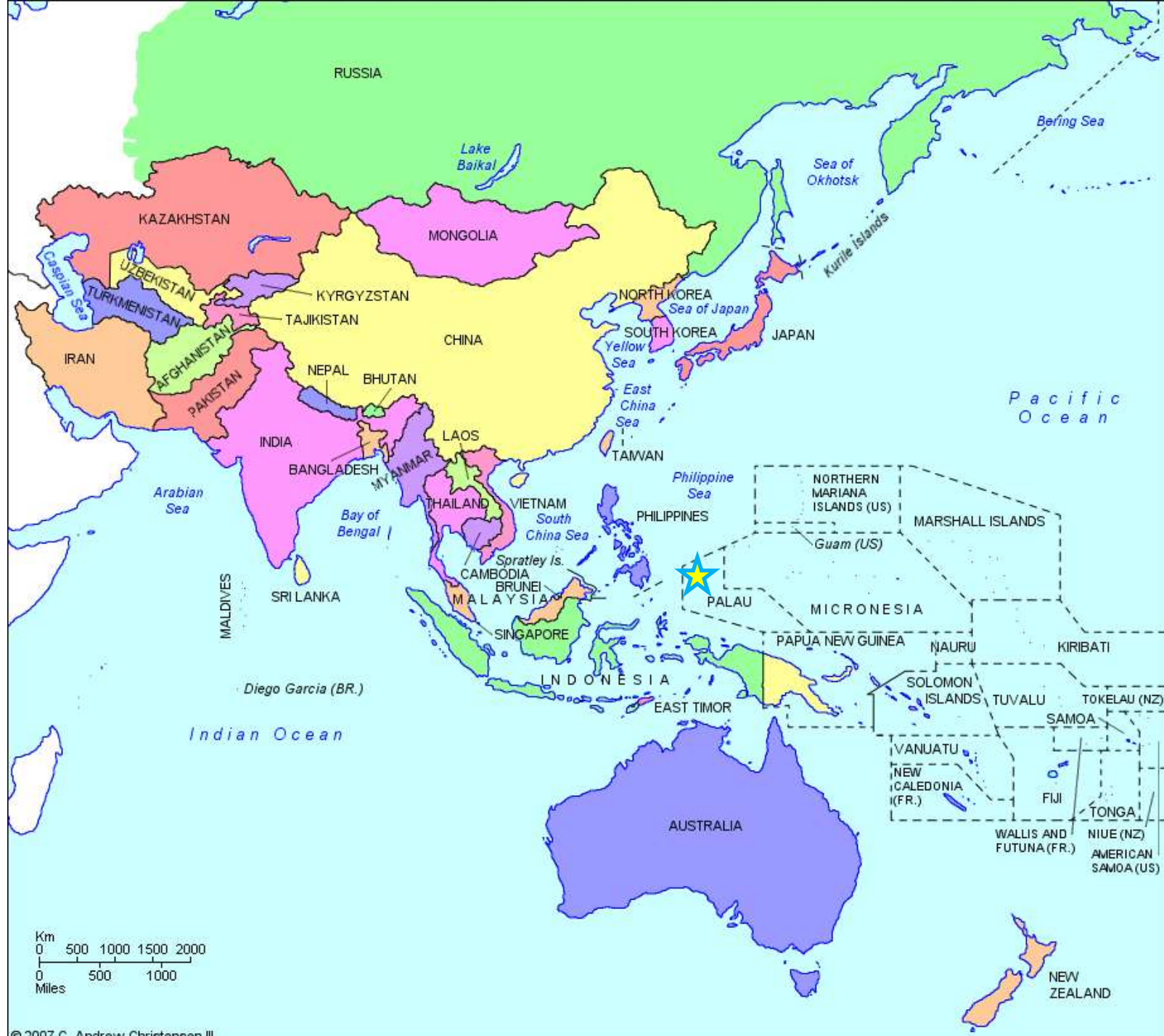


The Status of Palau's Marine Protected Areas And the Protected Areas Network

Kevin Polloi

Palau International Coral Reef Center





Ngerukewid Island Preserve

Established 1956

NO ENTRY



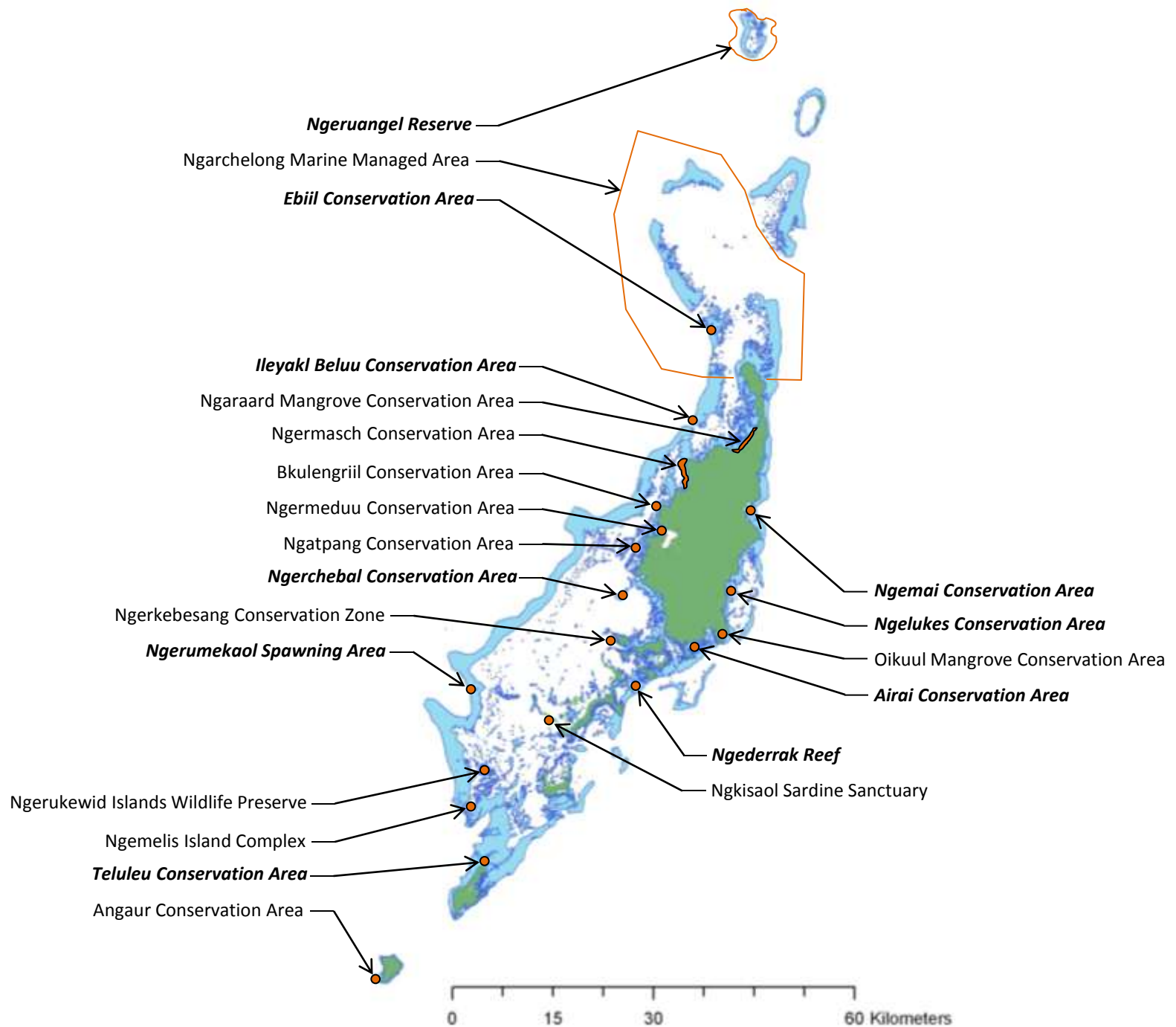


Ngerumekaol Spawning Area

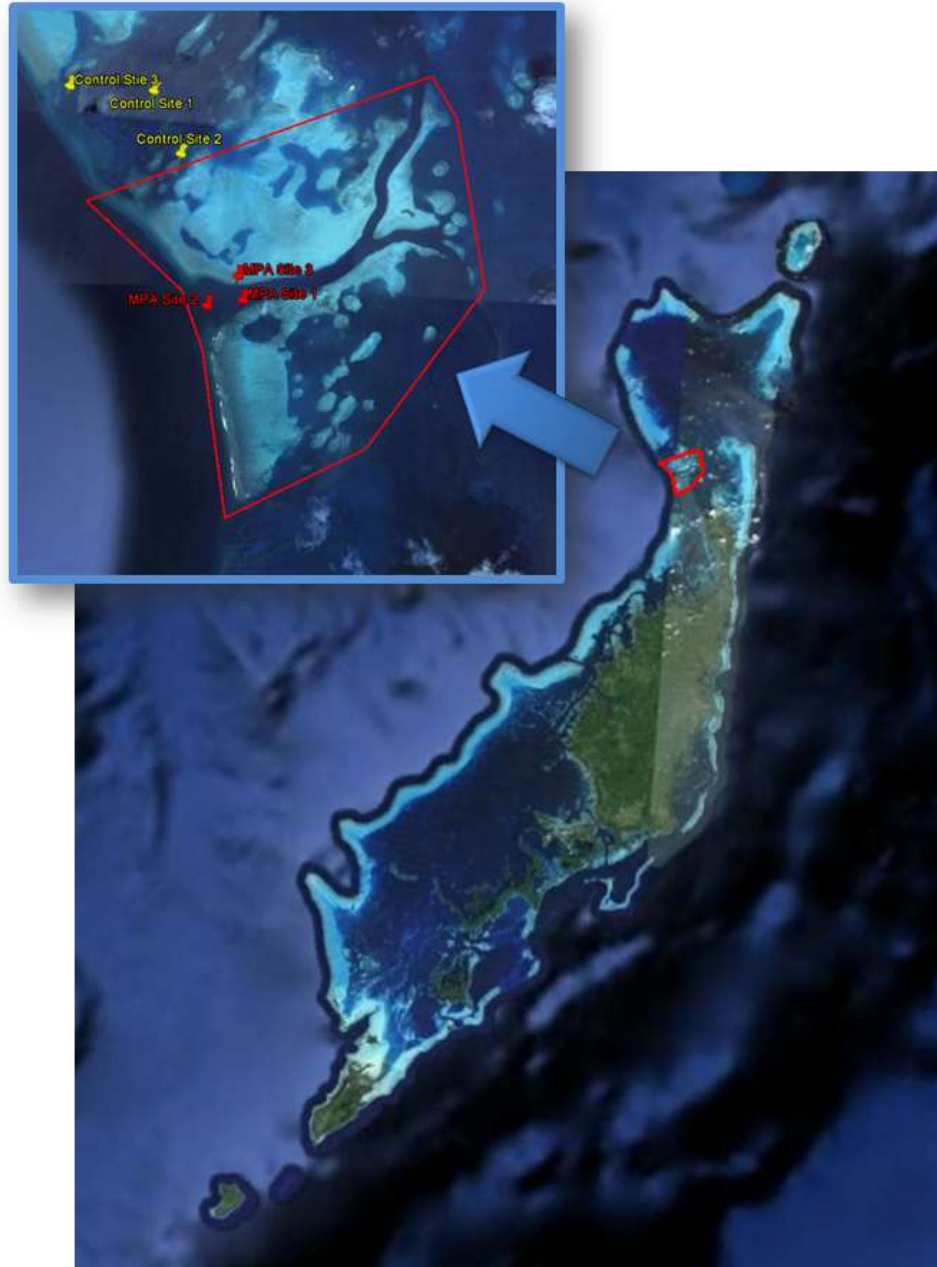
Established 1976

3.5 sq. mi.

NO TAKE



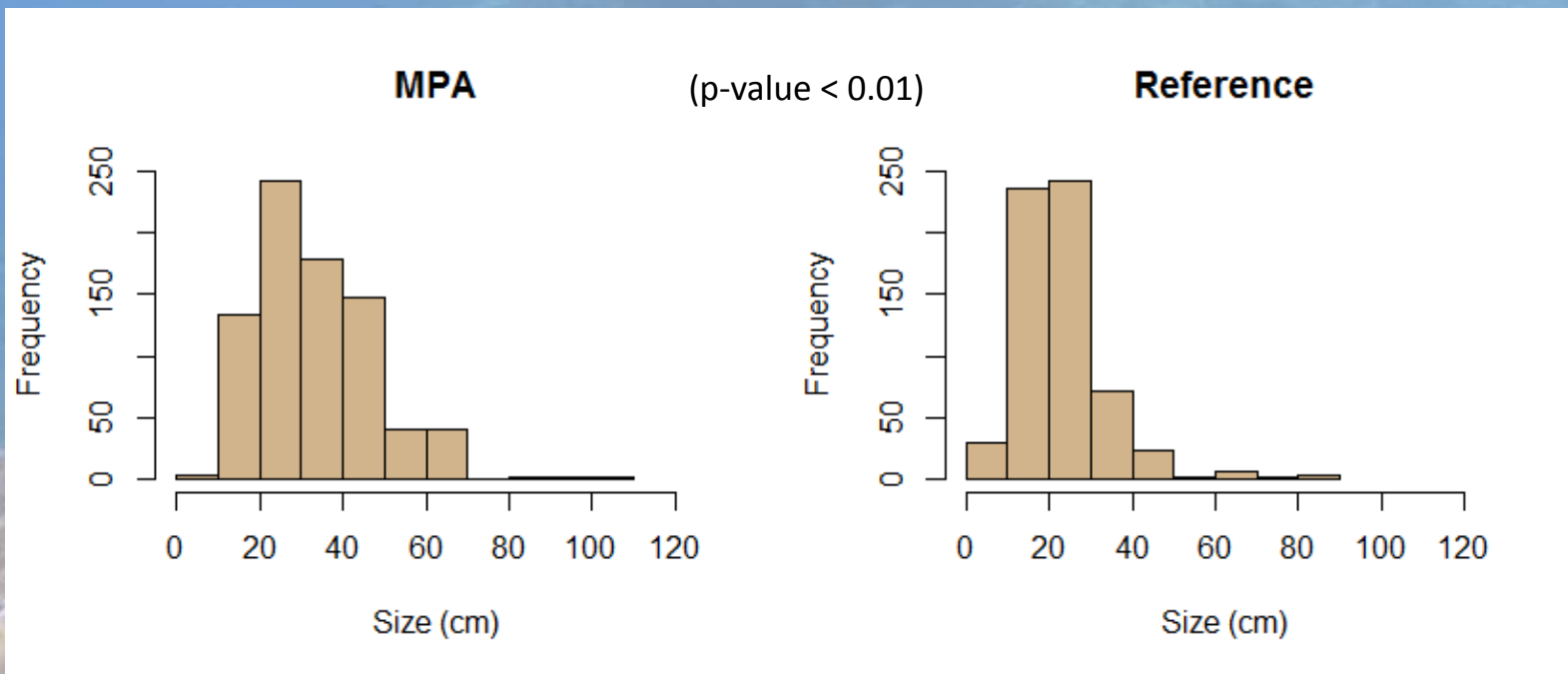
Ebiil Conservation Area



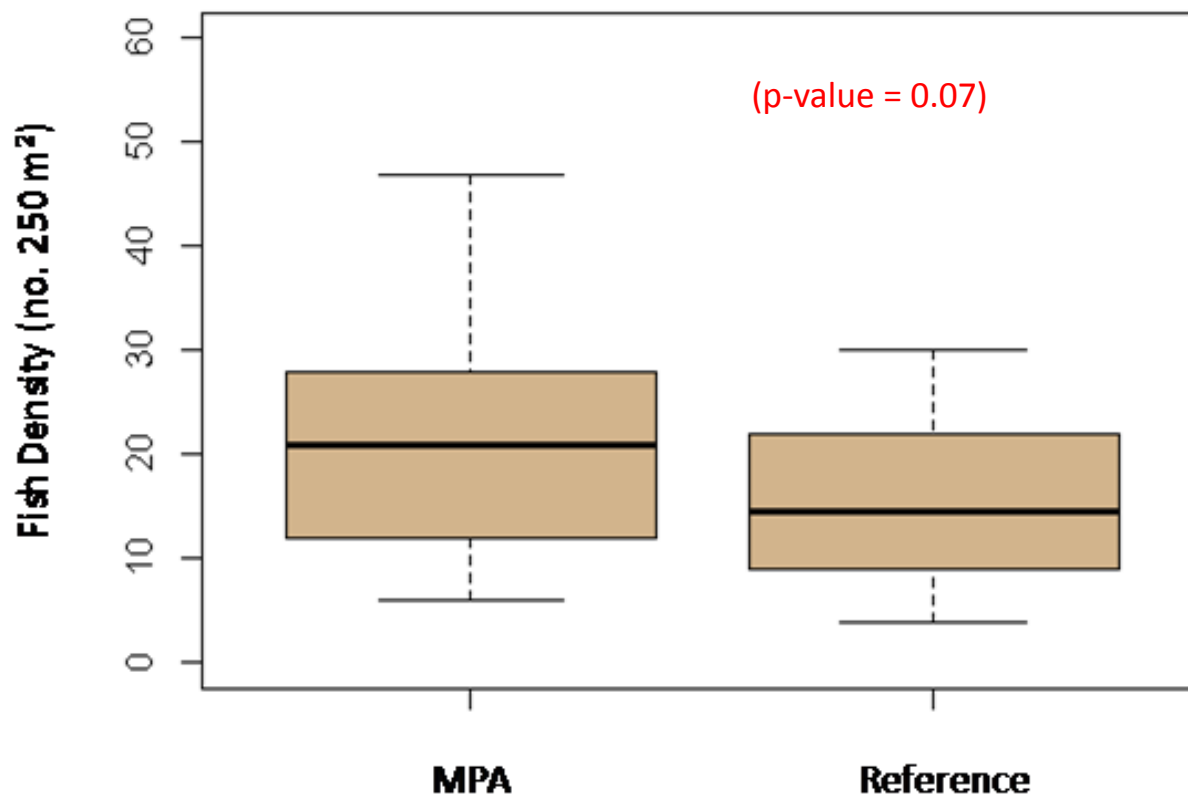
Established 1999

19.1 sq. km.

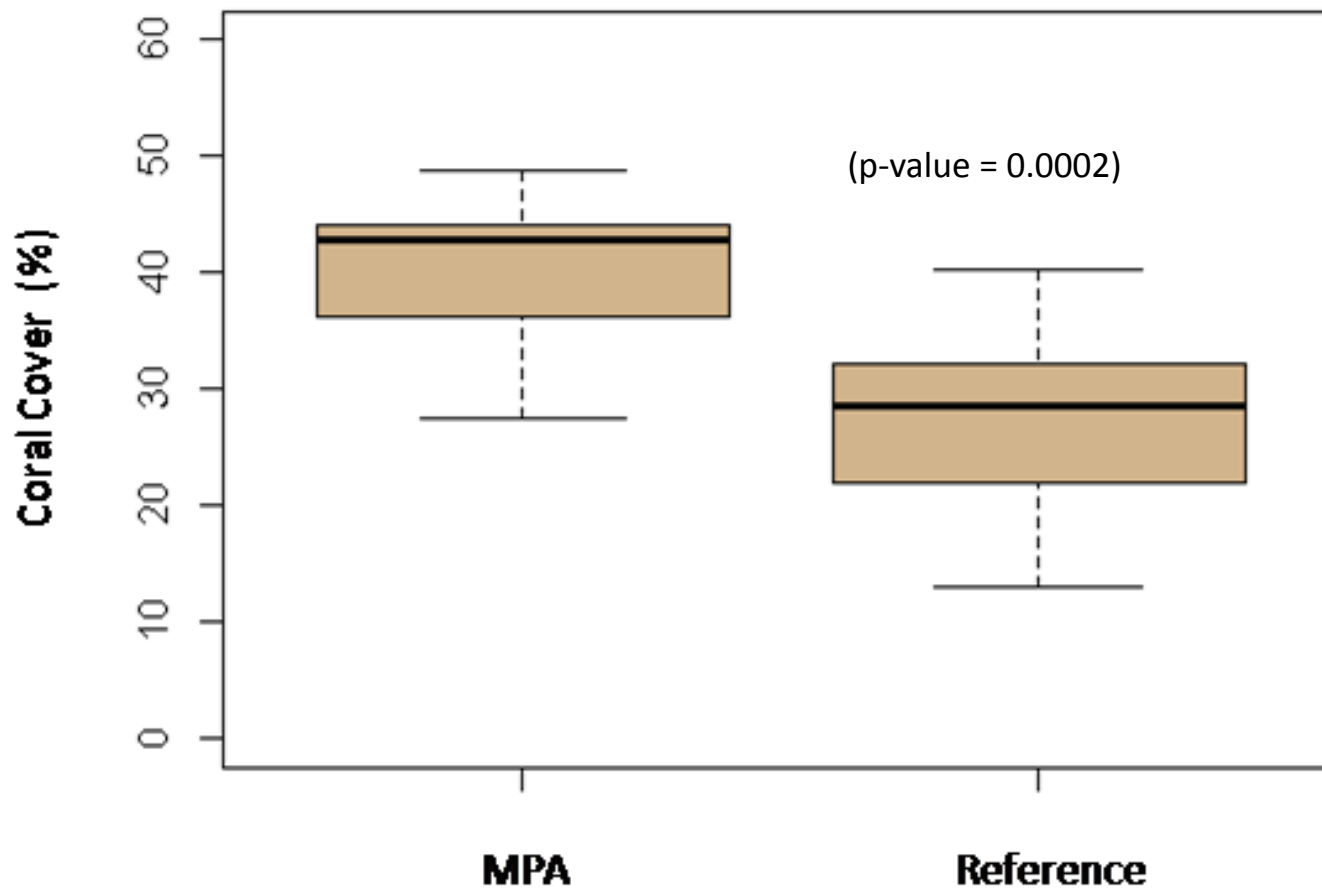
NO ENTRY



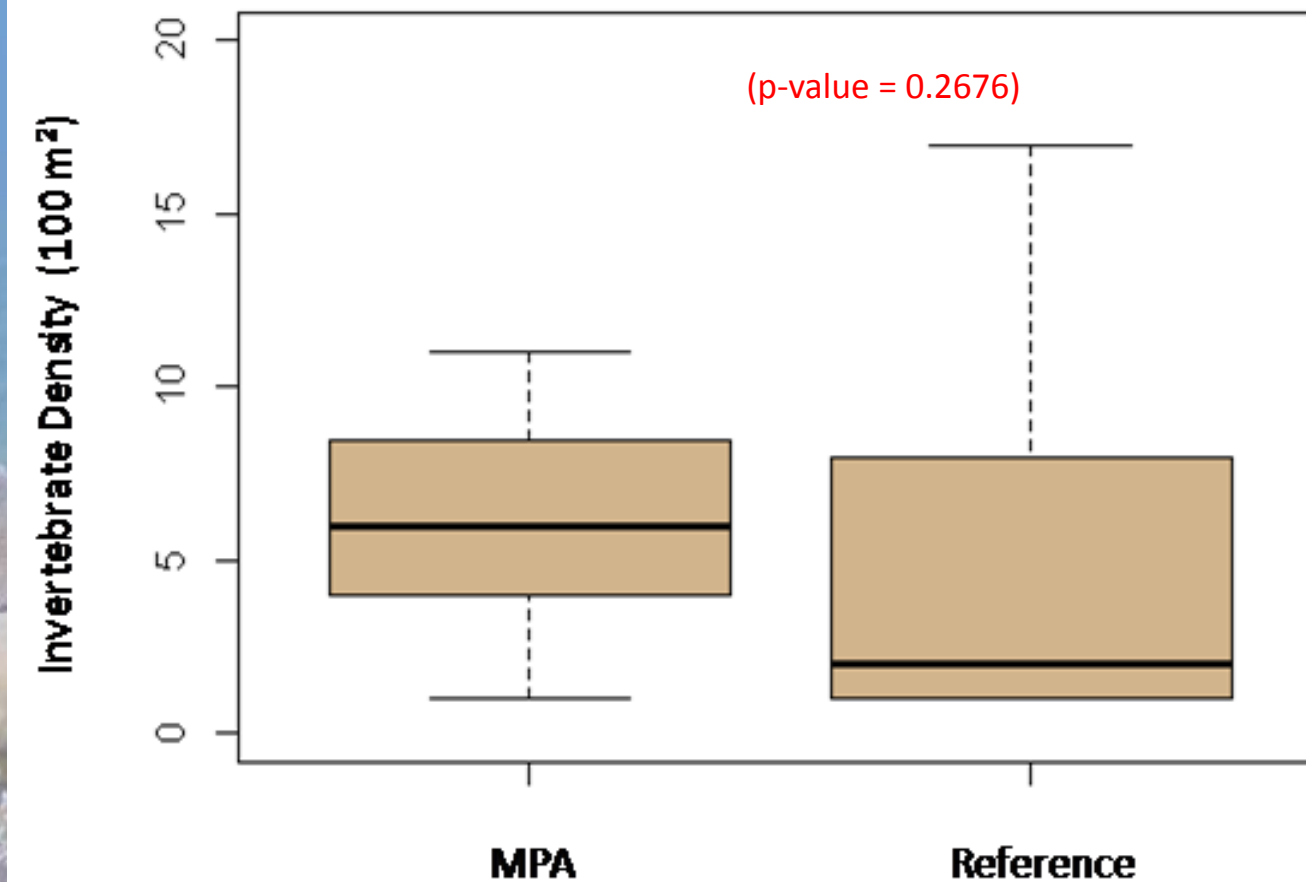
Fish Size Comparison - Ebiil marine protected area and the reference site



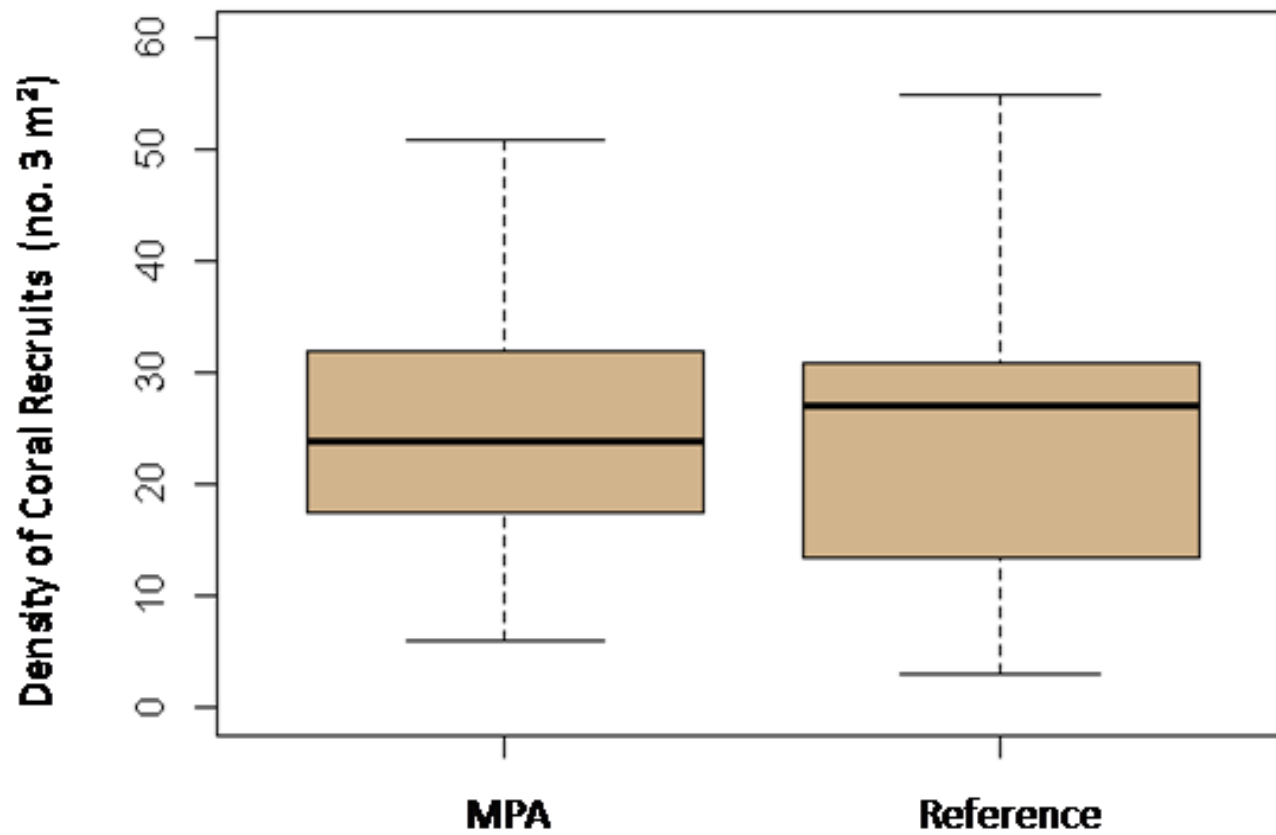
Fish Density Comparison - Ebiil marine protected area and the reference site



Coral Cover Comparison - Ebiil marine protected area and the reference site



Invertebrate Density - Ebiil marine protected area and the reference site

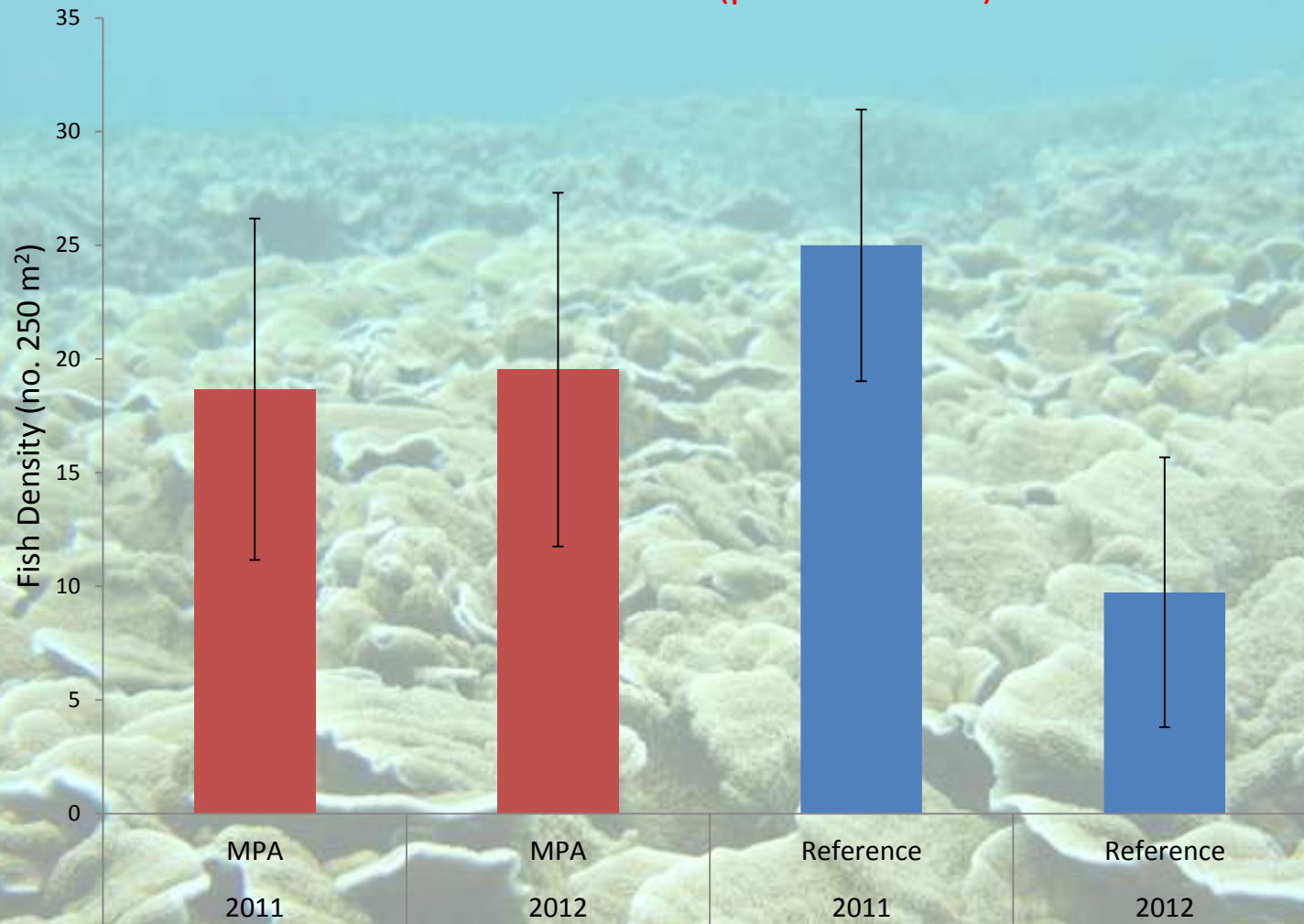


Coral Recruits - Ebiil marine protected area and the reference site

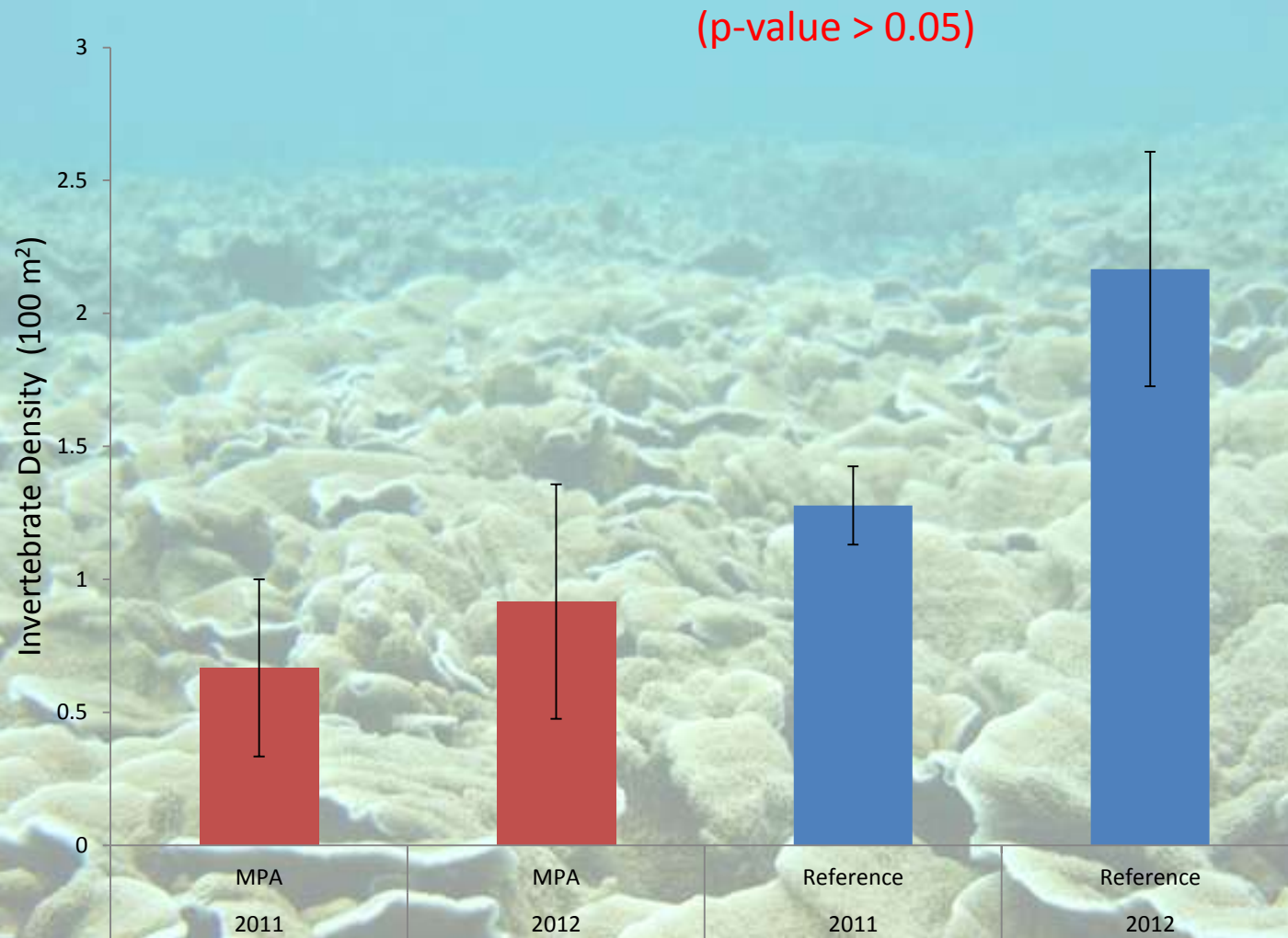
Ngemai Conservation Area



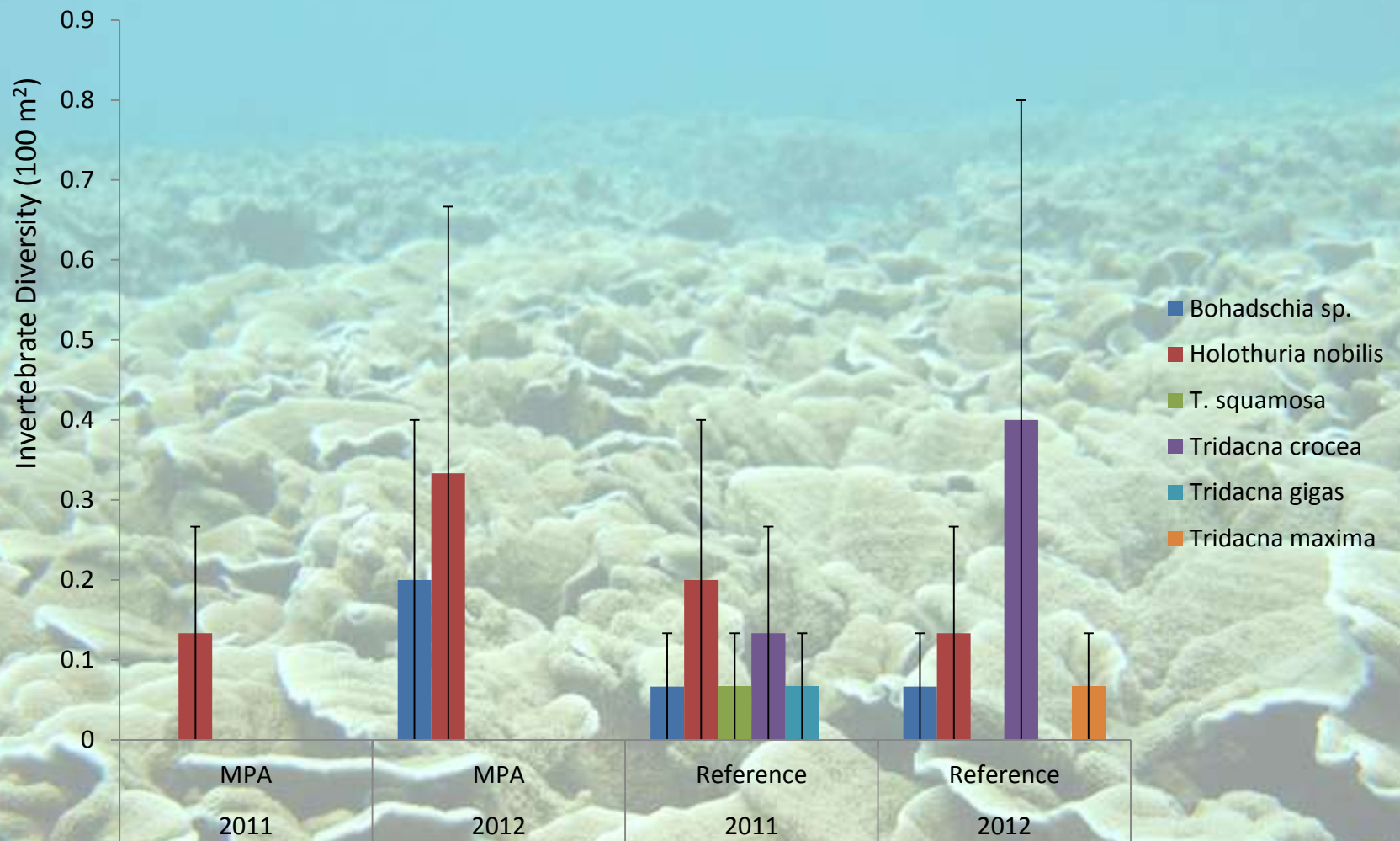
(p-value > 0.05)



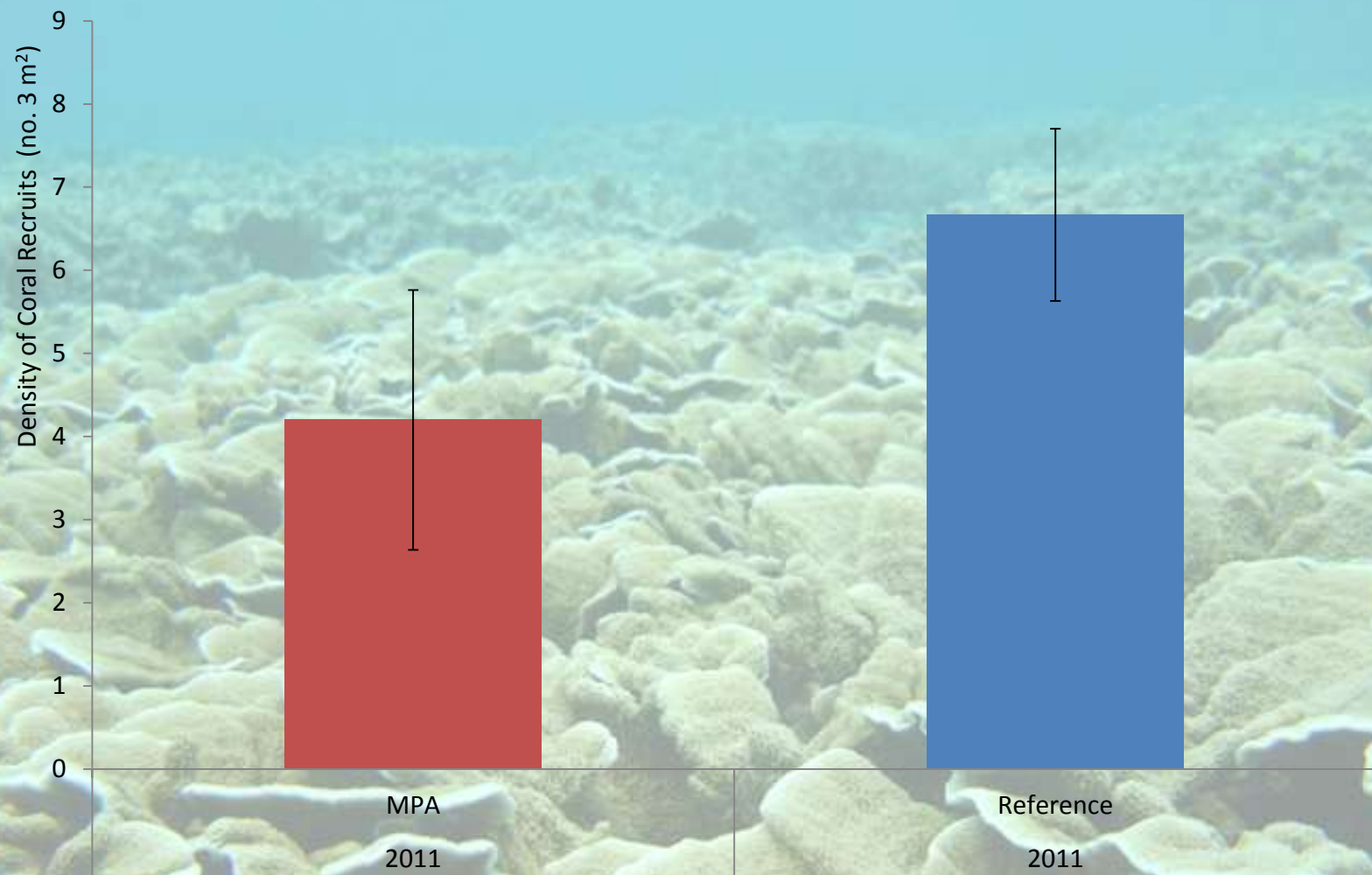
Fish density in Ngemai MPA and reference site in 2011-2012.



Invertebrate Density in Ngemai MPA and reference site in 2011-2012.



Invertebrate Density by Species



Coral Recruit Density

Ngedebus Island

N

TC2.1

Teluleu Conservation Area

TI3.1

TI2.1

TC3.1

TI1.1

Peleliu State

TC1.1

Established 2001

0.83 sq. km.

NO TAKE

Image © 2011 DigitalGlobe

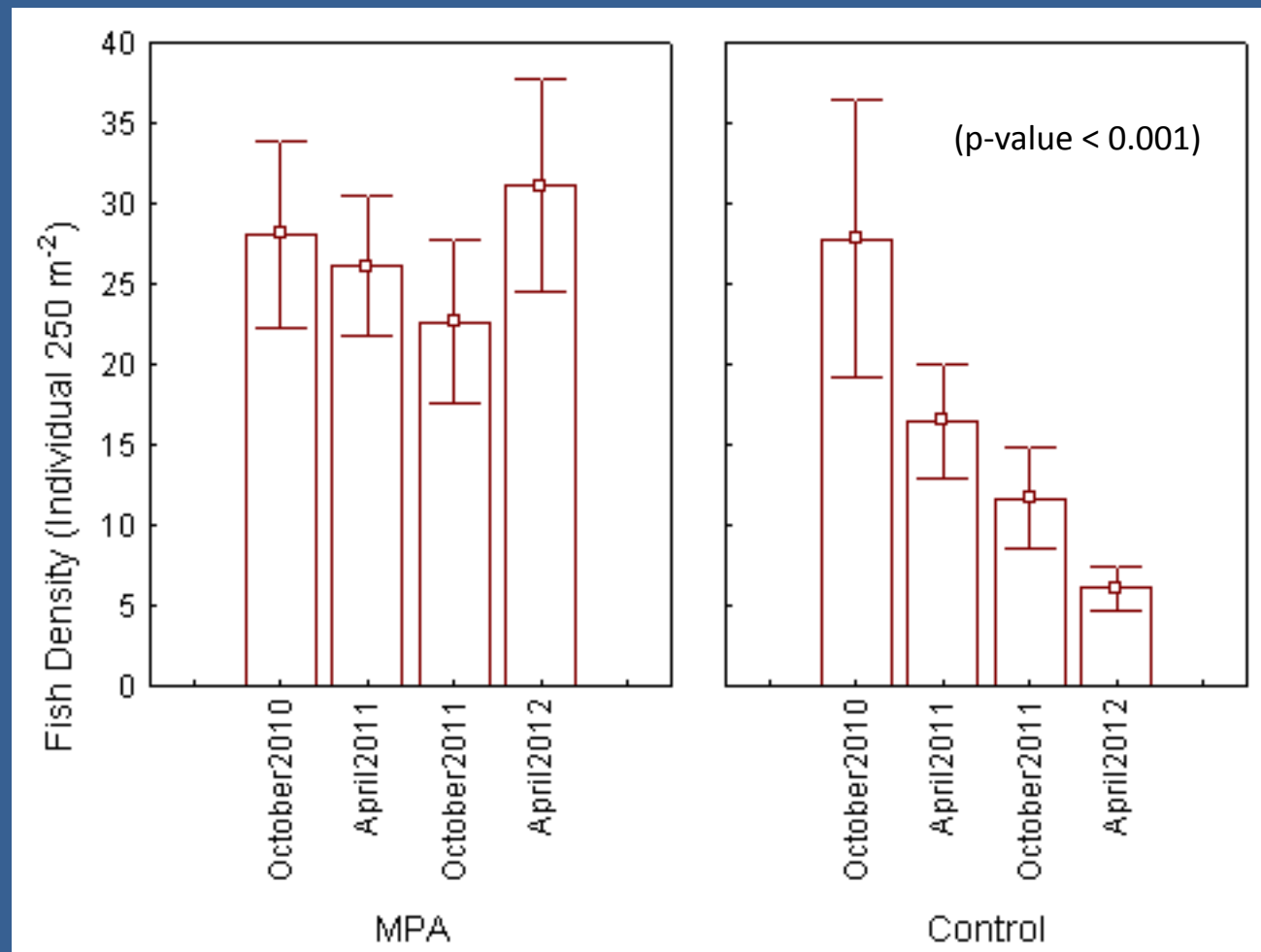
2069 ft

©2009 Google

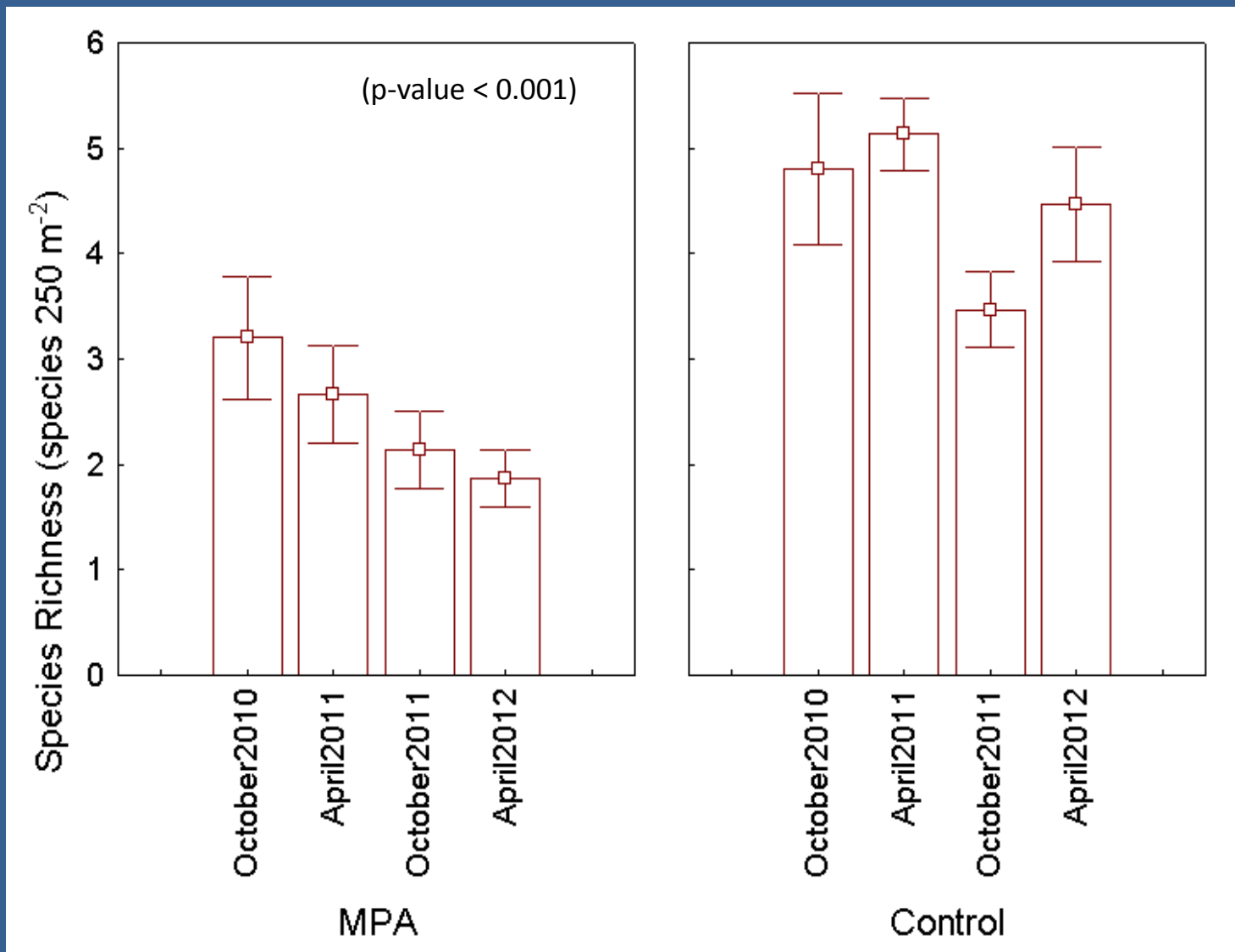
Imagery Date: Feb 27, 2006

7° 2.864' N 134° 16.318' E elev 0 ft

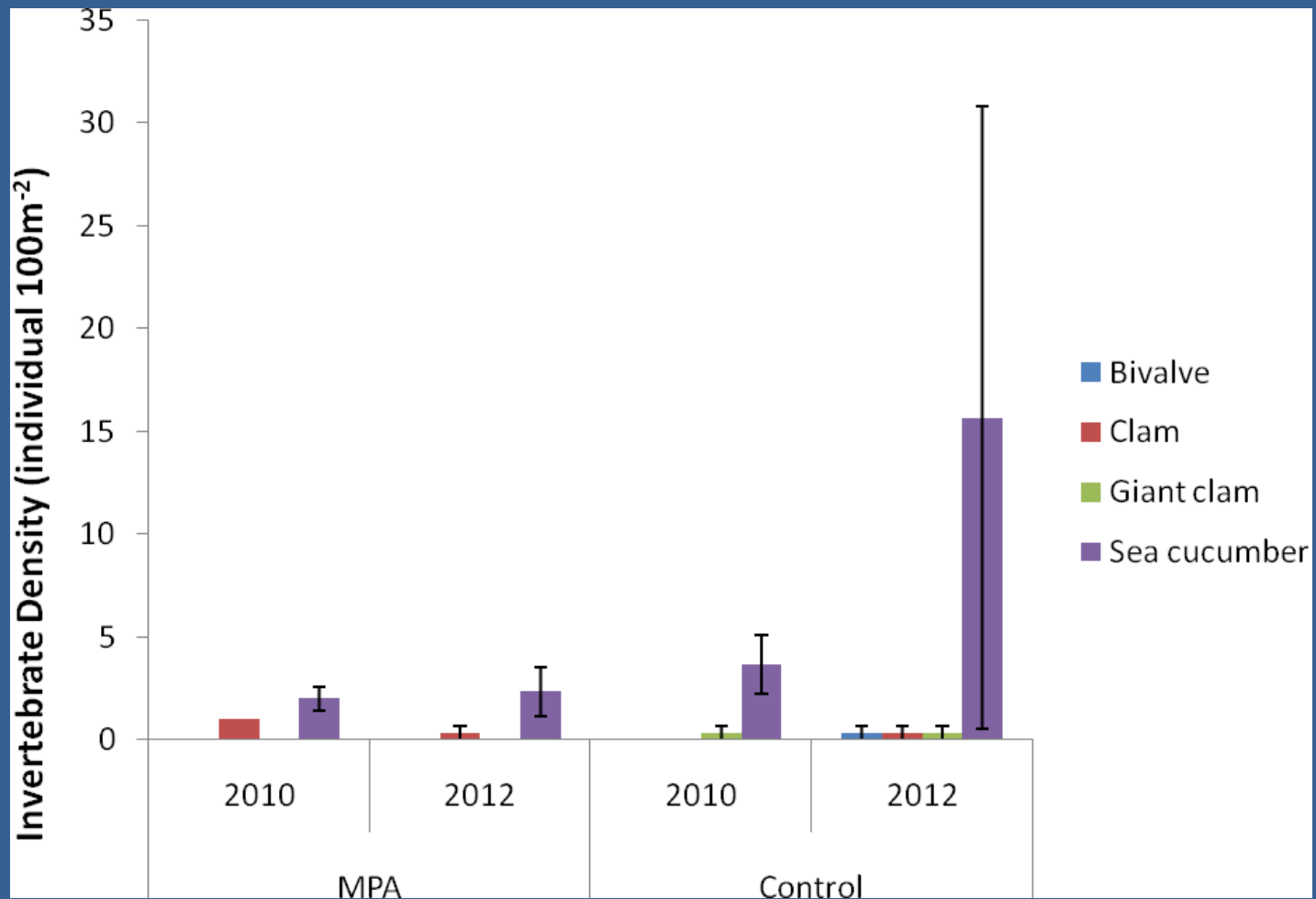
Eye alt 7510 ft



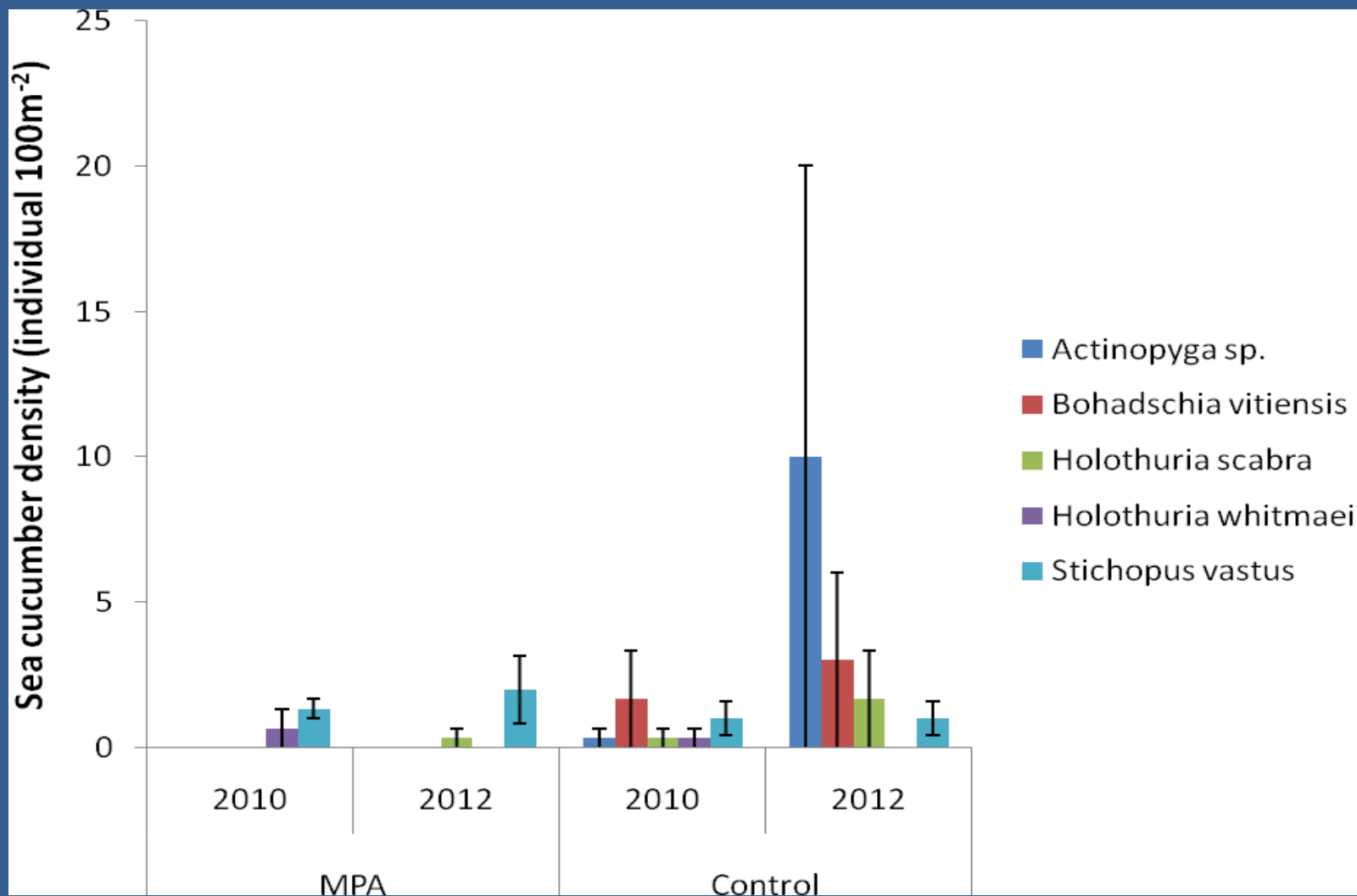
Fish Density - Teluleu MPA vs. Reference Site



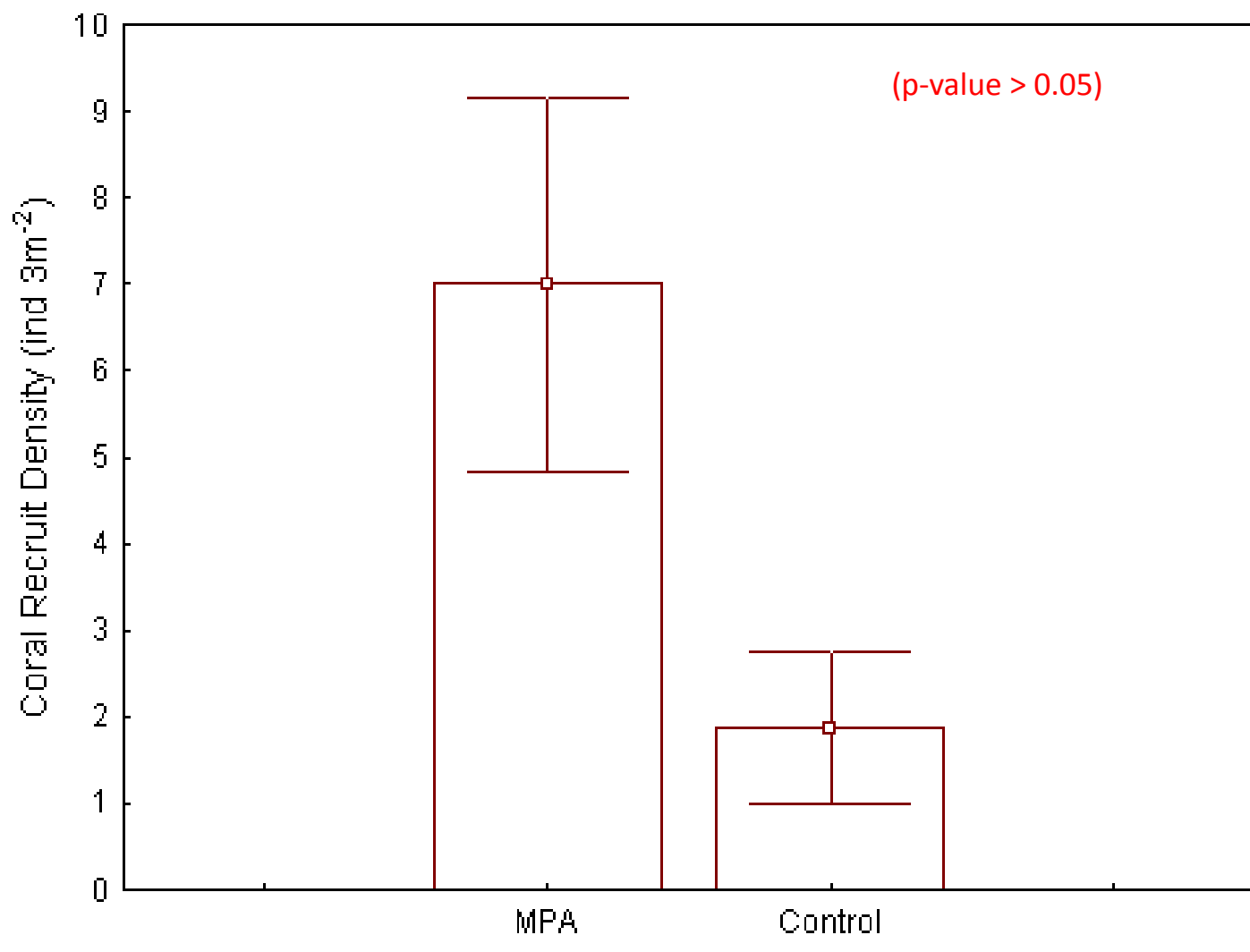
Fish Diversity - Teluleu MPA vs. Reference Site



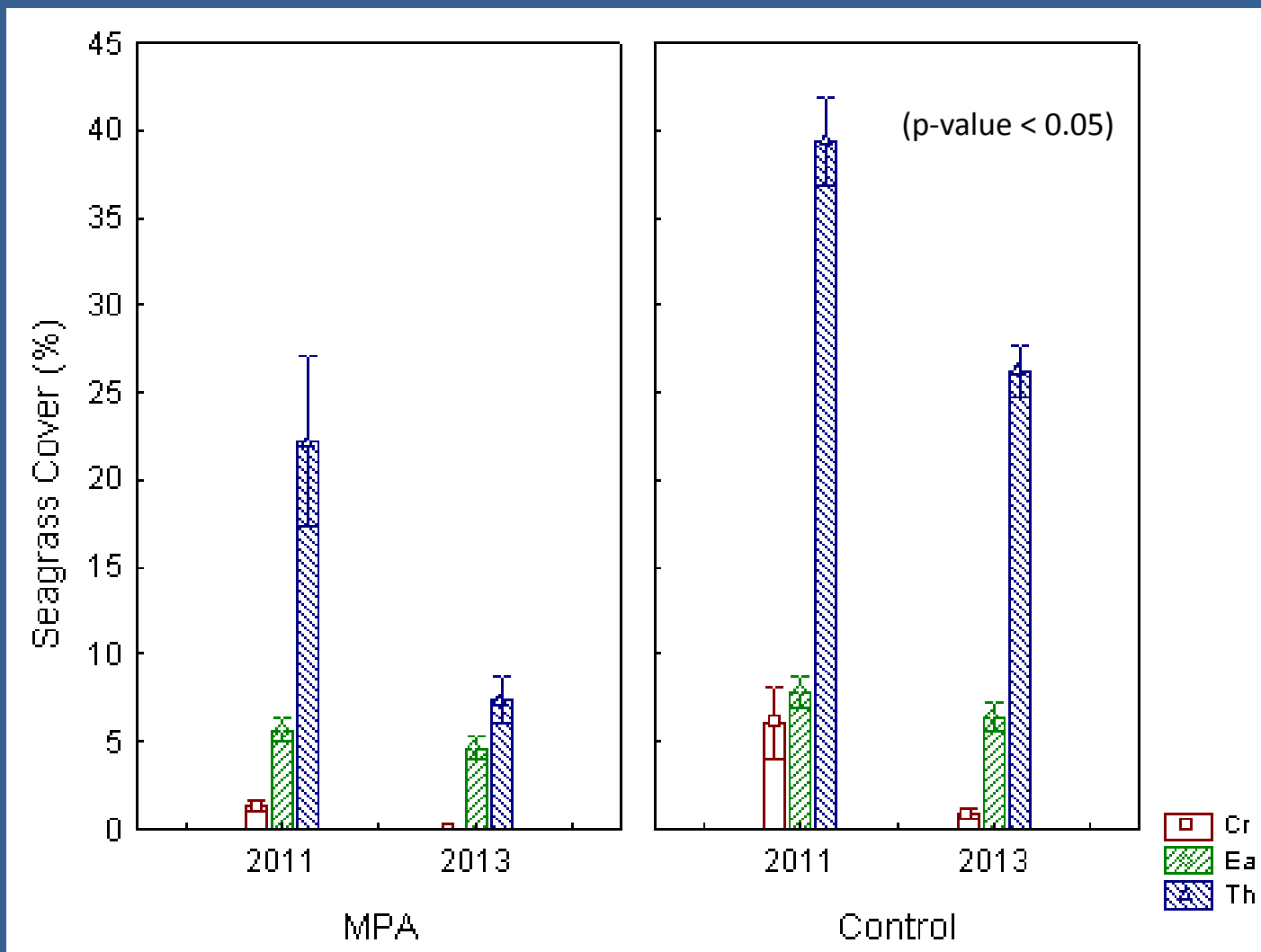
Invertebrate Density - Teluleu MPA vs. Reference Site



Sea Cucumber Density - Teluleu MPA vs. Reference Site



Coral Recruit Density- Teluleu MPA vs. Reference Site



Seagrass Percent Cover - Teluleu MPA vs. Reference Site

- **Need for Long-term Biological Monitoring to see Benefits of MPAs**
- **Need financial support for Local Conservation Efforts and On-going Biological Monitoring**

PROTECTED AREAS NETWORK

Issues

Current MPAs formed an *ad hoc* system of protected areas

Not necessarily effective for nation-wide biodiversity

Does not incorporate concepts such as resilience and ecological integrity

Ad hoc created protected areas cannot deal with the impact global climate change

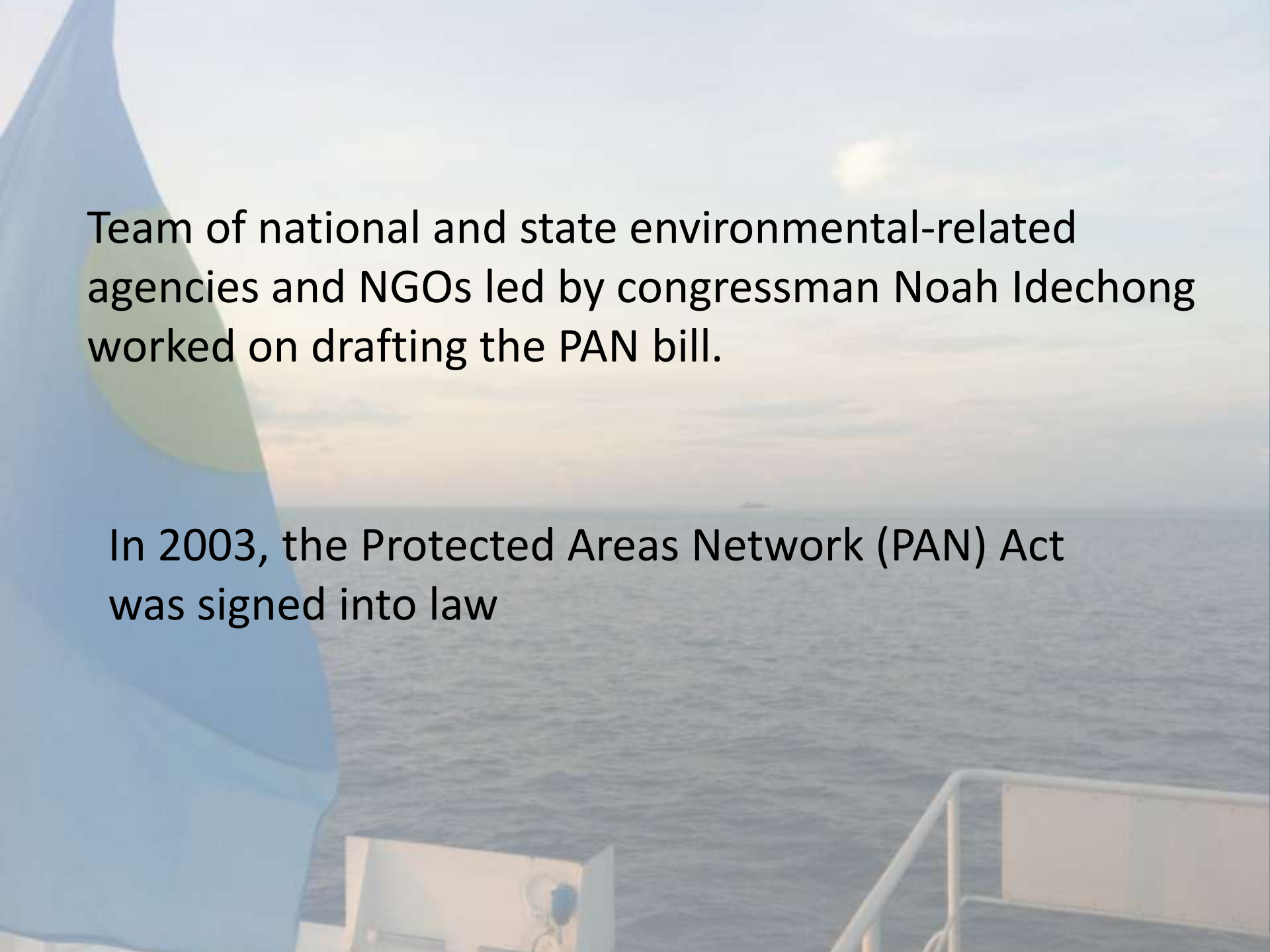


Solutions

We needed to look nationally because we are facing nation-wide issues with conservation

Fish and coral larvae do not recognize community boundaries

Led to the drafting of the Protected Areas Network Act



Team of national and state environmental-related agencies and NGOs led by congressman Noah Idechong worked on drafting the PAN bill.

In 2003, the Protected Areas Network (PAN) Act was signed into law

Purpose of PAN Act

Establish a nationwide network of terrestrial and marine protected areas that will protect areas of significant biodiversity, important habitats, and other valuable resources that are essential to the future social, cultural, economic and environmental stability and health of Palau



Objectives of PAN

Protecting the country's biodiversity

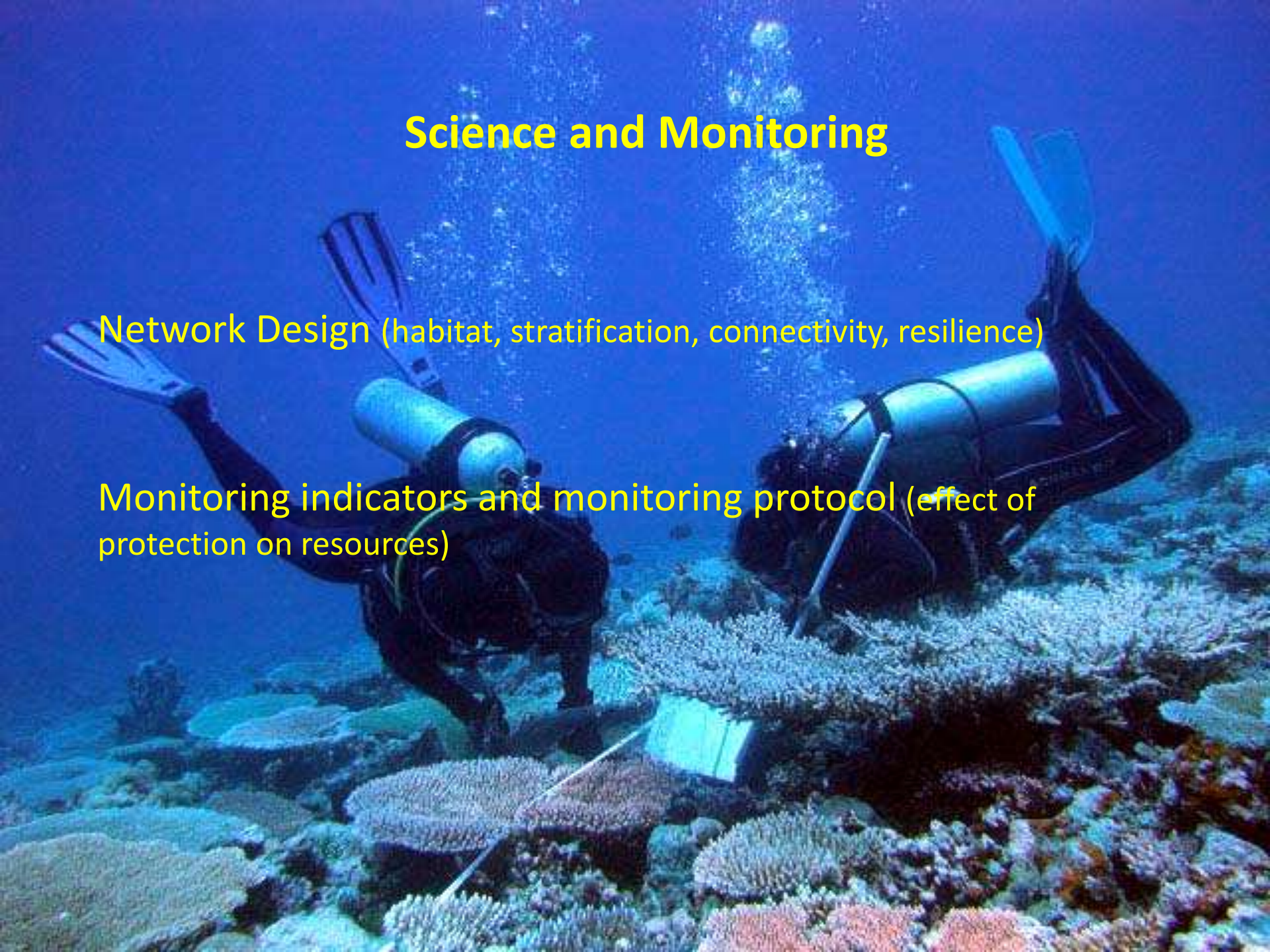
Assist with local management of natural resources



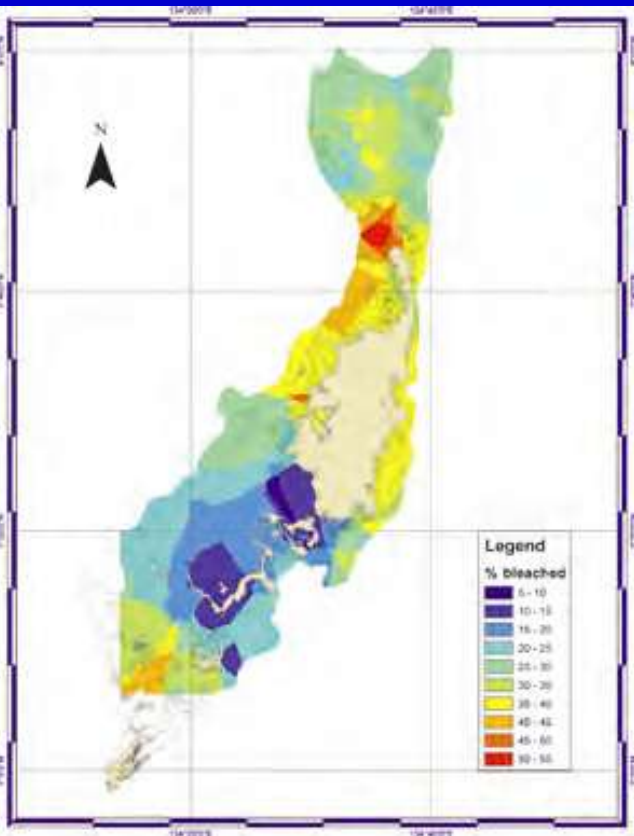
Science and Monitoring

Network Design (habitat, stratification, connectivity, resilience)

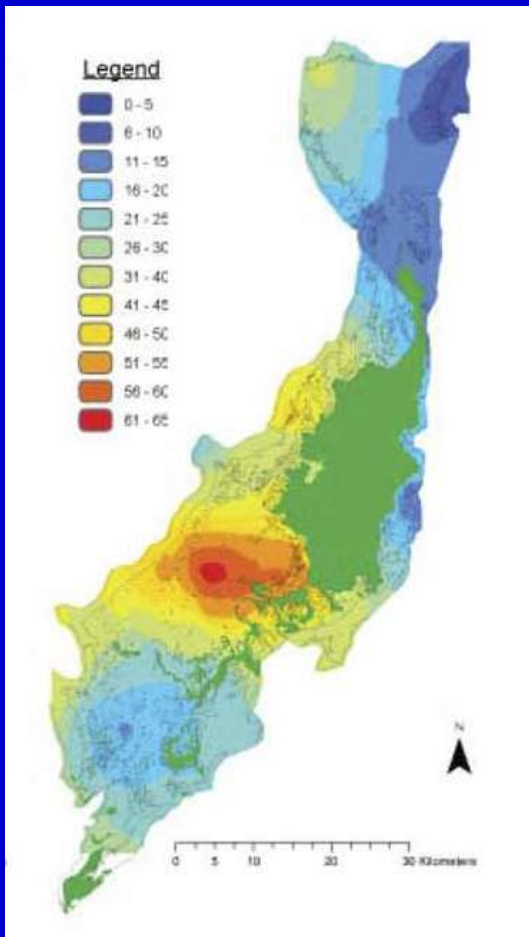
Monitoring indicators and monitoring protocol (effect of protection on resources)



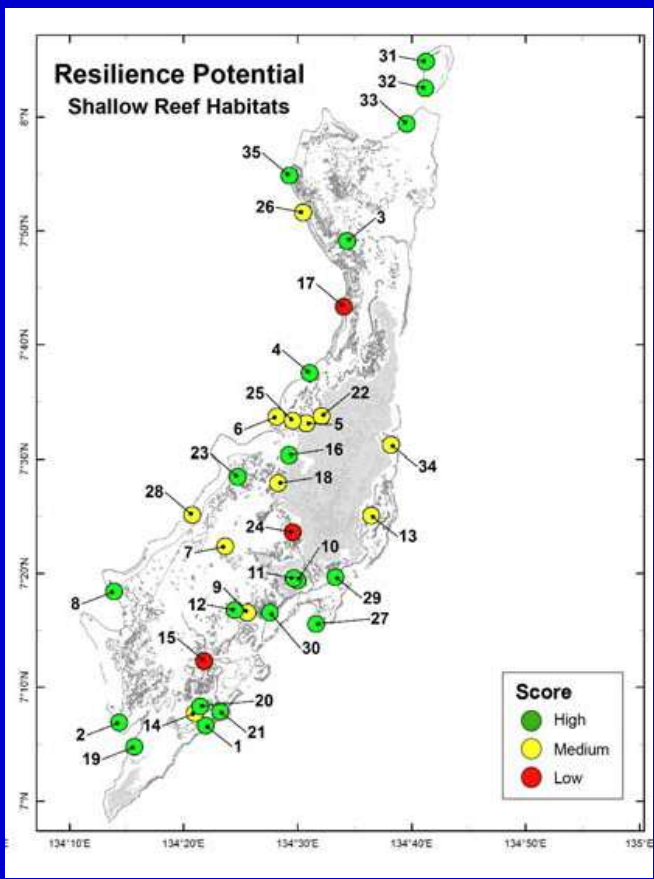
Resistance/Refugia
Coral bleaching 2010
(van Woesik et al 2012)



Resilience/Recovery
From 1998 bleaching
(Golbuu et al. 2012)



Reef Resilience Potential
Field assessment
+ temperature data
+ bleaching records
(McLeod et al. 2012)



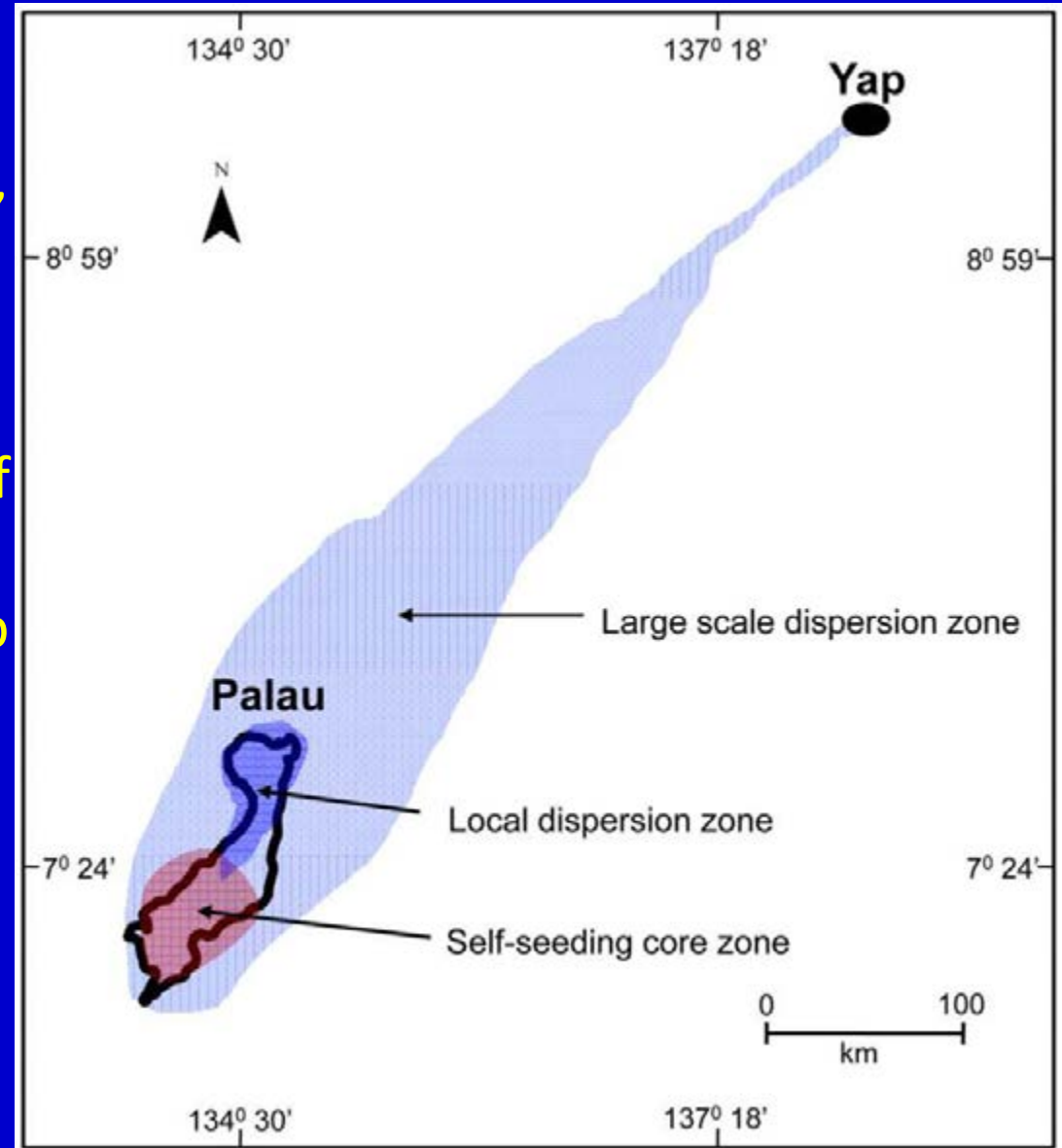
TAKE CONNECTIVITY INTO ACCOUNT IN MPA NETWORK DESIGN

OCEANOGRAPHIC MODEL OF CORAL LARVAE DISPERSAL (GOLBUU ET AL 2012)

3 Temporal & Spatial Scales:

- Local & yearly self seeding, enhanced by high reef density
- Archipelago wide, yearly from other areas (high reef density)
- Regional, decadal from Yap

Coral populations may be maintained by a MPA network in each zone



Effective Management



Training and Capacity Building



Sustainable Financing

Micronesia Challenge Endowment	\$600,000	Assumes 5% net return on \$12 million endowment
Departure Tax Revenue	\$1,200,000	Assumes 80,000 visitors annually
Total Sources	\$1,800,000	

