

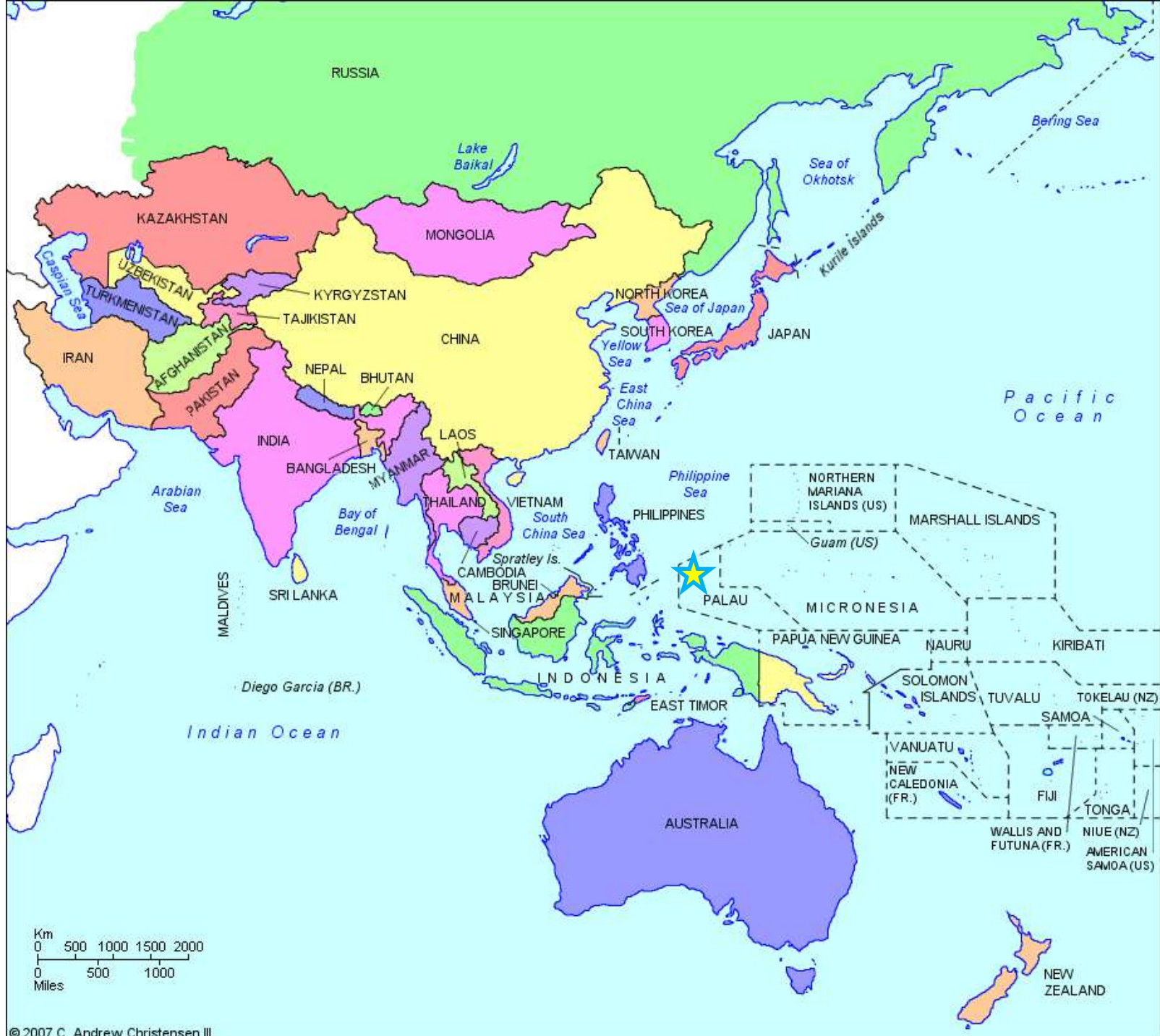
# The Status of Palau's Marine Protected Areas And the Protected Areas Network

**Kevin Polloi**

**Palau International Coral Reef Center**







# Ngerukewid Island Preserve

Established 1956

NO ENTRY





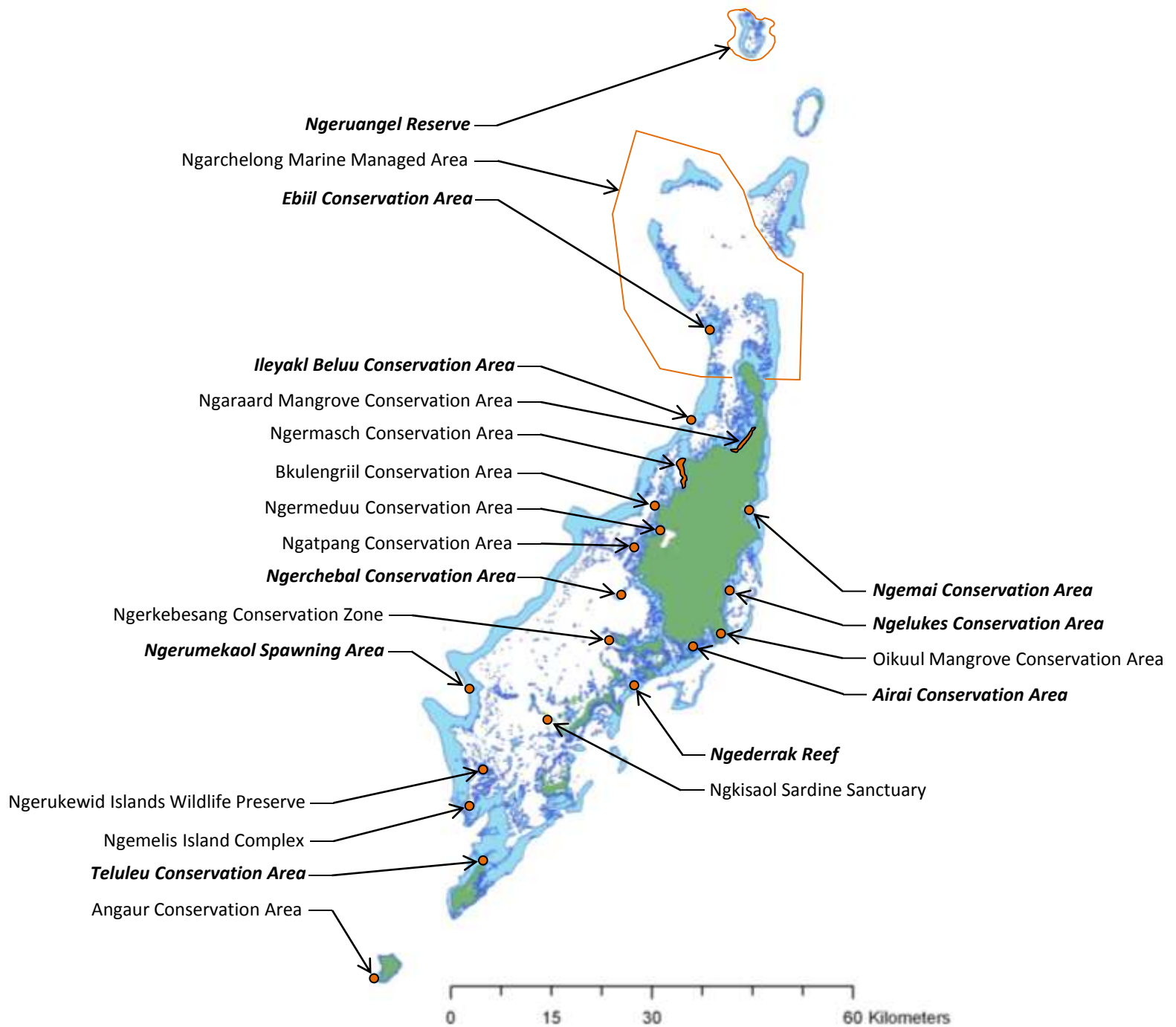


# Ngerumekaol Spawning Area

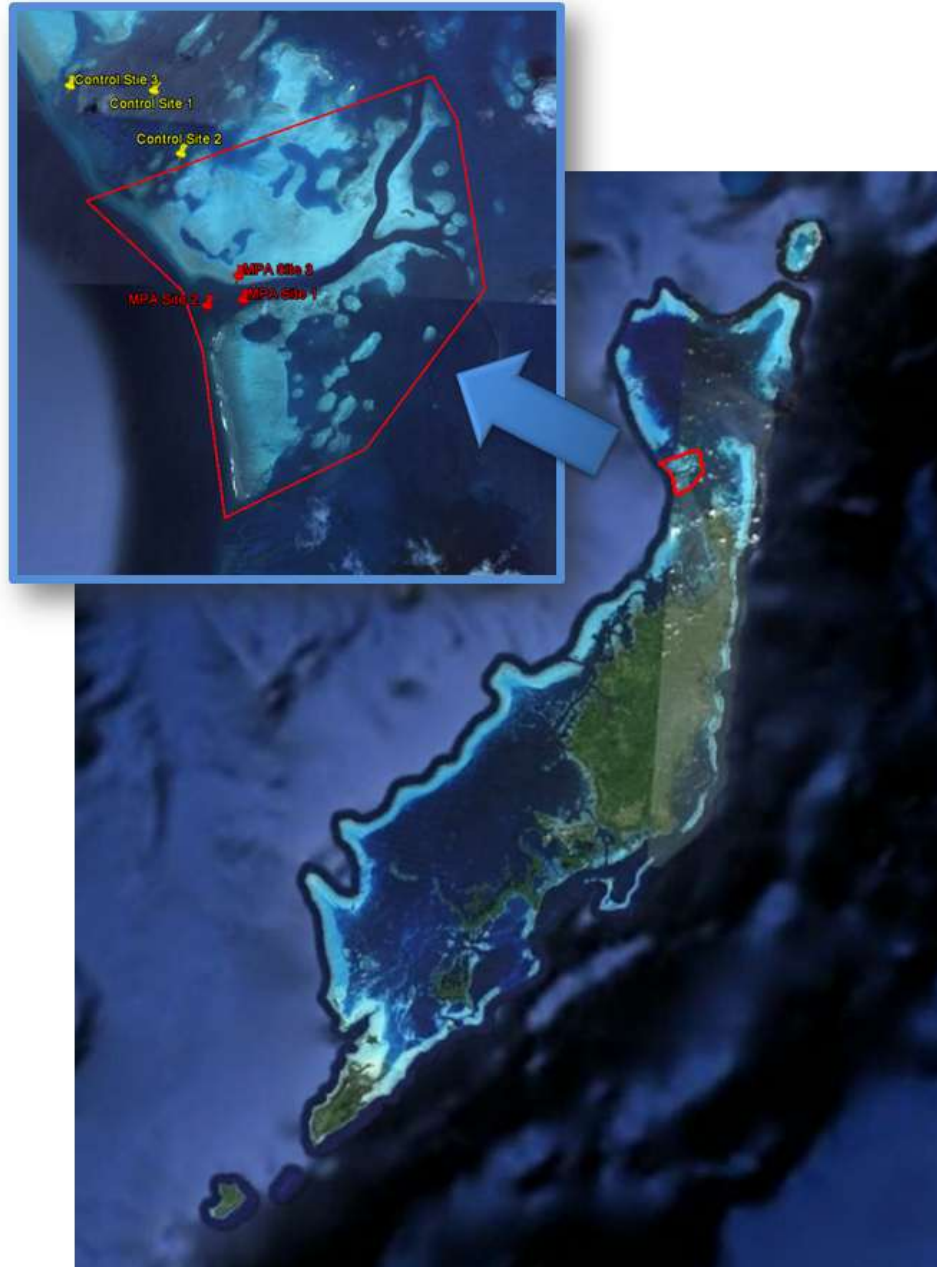
Established 1976

3.5 sq. mi.

**NO TAKE**

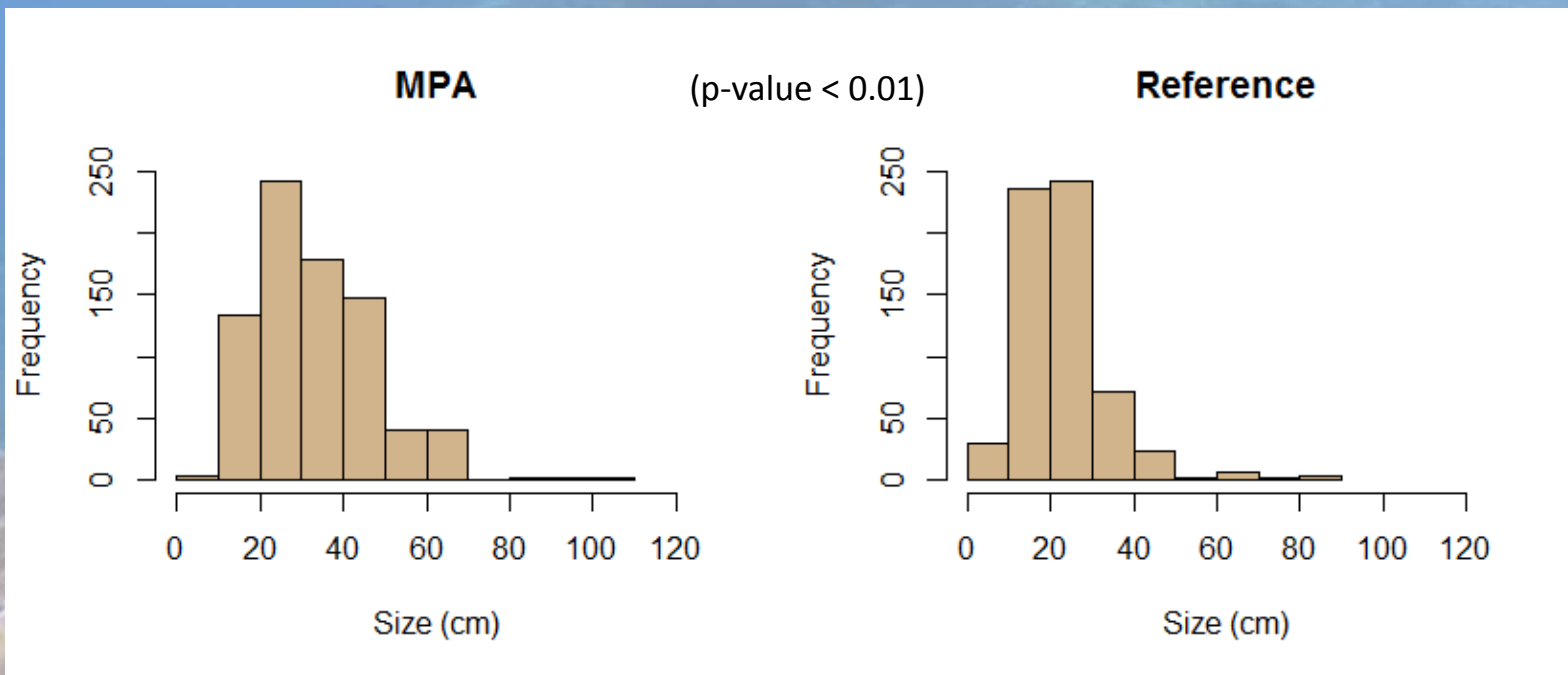


# Ebiil Conservation Area

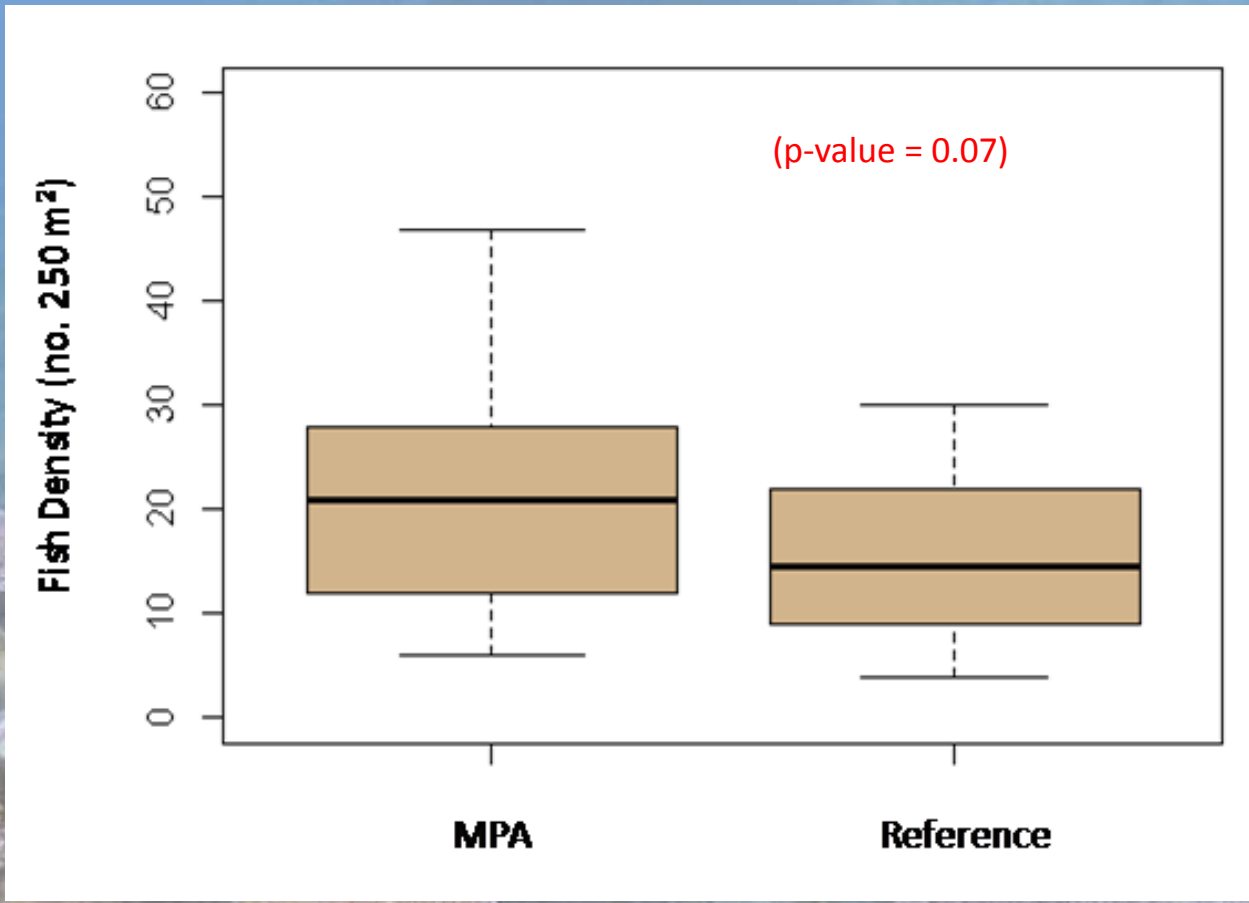


Established 1999  
19.1 sq. km.  
**NO ENTRY**



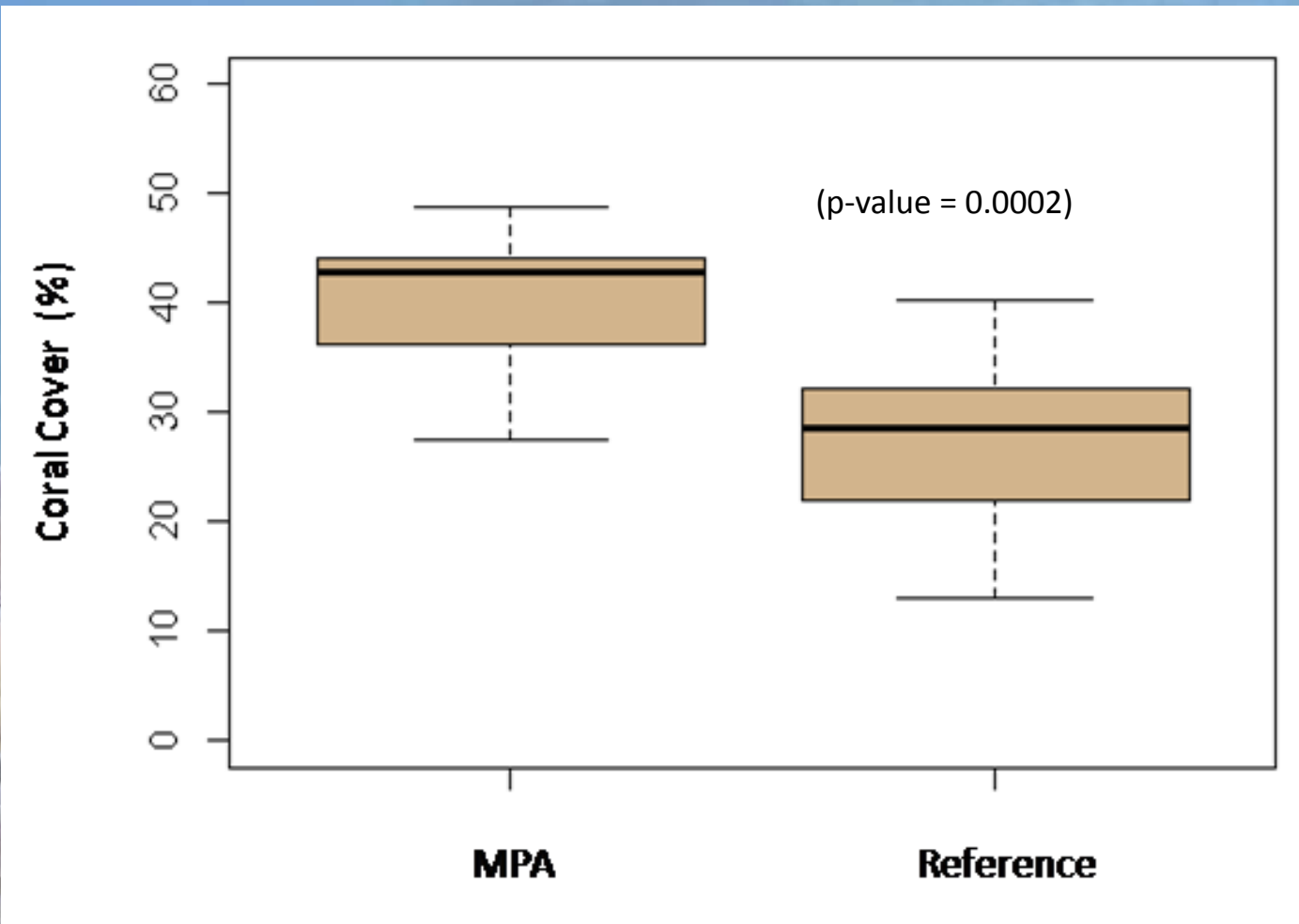


**Fish Size Comparison - Ebiil marine protected area and the reference site**

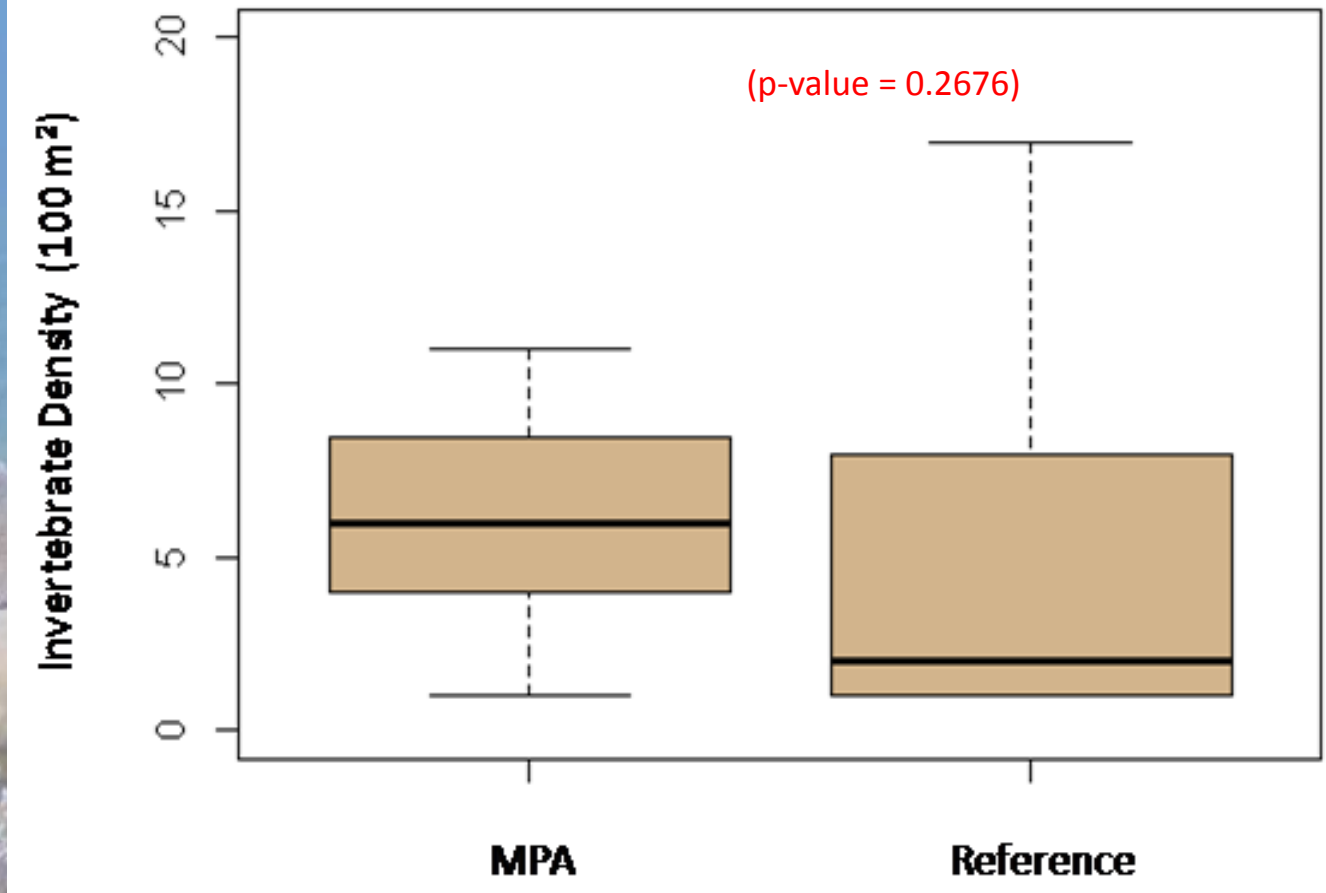


**Fish Density Comparison - Ebiil marine protected area and the reference site**



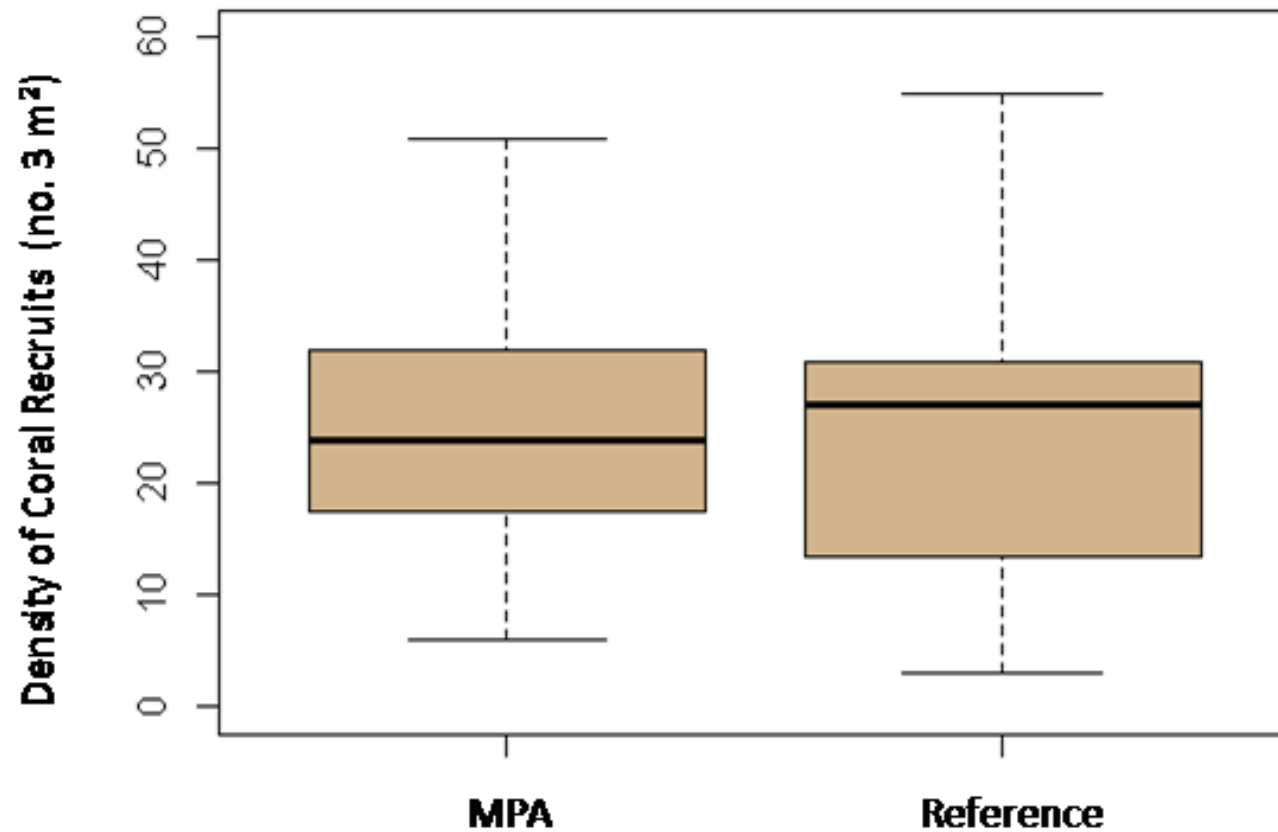


**Coral Cover Comparison - Ebiil marine protected area and the reference site**



**Invertebrate Density - Ebiil marine protected area and the reference site**





**Coral Recruits - Ebiil marine protected area and the reference site**

# Ngemai Conservation Area



Established 1997

1 sq. km.

**NO ENTRY**

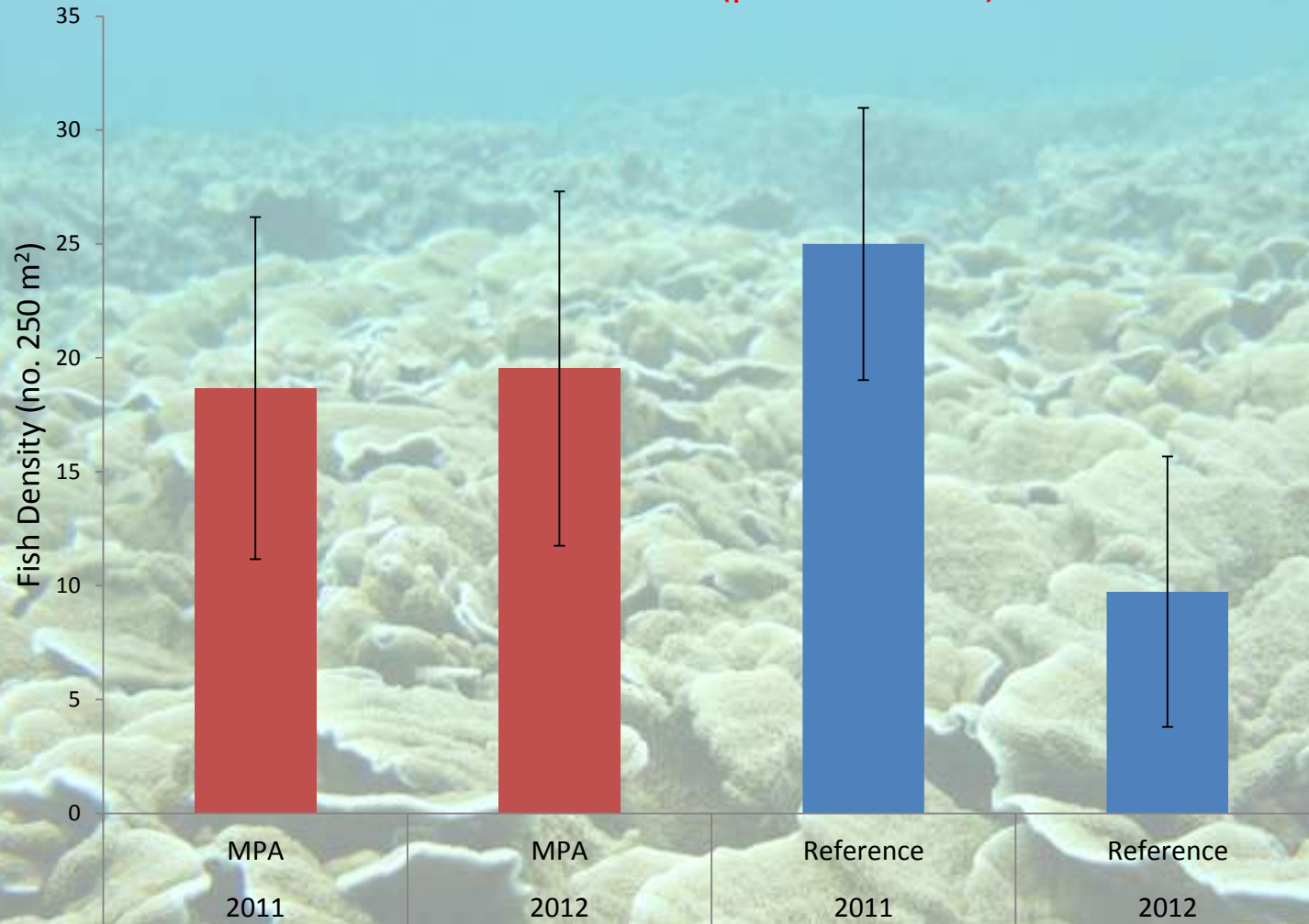
© 2013 Google  
Image © 2013 Google/Earth

Google Earth

Draggers Date: 2/15/2000 101.7221° East 37.6031° E elev: 0 ft view alt: 32946 m

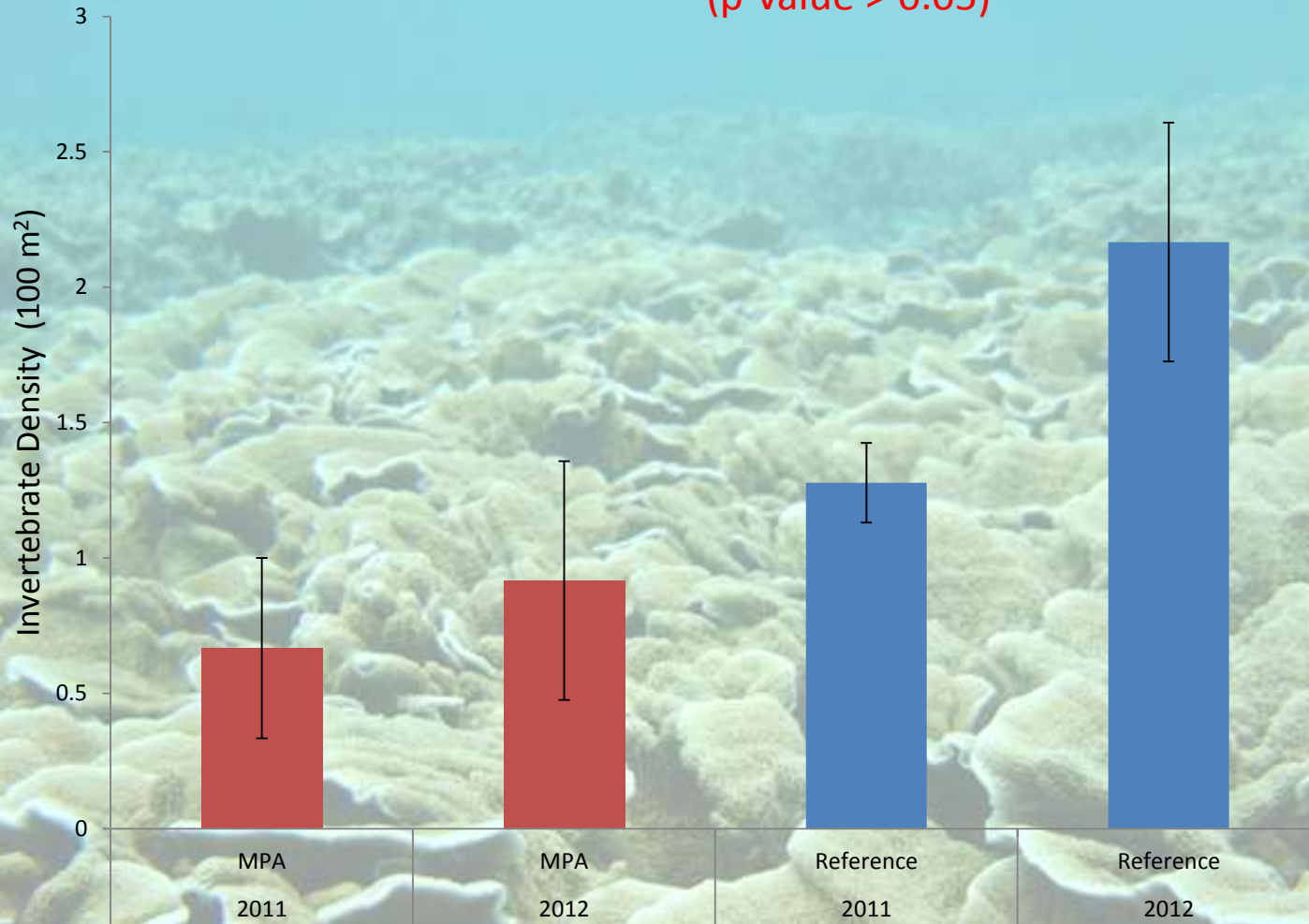


(p-value > 0.05)



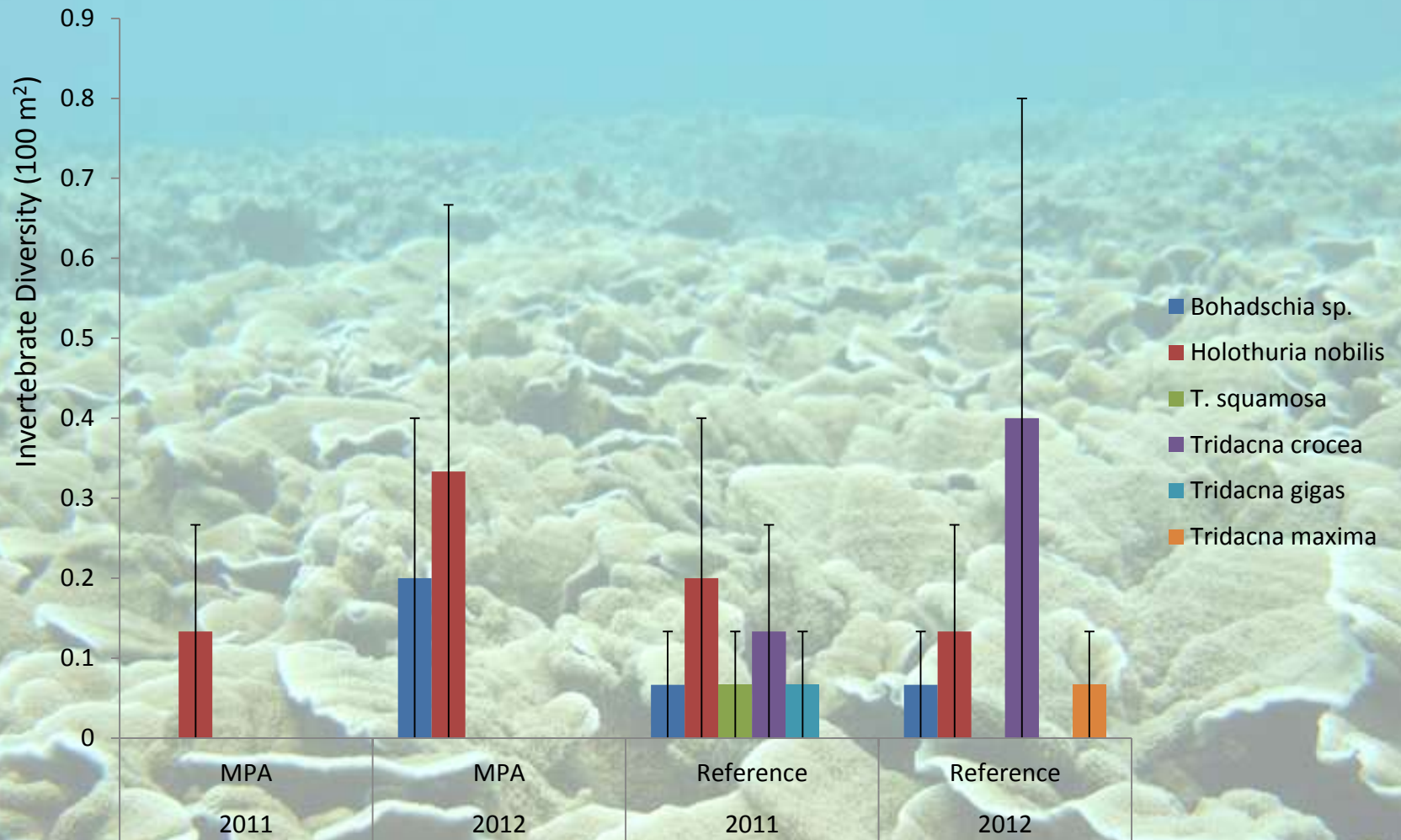
**Fish density in Ngemai MPA and reference site in 2011-2012.**

(p-value > 0.05)

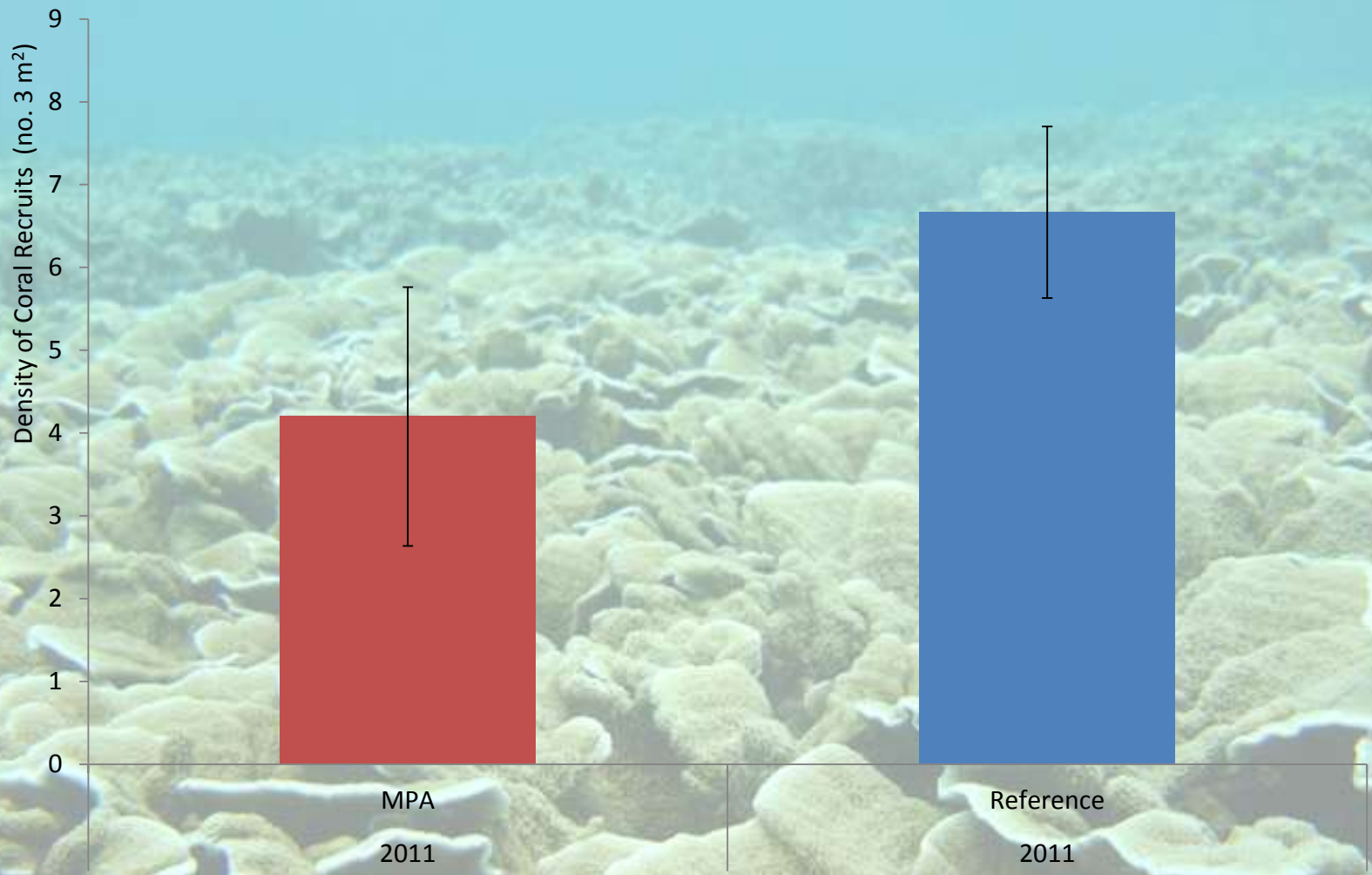


**Invertebrate Density in Ngemai MPA and reference site in 2011-2012.**





**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

©2009 Google

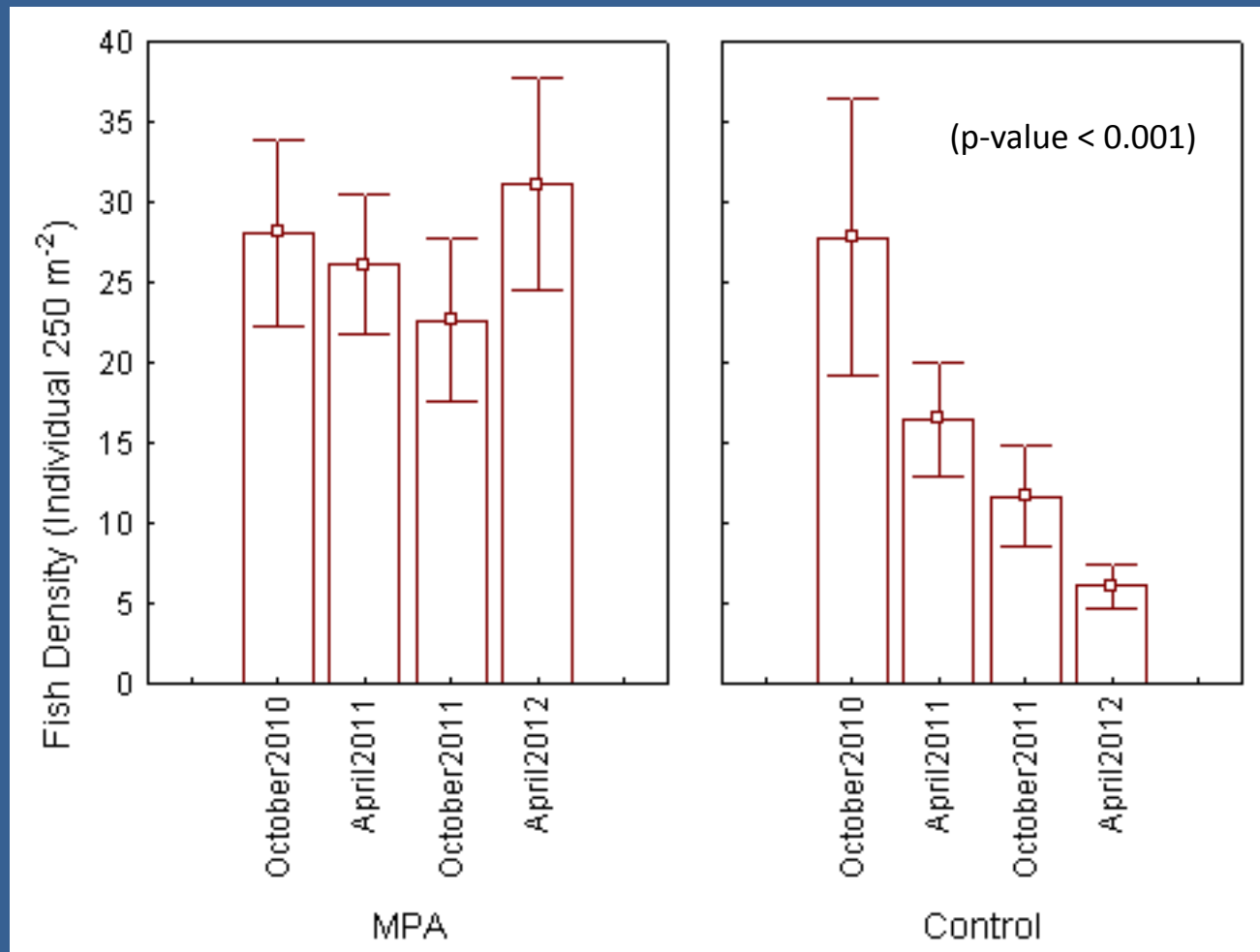
2069 ft

Imagery Date: Feb 27, 2006

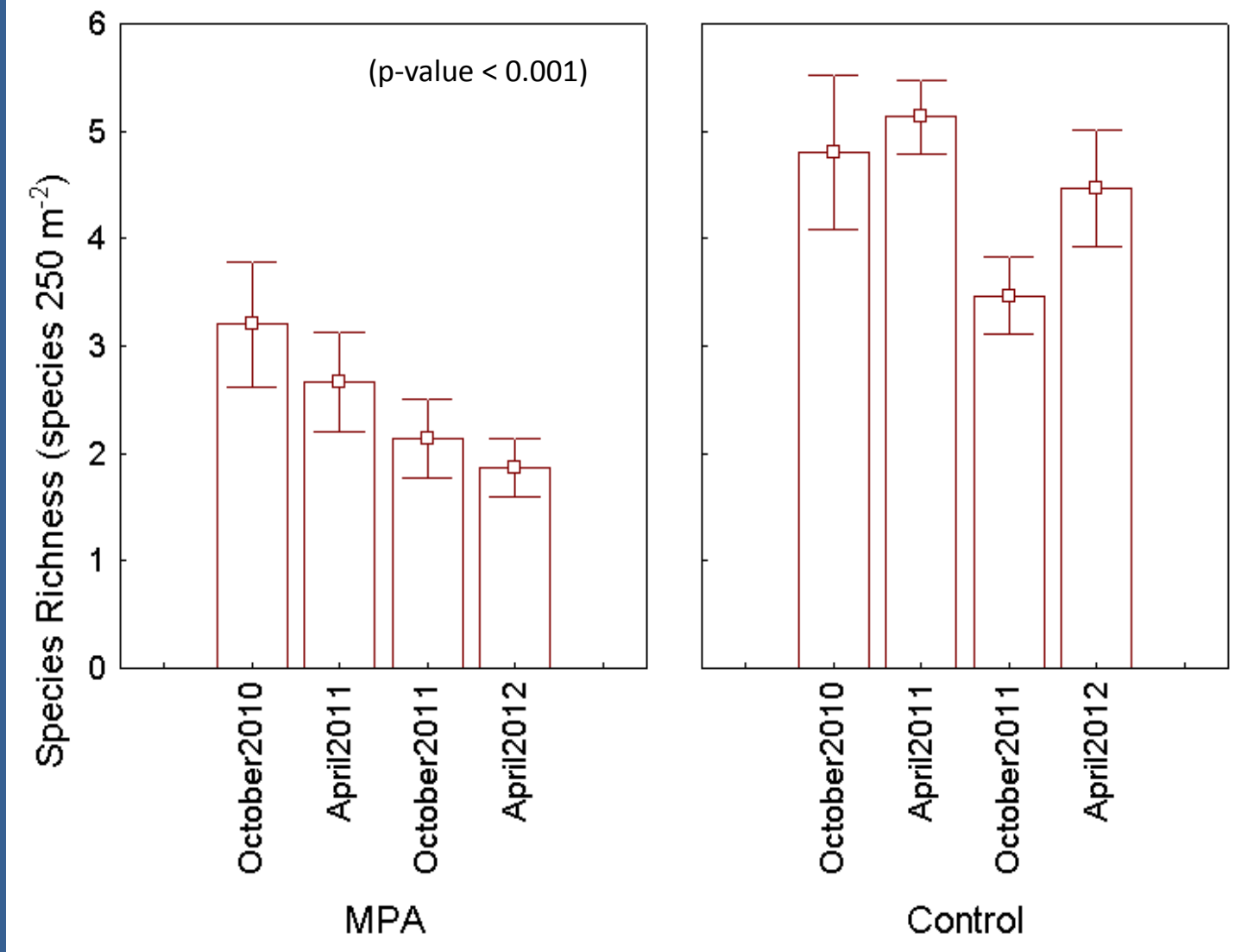
7° 2.864' N 134° 16.318' E elev 0 ft

Eye alt 7510 ft

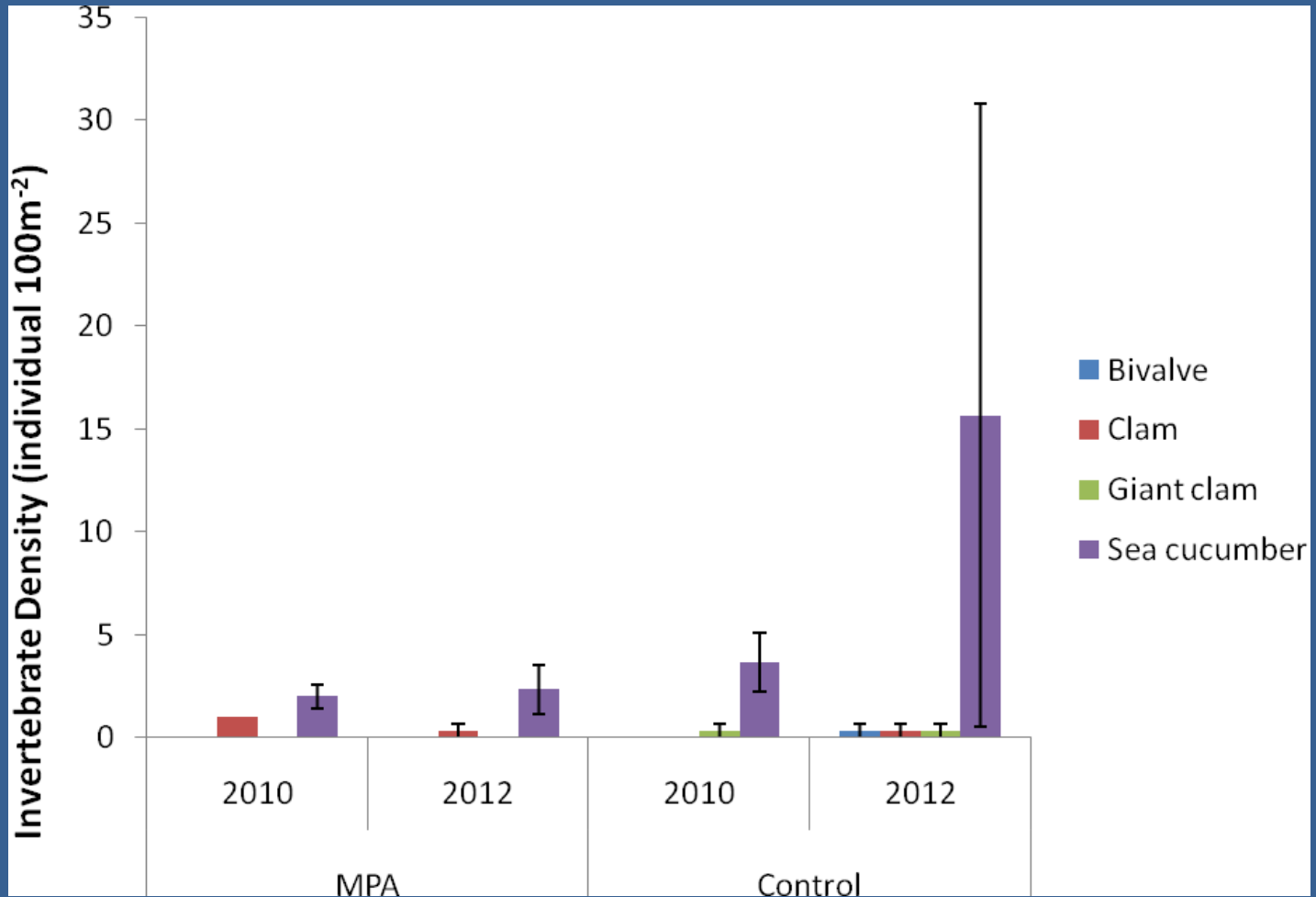




**Fish Density - Teluleu MPA vs. Reference Site**

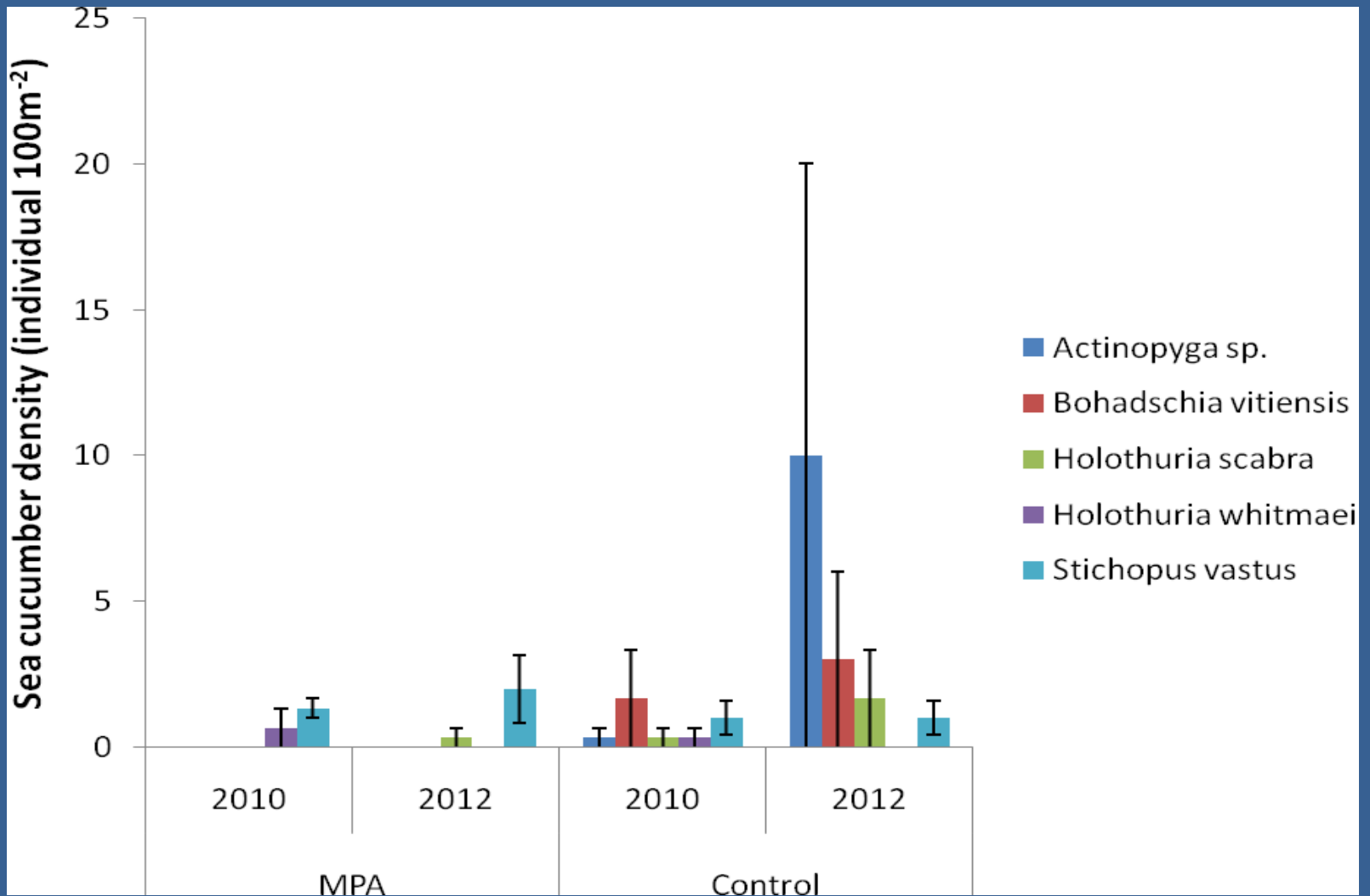


**Fish Diversity - Teluleu MPA vs. Reference Site**

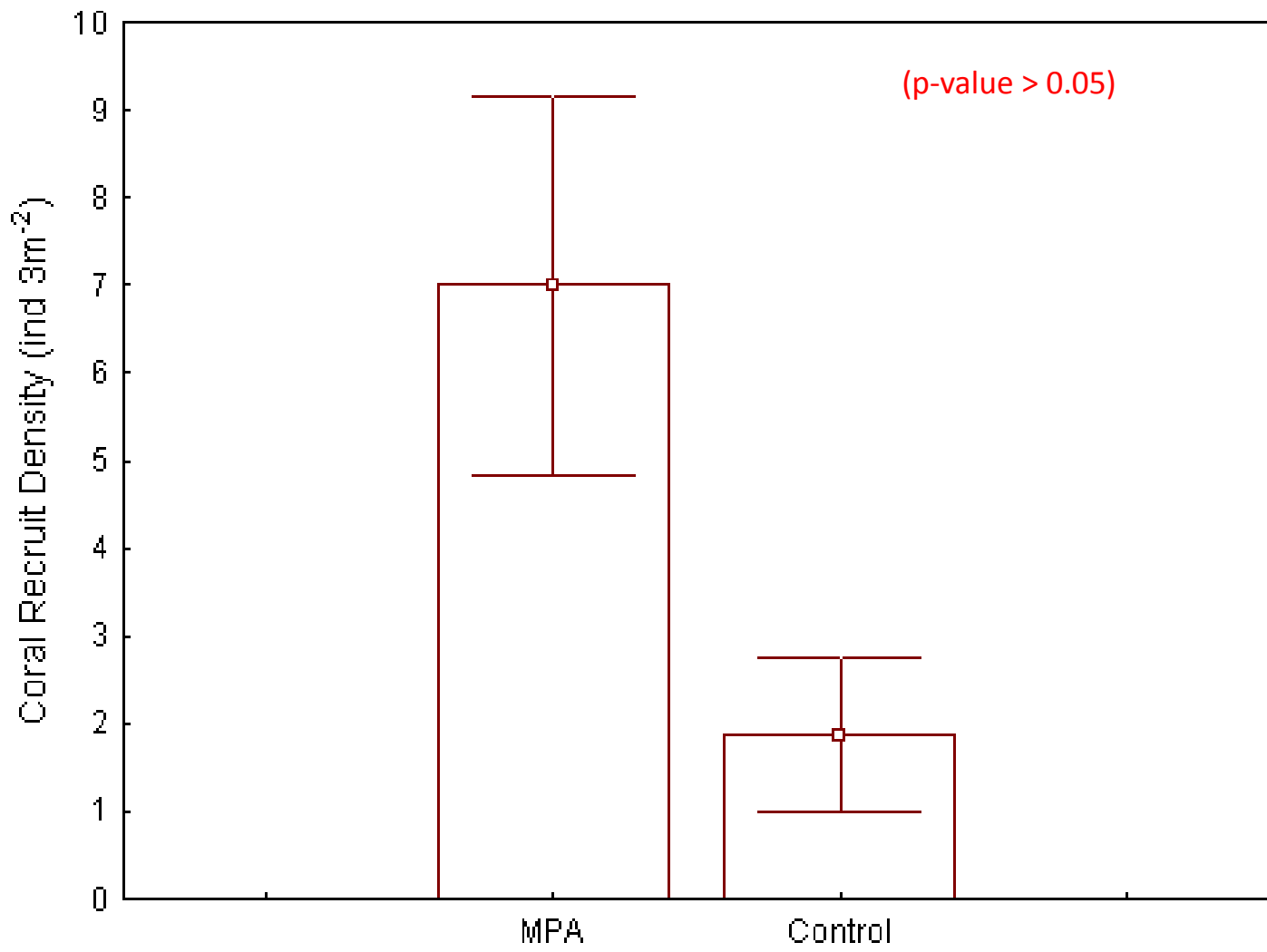


**Invertebrate Density - Teluleu MPA vs. Reference Site**

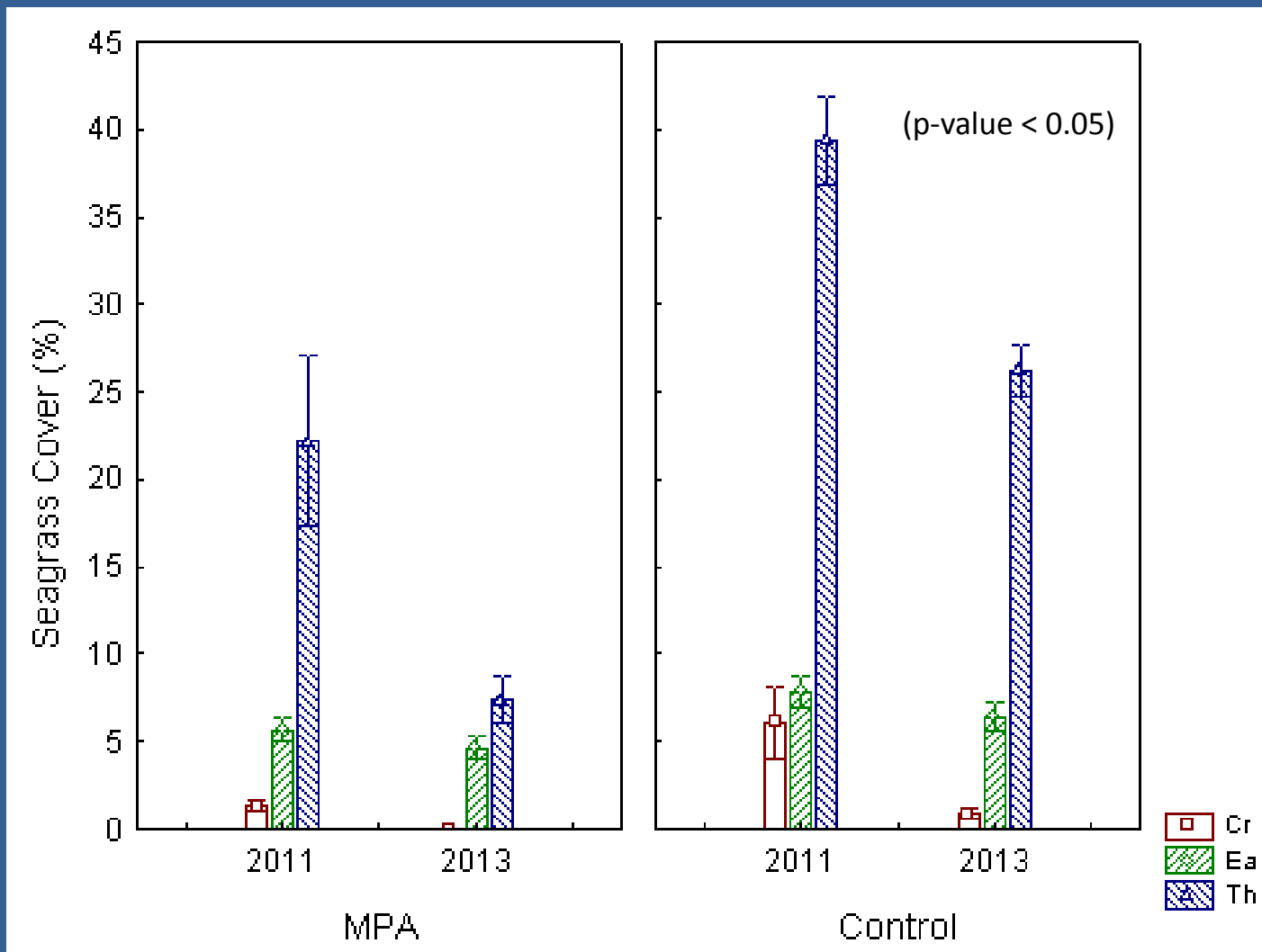




**Sea Cucumber Density - Teluleu MPA vs. Reference Site**



**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





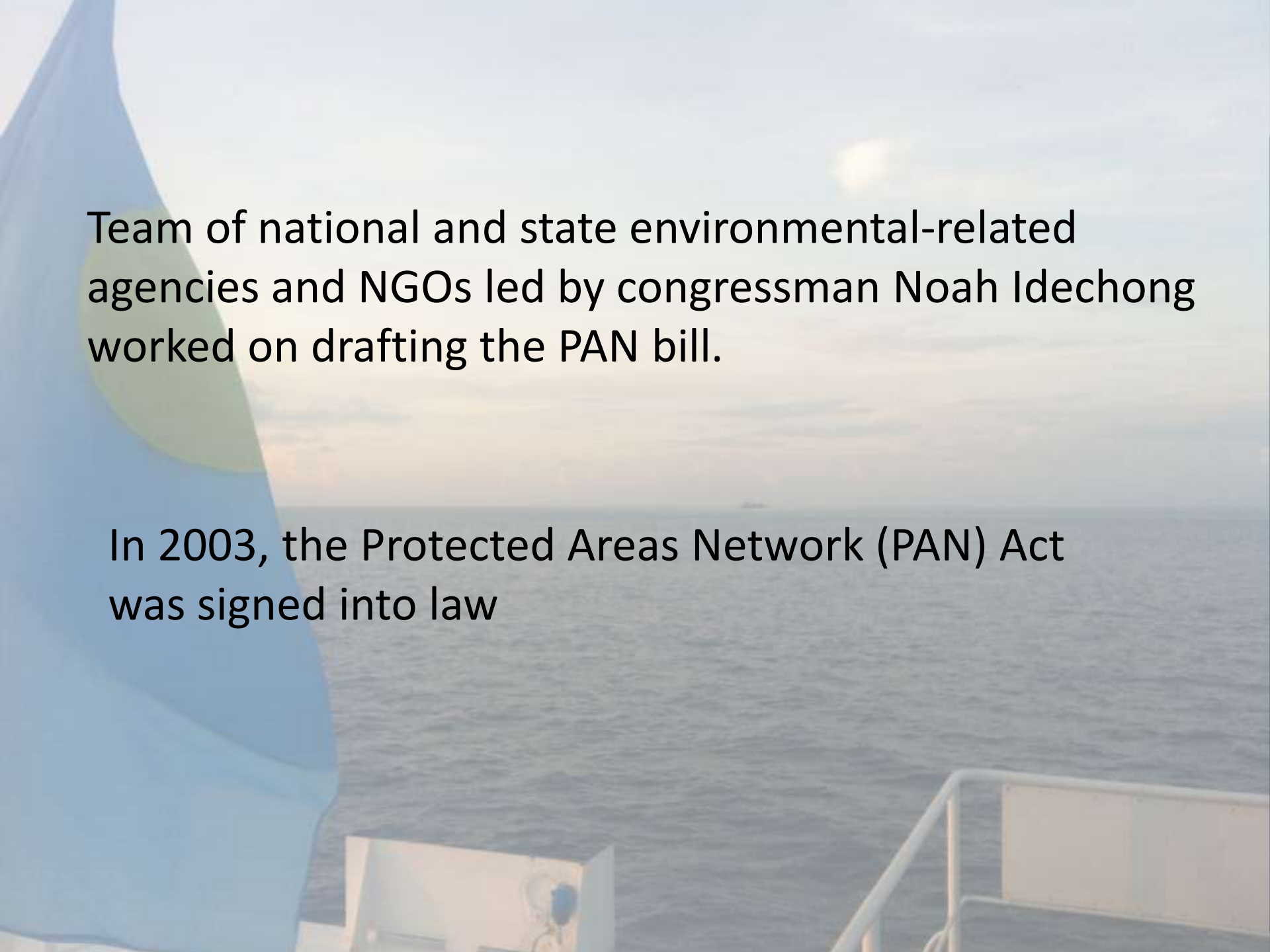


# Solutions

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

A photograph of a boat on the water at sunset or sunrise. The sun is low on the horizon, creating a warm glow. A blue flag is visible in the foreground on the left side. The water is calm, and the sky is a mix of light blue and orange.

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

A photograph of two divers in a coral reef. The divers are wearing black wetsuits, blue fins, and silver scuba tanks. They are positioned on either side of a large, branching coral structure. The water is clear and blue, with bubbles rising from the divers. The coral reef is diverse, with various shapes and colors of coral.

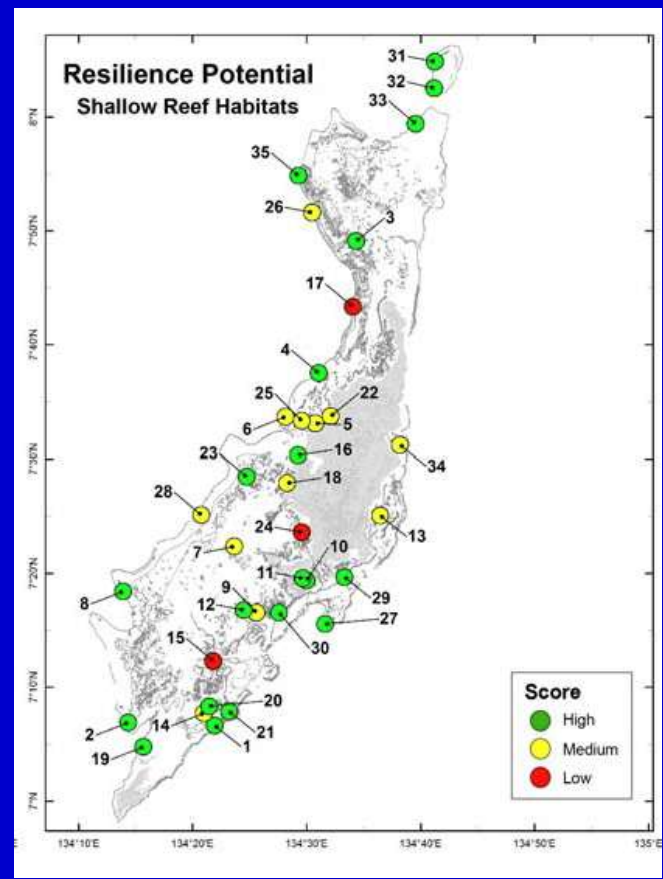
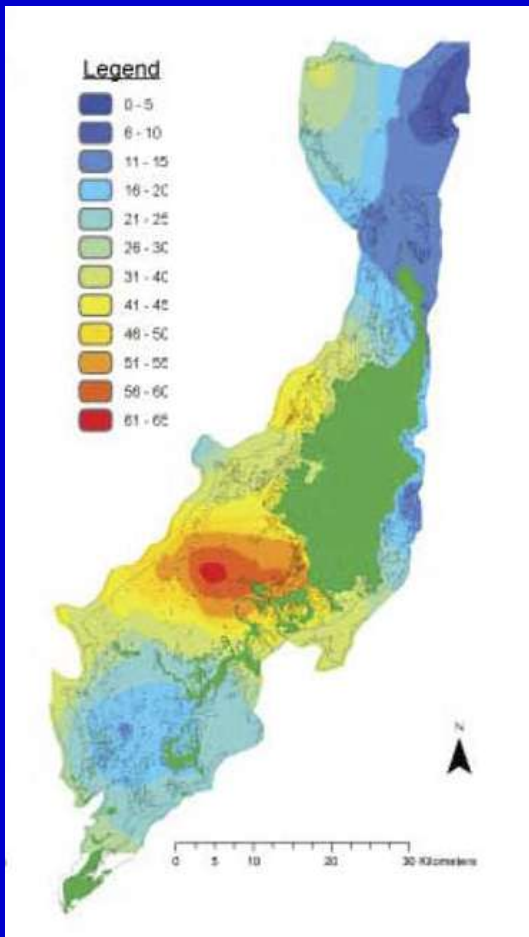
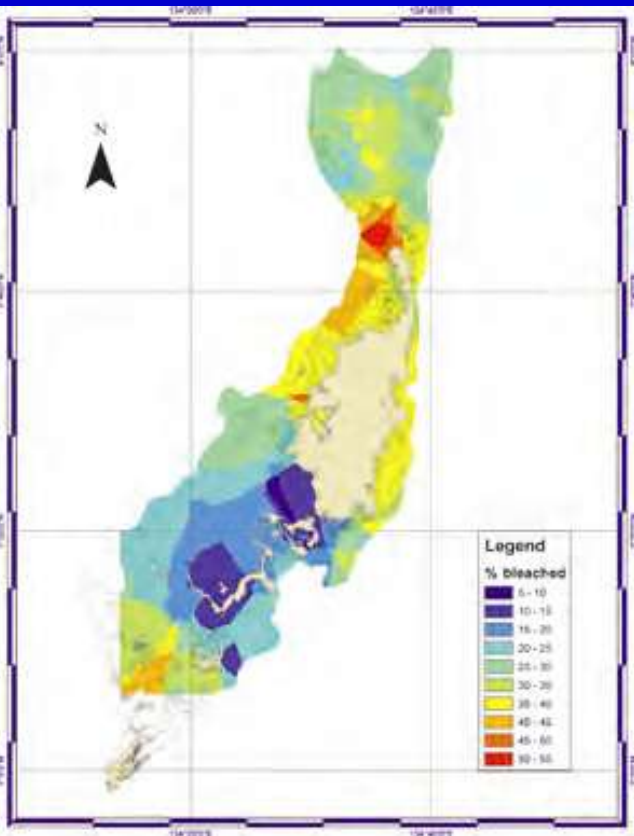
Network Design (habitat, stratification, connectivity, resilience)

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)





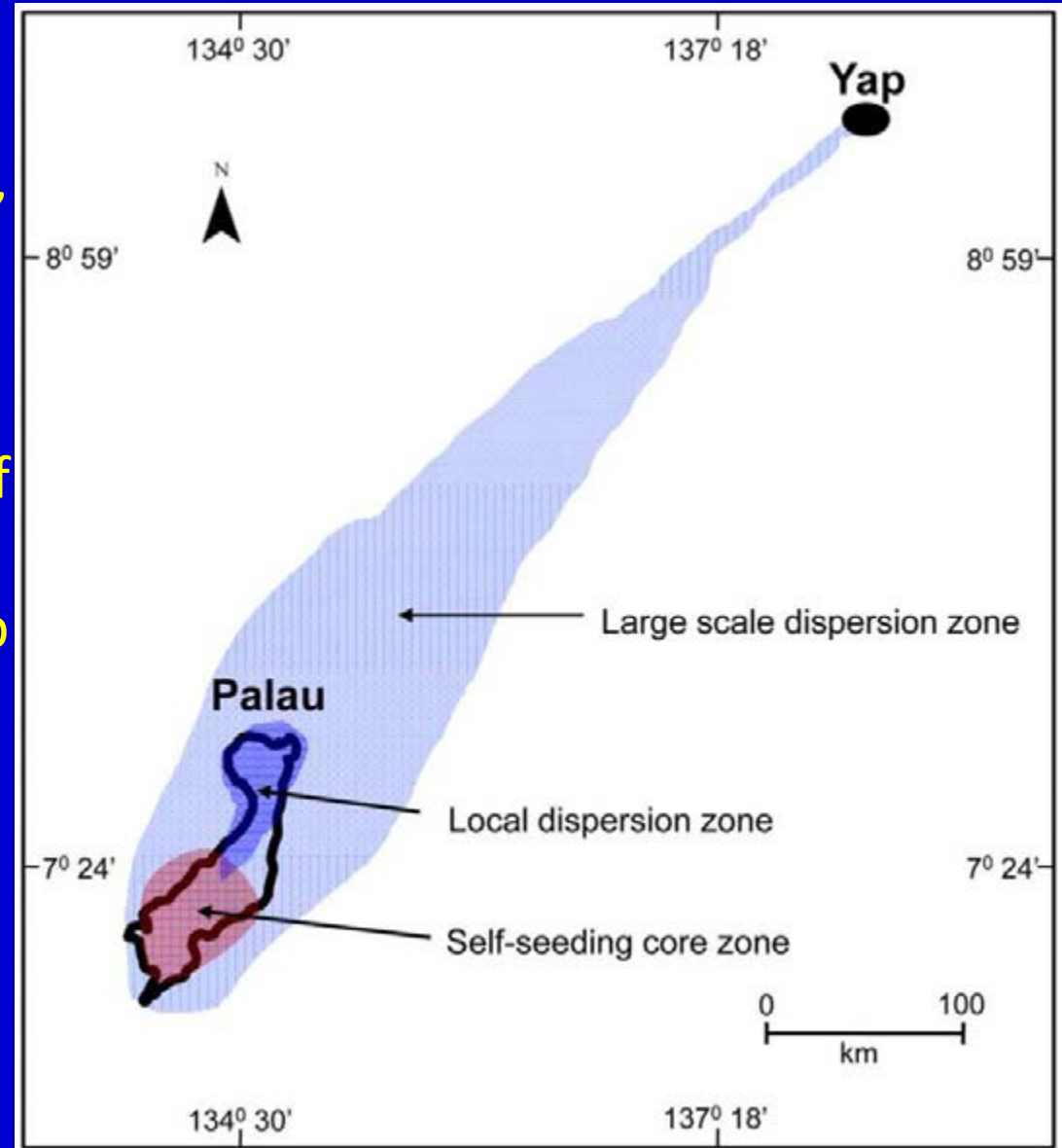
# TAKE CONNECTIVITY INTO ACCOUNT IN MPA NETWORK DESIGN

## 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	

